

# The Crosley Service Supplement

No. 1.

Supplement to Crosley Broadcaster

Nov. 1, 1929

## Reception Troubles and Their Usual Causes

Not including fading, outside interference (such as static, interference from electrical machinery), etc., which will be covered in a subsequent Service Supplement.

### A. ALTERNATING CURRENT RECEIVERS.

| Trouble  | Possible Causes   | Tests   |
|--|---|---|
| <b>I. No tubes light</b>                                 | 1. Power off at socket . . . . .  | Plug in lamp at socket, or use voltmeter across lines.  |
|  | 2. Fuse blown . . . . .   | Try new fuse, noting whether or not tubes light.  |
|  | 3. A. C. receiver on D. C. line, or vice versa . . . . .  | See rating label on chassis.  |
|  | 4. Open in supply cord or primary circuit of power transformer . . . . .                          | Try continuity tests.   |
| <b>II. One or more tubes (but not all) fail to light</b> | 1. Burned out tube or tubes . . . . .   | Try other tubes.  |
|  | 2. Open in power transformer secondary supplying filaments . . . . .                              | Use voltage tests at socket, or continuity tests.   |
|  | 3. Short or open filament circuit . . . . .   | Same as 2.  |
| <b>III. Tubes light but signals are not received</b>     | 1. Antenna, ground, or both disconnected, or open circuit or short in same . . . . .              | Inspect aerial and ground system.   |
|  | 2. Output to speaker not connected, or open in output-speaker circuit . . . . .                   | Inspect connections. Check output plate voltages.   |
|  | 3. Open or defect in plate circuit of other tubes (e. g., open resistances, etc.) . . . . .       | Check socket plate voltages.  |
|  | 4. Defects in grid circuits (e. g., open resistances, etc.) . . . . .                             | Check voltages of operating grids, and screen grids (if any).   |
|  | 5. Defective speaker . . . . .  | Try different speaker.  |
| <b>IV. Unsatisfactory Volume</b>                         | 1. Aerial shorter than recommended; defects in aerial, ground, or both; poor location . . . . .   | Inspect aerial and ground system for size, shorts, poor insulation, poor connections, etc. If necessary, test with good receiver. |
|  | 2. Low line voltage, fuse should be in "Low" position . . . . .                                   | Check line voltage with A. C. meter.  |
|  | 3. Defective tube or tubes . . . . .  | Try new ones.   |
|  | 4. Improper socket voltages, due to defects in circuit (as defective resistances, etc.) . . . . . | Test to see if "Voltage Limits" are complied with.  |

# **New Service Manual**

---

Beginning with this issue of "The Broadcaster" a service supplement will be included with each number. This will be printed separately on punched sheets of appropriate size for an ordinary three-ring binder. It is planned to cover in these supplements:

1. Crosley service policies.
2. The service department, its organization, etc.
3. Equipment for servicing, both on service calls and in the shop.
4. A radio course abridged from the course in "The Broadcaster," but containing more examples and illustrations with regard to Crosley receivers.
5. Methods of installing receivers, including aerials, grounds, Underwriters' rules, etc.
6. Troubles not in the receiver, outside interference, etc.
7. Troubles in the receiver or loudspeaker, methods of locating them, various tests.
8. Circuits, chasses, test charts, and parts lists for each individual receiver.

The publication of this material will not follow in the exact order listed above. At the present time, for instance, there is need for more complete data on some of the current models. This will be published first, and the more general information will follow after the complete line of receivers and speakers has been covered.

It is obvious that complete information regarding new chasses cannot be published until after they are in production and actual production units are available for photographs, etc. Crosley distributors and dealers, however, require service information at the earliest possible moment. To take care of this situation it is planned to publish the circuit and a general description of each receiver the moment it is placed in production and to follow up this brief description as soon as possible thereafter with a complete series of test charts, photographs, etc.

**We are earnestly desirous of making this supplement better than anything else now available to radio dealers in the way of service information. Comments and suggestions from Crosley dealers and distributors will be appreciated.**

| Trouble  | Possible Causes   | Tests   |
|--|---|---|
|  | 5. Defective speaker . . . . .<br>6. Wrong balancing of neu-<br>trodyne receiver . . . . .<br>7. Defective audio or radio<br>transformer . . . . .<br>8. Defective connections, bad<br>soldering, etc. . . . .  | Try new one.<br>Check balancing.<br>Inspect connections and apply<br>continuity tests.<br>Inspect all connections and sol-<br>dered joints.   |
| <b>V. Intermittent<br/>                     Reception</b>                  | 1. Loose or broken connec-<br>tion in aerial or ground<br>circuit . . . . .<br>2. Loose or broken connec-<br>tion in receiver . . . . .<br>3. Defective speaker or<br>speaker connections . . . . .   | Examine throughout for breaks<br>and poor connections.<br>Check socket voltages and ap-<br>ply continuity tests, jarring<br>receiver while making tests.<br>Try different speaker.  |
| <b>VI. Unsatisfactory<br/>                     Quality</b>                 | 1. Defective or worn out<br>tubes . . . . .<br>2. Wrong socket voltages<br>(especially bias) due to<br>defects in circuit, defect-<br>ive resistors, etc. . . . .<br>3. Defective speaker . . . . .   | Try other tubes.<br>Test to see that socket voltages<br>comply with "Voltage Lim-<br>its".<br>Try another speaker.  |
| <b>VII. A. C. Hum</b>  | 1. Defective tube (especial-<br>ly rectifier) . . . . .<br>2. Poor ground . . . . .<br>3. Shorted choke or con-<br>denser, etc. . . . .<br>4. Inductive pick up of aerial<br>system, ground wire, lead<br>in, etc. from power line<br>or A. C. leads . . . . .<br>5. Other defects in circuit . . . . . | Try other tubes.<br>Inspect.<br>Check socket voltages and ap-<br>ply continuity tests.<br>Inspect. See if disconnecting<br>aerial or ground stops hum.<br>Check socket voltages and apply<br>continuity tests throughout. |
| <b>VIII. Microphonism</b>  | 1. Jarring of receiver . . . . .  | Inspect for cause of jarring<br>(with table type sets try dif-<br>ferent placement of speaker).   |
| <b>IX. Oscillations in Neu-<br/>                     trodyne Receivers</b> | 1. R. F. tubes . . . . .<br>2. Aerial length different<br>from that recommended<br>for receiver, or defective<br>ground . . . . .<br>3. Receiver requires balancing   | Try changing tubes around, or<br>try different tubes in R. F.<br>sockets.<br>Inspect.<br>Check balancing.   |
| <b>X. Oscillations in Screen<br/>                     Grid Receivers</b>   | 1. Aerial too short, or open<br>in aerial-ground circuit . . . . .  | Inspect aerial and ground sys-<br>tem throughout. If neces-<br>sary, test receiver on longer<br>aerial.   |

RECEPTION TROUBLES

| Trouble                      | Possible Causes  | Tests   |
|------------------------------|--|---|
|                              | 2. Defective r. f. tubes or tubes with too high "mu" .<br>3. High-resistance grounds to chassis . . . . .<br>4. Too high line voltage (above 125 with fuse in "High" clips) . . . . .<br>5. Coupling between speaker leads and antenna or ground wires . . . . .<br>NOTE: If other methods fail, connecting a 50 micro microfarads condenser from antenna to ground usually prevents oscillations. | Try other tubes in r. f. sockets.<br>Try tightening up all connections to chassis. Examine variable condenser rotor connections.<br>Test line voltage with A. C. meter.<br>See that leads are as far removed as possible. |
| <b>XI. Excessive Heating</b> | 1. Shorted primary or secondary of power transformer . . . . .   | Apply continuity tests.   |

B. DIRECT CURRENT RECEIVERS (110 OR 220 VOLT)

| Trouble  | Possible Causes   | Tests  |
|--|---|--|
| <b>I. No tubes light</b>                                 | 1. One or more tubes "burned out" . . . . .<br>2. Power off at socket . . . . .<br>3. Fuse or fuses blown . . . . .<br>4. Open in supply cord or filament circuit . . . . . | In some of these receivers all of the tube filaments are in series, and if one burns out all will fail to light. In other receivers certain groups of tubes are in series, while some tubes are in parallel. See circuit diagram of receiver, and check accordingly.<br>Plug in lamp at socket, or test with voltmeter across lines.<br>Try new fuse or fuses (some D. C. receivers have 2 fuses, one on chassis and one on supply cord).<br>Apply continuity tests. |
| <b>II. One or more tubes (but not all) fail to light</b> | 1. Burned out tube . . . . .<br>2. Defect in filament circuit . . . . .   | Possible only in cases where filaments of some tubes are paralleled (see circuit diagram). See 1, above.<br>See above. Apply continuity tests.   |
| <b>III. Tubes light but signals are not received</b>     | 1a. Polarity may be reversed . Otherwise same as for A. C. receivers, which see.  | Check as outlined in instructions accompanying receiver.   |
| <b>IV. Unsatisfactory Volume</b>                         | Same as for A. C. receiver, which see, except . . . . .   | Test line voltage with D. C. meter.  |

| Trouble   | Possible Causes   | Tests |
|---|---|-------|
| V. Intermittent Reception,<br>VI. Unsatisfactory Quality,<br>VII. Microphonism,<br>VIII. Oscillations in Neutrodyne Receivers, and<br>IX. Oscillations in Screen Grid Receivers | Same as for A. C. receivers, which see.<br><br>NOTE: VII and XI under "A. C. Receivers" do not apply to D. C. |       |

C. BATTERY RECEIVERS

| Trouble   | Possible Causes   | Tests   |
|---|---|---|
| I. No tubes light                                 | 1. "A" battery run down . . .<br>2. Bad connections or open circuit . . . . .   | Test with voltmeter or hydrometer.<br>Inspect wiring and apply continuity tests.  |
| II. One or more tubes (but not all) fail to light | 1. Defective tubes . . . . .<br>2. Open or short circuit . . .  | Try other tubes.<br>Apply continuity tests.   |
| III. Tubes light but signals are not received     | 1. Wrong battery connections<br>2. "B" voltage low . . . . .<br>3. Defect in antenna or ground circuit or connections . .<br>4. Defective or worn out tube or tubes . . . . .<br>5. Defective speaker or speaker leads . . . . .<br>6. Defective plate or grid circuit . . . . .  | Inspect.<br>Test with voltmeter.<br>Inspect.<br>Try other tubes.<br>Try another speaker.<br>Test socket voltages and apply continuity tests.  |
| IV. Unsatisfactory Volume                         | 1. Run down battery or batteries or excessive "C" . .<br>2. Aerial shorter than recommended; defects in aerial or ground system; poor location . . . . .<br>3. Defective tube or tubes . . .<br>4. Defective speaker . . . . .<br>5. Wrong balancing of neutrodyne receiver . . . . .<br>6. Defective audio or radio transformer . . . . .<br>7. Defective connections, bad soldering, etc. . . . . | Test battery voltages with receiver in operation.<br>Inspect aerial and ground system for shorts, open circuits, bad connections, sooty insulators, etc. If necessary, try standard receiver on aerial and ground.<br>Try other tubes.<br>Try another speaker.<br>Check balancing.<br>Apply continuity tests.<br>Inspect. |
| V. Intermittent Reception                         | Same as for A. C. receivers, which see.   |   |

RECEPTION TROUBLES

| Trouble   | Possible Causes  | Tests  |
|---|--|--|
| VI. Unsatisfactory Quality  | 1. Run down batteries . . .<br>2. Defective tube or tubes . . .<br>3. Improper "C" bias . . . . .<br>4. Defective speaker . . . . .<br>5. Defects in circuit, grid leak, etc. . . . .  | Test all batteries.<br>Try other tubes.<br>Inspect connections, and see "1", above.<br>Try another speaker.<br>Check by continuity tests, socket voltage tests, and inspection of wiring.        |
| VII. Oscillations in Neutrodyne Receivers, and<br>VIII. Oscillations in Screen Grid Receivers | Same as "IX" and "X" for A. C. receivers, which see.   |  |
| IX.. Other Oscillations, Squeals, A. C. Hum, etc.   | 1. Run down "C" battery . . .<br>2. Tube microphonism . . . . .<br>3. Defective ground or aerial system . . . . .<br>4. Defects in circuit, especially in audio transformers . . . . .<br>5. A. C. eliminator or other A. C. leads too close to receiver . . . . .<br>6. Aerial too close to power lines . . . . . | Check voltage with receiver in operation.<br>See "VIII" under "A. C. Receivers."<br>Inspect.<br>Inspect, and apply continuity tests.<br>Inspect.<br>See if disconnecting aerial stops A. C. hum. |

TEST METHODS

The brief notes below indicate the manner in which tests are to be carried out. Detailed information will be given in subsequent Service Supplements.

**SOCKET VOLTAGE TESTS** for light-socket receivers should comply with **VOLTAGE LIMITS** as given in the service folder for each individual model (which see). For battery receivers, socket voltages should be practically the same as voltages applied to supply cord (with volume control turned on full).

**CONTINUITY TESTS** are to be made with a 50 volt D. C. meter in series with contact points and a 45 volt "B" battery. Important continuity tests are tabulated in the service folders describing the individual receivers.

**TEST DRY BATTERIES** with a D. C. voltmeter while receiver is in operation. Minimum allowable voltages are: 36 volts for 45 volt "B" battery; 18 volts for 22½ volt "B" battery; 1.2 volts for 1.5 volt "A" battery; others in proportion (80% of rated voltage).

**TEST STORAGE BATTERIES** (Lead Type) with hydrometer or voltmeter. Hydrometer tests show 1250 to 1300 for fully charged batteries, 1100 to 1150 for discharged batteries. Make voltage test with D. C. voltmeter while receiver is in operation. Fully charged batteries should test 2.0 (or slightly more) volts per cell.

**CHECK BALANCING** of Neutrodyne receivers as outlined on page 4, "Crosley Service Manual." This procedure will also be described in a special service supplement.

# The Crosley Service Supplement

No. 2

Supplement to Crosley Broadcaster

Nov. 1, 1929

## Models 40S, 41S, 42S, 82S

### Specifications

These four chassis all use the same eight-tube (including rectifier), screen-grid, A. C. chassis. They are supplied for 110 volts, 60 cycles; 110 volts, 25 to 50 cycles; or 220 volts, 25 to 60 cycles.

### Installation Notes

Recommended aerial length: 50 to 100 feet for outdoor aerial, 40 to 100 feet for indoor aerial. To operate without aerial connect ground wire to aerial terminal.

Plug in speaker before making final connections. Never disconnect the speaker when the receiver is connected to the light socket.

See instruction book for further information.

### Chassis Changes

The following changes of importance to dealers have been made in this chassis from its introduction to the present time:

1. The volume control, which in earlier chassis varied both the positive potential applied to the screen grids of the radio-frequency tubes and the energy transferred from the antenna circuit to the first stage, in later models controls only the grid potentials.

2. Receivers having the newer volume control are equipped with "range controls," operated by rotating the switch lever, which vary the energy delivered into the first stage, hence the effective pick up of the receiver.

3. Earlier chassis use Type J, 85 milliamperere, Dynacoil four-lead speakers; later chassis use Type M, 45 milliamperere, Dynacoil speakers with plug connections fitting sockets on the chassis.

4. Early chassis use 1 ampere automobile fuses; later chassis use 2 ampere fuses.

### Circuit

The circuit consists of three stages of transformer-coupled radio-frequency amplification, a plate-rectification or "power" detector (also known as "C" bias type), a resistance-coupled first audio stage, together with a transformer-coupled, push-pull output stage, together with a built-in power supply system. Screen grid 222 type tubes are used in the radio-frequency stages, 227 type tubes in the detector and first audio stages, 245 type power tubes in the output stage, and a 280 type tube for the rectifier.

The volume and range controls have been described above under "Chassis Changes," and

their connection will be made clear by reference to the accompanying circuit diagram.

The filaments of the first five tubes are connected in parallel to a secondary of the power transformer. The filament leads are shunted by the dial light and a 50-ohm potentiometer with its middle tap grounded. The output filaments are connected in parallel to a second power-transformer secondary, shunted by a 50 ohm potentiometer with its middle tap grounded to the chassis through an 850 ohm resistance. The rectifier filament is con-

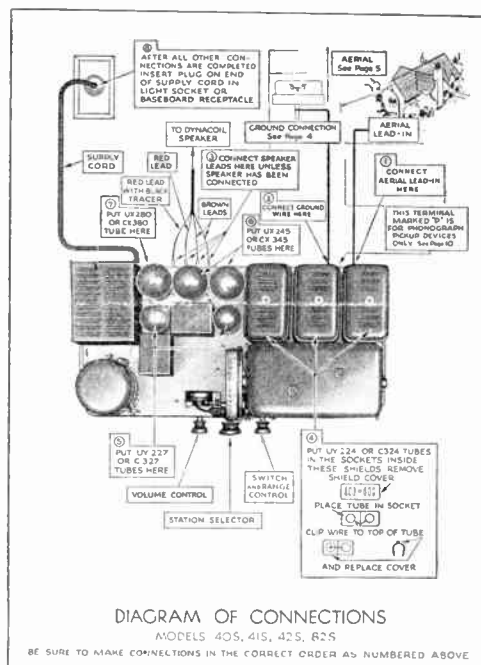


Fig. 1.—Connection Diagram.

nected to a third secondary, to the middle tap of which is connected the high potential plate supply.

From the transformer secondary tap the high potential plate circuit leads to one terminal of the Mershon filter condenser, and through a filter choke to the "Black" speaker terminal and a second terminal of the Mershon condenser. The low-potential lead is connected to the middle tap of a fourth transformer secondary, supplying the plates of the rectifier, and is grounded to the chassis.

From the "Black" terminal the plate supply passes through the speaker fields. It then branches—one side going to the middle tap on the output transformer primary to apply

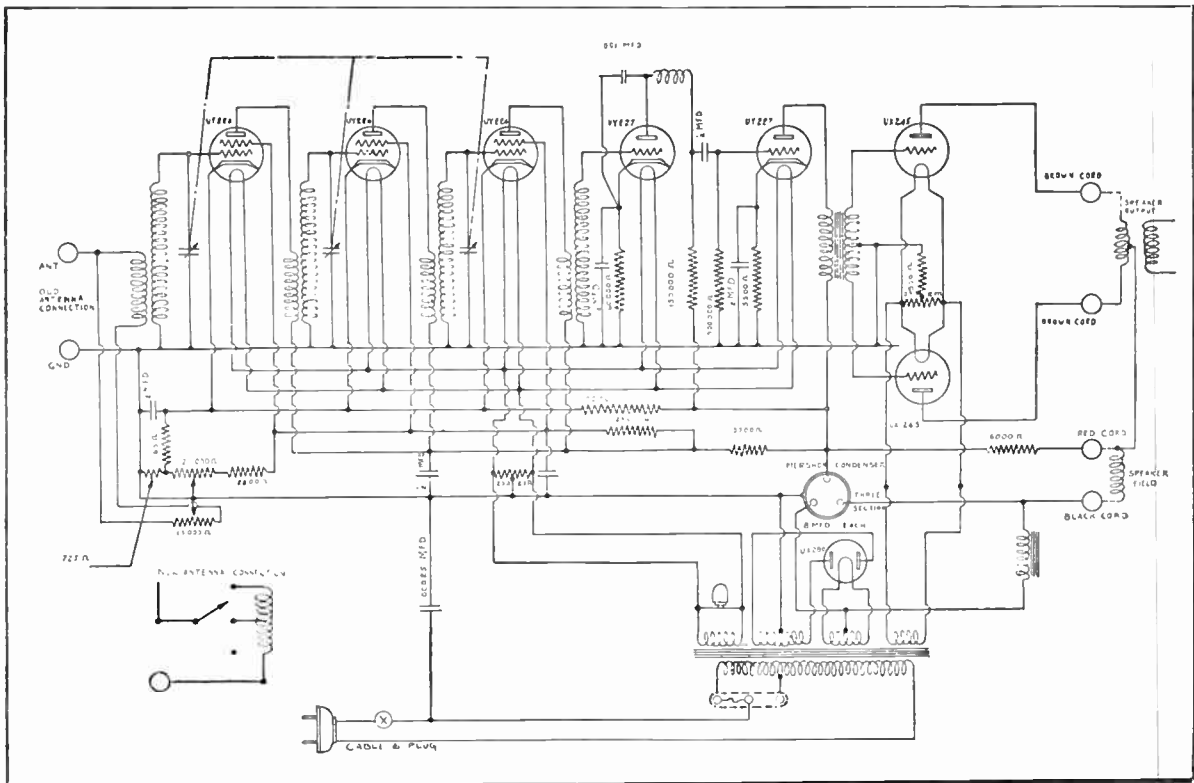


Fig. 2.—Circuit Diagram

the proper voltage to the plates of the output tubes; the other connecting to the "Red" terminal on the receiver, and thence, through a 6000 ohm resistance, to the plate of the first audio tube and a third terminal on the Mershon condenser. The 6000 ohm resistance reduces the voltage to the proper value for the plate of the first audio tube. Continuations of the high-potential plate supply pass through further voltage-reducing resistances of 150,000 ohms to the detector plate, and of 3500 ohms to the screen grid plates. From the low side of the 3500 ohm resistance the voltage is further reduced by a 25,000 ohm resistance to the proper value for the screen grids.

Resistances are used for obtaining the voltage differences for biasing, as follows: an 850 ohm unit between the output filament potentiometer and chassis; a 3500 ohm unit between the first audio emitter and chassis; a 60,000 ohm unit between the detector emitter and chassis, and a group of resistances (the connections of which are apparent from the circuit diagram) between the radio-frequency operating grids and chassis. Bleeder current from a 100,000 ohm resistance connected to the first audio plate supply, in addition to normal tube current, flows through the screen grid biasing resistances, providing adequate biasing voltage.

**Voltage Limits**

|                             | With M Speaker | With J Speaker |
|-----------------------------|----------------|----------------|
| <b>Filament Voltage</b>     |                |                |
| All tubes but rectifier ..  | 2.3 to 2.6     | same           |
| Rectifier tube .....        | 4.6 to 5.2     | same           |
| <b>Plate Voltage</b>        |                |                |
| R. F. tubes .....           | 135 to 165     | 140 to 170     |
| Detector ..                 | 65 to 125      | 70 to 130      |
| 1st Audio tube .....        | 135 to 175     | 160 to 200     |
| Output tubes .....          | 225 to 255     | 225 to 255     |
| <b>Control Grid Voltage</b> |                |                |
| R. F. tubes .....           | 1.4 to 2.4     | 1.5 to 2.5     |
| Detector ..                 | 9 to 19        | 10 to 20       |
| 1st Audio tube .....        | 8 to 17        | 11 to 17       |
| Output tubes .....          | 35 to 55       | 35 to 55       |
| <b>Screen Grid Voltage</b>  |                |                |
| R. F. tubes .....           | 50 to 80       | 45 to 60       |

To be measured with speaker connected, volume control on full, and line voltage of 117½ with fuse in "High" position or 107½ with fuse in "Low" position. Measure plate and grid voltages with high-resistance D. C. voltmeter from plate or grid socket contact to emitter contact, except operating grid voltage of first audio tube, which is to be measured from emitter to chassis (filaments of output tubes serve also as emitters, while other tubes have heating coils and separate emitters). Measure filament voltages with low-range A. C. voltmeter.



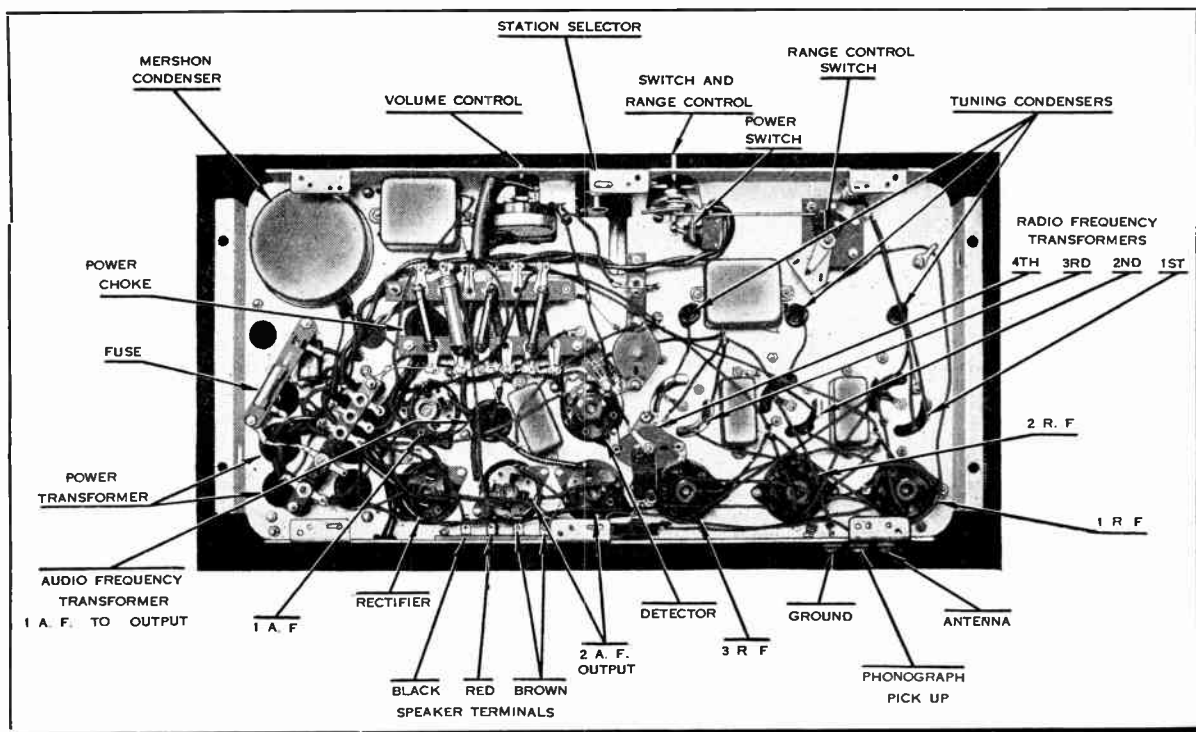


Fig. 3.—Bottom View of Chassis

**Continuity Tests**

NOTE: In order to make the test procedure as simple as possible tests are omitted which are taken care of by voltage limits on previous page.

| Circuit   | Remarks  | Correct Test            | Incorrect Test Indicates   |
|---|--|-------------------------|--|
| <b>A. Using 50 Volt D. C. Voltmeter In Series With 45 Volt "B" Battery.</b> |  |                         |  |
| Antenna to Ground (Chassis)   | Range Control on full                                    | Full Scale              | Open antenna transformer primary or faulty connections               |
| Operating grids R. F., Det., and Push Pull stages to Ground (Chassis)       | Tubes Removed  | Full Scale              | Open transformer secondary or faulty connection                      |
| Grid First Audio Stage to Ground (Chassis)                                  | Tubes Removed  | Part Scale              | Open grid leak resistance or faulty connection                       |
| Screen Grids R. F. Stages to Ground (Chassis)                               | Tubes Removed  | Part Scale              | Open in biasing resistance, volume control, or connections           |
| Plates R. F. and I. A. F. stages to "Red" Terminal                          | Tubes Removed  | Part Scale              | Open in transformer primary or plate resistance or faulty connection |
| Plates Push Pull Stage to "Red" Terminal                                    | Tubes Removed and Speaker Connected                      | Full Scale              | Open in speaker output transformer primary or faulty connections     |
| <b>B. Using 10 Watt Lamp In Series With 110 Volts A. C.</b>                 |  |                         |  |
| All Condensers 1/2 M. F. or over except Mershon                             | Mershon is Checked by Voltage Readings on opposite page. | Lamp should burn dimly. | Faulty connection, open circuit, or high resistance leak.            |

Parts List

INSTRUCTIONS FOR ORDERING—Give part number, and description of part, and serial number of set on which part is to be used. If article wanted is not listed separately, then that part of complete assembly containing this article should be ordered. Goods shipped on open account to Crosley Wholesale Distributors only. Cash in full must accompany Dealer and Consumer Orders. Prices are subject to the usual trade discounts.

| Qty.   | Part No. | Description   | List Price Each | Doz. | Qty.               | Part No. | Description  | List Price Each | Doz. |
|--|----------|---|-----------------|------|--------------------|----------|--|-----------------|------|
| <b>CHASSIS ASSEMBLY</b>  |          |   |                 |      |                    |          |  |                 |      |
| 1  | D-6606 D | Chassis   | 4.00            |      | 1                  | W-4562   | No. 6 Shakeproof Lug                                 | .05             | .15  |
| 1  | W-6793   | Socket  | .35             |      | 1                  | W-7159   | Resistance (4400 ohm)                                | .60             |      |
| 2  | W-5538   | Socket  | .35             |      | 1                  | W-5063   | Rubber Tubing  | .05             |      |
| 5  | W-5546   | Socket  | .40             |      | 1                  | W-7022   | Volume Control                                       | 1.75            |      |
| 1  | W-5253   | Mershon Condenser (3 section 8 mfd. each)                         | 6.30            |      | 2                  | W-4034   | Mounting Nut   | .05             | .20  |
| 1  | W-6764 A | Condenser Cap   | .30             |      | 2                  | W-6583   | Resistance Mounting Strip                            | .25             |      |
| 1  | W-4944 A | Wire Shield (Metal)   | .10             |      | 1                  | W-4562   | No. 6 Shakeproof Lug                                 | .05             | .15  |
| 2  | W-6762   | Mounting Clamp  | .15             |      | 1                  | W-4229   | No. 6 Shakeproof Lug                                 | .05             | .15  |
| 1  | W-6682   | Power Transformer (110 Volt, 60 cy.)                              | 14.00           |      | 1                  | W-6754   | Condenser (.001 M. F.)                               | .40             |      |
|  | W-6678   | Power Transformer (110 Volt, 25 cy.)                              | 14.00           |      | 1                  | W-6705   | Resistance (3,500 ohms)                              | .60             |      |
|  | W-6681   | Power Transformer (220 Volt, 25 cy.)                              | 14.00           |      | 1                  | W-6703   | Resistance (6,000 ohms)                              | .75             |      |
| 2  | W-5654   | Grommet (3/8")  | .10             |      | 1                  | W-6704   | Resistance (300,000 ohms)                            | .60             |      |
| 1  | W-5295   | Power Transformer Shield  | .90             |      | 1                  | W-6705   | Resistance (3,500 ohms)                              | .60             |      |
| 1  | W-6742   | Filter Choke  | 3.00            |      | 1                  | W-5469 A | Resistance (100,000 ohms)                            | .60             |      |
| 1  | W-5654   | Grommet (3/8")  | .10             |      | 1                  | W-4923 C | Resistance (60,000 ohms)                             | .60             |      |
| 1  | W-6590   | Push-Pull Transformer   | 6.00            |      | 1                  | W-6706   | Resistance (25,000 ohms)                             | .60             |      |
| 1  | W-5654   | Grommet (3/8")  | .10             |      | 1                  | W-5735   | Resistance (150,000 ohms)                            | .60             |      |
| 1  | W-6375   | Terminal Board Assembly (Speaker)                                 | .50             |      | 1                  | W-4968   | Condenser (.5 M F)                                   | 1.20            |      |
| 1  | W-6610 B | Dial Light Bracket  | .20             |      | 1                  | W-4562   | No. 6 Shakeproof Lug                                 | .05             | .15  |
| 1  | W-5750 A | Dial Light Socket (without lamp)                                  | .15             |      | 1                  | W-7158   | Phonograph Pick-up Filter Choke                      | .50             |      |
| 1  | W-4838   | Rubber Tubing   | .05             |      | 1                  | W-6614   | R. F. Coupling Choke                                 | .80             |      |
| 2  | W-6797 E | R. F. Transformer Assembly  | 1.50            |      | 1                  | W-6754   | Condenser (.001 mf.)                                 | .40             |      |
| 1  | W-7145   | Antenna Coupler   | 1.50            |      | 1                  | W-4229   | No. 6 Shakeproof Lug                                 | .05             | .15  |
| 3  | W-6684 B | Tube Terminal Assembly  | .25             |      | 1                  | W-4362 D | Plate Choke  | .50             |      |
| 3  | W-4562   | No. 6 Shakeproof Lug  | .05             | .15  | 1                  | W-6944   | Resistance (725 ohms)                                | .30             |      |
| 3  | W-6436   | Shield Assembly   | 1.00            |      | 1                  | W-6601   | Resistance (165 ohms)                                | .30             |      |
| 3  | B-6473   | Shield Cover  | .30             |      | 1                  | W-7080   | Off-On Switch Assembly                               | 1.25            |      |
| 3  | W-6474   | Shield Cover Nut  | .05             |      | 1                  | W-7059   | Switch only  | .80             |      |
| 1  | W-7053   | Terminal Board Assembly (A, G, and P)                             | .35             |      | 1                  | W-7078   | Bracket Sub-Assembly                                 | .30             |      |
| 1  | W-4562   | Shakeproof Lug  | .05             | .15  | 1                  | W-7079 A | Shaft Sub-Assembly                                   | .25             |      |
| <b>CONDENSER GANG</b>  |          |   |                 |      |                    |          |  |                 |      |
| 1  | W-6666   | Complete 3 Gang Variable Condenser Assembly (Including Dial Drum) | 20.00           |      | 1                  | W-7081 A | Connecting Link                                      | .10             |      |
| 1  | W-2047   | No. 8 Shakeproof Lug  | .05             | .15  | 1                  | W-7060 A | Antenna Switch Assembly                              | .75             |      |
| 1  | B-6674 A | Dial Indicator Strip  | .25             |      | 1                  | W-7075 A | Contact Sub-Assembly                                 | .25             |      |
| 3  | W-4681   | Grommet (3/8")  | .10             |      | 1                  | W-7071 A | Base Sub-Assembly                                    | .50             |      |
|  | W-6683   | Drive Pulley Sub Assembly complete                                | 1.00            |      | 1                  | W-4919   | Condenser (.5 M F)                                   | 1.20            |      |
|  | W-6667   | Stirrup Assembly  | .50             |      | 1                  | W-4562   | No. 6 Shakeproof Lug                                 | .05             | .15  |
|  | W-6671   | Drive Pulley  | .25             |      | 2                  | W-4968   | Condenser (.5 M F)                                   | 1.20            |      |
|  | W-6672   | Pulley Bracket  | .15             |      | 2                  | W-4562   | No. 6 Shakeproof Lug                                 | .05             | .15  |
|  | C-6673 B | Dial Drum   | 1.25            |      | 1                  | B-6867   | Cable  | 1.50            |      |
|  | W-5985 B | Tension Spring  | .25             |      | 1                  | W-4751 A | Cable Clamp  | .15             |      |
|  | W-5749   | Drive Rope  | .50             |      | 1                  | W-6840   | Socket Bushing                                       | .05             |      |
|  | W-5719   | Dial Drum Stop  | .15             |      | 1                  | W-6841   | Bushing Nut  | .05             |      |
|  | B-4879 B | Frame Cover   | .50             |      | 1                  | C-6949   | Bottom   | .75             |      |
|  | W-4894   | 6/32 Acorn Nut  | .05             | .20  | 1                  | W-6950   | Fuse Cover   | .05             |      |
|  | W-5726 A | Rotor Thrust Collar   | .20             |      | 6                  | R-154    | 8/32x5/16 R. H. M. Screw                             | .05             | .10  |
|  | W-6966   | Contact Spring  | .10             |      | <b>OTHER PARTS</b> |          |  |                 |      |
| <b>PARTS UNDER CHASSIS</b>   |          |   |                 |      |                    |          |  |                 |      |
| 1  | W-6587   | Fuse Panel Assembly   | .50             |      | 1                  | B-6820   | Front Panel, 40S                                     | 1.10            |      |
| 1  | W-4229   | No. 6 Shakeproof Lug  | .05             | .15  | 1                  | W-6712   | Esentecheon  | .75             |      |
| 1  | W-4924   | Condenser (.00025 MF)   | .35             |      | 1                  | W-6706   | Drive Knob   | .25             |      |
| 2  | W-5669   | Fixed Potentiometer   | .50             |      | 1                  | W-6757   | Drive Shaft  | .05             |      |
| 1  | W-7084   | Resistance 850 ohms   | .35             |      | 2                  | W-6389   | Knob   | .15             |      |
| 1  | W-4562   | No. 6 Shakeproof Lug  | .05             | .15  | 1                  | W-6467 D | Cabinet Shell with four B6366 Corners Assembled, 41S | 4.00            |      |
| 1  | W-6428   | Condenser (2 1/2 M. F.)   | 1.75            |      | 4                  | W-6376   | Felt Foot, 41S                                       | .10             |      |
|  |          |   |                 |      | 1                  | C-6383 B | Cabinet Cover, 41S                                   | 1.75            |      |
|  |          |   |                 |      | 1                  | W-6766   | Drive Knob   | .25             |      |
|  |          |   |                 |      | 1                  | W-6757   | Drive Shaft  | .05             |      |
|  |          |   |                 |      | 2                  | W-6389   | Knob   | .15             |      |
|  |          |   |                 |      | 1                  | D-6621 A | C-23-S Wood Cabinet, 42S                             | 38.00           |      |
|  |          |   |                 |      | 2                  | W-5837   | Shaft Extension, 42S, 82S                            | .10             |      |
|  |          |   |                 |      | 1                  | D-6788   | C-25-S Wood Cabinet, 82S                             | 55.00           |      |
| <p>NOTE:—When ordering parts for sets with serial number prefix GC, GCA, GCB and GCC do not use part number, but give description of parts and serial number of set.</p> |          |   |                 |      |                    |          |  |                 |      |

# The Crosley Service Supplement

No. 3.

Supplement to Crosley Broadcaster

Nov. 15, 1929

## Additional Information Regarding Models 40S, 41S, 42S, 82S

The circuits of Models 40S, 41S, 42S, and 82S as described in Service Supplement No. 2 applies in particular to these receivers as built for use with the type J Dynacoil speaker. While the essential features of the circuit have remained the same, it was necessary to change the resistance values and the circuit arrangement of certain of the resistances in order to adapt these receivers to the type M speaker. A diagram of the latest circuit for the M type speaker is given herewith, and a more complete list than was given in the preceding Supplement of all changes of importance to Dealers that have occurred in these chassis since their introduction is tabulated below.

The description of the circuit in Service Supplement No. 2 should be followed for practically all information except with regard to the plate supply system of receivers used with the M type speaker. The modifications made in adapting the chassis to the M type speaker are described in what follows.

### Plate Supply System

#### In Receivers Using M Type Speakers

As in receivers using the J speaker, the negative or low-potential plate supply lead (connected to the middle tap of the secondary supplying the rectifier plates) is grounded to the chassis, and the high-potential lead (from the middle tap of the secondary supplying the rectifier filament) is connected through a choke coil to a speaker terminal on the chassis. From this speaker terminal the circuit continues through the speaker leads to the speaker itself. At this point, instead of all of the plate current flowing through the speaker field, a part branches off and goes directly to the middle tap of the output transformer primary (built into the speaker) and thence to the output tubes. The plate current for the radio-frequency, detector, and first audio stages flows through the speaker field and back to a terminal on the receiver (Figure 1).

It is necessary that the plate supply circuit branch within the M type speaker in this way, because the field coil of this speaker requires but 45 milliamperes (considerably less than the entire plate current drawn by all of the tubes) instead of 85 milliamperes, as required by the field of the J speaker.

The combined plate current used by the radio-frequency detector, and first audio-fre-

quency tubes is less than 45 milliamperes, however. This makes it necessary to shunt part of the speaker field current around the plate circuits of these tubes, direct to the chassis. For this purpose a 5500 ohm resistance in the receiver (or two 11,000 ohm resistances in parallel) is connected from the plate supply circuit to ground (chassis).

As the plate supply circuit enters the receiver from the speaker field it is divided into two branches, one of which goes direct to the detector and first audio plates, the other going through a 440 ohm resistance to the radio-frequency plates and the 5500 ohm shunt resistance. A further resistance of 150,000 ohms is inserted in the detector plate circuit. These various resistances reduce the voltages to the proper values for the tubes in question.

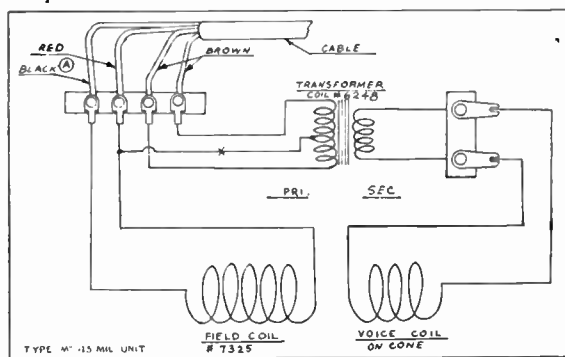


Fig. 1.—Connections of M Type Speaker

"Red" lead represents positive plate circuit entering speaker from power supply system in receiver. "Black" lead represents plate current for r. f. detector, and 1st a. f. tubes returning to receiver. "Brown" leads connect in receiver to push pull output plates.

The screen elements of the screen grid tubes are kept at appropriate positive potentials through a 20,000 ohm resistance connected to the positive plate supply.

The method of obtaining biasing voltages is the same as in receivers using the J type speaker (see Bulletin No. 2, page 2), except that the values of resistances have been changed, as follows:

1. Output bias resistance from 850 to 700 ohms.
2. Detector bias resistance from 60,000 to 55,000 ohms.
3. Bleeder current resistances from 100,000 to 55,000 ohms.

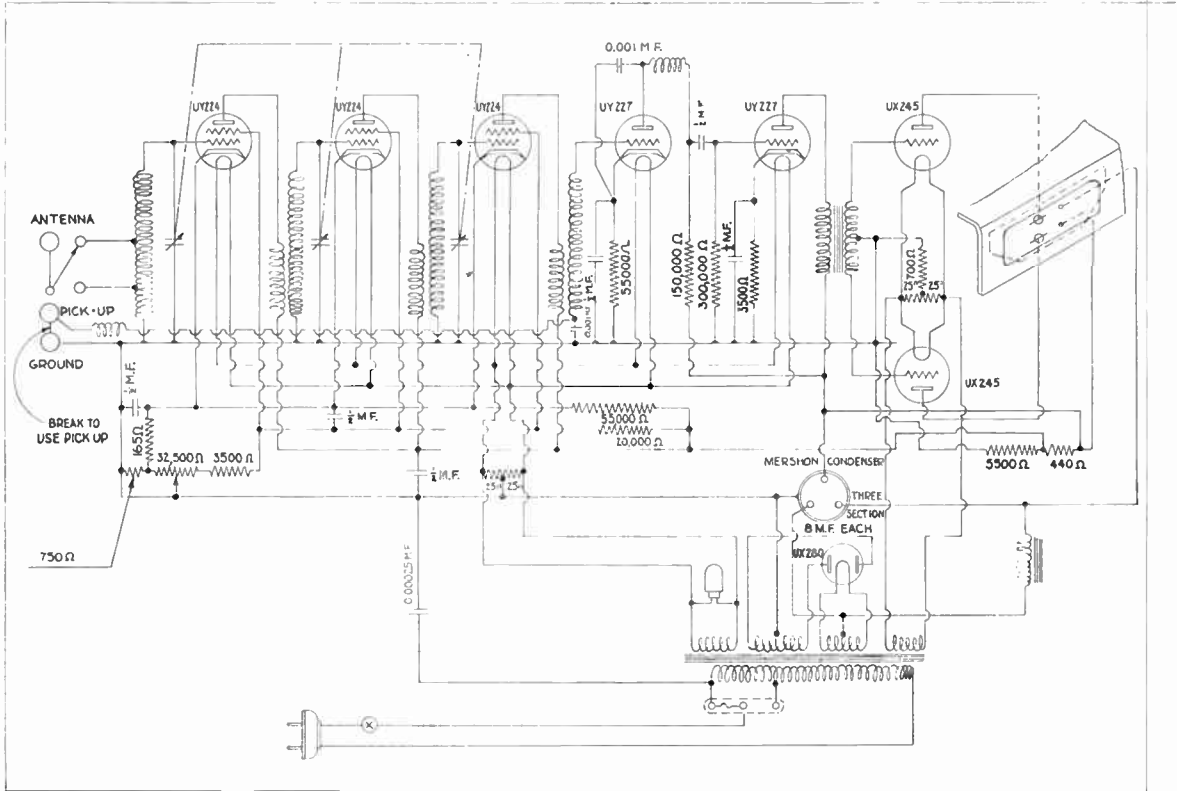


Fig. 2.—Circuit Diagram of Models 40S, 41S, 42S, 82S, arranged for M type speaker.

**Volume Control Changes**

Three types of volume control have been used at various times on these chassis since

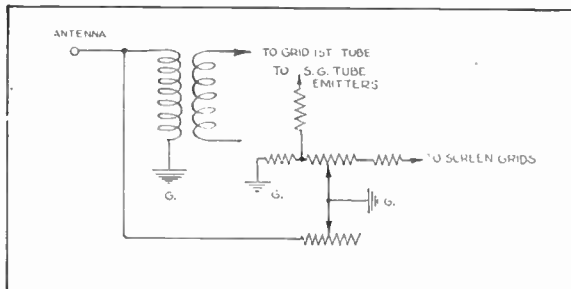


Fig. 3.—First Type of Volume Control.

their first introduction. These were briefly mentioned in Service Supplement No. 2, but will be described in more detail here.

In the first type of volume control two resistances, varied simultaneously, were used. One of these controlled the energy transferred from the antenna circuit to the grid circuit of the first tube, while the other controlled the bias potential and screen element potential of the screen grid tubes. The connections are shown in Fig. 3.

The second type of control was exactly the same as the first except that the primary

of the first r. f. transformer was connected to the free end of the volume control resistance instead of to ground, as shown in Fig. 4.

The third type of volume control was introduced coincident with the addition of the range control on this receiver. The variable resistor in the antenna circuit was omitted. The arrangement for controlling bias and screen grid voltages remained the same. The primary of the first r. f. transformer was omitted and a single coil used, connected directly in the grid circuit of the first tube. Two points of the range control switch are connected to taps on this coil, and a third point provides

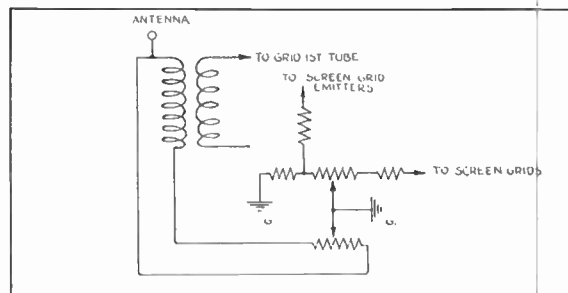


Fig. 4.—Second Type of Volume Control.

pick up through capacity coupling to the other two. The arm of the range control switch

### Chart of Changes in Models 40S, 41S, 42S, 82S of Importance to Dealers

NOTE: These changes are not given in the exact sequence in which they occurred, but are intended to show all possible variations of these chasses which the service man may be called upon to handle.

| Before Change   | After Change  |
|---|---|
| 1. Volume control consists of two resistors, one varying r. f. grid bias and screen grid potential, the other grounding antenna end of 1st r. f. transformer primary (other end of primary grounded). | 1a. Same, except lower end of 1st r. f. transformer primary connected to free end of volume control instead of to ground, so that resistor is shunted across primary and only connection to ground is through volume control. |
| 2. Same as 1a.  | 2a. Antenna circuit resistor omitted from volume control. Range control added.  |
| 3. "On-off" switch of rotary type, operated by turning switch knob clockwise.   | 3a. "On-off" switch of toggle type, operated by pulling out or pushing in switch knob. Changed so that range control added to chassis, could be operated by rotating switch knob.   |
| 4. A group of resistances shown on the diagram in connection with the volume control bias resistor, having various values of resistance.  | 4a. The values of these resistances have been changed from time to time to improve the control of volume.   |
| 5. Fuse on bottom of chassis reached through hole in bottom of plate.   | 5a. Cover added over bottom plate hole.   |
| 6. No pick-up terminal.   | 6a. Pick-up terminal added.   |
| 7. Pick-up terminal connected direct to detector grid circuit.  | 7a. Choke A12 and 0.001 condenser added in pick-up lead.  |
| 8. Output bias resistance 850 ohms.   | 8a. Changed to 700 ohms.  |
| 9. Fuse 1 ampere cartridge type.  | 9a. Changed to 2 ampere because larger current is drawn when receiver is first put into operation until Mershon condenser builds up.  |
| 10. Plate voltage resistances and connections suitable for J speaker, as shown in Fig. 2, Bulletin No. 2.   | 10a. Changed to accommodate M type speaker, as shown in Fig. 2 of this bulletin and described in accompanying text.   |
| 11. Resistance of 5500 or 6000 ohms shunted from 440 ohm resistance in positive plate supply to ground in chasses for M speaker.  | 11a. Replaced by two 11,000 ohm resistances in parallel. Later changed back to single 5500 ohm resistance.  |
| 12. Grounding condenser 0.00025 m. f. connected to line on line side of fuse.   | 12a. Changed so as to connect to line on receiver side of fuse in order to protect against shorts in condenser.   |

is connected to the antenna terminal. Fig. 5 shows the connections used.

Some Dealers have been confused by the small diagram labelled "New Antenna Connections" in Fig. 2, Service Bulletin No. 2. As drawn, it is not clear that the coil shown is connected directly in the grid circuit of the first tube, to act as an auto transformer. Reference to Fig. 1 of this bulletin will make the method of connection clear.

#### Pick Up Terminals

A pick up terminal for phonograph pick

up devices was added after earlier chasses had been built. It is not shown in the circuit diagram of Bulletin No. 1, but is illustrated in Fig. 2 of this Bulletin. If the strap between the pick up and ground terminals is broken and the pick up device connected to these terminals it will then be included in the grid circuit of the detector tube. When the receiver is used for broadcast reception, the pick up terminal must be shorted to ground. The choke coil and condenser shown in the pick up lead in Fig. 2 have been used only in the more recent chasses.

### Line Condenser Protection

To protect against short circuits in the 0.00025 m. f. grounding condenser, from the 110 volt (or 220 volt) line to ground, this

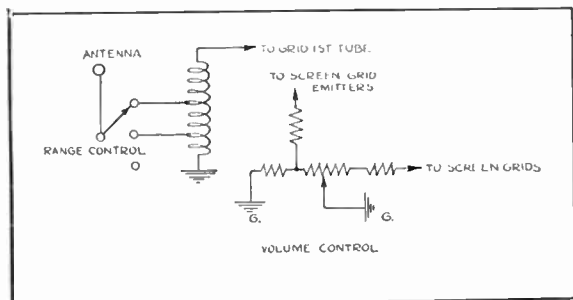


Fig. 5.—Third Type of Volume Control.

condenser is now connected to the line on the receiver side of the fuse, as shown in Fig. 2, instead of to the line side of the fuse, as in Fig. 2, Bulletin No. 2.

### Additional Notes on Socket Voltages and Continuity Tests

In checking the voltages at the tube

sockets as outlined under "Voltage Limits", Bulletin No. 2, it is necessary to use a high-resistance voltmeter, of resistance at least 1000 ohms per volt, in order to obtain correct readings for the plate and grid voltages. The voltage limits given are for standard line voltages as specified. If the line voltage is higher than the standard voltages specified it may be reduced by inserting a suitable power rheostat in series with the receiver.

In the continuity test chart, the designation "full scale" means about 45 volts, inasmuch as the 45 volt battery used should register about that amount when shorted with the voltmeter.

### Ordering Parts

In ordering parts, be sure to specify the serial number of the receiver, to make sure of receiving the proper part for the chassis in question.

### Correction

In the descriptive matter in Bulletin No. 2 it was stated that these receivers employed 222 type screen grid tubes. This statement should have said that 224 type tubes are used.

## Crosley Dealers and Distributors

We would appreciate your comments on these Bulletins, and your suggestions for improving them. Our aim is to make them as useful as possible to you. Send your suggestions to the Editor "Crosley Radio Broadcaster."

Bulletin No. 4, to accompany the December 1 issue of the "Broadcaster", will describe Models 30S, 31S, 33S and 34S.

# The Crosley Service Supplement

No. 4.

Supplement to Crosley Broadcaster

Dec. 1, 1929

## Models 30S, 31S, 33S, 34S

### Specifications

Models 30-S, 31-S, 33-S, and 34-S use the same seven tube (including rectifier) A. C. screen grid chassis. They differ only in type of cabinet. These models are supplied for 110 volts 60 cycles, 110 volts 25 to 50 cycles, and 220 volts 25 to 60 cycles.

### Installation Notes

Recommended aerial length: 50 to 100 feet for outdoor aerial, 40 to 100 feet for indoor aerial. To operate without aerial, connect ground wire to aerial post.

Plug in speaker before making final connections. Never disconnect the speaker when the receiver is connected to the light socket.

Information will be found in the instruction books accompanying the receivers regarding the use of phonograph pick-up devices. If the pick-up device is disconnected from the receiver, pick-up terminals "P1" and "P2" must be connected together before the receiver is operated.

For further information, see instruction books supplied with the receivers.

### Circuit

The circuit used in these receivers consists of two stages of tuned radio-frequency amplification, utilizing 224 type screen grid tubes, a detector and first audio stage utilizing UY 227 heater type tubes, and a push-pull output audio stage using two UX 245 type tubes. All coupling is by means of transformers except that of the detector to the first audio stage. Resistance coupling is used between these two stages.

Tuning is accomplished by a gang of three variable condensers, operated by a single control, in the grid circuits of the radio-frequency stages and detector stage.

The radio-frequency transformers have been especially designed so as to introduce capacity coupling between stages in addition to the usual inductive coupling. The effect of this capacity coupling is to increase the transfer of energy between stages at the higher radio-frequencies, balancing out the decreased transfer of energy at these high frequencies by inductive coupling. The combined result of the inductive and capacity coupling is, thus, automatically to give equal energy transfer between stages at all frequencies throughout the entire broadcasting range.

The energy transfer from the antenna circuit to the grid circuit of the first tube may be varied by the "range control," which, as is apparent from an examination of the circuit diagram, may be adjusted so as to by-pass around the first radio frequency transformer varying portions of the antenna circuit energy, direct from the antenna to ground.

Volume is controlled by a potentiometer which regulates the positive potential applied to the screen grids, and the bias potential applied to the control grids of the two radio frequency tubes.

The detector is of the C bias, or plate-rectification type, and is resistance coupled to the first audio stage. The latter stage is coupled through a transformer to the grid of the output tubes.

Three secondary windings on the power transformer supply power to the heater filaments of the tubes. One winding supplies the heaters of the radio-frequency, detector, and first audio frequency tubes; a second supplies the filaments of the UX 245 output tubes; and a third, the filament of the UX 280 rectifier tube.

The ends of a high-voltage secondary winding on the power transformer, are connected to the two plates of the UX 280 rectifier tube. The negative "B" supply lead is connected to a middle tap on this high-voltage secondary, and the positive lead is connected to the middle tap of the rectifier filament secondary. Through the use of a double-plate rectifier tube in connection with a tapped transformer secondary, full-wave rectification is obtained.

The negative plate supply lead is grounded to the chassis. The positive lead is connected through a choke coil to a speaker terminal on the chassis. Inside the speaker the positive circuit branches, part of the current flowing to a middle tap on the output transformer primary (the output transformer is built into the speaker) and thence to the plates of the output tubes, the other part flowing through the speaker field and back to the terminal on the chassis. The choke coil, Mershon condenser, and speaker field act as a filter system for smoothing out the rectified plate supply current.

From the speaker field terminal on the chassis to which the positive plate circuit returns one branch goes direct to the audio

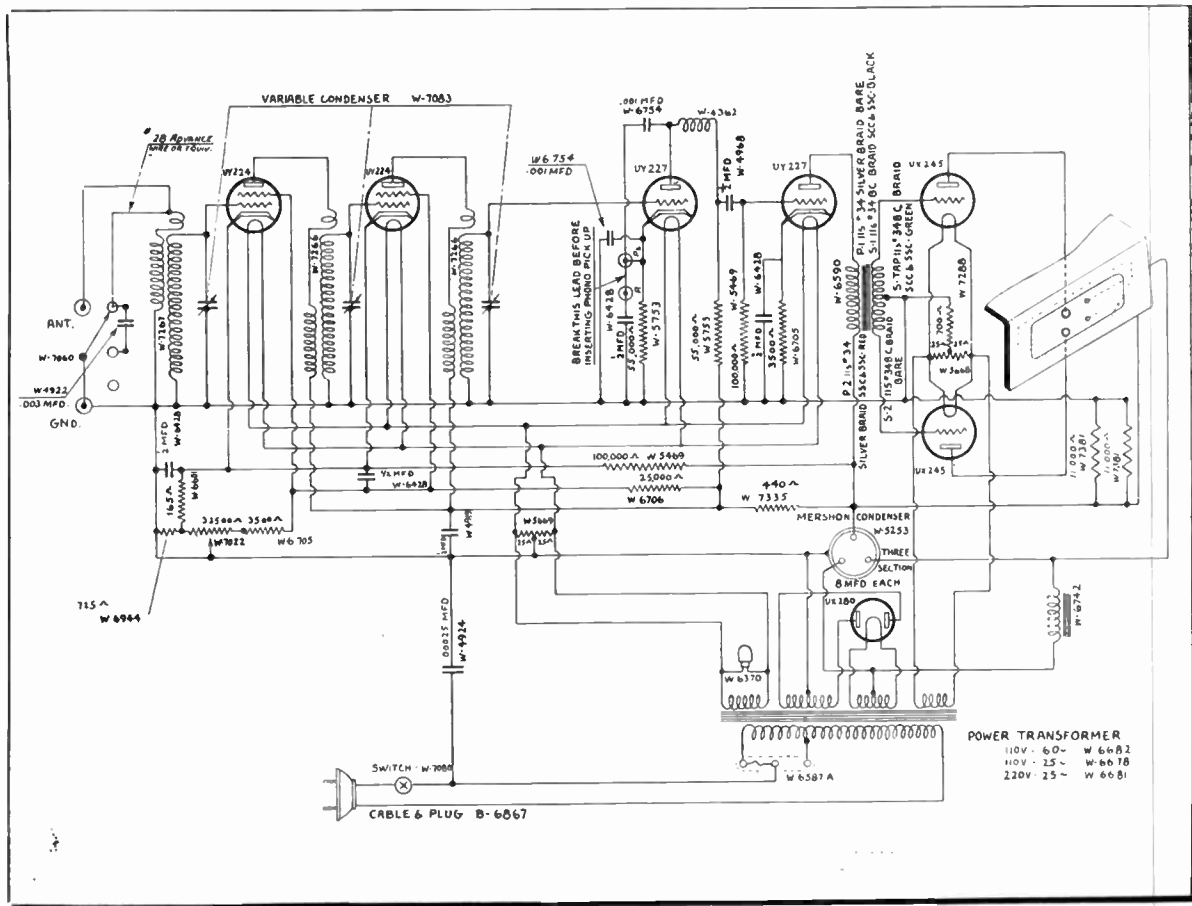


Fig. 1.—Circuit Diagram.

plate. Another branch passes through a 440 ohm resistance to the radio-frequency plates

**Voltage Limits**

|                              | Volume Control on Full | Volume Control Off |
|------------------------------|------------------------|--------------------|
| <b>Filament Voltages</b>     |                        |                    |
| All but rectifier .....      | 2.3 to 2.6             |                    |
| Rectifier tube .....         | 4.6 to 5.2             |                    |
| <b>Plate Voltages</b>        |                        |                    |
| R. F. tubes .....            | 145 to 180             |                    |
| Detector .....               | 65 to 125              |                    |
| 1st Audio tube .....         | 130 to 170             |                    |
| Output tubes .....           | 220 to 255             |                    |
| <b>Control Grid Voltages</b> |                        |                    |
| R. F. tubes .....            | 1.3 to 2.3             | 0.8 to 2.4         |
| Detector .....               | 8 to 18                |                    |
| 1st Audio tube .....         | 9 to 16                |                    |
| Output tubes .....           | 40 to 55               |                    |
| <b>Screen Grid Voltages</b>  |                        |                    |
| R. F. tubes .....            | 50 to 85               | 14 to 26           |

To be measured with speaker connected and line voltage of 117½ with fuse in "High" position or 107½ with fuse in "Low" position. Measure plate and grid

voltages with high-resistance (1000 ohms per volt) D. C. voltmeter from plate or grid socket contact to emitter contact, except operating grid voltage of first audio tube, which is to be measured from emitter to chassis (filaments of output tubes serve also as emitters, while other tubes have heating coils and separate emitters). Measure filament voltages with low-range A. C. voltmeter.

and through an additional 55,000 ohm resistance to the detector plate. These resistances serve to reduce the voltage to the proper values for the tubes in question.

Since the speaker field current is greater than the plate current of the r. f., detector, and first a. f. tubes, this additional current is carried to ground (chassis) through a 5500 ohm resistance (or two 11,000 ohm resistances in parallel) in shunt with the plate supply circuit of the r. f. and detector tubes, from the 440 ohm resistance to the chassis.

Another branch of the circuit goes from the 440 ohm resistance through a resistance of about 20,000 or 25,000 ohms to the screen elements of the screen grid tubes, maintaining them at the necessary positive potential with respect to the emitters (subject to adjustment



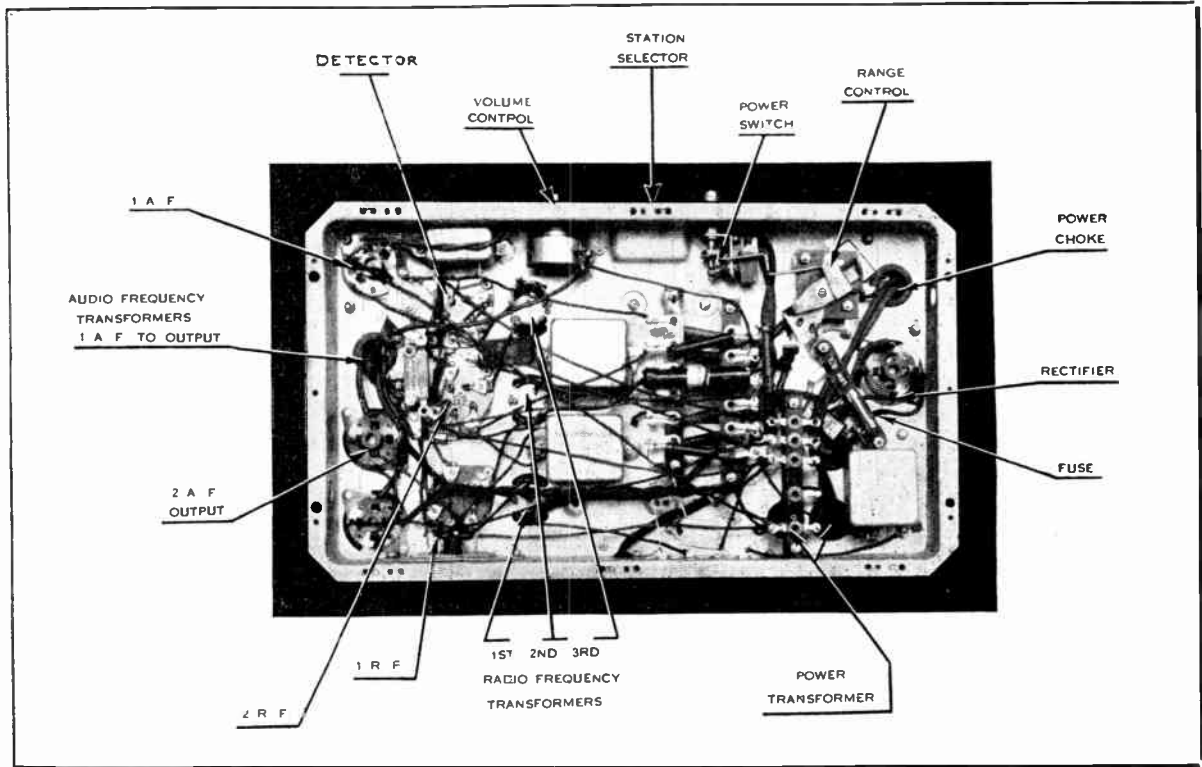


Fig. 2.—Bottom View of Chassis

**Continuity Tests**

NOTE: In order to make the test procedure as simple as possible certain tests are omitted which are taken care of by voltage limits on previous page.

| Circuit   | Remarks   | Correct Test                        | Incorrect Test Indicates   |
|---|---|-------------------------------------|--|
| A. Using 50 Volt D. C. Voltmeter In Series With 45 Volt "B" Battery.  |   |                                     |  |
| Antenna to Ground (Chassis)   | Range Control at Minimum Position.                      | Full Scale (i. e., about 45 volts). | Open antenna transformer or faulty connections                       |
| Operating grids R. F., Det., and Push Pull stages to Ground (Chassis) | Tubes Removed   | Full Scale                          | Open transformer secondary or faulty connection                      |
| Grid First Audio Stage to Ground (Chassis)                            | Tube Removed  | Part Scale                          | Open grid leak resistance or faulty connection                       |
| Screen Grids R. F., Stages to Ground (Chassis)                        | Tubes Removed   | Part Scale                          | Open in biasing resistance, volume control, or connections           |
| Plates R. F., Detector and I. A. F. stages to Speaker Terminal        | Tubes Removed   | Part Scale                          | Open in transformer primary or plate resistance or faulty connection |
| Plates Push Pull Stage to Speaker Field Terminal                      | Tubes Removed and Speaker connected                     | Full Scale                          | Open in speaker output transformer primary or faulty connections     |
| B. Using 10 Watt Lamp In Series With 110 Volts A. C.                  |   |                                     |  |
| All Condensers 1/2 M. F. or over except Mershon                       | Mershon is checked by Voltage Readings on opposite page | Lamp Should burn dimly.             | Faulty connection, open circuit, or high resistance leak.            |

below this value by means of the volume control).

The grid of each stage is connected through its coupling inductance, or resistance, to the chassis. The grids of the tubes are thus maintained at potentials practically the same as, or but slightly lower than, that of the chassis. In order to operate the tubes with their grids at the optimum negative biasing values with respect to the emitters, biasing resistances are inserted between the emitters of the tubes and the chassis. The fall of potential caused by the flow of plate current and bleeder current (the latter coming from a bleeder resistance connected to the high side of the 440 ohm resistance and affecting only the r. f. tube bias) through these resistances is sufficient to maintain the emitters at potentials considerably positive with regard to the chassis and grids of the tubes, and thus to maintain the

grids negative with regard to the emitters.

A 700 ohm biasing resistance is used for the push-pull output tubes, a 3500 ohm biasing resistance for the first audio stage, and a 55,000 ohm biasing resistance for the detector stage. The biasing resistance for the radio-frequency stages consists of a 165 ohm fixed resistance, a 725 ohm fixed resistance, and a 32,500 ohm variable resistance. The positive potential applied to the screen grids of the R. F. tubes and the negative control grid bias are varied simultaneously by the control volume.

The biasing resistance for the output tubes is connected to the filaments of these tubes through the middle tap of a 50 ohm fixed potentiometer shunted across the filament leads. A similar potentiometer, with its middle tap grounded, is shunted across the heater leads for the other tubes.

### Parts List

**INSTRUCTIONS FOR ORDERING**—Give part number, and description of part, and serial number of set on which part is to be used. If article wanted is not listed separately, then that part of complete assembly containing this article should be ordered. Goods shipped on open account to Crosley Wholesale Distributors only. Cash in full must accompany Dealer and Consumer Orders. Prices are subject to the usual trade discounts.

| Qty. | Parts No. | Description   | List Price Each Doz. | Qty. | Parts No. | Description                                 | List Price Each Doz. |
|------|-----------|---|----------------------|------|-----------|---|----------------------|
| 1    | D-7007 E  | Chassis .....                                       | \$3.75               | 1    | W-4362    | Plate Choke .....                           | .50                  |
| 1    | W-6793    | Socket .....  | .35                  | 1    | W-6754    | .001 MF Condenser .....                     | .40                  |
| 2    | W-5538    | Socket .....  | .35                  | 1    | W-5030    | Junction Terminal .....                     | .10                  |
| 3    | W-7021    | Socket .....  | .30                  | 1    | W-6601    | 165 ohm Resistor .....                      | .30                  |
| 3    | W-7125    | Socket guide .....                                  | .10                  | 1    | W-6944    | 725 ohm Resistor .....                      | .30                  |
| 1    | W-5546    | Socket .....  | .40                  | 1    | W-7424    | Speaker Terminal (Socket type) .....        | .35                  |
| 1    | W-6590    | Push Pull Transformer .....                         | 6.00                 | 1    | W-7430    | Speaker Terminal Guide .....                | .10                  |
| 1    | W-7297    | R. F. Coil (Ant.) .....                             | 1.75                 | 1    | W-6754    | .001 MF Condenser .....                     | .40                  |
| 2    | W-7266    | R. F. Coils .....                                   | 1.75                 | 1    | W-7022    | Volume Control .....                        | 1.75                 |
| 2    | B-7279    | Coil Shields .....                                  | .50                  | 2    | W-6061    | Spacers (flat washers) .....                | .05                  |
| 1    | B-7278    | Coil Shields (Front cut out for Vol. Control) ..... | .50                  | 1    | W-4919    | ½ MF Condenser .....                        | 1.20                 |
| 1    | W-7072    | Shield (R. F. Stages) .....                         | 2.50                 | 1    | W-6428    | 2-½ M F Condenser .....                     | 1.75                 |
| 1    | W-7074    | Shield Cover .....                                  | .75                  | 1    | W-5713    | Terminal Strip (Mtg. for Resistor) .....    | .25                  |
| 2    | W-6474    | Shield Cover Nuts .....                             | .05                  | 1    | W-7381    | 1100 ohm Resistor .....                     | .75                  |
| 1    | W-7083    | Complete 3 gang Variable Condenser .....            | 18.00                | 1    | W-7277    | Resistor Block Complete (9 Resistors) ..... | 7.00                 |
| 1    | W-5354 D  | Dial .....  | .25                  | 2    | W-6583    | Terminal Strips .....                       | .25                  |
| 1    | W-7152 B  | Dial Gear and hub .....                             | .35                  | 1    | W-6706    | 2500 ohm Resistor .....                     | .60                  |
| 1    | W-7155    | Pinion Bracket .....                                | .15                  | 2    | W-5469    | 100000 ohm Resistor .....                   | .60                  |
| 1    | W-7157    | Pinion Spring .....                                 | .10                  | 1    | W-7335    | 440 ohm Resistor .....                      | .60                  |
| 1    | W-5442    | Pinion .....  | .35                  | 2    | W-6705    | 3500 ohm Resistor .....                     | .60                  |
| 1    | W-5253    | Mershon Condenser (3 Sec. 8 m. f. each) .....       | 6.30                 | 1    | W-5733    | 55000 ohm Resistor .....                    | .60                  |
| 1    | W-6764    | Condenser Cap .....                                 | .30                  | 1    | W-7381    | 11000 ohm Resistor .....                    | .60                  |
| 1    | W-4794    | Shield (¼" Stiffened Sleeve) .....                  | .10                  | 1    | W-7059    | Switch (Power) .....                        | .80                  |
| 2    | W-7082    | Mountain Clamps .....                               | .15                  | 1    | W-7079 C  | Switch Shaft .....                          | .25                  |
| 1    | W-7380    | Tube Shield (280) .....                             | .25                  | 1    | W-7078 B  | Switch Bracket .....                        | .10                  |
| 1    | W-6682    | Power transformer (110 Volt 60 cy.) .....           | 14.00                | 1    | W-7194    | Link .....                                  | .10                  |
|      | W-6678    | Power transformer (110 Volt 25 cy.) .....           | 14.00                | 1    | W-7464    | Ant. Switch Base .....                      | .50                  |
|      | W-6681    | Power transformer (220 Volt 25 cy.) .....           | 14.00                | 1    | W-7065 A  | Bearing .....                               | .10                  |
| 1    | W-7496    | Power Transformer Shield .....                      | .90                  | 1    | W-7075 C  | Ant. Sw. Contact Assembly .....             | .25                  |
| 1    | W-6742    | Filter Choke .....                                  | 3.00                 | 1    | W-4922    | .003 MF Condenser .....                     | .40                  |
| 1    | W-7148    | A. G. P1, P2, terminal strip .....                  | .50                  | 1    | W-6587    | Fuse Panel .....                            | .50                  |
|      |           | <b>PARTS UNDER CHASSIS</b>                          |                      | 1    | W-4639    | Fuse .....                                  | .10                  |
| 1    | W-4968    | .5 MF Condenser .....                               | 1.20                 | 1    | W-6428    | 2-½ MF Condenser .....                      | 1.75                 |
|      |           |   |                      | 1    | W-4924    | .00025 MF Condenser .....                   | .35                  |
|      |           |   |                      | 1    | W-7288    | 700 ohm Resistor .....                      | .40                  |
|      |           |   |                      | 2    | W-5669    | Fixed Potentiometer .....                   | .50                  |
|      |           |   |                      | 1    | B-6867    | Cable .....                                 | 1.50                 |
|      |           |   |                      | 1    | W-4751    | Cable Clamp .....                           | .15                  |
|      |           |   |                      | 1    | C-7008    | Chassis Bottom .....                        | .75                  |
|      |           |   |                      | 1    | W-6950    | Fuse Cover .....                            | .05                  |
|      |           |   |                      | 6    | W-5718    | Bottom Double Nut .....                     | .05                  |