Instructions for

RCA Victor Duo 321

Six-Tube Superheterodyne "Selective Short-Wave" Combination

INTRODUCTION

This radio-phonograph combination contains a receiver operable throughout two tuning ranges, one covering the usual band of from 540 to 1500 kilocycles and the other covering a band of from 5400 to 15,350 kilocycles. Between the limits of the latter range are included four of the internationally-assigned short-wave broadcast bands, located at 49, 31, 25 and 19 meters, respectively. Thus, in addition to providing entertainment from the accustomed broadcasting stations, this instrument permits direct reception of programs from the principal short-wave broadcast transmitters located in all parts of the world.

Provisions for short-wave reception are built into the radio chassis—not simply connected to an existing chassis as a short-wave adaptor—resulting in distinctly superior performance. The tuning ranges are quickly interchangeable by means of a push-pull switch on the front of the cabinet. Other features contributing to tuning ease and accuracy are: (1) the "vernier" dual-ratio station selector drive, permitting either rapid or fine adjustments independently; and (2) the clock-type "full-vision" illuminated dial, calibrated directly in frequency for both ranges.

Facilities for the electrical reproduction of either standard speed (78 revolutions per minute) or long-playing (33⅓ R. P. M.) records of 12 inches diameter or less are accessible beneath the hinged lid of the cabinet. To insure uniform high-quality reproduction and satisfactory operation, Victor records should be used with this instrument.

INSTALLATION

Preliminary—After withdrawing the instrument from its shipping container and removing the packing framework bolted to the underside of the cabinet, extract the interior wooden brace fastened by screws to the radio chassis shelf. Also remove the two red hex-head bolts which pass through the mounting rails and withdraw the two wooden blocks from between those rails and the motorboard, which should then float freely on its spring suspension.

Tubes—The instrument is equipped and tested at the factory with RCA Radiotrons and is shipped with these tubes installed. Remove the strip of tape which protects the rectifier (RCA-80) tube against damage in transit, then refer to the tube location diagram printed on the rating label attached to the rear of the receiver chassis and *make certain:*

(a) That all tubes are in the proper sockets and pressed down firmly. *Never apply power to the instrument unless all tubes are in place.*

(b) That the shields are rigidly in place over those tubes represented by double circles on the diagram.

(c) That the spring connectors of the short flexible (grid) leads shown on the diagram are securely attached to the dome terminals of the proper tubes.

NOTE—The grid lead for the RCA-2B7 must be enclosed by the cylindrical tube shield. A slot is provided at the bottom of this shield for entrance of the lead.

(d) That the lid is securely in place on the shield of that tube designated by a heavy outer circle on the diagram.

Phonograph—Raise the cabinet lid and remove all packing material from the playing compartment. Withdraw the turntable and used-needle cup from the Outfit Package and insert the latter in the opening provided in the motorboard. With the speed-shifter (lever projecting toward front left-hand corner of motor-board) set in its 78 R. P. M. (outward) position, mount the turntable on the motor spindle. Make certain that the spindle drive key engages the slot in the turntable hub.

Location—The instrument should be placed convenient to the antenna and ground connections and near an electrical outlet.

Antenna and Ground—The efficiency of any antenna varies greatly with the frequency of incoming radio waves, a given length being excellent at certain frequencies and comparatively poor at others. For uniform results throughout a wide tuning range such as found in this instrument, therefore, an antenna of adjustable length would be desirable theoretically. From a practical standpoint, however, very good results will be obtained using two antennas of different length, one 24–29 feet for short-wave reception and the other 50–100 feet for reception in the standard broadcast band (540–1500 kc), the lead-in considered as part of the total length in each case.

The shorter antenna may be used alone if preferred, but probably will not be satisfactory for receiving distant or low-powered stations in the standard broadcast band. Further, no advantage will be gained by its use on the shorter wave lengths unless it can be installed so that the majority of its length is unshielded (not contained in a building of metallic construction) and sufficiently remote from sources of man-made interference (such as house-wiring, power lines, street-railways and passing automobiles) to prevent excessive noise. If these conditions cannot be fulfilled, it will be preferable to erect a single antenna of compromise length (100–105 feet overall) which, in addition to providing excellent results in the standard broadcast band, will also favor reception in the short-wave broadcast bands located at 49, 31, 25 and 19 meters.

Good reception in many installations will be obtained without connecting the instrument to an external ground, since the power line characteristics often render a separate radio ground unnecessary. In any case, however, best results will be insured by grounding the set in the conventional manner to a water-pipe or radiator or to a metallic pipe or stake driven from five to eight feet into the soil. The ground lead, when used, should be short, preferably not more than 15 feet in length, and connected to a clean portion of the pipe or stake surface by means of an approved ground clamp.

A terminal board is provided at the rear of the receiver chassis for connecting to the antenna and ground. Attach the antenna lead to the left-hand terminal (marked "ANT") and the ground lead to the right-hand terminal (marked "GND"). Tighten the terminals with a screw driver to insure permanent electrical connections.

Power Supply—Connect the power cord of the instrument to an electrical outlet supplying alternating current at the voltage and frequency (cycles) specified on the rating label. While any voltage within the specified limits may be employed, a change in the internal connections will be required if the local voltage is less than 110 (for 105–125 volt models) or 220 (for 200–250 volt models). The alternative connections are shown in the Service Data section of this booklet and the changeover, when necessary, preferably should be made by the dealer. Consult your power company if you are in doubt as to the specific voltage or frequency of the supply.

OPERATION

Controls

The four control knobs on the front of the cabinet, in sequence from left to right, are:

(1) ***Power Switch and Tone Control***—The power switch operates at the counter-clockwise end of the control range. A slight clockwise rotation actuates the switch, causing illumination of the dial—indicative of normal operation. Continued clockwise rotation increases the treble response gradually.

(2) ***Volume Control***—Sound level (volume) increases upon rotation of this control in a clockwise direction.

(3) ***Station Selector*** (Dual Knob)—The large knob (adjacent to panel) should be used for rapid approximate settings of the dial pointer and the small outer knob for accurate or "vernier" adjustments. The lower end of the pointer traverses a scale calibrated directly in kilocycles to facilitate the selection of stations transmitting in the standard broadcast band (540 to 1500 kc.). Stations in the short-wave range (5400 to 15,350 kc.), however, should be located with the upper end of the pointer which passes over a scale calibrated in "megacycles" (thousands of kilocycles). Bracketed segments adjacent to the upper scale indicate the positions and approximate spans of the short-wave broadcast bands, each being identified with respect to its nominal wave length: 49 M, 31 M, 25 M and 19 M (meters).

(4) ***Range Switch***—This switch is of push-pull construction and adapts the receiver for operation within either tuning range as follows:

(a) *Inward Position*—For standard broadcast band (540 to 1500 kilocycles).

(b) *Outward Position*—For short-wave range (5400 to 15,350 kilocycles).

A fifth knob is located in the phonograph playing compartment at the front right-hand corner of the motorboard. This control serves two functions as follows:

(5) ***Transfer Switch and Record Volume Control***—The transfer switch operates at the counter-clockwise end of the control range. With the knob turned fully counter-clockwise, the switch is set for Radio operation. Clockwise rotation first transfers the circuits for Phonograph operation and then increases the sound level (volume) obtained from records.

Radio Procedure

The actual operation is simple and not unlike that of more conventional instruments designed for the reception of standard broadcast programs alone. However, the full possibilities of any short-wave receiver cannot be attained until the user has a practical knowledge of short-wave transmission behavior and operating schedules. It is therefore recommended that the appended Notes on Short-Wave Reception be studied carefully.

A brief outline of the recommended operating procedure should suffice. See the foregoing description of the controls and proceed as follows:

1. Set the Transfer Switch counter-clockwise for Radio operation, and the Range Switch for the frequency range within which the desired station is included.

2. Turn the Power Switch "on" and adjust the Tone Control to its extreme clockwise position—*for full-range reproduction.* Wait a few seconds in order that the tubes may attain the proper temperature before attempting further operation.

3. Advance the Radio Volume Control to a position near the middle of its range and rotate the Station Selector until the dial indicator assumes a position coincident with the listed frequency of the desired station. Then with the vernier control (small knob), turn the selector *very slowly* over a narrow range on each side of that setting, advancing the volume control further in a clockwise direction and repeating the tuning process, if necessary, until the signal is heard.

> **NOTE**—This procedure is important—especially so for short-wave reception. Because of the wide band of frequencies covered by the short-wave range, tuning is critical (sharp). A station of suitable strength often will be imperceptible if passed through rapidly or in a haphazard manner.

4. After receiving the signal, turn the Radio Volume Control counter-clockwise until the volume is reduced to a low level. Then readjust the Station Selector accurately to the position mid-way between the points where the quality becomes poor or the signal disappears. *This setting minimizes the proportion of background noise and provides the fine quality of reproduction possible with this instrument.*

5. Adjust the Radio Volume Control to the desired volume level.

> **NOTE**—*The automatic volume control* built into this instrument maintains the volume level substantially constant irrespective of normal fluctuations of signal strength (fading). Also, other stations with good signal strength will be received at approximately the same level without manual readjustment of the volume.

6. Turn the Tone Control counter-clockwise if decreased treble response is preferred or to reduce noise interference if excessive.

7. When through operating, return the Tone Control to its counter-clockwise extremity, thus switching "off" the power.

Phonograph Procedure

To operate the electrical phonograph, refer to the section on "Controls" and proceed as follows:

1. Turn the Transfer Switch and Record Volume Control knob clockwise, for phonograph operation.

2. Apply power by turning the Tone Control clockwise from the "off" position. Set this control in the extreme clockwise position for *full-range* reproduction. A few seconds are required for the tubes to heat before operation is possible.

3. Place the desired record on the turntable. Insert a *new* needle in the pickup as far as it will go and tighten the needle screw. For long-playing (33⅓ R. P. M.) records, use *only* the *orange Chromium* needle. For standard (78 R. P. M.) records, use the latter needle or, if preferred, either the *green Chromium* or the full volume *Tungstone* needle. Ordinary steel needles (full volume) can be used with standard (78 R. P. M.) records, provided a new needle is inserted for each selection.

> **NOTE**—With care, the *orange* Chromium needle should play 75, the *green* Chromium 100, and the Tungstone 100 to 150 records. *Never re-insert in the pickup a Chromium needle which has been used (however slightly), as damage to the record grooves would result.* Do not use *Tungstone* needles with thin, flexible records or with transparent-faced (illustrated) records.

4. Pull the starting lever (right-hand side of turntable) forward to start the motor. Set the speed shifter (left-hand side of turntable) for the speed—78 or 33⅓ R. P. M.—corresponding to the record on the turntable. Then place the needle on the smooth outer surface of the record and slide it into the first groove.

> **NOTE**—The speed shifter should not be moved inward (from the 78 to the 33⅓ R. P. M. position) while the turntable is at rest.

5. Adjust the Record Volume Control to obtain the desired volume.

6. For most faithful reproduction, the Tone Control should be left in the fully clockwise position while using the phonograph. Turning this control counter-clockwise decreases the treble response and reduces the needle scratch noise (particularly noticeable with old records) reproduced by the loudspeaker.

7. At the completion of the record, lift the pickup arm and move it toward the right to stop the motor (motor stops automatically at the end of a record having the *eccentric* final groove). Lower the pickup outside the turntable—never allow it to rest on the record (or turntable) when not operating the phonograph.

8. When through operating, close the lid and turn the power switch "off."

Lubrication—The motor should be lubricated with light oil once every six months. Two oil holes on top of the motor are accessible through openings in the motorboard when the turntable is removed. The ball-bearing mechanism under the turntable should be lubricated once a year by prying off the cover and packing with vaseline or light motor grease, being careful to prevent any dirt particles from entering with the grease. Make sure that the speed shifter is in the outward (78 R. P. M.) position before replacing the turntable on the spindle.

NOTES ON SHORT-WAVE RECEPTION

While the design of this instrument is such that no previous experience or special skill is required for proper operation, its full possibilities can be realized only by those familiar with the general characteristics of transmission on the shorter wave-lengths. The following notes are a summary of extensive data compiled mainly by experimentation and should be found both interesting and helpful, especially to beginners in the field of short-wave reception.

Broadcast transmission at 49 meters is most reliable when received from a distance of 300 miles (500 kilometers) or more, although good reception at distances greater than 1500 miles (2400 kilometers) can be expected only when a large portion of the signal path lies in darkness.

Thirty-one (31) meter stations afford greatest reliability of service to receivers situated at a distance exceeding 800 miles (1300 kilometers). Good reception from distant stations in this band is possible both day and night.

Reception from stations operating in the 25 meter band is most common when a span of 1000 miles (1600 kilometers) or more separates the receiver and transmitter. Such transmission over distances of less than 2000 miles (3200 kilometers) will be received best during daylight hours. The more distant stations, however, can still be heard well after nightfall under favorable conditions.

In the 19 meter band, stations situated at a distance of 1500 miles (2400 kilometers) or greater will be found most satisfactory. Signals in this band will generally be heard during daylight hours—rarely after nightfall or when any appreciable portion of the transmission path is in darkness. Wave-lengths below 19 meters are useful only when transmitted entirely through daylight and over long distances (2000 miles or more); ordinarily they cannot be received after sunset.

Transmitted signals of any wave-length are known to divide into two components—the "ground" wave and the "sky" wave. The former remains close to the earth's surface, providing reliable service only over short distances from the broadcasting station. The sky wave, however, travels into the higher layers of the atmosphere and is reflected back to the earth's surface at an appreciable distance from the station. With short-wave signals, the sky wave usually does not return within the radius covered by the ground wave, resulting in a so-called dead-spot region within which reception is impossible or extremely unsatisfactory. The length of the region wherein such conditions are effective is known as the skip distance, varying greatly from day to night and from summer to winter approximately as shown in Table I.

When attempting to receive distant or foreign stations, the time standards observed at various longitudes throughout the world must be considered. At 8:00 P. M. in New York or 7:00 P. M. in Chicago, it is of the next day—1:00 A. M. in London, 2:00 A. M. in most of Europe and 11:00 A. M. in Australia. On the American continents, therefore, regular evening broadcasts from Europe will be received in the late afternoon and from Australia in the early morning. Special programs, however, are frequently transmitted from European stations at times chosen for evening reception in America.

Although reception on the short wave-lengths is less affected by atmospherics or static and good results may be had in midsummer even during a thunder storm, the reverse is true of man-made interference. Electrical machinery such as trolleys, dial telephones, motors, electric fans, automobiles, airplanes, electrical appliances, flashing signs and oil burners create far more interference to the shorter waves than to frequencies in the standard broadcast band (200 to 555 meters).

While the foregoing statements are valid, many other factors may so influence the transmission of short waves that exceptions are probable in certain locations. Experience in the operation of short-wave receivers in a given location is the best guide as to what to expect in reception at various times.

Table I—Effect of Time of Day and Season of Year on Short-Wave Transmission*

Wave-length (Meters)	Ground-Wave Range		Sky Wave (Mid-Summer) Approximate Range				Sky Wave (Mid-Winter) Approximate Range			
			Noon		Midnight		Noon		Midnight	
	Miles	Kilom.	Miles	Kilom.	Miles	Kilom.	Miles	Kilom.	Miles	Kilom.
100	90	145	—90	—145	90—600	145—960	90—100	145—160	90—2500	145—4000
49	75	120	100—200	160—320	250—5000	400—8000	200—600	320—960	400—∞	640—∞
31	60	97	200—700	320—1125	1000—∞	1600—∞	500—2000	800—3200	1500—∞	2400—∞
25	50	80	300—1000	480—1600	1500—∞	2400—∞	600—3000	960—4800	2000—∞	3200—∞
19	35	56	400—2000	640—3200	2500—∞	4000—∞	900—4000	1450—6400	X	X
15	15	24	700—4000	1125—6400	X	X	1500—∞	2400—∞	X	X

∞—Unlimited distance. X—Ordinarily cannot be heard.

*Time and season apply to transmitting station. Distances specified are based on relatively high-power transmission and favorable conditions of reception.

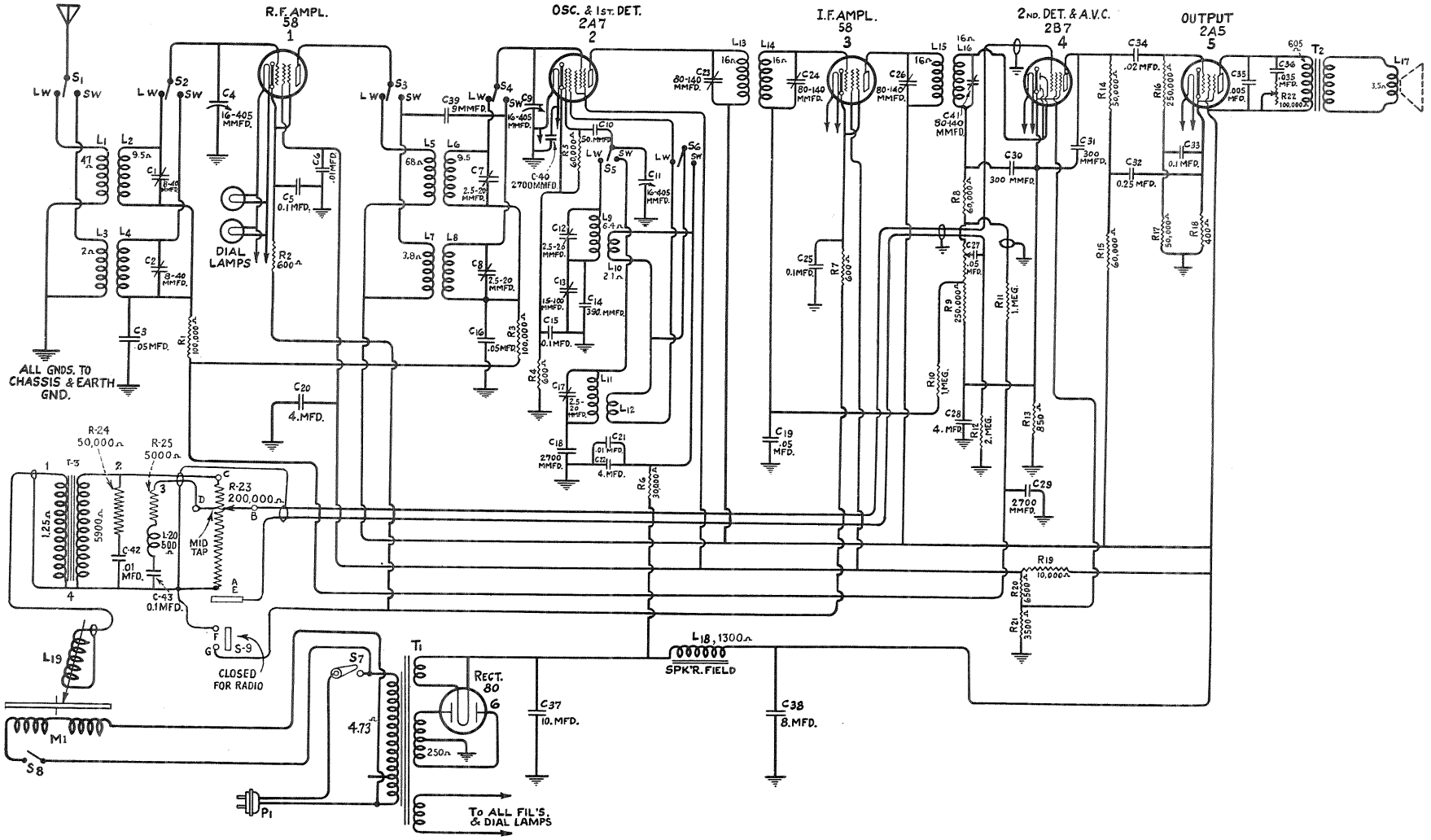

Figure A—Schematic Circuit Diagram

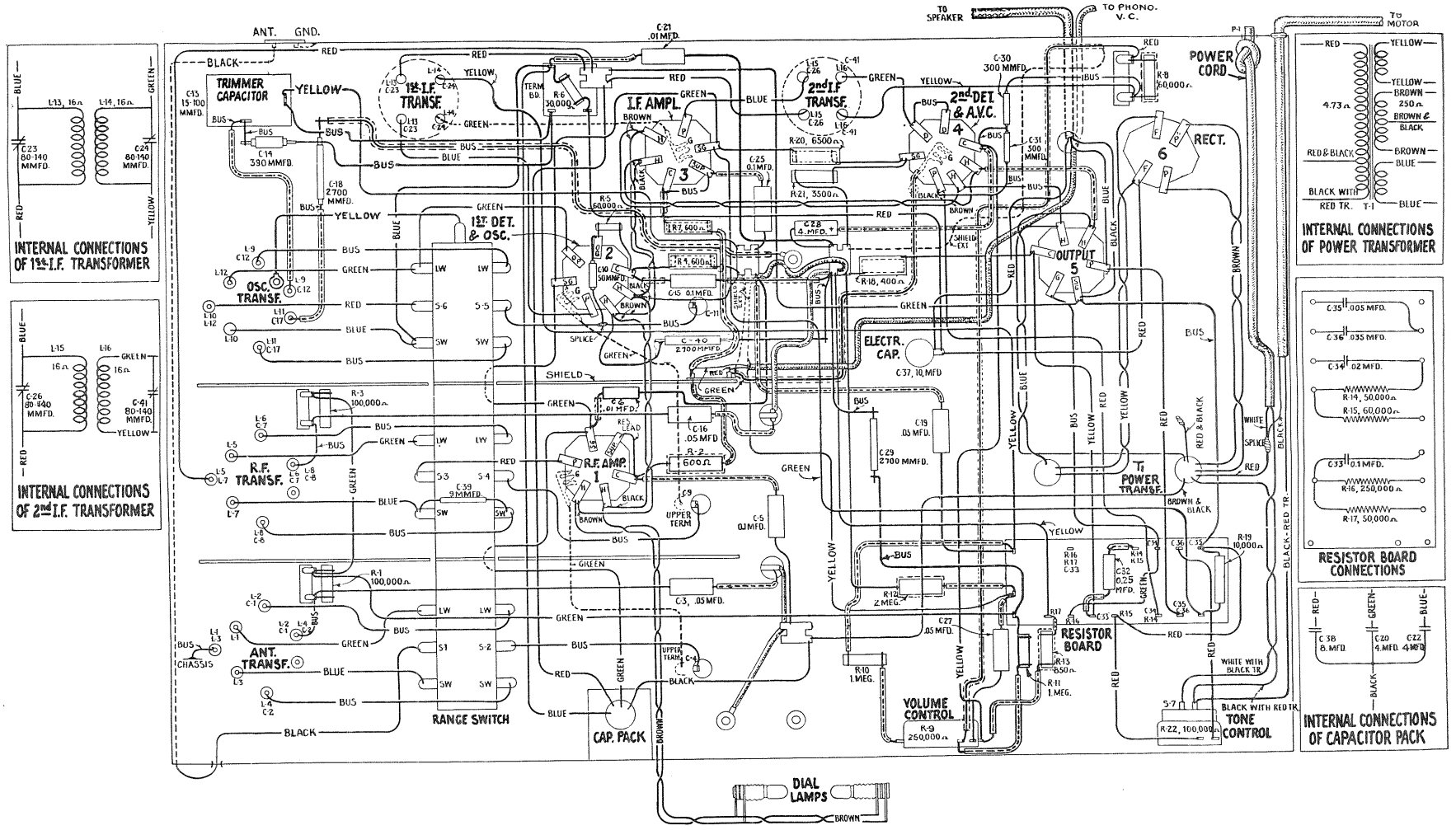

Figure B—Chassis Wiring Diagram

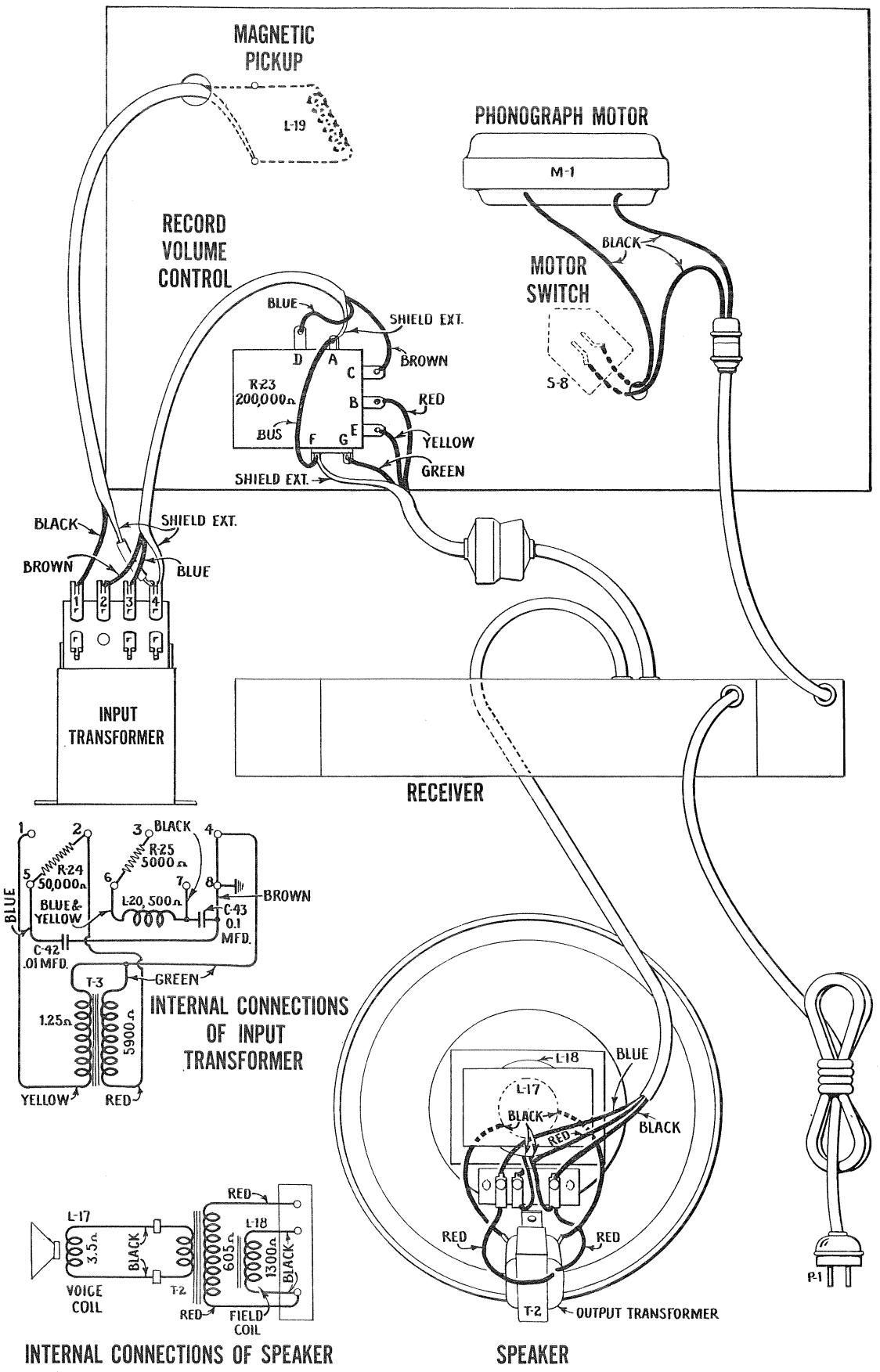

Figure C—Assembly Wiring Diagram

SERVICE DATA

Electrical Specifications

Voltage Rating.....105–125 Volts
Frequency Rating.....25, 30, 50 and 60 Cycles
Power Consumption..30, 50 and 60 Cycle, 105 Watts; 25 Cycle, 110 Watts
Number and Type of Radiotrons.....2 RCA-58
1 RCA-2A7, 1 RCA-2B7, 1 RCA-2A5, 1 RCA-80—Total 6
Tuning Ranges..... 540 K. C.–1500 K. C. and 5400 K. C.–15,350 K. C.
Undistorted Output.....1.75 Watts

This "Selective Short-Wave" combination instrument utilizes the new six-tube double band superheterodyne together with the standard two-speed motor board assembly. Excellent quality of record reproduction, together with unusual radio performance, characterizes this instrument.

The receiver is a six-tube two-band A. C. operated Superheterodyne receiver combining the standard and short-wave broadcasting bands. The frequency ranges are selected by means of a two-position switch. Other features include a double reduction vernier tuning drive using two concentric knobs giving a 10–1 and a 55–1 ratio of speed reduction, a continuously variable tone control, eight-inch electrodynamic loudspeaker, automatic volume control, single Pentode output tube and the inherent sensitivity, selectivity and tone quality of the Superheterodyne.

The chassis is of compact construction, affording unusual accessibility to all parts and adjustments. An "Airplane" type dial calibrated in frequency and showing the location of the short-wave bands is a special feature of this instrument. Figure A shows the schematic circuit, Figure B the wiring diagram, Figure C the assembly wiring and Figure D the location of the line-up capacitors. Service data on the magnetic pickup is given on one of the following pages.

Line-Up Capacitor Adjustments

In order to properly align this receiver it is essential that Stock No. 9050 Test Oscillator be used. This oscillator covers the frequencies of 150 K. C. to 25,000 K. C. continuously, has good stability and includes an attenuator. In addition to the oscillator, a non-metallic screwdriver such as Stock No. 7065 and an output meter are required. The output meter should be preferably a thermo-couple galvanometer connected across or in place of the cone coil of the loudspeaker.

I. F. Tuning Adjustments—Two transformers comprising four tuned circuits are used in the intermediate amplifier. These are tuned to 370 K. C. and the adjustment screws are accessible as shown in Figure D. Proceed as follows:

(a) Short-circuit the antenna and ground terminals and tune the receiver so that no signal is heard. Set the volume control at maximum and connect a ground to the chassis.

(b) Connect the test oscillator output between the first detector control grid, and chassis ground. Connect the output meter across the voice coil of the loudspeaker and adjust the oscillator output so that, with the receiver volume control at maximum, a slight deflection is obtained in the output meter.

(c) Adjust the secondary and primary of the first and then the second I. F. transformers until a maximum deflection is obtained. Keep the oscillator output at a low value so that only a slight deflection is obtained on the output meter at all times. Go over these adjustments a second time, as there is a slight interlocking of adjustments. This completes the I. F. adjustments.

R. F. and Oscillator Adjustments—The R. F. line-up capacitors are located at the bottom of the coil assemblies instead of their usual position on the gang capacitor. They are all accessible from the bottom of the chassis except the 600 K. C. series capacitor, which is accessible from the rear of the chassis. Proceed as follows:

(a) Connect the output of the oscillator to the antenna and ground terminals of the receiver. Check the position of the indicator pointer when the tuning capacitor plates are fully meshed. It should be coincident with the radial line adjacent to the dial reading of 540. Then set the Test Oscillator at 1400 K. C., the dial indicator at 1400 and the oscillator output so that a slight deflection will be obtained in the output meter when the volume control is at its maximum position.

(b) With the Range Switch at the "in" position, adjust the three trimmers under the three R. F. coils designated as L. W. in Figure D, until a maximum deflection is obtained in the output meter. Then shift the Test Oscillator frequency to 600 K. C. The trimmer capacitor accessible from the rear of the chassis should now be adjusted for maximum output while rocking the main tuning capacitor back and forth through the signal. Then repeat the 1400 K. C. adjustment.

(c) Now place the Range Switch at the "out" position, shift the Test Oscillator to 15,000 K. C. and set the dial at 15 on megacycle scale. Adjust the three trimmer capacitors designated as S.W. in Figure D for a peak, beginning with the oscillator trimmer. It will be noted that the oscillator and first detector trimmers will have two peaks. The position which uses the lower trimmer capacitance, obtained by turning the screw counter-clockwise, is the proper adjustment for the oscillator while the position that uses a higher capacitance is correct for the detector. *Both of these adjustments must be made as indicated irrespective of output.* The R. F. is merely peaked. In conjunction with the detector adjustment, it is necessary to rock the main tuning capacitor back and forth while making the adjustment. This completes the line-up adjustments.

The important points to remember are the need for using the minimum oscillator output to obtain a deflection in the output meter with the volume control at its maximum position and the manner of obtaining the proper high frequency oscillator and detector adjustments.

Power Transformer Connections

The power transformer used in this model has a tapped primary winding. The transformer is normally connected for lines ranging in voltage from 110 to 125 volts. If for any reason the line is normally below 110 volts, the connections should be changed so the tap will be used. This is done by unsoldering the black with red tracer transformer lead connected to the power switch (on tone control) and substituting the red and black lead normally taped up. The black with red tracer lead should then be carefully taped to prevent short-circuit.

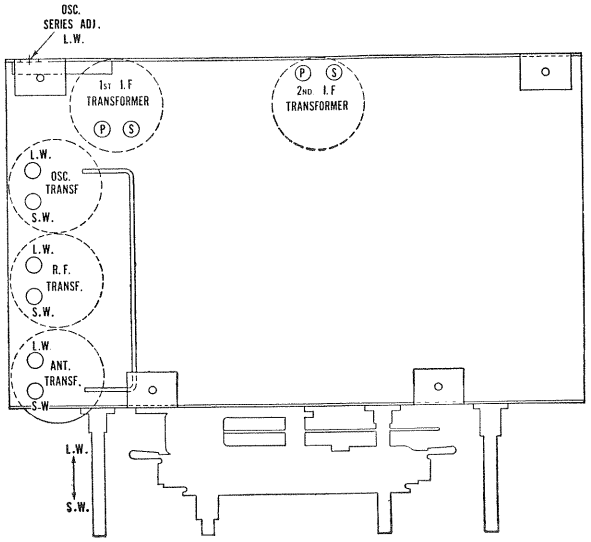

Figure D—Location of Line-Up Capacitors

TUBE SOCKET VOLTAGES (RADIO OPERATION)

115 VOLTS, A. C. Line—No Signal

Radiotron No.	Cathode to Control Grid, Volts	Cathode to Screen Grid, Volts	Cathode to Plate, Volts	Plate Current M. A.	Heater Volts
1. RCA-58 R. F.	3.0	100	265	6.0	2.32
2. RCA-2A7 1st Det. Osc.	3.0	100*	265*	2.0*	2.32
3. RCA-58 I. F.	3.0	100	265	6.0	2.32
4. RCA-2B7 2nd Det. A. V. C.	1.5	35	100	1.5	2.32
5. RCA-2A5 Power	16.0	255	240	35.0	2.32
6. RCA-80 Rectifier	725 Volts R. M. S.—75 M. A. Total Current				4.80

* The voltages and current refer to the detector part of the tube.

SERVICE DATA ON MAGNETIC PICKUP

The Magnetic Pickup used in this combination instrument is of a new design with an improved frequency range. While in physical appearance it is similar to that of the older type, details of construction are considerably different. It consists essentially of a chromium steel magnet, two thin pole pieces, a mechanism support and bracket, a coil, and an armature that is damped by means of an anchored damping block.

The use of the anchored damping block eliminates any bad peaks in the frequency range. The frequency-response characteristic is substantially flat from 50 to 5,000 cycles.

Replacing Magnet Coil, Pivot Rubbers, Armature or Damping Block

In order to replace a defective coil or the hardened pivot rubbers (see Figure F), it is necessary to proceed as follows:

(a) Remove the pickup cover by removing the center holding screw and needle screw.

(b) Remove the pickup magnet and the magnet clamp by pulling them forward.

(c) Unsolder the coil leads and remove the mechanism assembly from the back plate by releasing the two mounting screws and the damping block clamping screw.

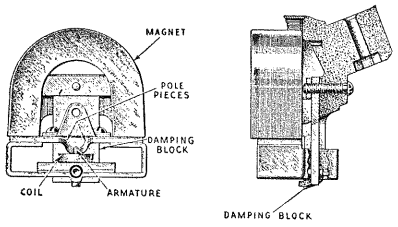

Figure E

(d) Remove screws A and B, Figure F, and then remove the mechanism assembly from the pole pieces.

(e) The coil or the front pivot rubber may now be removed and replaced. If it is desired to replace the rear pivot rubber, then the end of the armature soldered to the mechanism support must be unsoldered and the damping block removed. The rear pivot rubber now may be replaced. After putting the pivot rubbers in place a new damping block should be fastened to the armature as outlined in instructions on replacing the damping block.

(f) The mechanism should now be reassembled, except for the magnet, which must be magnetized. After being magnetized, the mechanism—with the pole pieces upward—should be placed so that the magnet may be slid from the magnetizer onto the pole pieces without breaking physical contact. After placing the pole pieces on the magnet, the entire assembly should be remagnetized thoroughly, being careful not to change the polarity obtained by the initial magnetization.

(g) After assembling to the mechanism, the entire assembly should be fastened to the back plate by means of the screws provided, making sure the damping block is securely clamped. At the same time, the metal dust cover must be placed in position.

(h) After remagnetizing, it is necessary to correctly center the armature. This may be done quite accurately by feeling its play after the needle is inserted. A little practice will quickly show which way an adjustment is necessary to have the armature centered properly. The adjustment is made by loosening screws A and B (Figure F), and sliding the mechanism slightly in relation to the pole pieces.

(i) The cover may be now replaced over the entire assembly, and the pickup returned to the tone arm.

In assembling, it may be desirable to check the armature air gap by means of a small Feeler Gauge. This air gap should be nine mils on each side of the armature. However, a little practice with the needle in place will quickly disclose whether or not the armature is centered.

Replacing the Damping Block

If it is desired to replace the damping block, it may be done in the following manner:

(a) Disassemble the pickup as described under the preceding section.

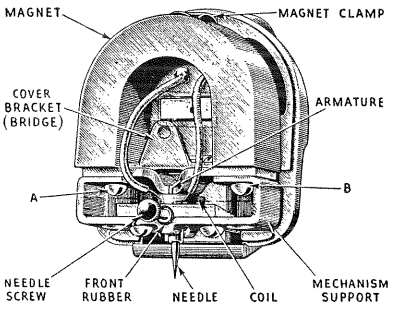

Figure F

(b) Remove the armature entirely by unsoldering it at its joint with the mechanism support.

(c) Remove the damping block from the armature and clean the bushing for holding the damping block with emery paper.

(d) Insert the armature through the new block so that it occupies the same position as that of the old. Also ascertain that the block is in correct vertical alignment with the armature. It will be noted that the hole in the damping block is somewhat smaller than the diameter of the armature. This is done so that a snug fit will be obtained.

(e) After properly locating the damping block, a soldering iron should be applied to the armature so that the block will melt slightly at its point of contact with the armature. A special tip, constructed as shown in Figure G, will prove desirable for fusing the block in place. The iron should be applied long enough to slightly melt the block and cause a small bulge on both sides, but should not be applied long enough to cause any bubbling. The pickup should then be reassembled as described in the preceding section.

Only rosin core solder should be used for soldering the coil leads in the pickup. Also rosin core solder should be satisfactory for resoldering the end of the spring in the hole in the mechanism, since both these parts have been previously tinned. In case the parts are not well tinned, it will be necessary to scrape the end of the spring and the hole in the mechanism until bright. These parts may now be tinned by using as a flux a water solution of zinc chloride (commonly called

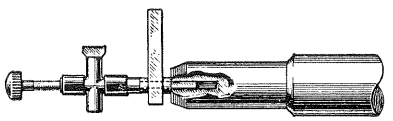

Figure G

acid flux). After tinning, dip the parts in water to wash off the acid flux and thereby prevent serious subsequent corrosion. After making sure that the pivot rubbers and damping block are properly in place, as described under (e) above, the armature may now be soldered in place in the mechanism by using rosin core solder, since the parts are now tinned. Care must be exercised to get the needle hole perfectly square with respect to the mechanism, or otherwise it will be difficult if not impossible to center the armature in the airgap as explained under (h).

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
2240	Resistor—30,000 ohms—Carbon type—1 watt (R6)	$0.22
2747	Cap—Contact cap—Package of 5	.50
3056	Shield—2nd detector Radiotron shield—Package of 2	.40
3076	Resistor—1 megohm—Carbon type—½ watt (R10, R11)—Package of 5	1.00
3252	Resistor—100,000 ohms—Carbon type—½ watt (R1, R3)—Package of 5	1.00
3470	Resistor—6,500 ohms—Carbon type—1 watt (R20)—Package of 5	1.10
3514	Resistor—250,000 ohms—Carbon type—½ watt (R16)—Package of 5	1.00
3529	Socket—Dial lamp socket	.32
3572	Socket—7-contact Radiotron socket	.38
3594	Resistor—50,000 ohms—Carbon type—½ watt (R14, R17)—Package of 5	1.00
3631	Resistor—850 ohms—Carbon type—½ watt (R13)—Package of 5	1.00
3639	Capacitor—.02 mfd. (C34)	.25
3683	Shield—Radiotron shield top	.20
3701	Capacitor—.01 mfd. (C6, C21)	.30
3702	Capacitor—.25 mfd. (C32)	.42
3768	Screw—Square head No. 6-32-¼" set screw for condenser drive—Package of 10	.35
3796	Capacitor—4. mfd. (C28)	.60
3849	Capacitor—50 mmfd. (C10)	.30
3859	Socket—4-contact Radiotron socket	.30
3861	Capacitor—Adjustable capacitor (C13)	.78
3877	Capacitor—.1 mfd. (C5, C15, C25, C33)	.32
3878	Screw—No. 4-40-$\frac{3}{16}$" screw for fastening station selector pointer—Package of 20	.25
3888	Capacitor—.05 mfd. (C19, C27)	.25
3892	Resistor—600 ohms—Carbon type—½ watt (R2, R4, R7)—Package of 5	1.00
3897	Resistor—400 ohms—Carbon type—1 watt (R18)—Package of 5	1.10
3901	Capacitor—.05 mfd. (C3, C16)	.36
3906	Mounting assembly—Variable condenser mounting assembly comprising 3 bushings, 3 lockwashers, 3 nuts, and 3 washers	.28
3937	Capacitor—300 mmfd. (C30, C31)	.34
3938	Capacitor—9 mmfd. (C39)	.25
3939	Resistor—3,500 ohms—Carbon type—½ watt (R21)—Package of 5	1.00
3942	Shield—1st detector Radiotron shield	.18
3943	Screen—Translucent screen for dial light—Package of 2	.18
3944	Shield—Antenna, R. F. or oscillator coil shield	.28
3991	Resistor—10,000 ohms—Porcelain type (R19)	.60
4031	Capacitor—2,700 mmfd. (C18, C29, C40)	.50
4032	Capacitor—390 mmfd. (C14)	.34
4119	Screw—No. 8-32-¼" headless cup point set screw for station selector knob—Package of 20	.38
6188	Resistor—2 megohm—Carbon type—½ watt (R12)—Package of 5	1.00
6282	Resistor—60,000 ohms—Carbon type—½ watt (R5, R8, R15)—Package of 5	1.00
6571	Capacitor—10 mfd. (C37)	1.20
6620	Capacitor—Comprising one .005 mfd. and one .035 mfd. (C35, C36)	.50
6676	Socket—6-contact Radiotron socket—Output	.40
6694	Condenser—3-gang variable tuning condenser (C4, C9, C11)	3.75
6695	Volume control (R9)	1.20
6696	Switch—Range switch (S1, S2, S3, S4)	2.24
6697	Transformer—First intermediate frequency transformer (L13, L14, C23, C24)	1.80
6698	Transformer—Second intermediate frequency transformer (L15, L16, C26, C41)	1.78
6699	Coil—R. F. coil (L5, L6, L7, L8, C7, C8)	2.44
6700	Coil—Oscillator coil (L9, L10, L11, L12, C12, C17)	2.30
6701	Coil—Antenna coil (L1, L2, L3, L4, C1, C2)	2.64
6702	Drive—Variable tuning condenser drive assembly complete	1.86
6703	Capacitor pack—Comprising one 8. mfd. and two 4. mfd. capacitors (C20, C22, C38)	2.46
6704	Shaft—Tuning condenser drive assembly shaft	.64
6705	Tone control complete (R22)	1.20
6841	Dial—Station selector dial—Package of 5	2.74
6842	Pointer—Station selector pointer—Package of 5	.46
7485	Socket—6-contact Radiotron socket	.40
7487	Shield—I. F. and R. F. amplifier Radiotron shield	.25
9446	Transformer—Pow ertransformer—105–125 volts—50–60 cycles (T1)	5.40
9451	Transformer—Power transformer—105–125 volts—25–50 cycles	5.40
10194	Ball—Steel ball for condenser drive assembly—Package of 20	.25
	PICKUP AND PICKUP ARM ASSEMBLIES	
3386	Cover—Pickup cover	.56
3387	Screw assembly—Pickup mounting screw assembly comprising one screw, one nut and one washer—Package of 10	.40
3388	Screw—Pickup needle holding screw—Package of 10	.60
3389	Rod—Automatic brake trip rod—Package of 5	.40
3417	Armature—Pickup armature	$0.72
3419	Screw—Cover mounting screw—Package of 10	.40
3516	Damper assembly—Comprising 1 upper and 1 lower damper 1 upper and 1 lower bearing—For pickup base	.14
3521	Cover—Pickup back cover	.18
3737	Damper—Viscoloid damping block—Package of 5	.65
6346	Back—Pickup housing back	.45
6601	Pickup—Magnetic pickup complete	4.54
3728	Coil—Pickup coil (L19)	.50
7731	Arm—Pickup arm complete less pickup and escutcheon	5.40
	TURNTABLE ASSEMBLIES	
3261	Bushing—Rubber bushing—Used on turntable spindle for long playing records—Package of 5	.40
3338	Ring—Clamp ring assembly—Comprising spring, latch lever and stud	.50
3340	Washer—Thrust washer—Package of 2	.56
3341	Pin—Groov-Pin—Package of 2	.56
3342	Spring—Latch spring—Located on clamping ring—Package of 2	.56
3343	Sleeve—Sleeve complete with ball race	2.86
3344	Cover—Grease retainer cover—Package of 2	.70
3346	Bushing—Speed shifter lever bushing—Package of 4	.66
3347	Spring—Speed shifter lever spring—Package of 2	.30
3399	Lever—Speed shifter lever with mounting screws	.50
8948	Turntable—Complete	5.50
	MOTOR ASSEMBLIES	
3398	Motor mounting assembly—Comprising 2 cup washers, 4 springs and 1 "C" washer	.48
3817	Stud—Motor mounting stud—Package of 3	.18
8989	Motor—Motor complete—105–125 volts—60 cycle	18.52
8990	Motor—Motor complete—105–125 volts—50 cycle	18.52
8991	Motor—105–125 volts—40 cycles	23.36
8992	Motor—Motor complete—105–125 volts—25 cycle	23.36
8993	Rotor and shaft for 105–125 volts, 60 cycle motor	7.00
8994	Spindle—Turntable spindle with fibre gear for 60 cycle motor	4.75
8995	Rotor and shaft for 105–125 volts—50 cycle motor	7.00
8996	Spindle—Turntable spindle with fibre gear for 50 cycle motor	4.75
8997	Rotor and shaft for 105–125 volts—40 cycle motor	8.00
8998	Spindle—Turntable spindle with fibre gear for 40 cycle motor	5.50
8999	Rotor and shaft for 105–125 volts—25 cycle motor	8.00
9001	Spindle—Turntable spindle with fibre gear for 25 cycle motor	5.50
	MISCELLANEOUS PARTS	
2917	Leather—Friction leather—Package of 20	.50
3322	Switch—Automatic brake switch with mounting screws (S8)	.75
3391	Suspension spring and washer assembly for motor board—Comprising one bolt, one top spring, one bottom spring, 2 cup washers, one "C" washer, and one nut	.50
3430	Box—Needle box with lid—Package of 2	.90
3994	Cover—Automatic switch brake cover	.26
4075	Knob—Tone control or range switch knob—Package of 5	1.00
4120	Knob—Volume control knob—Package of 5	1.18
4121	Knob—Station selector knob—Package of 5	1.18
4136	Screw—Chassis mounting screw assembly—Comprising four screws, four washers, eight cushions	.62
6614	Glass—Station selector dial glass	.30
6615	Ring—Retaining ring for dial glass—Package of 5	.34
6288	Knob—Phonograph volume control knob—Package of 5	1.00
6766	Volume control—Phonograph volume control (R23, S9)	2.28
6840	Bezel—Metal bezel for station selector dial	.56
6855	Cable—3-conductor cable with spade terminals—Reproducer cable	.44
6856	Cable—3-conductor shielded with male section of connection plug—Phonograph volume control	.85
6857	Cable—2-conductor motor cable	1.24
6858	Transformer—Phonograph input transformer—Comprising one transformer, one reactor, one .01 mfd. and 0.1 mfd. capacitors, one 5,000 and one 50,000 ohm resistor (T3, R24, R25, C42, C43, L20)	2.50
10174	Spring—Automatic brake springs—One set of 4 springs—Package of 2 sets	.50
10184	Plate—Automatic brake latch trip plate with mounting screws—Package of 5	.40
	REPRODUCER ASSEMBLIES	
6770	Transformer—Output transformer (T2)	2.00
8969	Cone—Reproducer cone (L17)—Package of 5	6.35
9460	Coil assembly—Comprising field coil magnet and cone support (L18)	6.00
9473	Reproducer complete	8.00

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