RCA VICTOR DUO JUNIOR MODEL R-93

SERVICE NOTES

Electrical Specifications

Voltage Rating.....105-125 Volts A.C.
Frequency Rating (three types).25, 50, and 60 Cycles
Power Consumption.....5 Watts
Type of Motor....Synchronous (Manual Starting)
Turntable Speed.....78 R. P. M.
Pickup Impedance.....1,400 Ohms at 1,000 Cycles
Volume Control Resistance.....20,000 Ohms

Mechanical Specifications

Height.....5 inches
Width.....11 inches
Depth.....8 inches
Turntable Diameter.....7 inches
Weight (Net).....8½ pounds
Weight (Shipping).....10 pounds

General Description

This phonograph turntable and pickup assembly is designed to provide record reproduction to the owner of a modern radio receiver by utilizing the audio amplifier system and loudspeaker of the radio receiver in such a way as to provide quality of reproduction equal to or better than that obtained from radio stations. A switch is provided for changing from radio to record reproduction, or vice versa. Simplicity, compact size, and ease of connections are outstanding features of this instrument.

Electrically, the instrument consists of a magnetic pickup for transforming the mechanical variations of the record grooves to voltage variations, a combined power switch and volume control for turning power on and off and adjusting the output voltage to any desired level, and a radio-record switch for shifting the connections to the receiver so that either radio or record reproduction may be obtained as desired by the user.

Figure 1 shows a typical layout of an ideal installation. Figure 3 shows the schematic and wiring diagrams. The wiring diagram indicates the proper connections to be made between the pickup unit, the switch assembly, and the end of the cable connecting to the switch.

Connecting Phonograph to the Radio Receiver

When connecting a phonograph unit to a radio receiver, a few fundamental facts should be considered. First, the output of the pickup must be connected to the receiver at a point where sufficient audio gain between it and the speaker is available to give normal sound output. Second, when doing this, some attention should be given to the possibilities of introducing hum and undesired noise, both in the audio and in the radio circuits.

In general, it will be found that the grid or cathode circuits of the second detector of a superheterodyne receiver are suitable for phonograph input. However, on receivers using the type 6H6 as a second detector, the grid of the first audio amplifier should be used. On tuned r-f receivers, either the detector cathode or the first audio transformer primary circuit may be employed, depending upon the amount of audio gain and the type of detector used.

On receivers employing a volume control in the audio circuit between the first and second audio stages, it is advisable to set the phonograph volume control to maximum and use the radio receiver volume control for adjusting the phonograph output. In circuits of this type which are aurally compensated, advantage is taken of the compensation feature when the radio receiver volume control is used.

On receivers employing a volume control between the second detector and first audio, or in the antenna, r-f, or i-f circuits, and with the phonograph input connected to the first a-f stage, it will be necessary to control the phonograph output by using the phonograph volume control. The receiver volume control may then be set to minimum to "kill" radio reception.

Investigation of a large number of receivers has shown that six general types of connections (five of which may be made without removing the chassis from the cabinet) cover practically every type of receiver. These connections are as follows:

(1) Receivers having phonograph input jacks and Radio-Record Switches. With these receivers, the cable and switch supplied with the R-93 are not used. The phonograph output is connected direct to the phonograph input jack and the Radio-Record Switch on the receiver is used for changing from Record to Radio reproduction.

(2) Receivers having phonograph terminal board connections. Such connections should be made in accordance with the instructions pertaining to that particular instrument.

(3) Receivers using the type 2B7 or 6B7 second detectors. With receivers of this type, the

yellow and green leads are connected in series with the grid cap connection of this tube, the green lead connected to the grid cap itself.

(4) Receivers using the type 6F5 as a first audio tube. On receivers of this type, the yellow and green leads are connected in series with the grid cap connection of this tube, the green lead connected to the grid cap itself.

(5) Receivers not having any of the foregoing features. On receivers of this type, a split cathode connection is necessary. Stock No. 4611 five-prong adapter, or Stock No. 4612 six-prong adapter, may be used which is placed under the tube used in the second detector socket of the receiver. Stock No. 11957 eight-prong "octal" adapter may be placed under the first audio tube, such as the type 6C5. In the above cases, the yellow and green leads are connected in series with the cathode, the green lead connected to the tube cathode and yellow lead to the cathode socket contact.

(6) Under Chassis Connections. The above connections (3), (4), and (5), are recommended when it is desired to connect the R-93 without removing the chassis and making changes in its wiring. Better results may often be obtained by making permanent connections underneath the chassis. Additional parts (such as a cathode bias resistor and its by-pass capacitor) may be added to supply the necessary bias for phonograph operation when the stage is signal biased. A typical example of such an arrangement as recommended for Model C 15-3 is shown by Figure 2. (Note the additional jumpers added to the switch for killing radio.) All leads should be kept as short as possible and properly shielded. Also, care should be taken in the placement of leads in regard to a-c heater wiring, power transformer, etc., to prevent hum pickup. Receivers using a multi-purpose tube for i-f and second detector (such as Model T 4-8), the yellow and green leads should be connected in series with the detector grid; the connection being made in series with the ground side of the i-f transformer secondary to avoid detuning due to capacity effects.

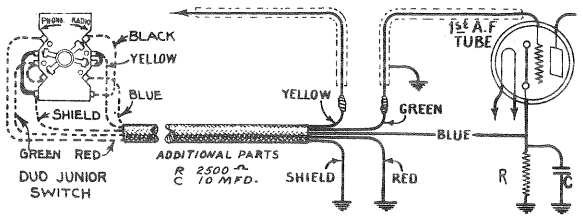


Figure 2—Typical Connections for Model C 15-3

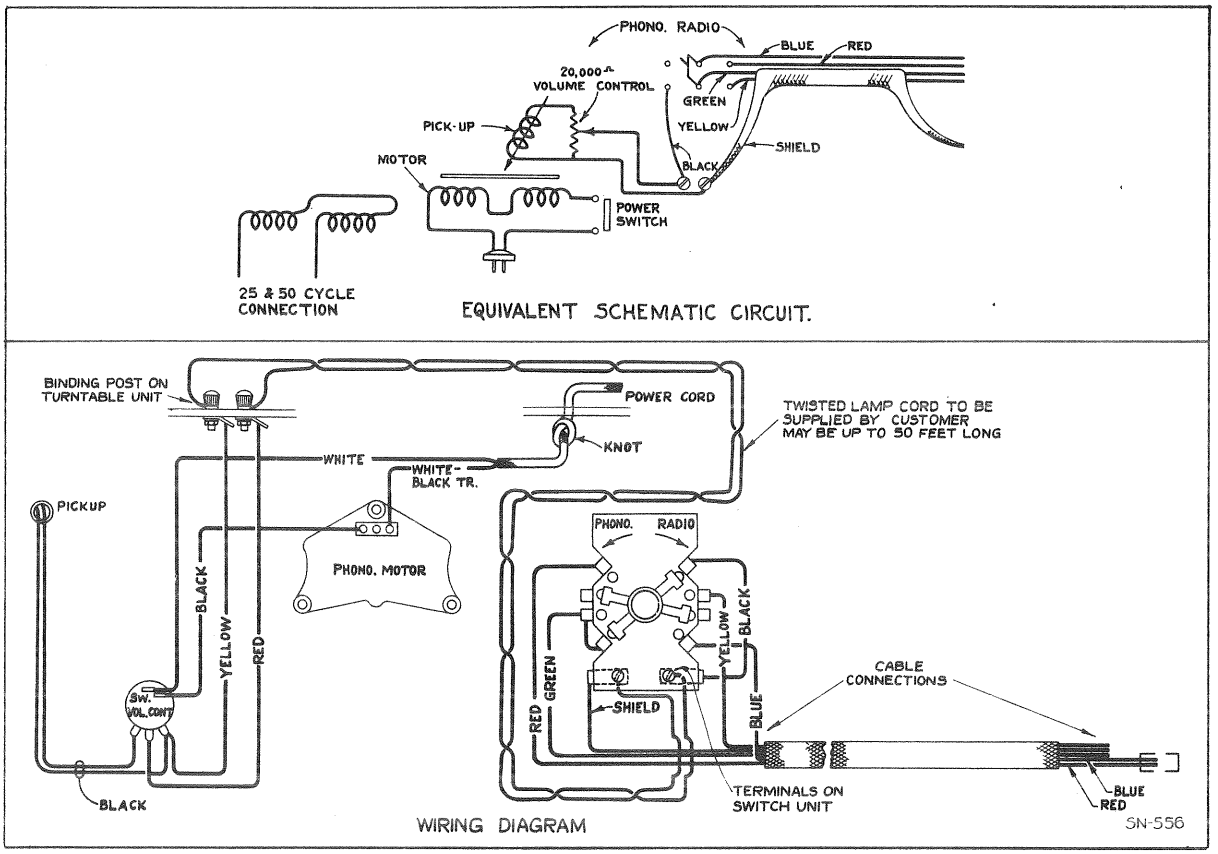


Figure 3—Wiring Diagram and Equivalent Schematic Circuit

RCA VICTOR RECEIVERS—DETAILS OF LEAD CONNECTIONS

Model	Method of Connection	Green	Yellow	Red	Blue	Shield
R-4, 6, 8, 10, 12, 70, 71, 72, 74, 76, 77	5. Adapter	Det. Cathode	Cathode Socket Contact	Ant.	Ant. Lead	Chassis
R-5, 17M, 27	5. Adapter	Det. Cathode	Cathode Socket Contact	Ant.	Ant. Lead	Det. Cathode (Yellow)
R-7, 7A	2. Term. Board	Term. 2 (Open Link)	Term. 1	Ant.	Ant. Lead	Term. 4
R-11,21	2. Term. Board	Term. 2 (Open Link)	Term. 3	Term. 4 (Open Link)	Term. 5	Term. 6
R-18W, 22	5. Adapter	Det. Cathode	Cathode Socket Contact	Ant.	Ant. Lead	Det. Cathode (Yellow)
RO-23	5. Adapter	Det. Cathode	Cathode Socket Contact	Ant.	Ant. Lead	Chassis
R-28	5. Adapter	Det. Cathode	Cathode Socket Contact	Ant.	Ant. Lead	Chassis
R-37, 38, 73, 73A, 75, 75A	3. Grid Clip	Grid Cap of Tube	Grid Clip	Ant.	Ant. Lead or Bind. Post	Chassis
Rad. 48	2. Term. Board	Term. 4 (Open Link)	Term. 5	Term. 2 (Open Link)	Term. 3	Term. 5
R-50, 55	2. Term. Board	Term. 3 (Open Link)	Term. 4	Term. 1 (Open Link)	Term. 2	Term. 6
R-78	2. Term. Board	Term. 7 (Open Link)	Term. 8	Term. 1 (Open Link)	Term. 2	Chassis
Rad. 80	5. Adapter	Det. Cathode	Cathode Socket Contact	Ant.	Ant. Bind. Post	Chassis
Rad. 82	2. Term. Board	Term. 2 (Open Link)	Term. 3 (Tie-in Term.1 to Term.3)	Term. 2	Term. 3	Term. 3
R-90, 260, 261	5. Adapter	Det. Cathode	Cathode Socket Contact	I-F Amp.* Cathode	I-F Cathode Socket Contact	Chassis
103	6. Under Chassis	Det. Grid Term.	Grid Lead	Ant.	Ant. Lead	Chassis
110, 111, 115, 210	5. Adapter	Det. Cathode	Cathode Socket Contact	Ant.	Ant. Lead or Bind. Post	Cathode Socket Contact
114	5. Adapter	Det. Cathode	Cathode Socket Contact	Ant.	Ant. Lead	Det. Cathode (Yellow)
117, 118, 119, 120, 121, 122, 124, 125, 128, 211, 214, 220, 221, 222, 224, 225, 226	3. Grid Clip	Grid Cap of Tube	Grid Clip	Ant.	Ant. Lead or Bind. Post	Chassis
140, 141, 240	2. Term. Board	Term. 3	Tape	Term. 1	Term. 2	Term. 1
143, 242	2. Term. Board	Term. 5 (Open Link)	Term. 4	Term. 1 (Open Link)	Term. 2	Chassis
262	2. Term. Board	Term. 2 (Open Link)	Term. 1	I-F Cathode (Adapter)	I-F Cathode Socket Contact	Chassis
280	5. Adapter	Det. Cathode	Cathode Socket Contact	I-F Cathode*	I-F Cathode Socket Contact	Chassis
T 4-8, 4-9	6. Under Chassis	Det. Grid Term.	Grid Lead	Ant.	Ant. Lead	Chassis
T 4-8A, 4-9A, 4-10, 5-2	3. Grid Clip	Grid Cap of Tube	Grid Clip	Ant.	Ant. Lead	Chassis
T 6-1, 6-9, 7-5, 8-14	4. Grid Clip	Grid Cap of Tube	Grid Clip	I-F Cathode (Adapter)	I-F Cathode Socket Contact	Chassis
C 6-2, 7-6, 8-15, 9-4	4. Grid Clip	Grid Cap of Tube	Grid Clip	I-F Cathode (Adapter)	I-F Cathode Socket Contact	Chassis
T 8-16, 9-9 C 8-17, 9-6	2. Term. Board	Term. 2 (Open Link)	Term. 1 (Left Term.)	Term. 3 (OpenLink)	Term. 4	Chassis
T 10-1 C 11-1, 13-2, 15-3	5. Adapter	1st Audio Cathode	Cathode Socket Contact	I-F Cathode*	I-F Cathode Socket Contact	Chassis
T 10-3, 11-8	2. Term. Board	Term. 2 (Open Link)	Term. 1	I-F Cathode (Adapter)	I-F Cathode Socket Contact	Chassis

* Use a second adapter.

It will be noted that red and blue leads are brought out from the switch for "killing" the radio circuit during record reproduction. On early receivers, these may be connected in series with the antenna lead to open the antenna circuit during phonograph operation. In the event of unsatisfactory radio suppression with this connection, better results may be obtained by re-connecting the red and blue leads to the adjacent respective lugs on the Radio-Phono Switch and attaching the outer ends to the Ant.-Gnd. terminals of the receiver so as to short-circuit these terminals during phonograph operation. CAUTION: This scheme of connection should be avoided on AC-DC receivers unless a small capacitor (.05 mfd.) is used in series with either switch lead.

For most positive radio suppression, a split cathode adapter should be used in an i-f socket and the red and blue leads connected (standard connection at Radio-Phono Switch) in series with the cathode so that this circuit will be open for phonograph operation.

If the receiver is of the "All-Wave" type, it is recommended that a split cathode adapter always be used in an i-f socket. CAUTION: If a "Doublet" antenna is used, do not place the switch in series with either side of the transmission line as the operation of the antenna system may be affected.

On the preceding page, a list of numerous receivers and their proper connections are given.

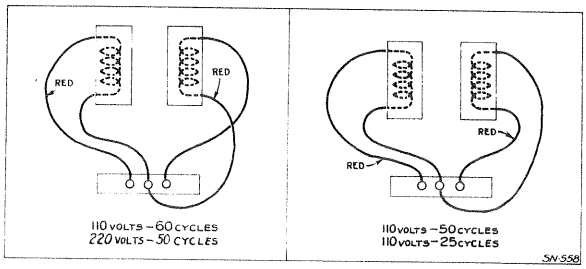
RK-24 Phonograph Oscillator

In addition to the above recommended connections of the R-93 to radio receivers, the RCA Stock No. 9554 RK-24 Phonograph Oscillator provides a convenient and reliable means for connection and operation of the R-93 with a radio receiver of any type of manufacture. Its proper connections are shown in the RCA Victor RK-24 Service Notes.

Phonograph Motor Service Data

NOTE: The motor used in the Second Production R-93 turntables is somewhat different from that used in the First Production. They are hereinafter designated as (1) First Production and (2) Second Production. Changes denoting the difference between the two types are indicated in Figure 5 (First Production) and Figure 6 (Second Production). Replacement Parts are likewise tabulated separately for each type.

The synchronous motor used in this instrument is designed to be simple and foolproof. Among its many features are constancy of speed, low power consumption, single moving part, ease of starting, viscoloid damper, and long life. The main parts of the motor and the points that may require attention are shown by Figure 5 (First Production) and Figure 6 (Second Production). The motor is started by turning "On" the power switch and giving the turntable a clockwise spin with the hand. If the motor is difficult to start it may be due to the stator failing to rotate on the outer bearing. This may be corrected by applying a slight amount of oil to the bearing surfaces. It is very important that the ball bearing be at the bottom of the main bearing assembly.



COIL RESISTANCE

First Production

110 V. 50 or 60 Cycles	218 ohms total
110 V. 25 Cycles	960 ohms total
220 V. 50 Cycles	1270 ohms total

Second Production

110 V. 50 or 60 Cycles	200 ohms total
110 V. 25 Cycles	660 ohms total

Figure 4—Motor Wiring Connections

Excessive Hum and Vibration

A small amount of hum when starting, decreasing to a negligible amount while running, is normal. If excessive vibration occurs either at starting or running, it may be due to one of the following:

(1) Insufficient lubrication in outer bearing or any other failure that will cause the stator to bind.
(2) Metal washer not above the leather washer at the bottom of the main bearing.
(3) Leather washer not oiled. When replacing the leather washer, make sure that it is thoroughly soaked in oil.
(4) Motor not properly supported from motor board. Unless the motor is properly supported from the motor board, normal vibration will be excessive.
(5) Burrs on salient poles of rotor or stator. They should be removed with fine emery cloth.

Removing Rotor from Stator

The rotor which includes the turntable may be removed as follows:

(1) First Production. Loosen the screw shown in Figure 5 until it clears the rotor. Then lift the turntable, being careful not to lose the steel ball of the end-bearing. After replacing the rotor, tighten the retaining screw securely.
(2) Second Production. Loosen the nut shown in (5) of Figure 6, pushing the stop out of the slot and rotating 180 degrees. Then lift the turntable, being careful not to lose the ball end-bearing. After replacing the rotor, return the stop to its normal position and tighten the nut securely.

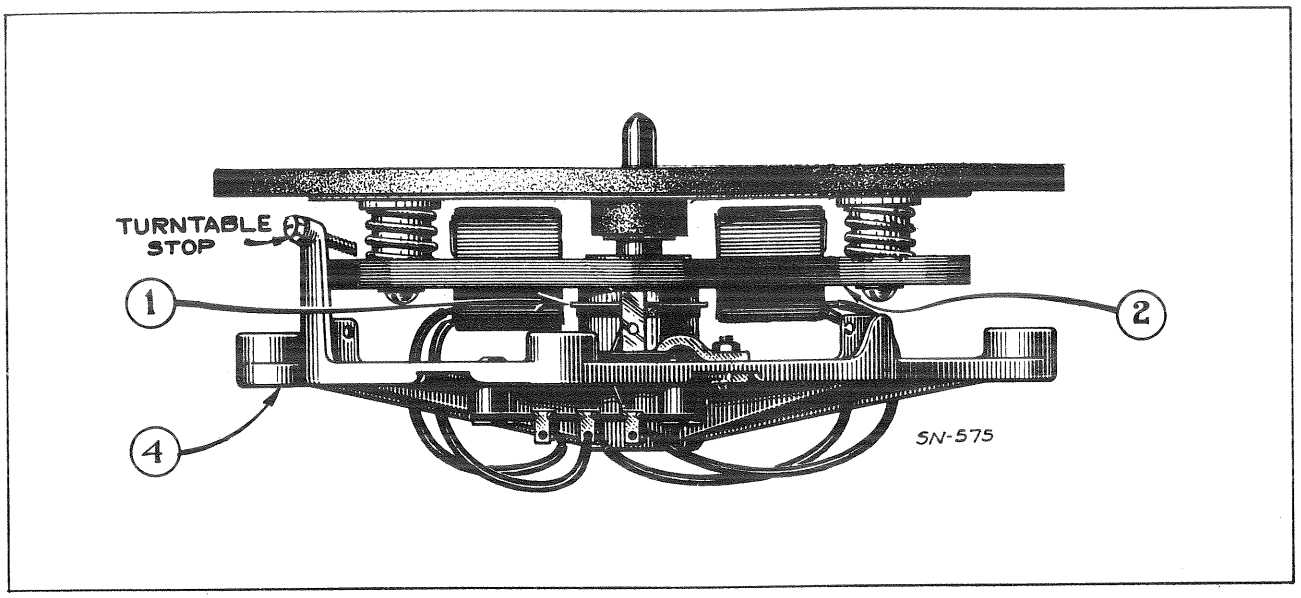


Figure 5—Details of Motor (First Production)

(For details of sections (1), (2), and (4), refer to corresponding sections below)

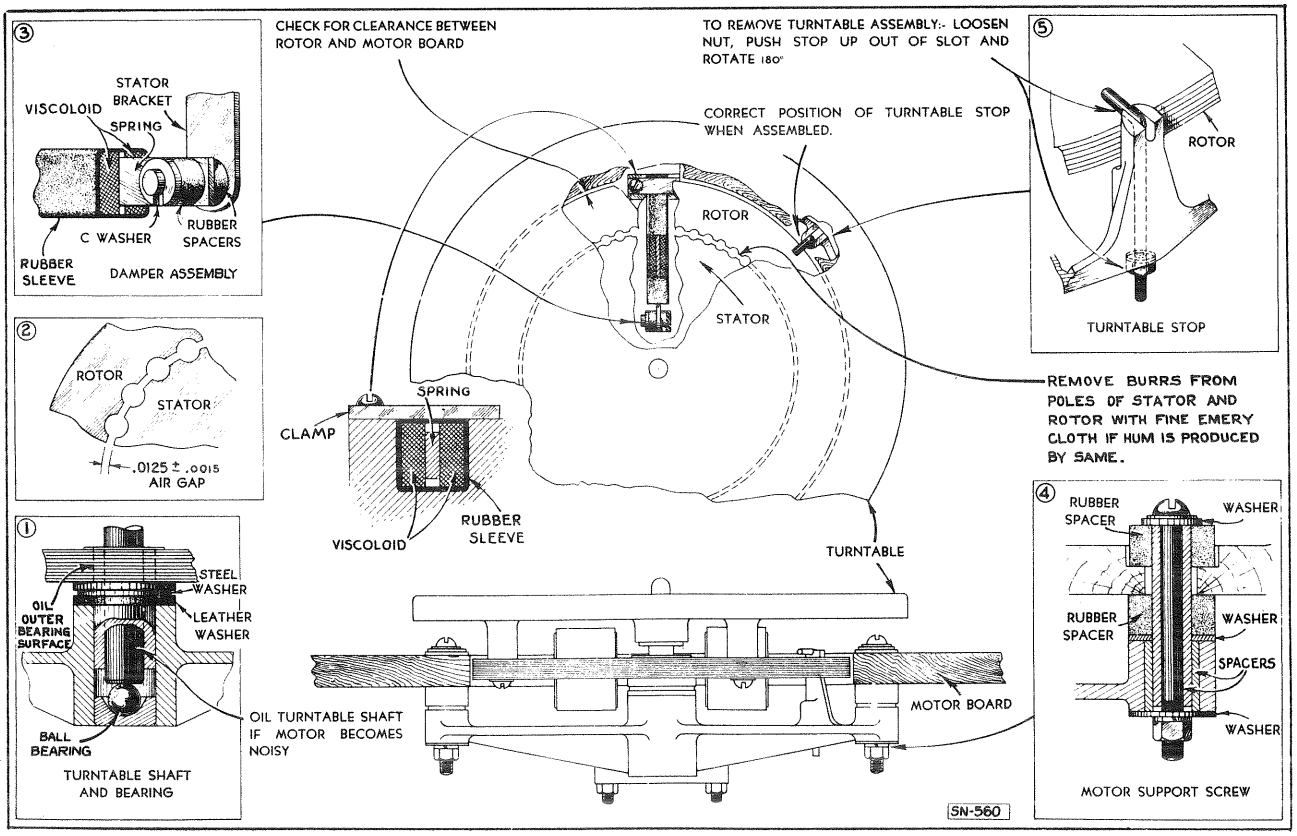


Figure 6—Details of Motor (Second Production)

PICKUP UNIT SERVICE DATA

The magnetic pickup and tone arm assembly of this instrument is of new design and unique construction. Service work will consist of centering the armature and replacing the spacer cushions, damping block, and replacing the magnet coil.

Disassembling the Pickup

The pickup may be disassembled in the following manner.

(a) Unsolder the two cable connections to the terminal strip.

(b) Remove the needle screw and screws "A" and "B."

(c) Remove the pickup assembly from the arm and housing.

(d) Unsolder the two magnet coil leads attached to the terminals and then remove screw E. This will allow the removal of the terminal board.

(e) If centering the pickup armature is the only adjustment required, such centering can be done without removing the terminal board indicated in (d). The armature is centered by loosening screw F, accessible through the hole shown, and holding the armature with the finger in proper position while screw F is tightened. "Feeling" the armature while deflecting it between its two extremes is the best manner of ascertaining proper centering. When centering, after work has been done or the magnet removed, it is important that the magnet be remagnetized while in place.

(f) If the coil or spacer cushions are to be replaced, the pickup must be further disassembled. This is done by removing the magnet and then removing screws C and D. The pole piece may now be removed and the old coil and sleeve disassembled. Acetone will be found helpful for dissolving the old cement that holds the coil in place. The new coil, with its sleeve, may now be replaced and cemented in a similar position to that occupied by the old coil. Duco household or Ambroid cement may be used to hold the coil in place. Be careful to center the coil with its paper sleeve before cementing. Only rosin core solder should be used for soldering the coil leads in the pickup.

(g) The spacer cushions are replaced by loosening the armature adjusting screw F and removing screw G, clamp H and washer I and removing the armature from its bracket. Damping block J must be removed from the armature. After putting the new spacer cushions in place, a new damping block should be fastened to the armature as outlined in instructions on replacing the damping block. The cushions can then be removed by slipping them from each end of the pivot shaft.

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.

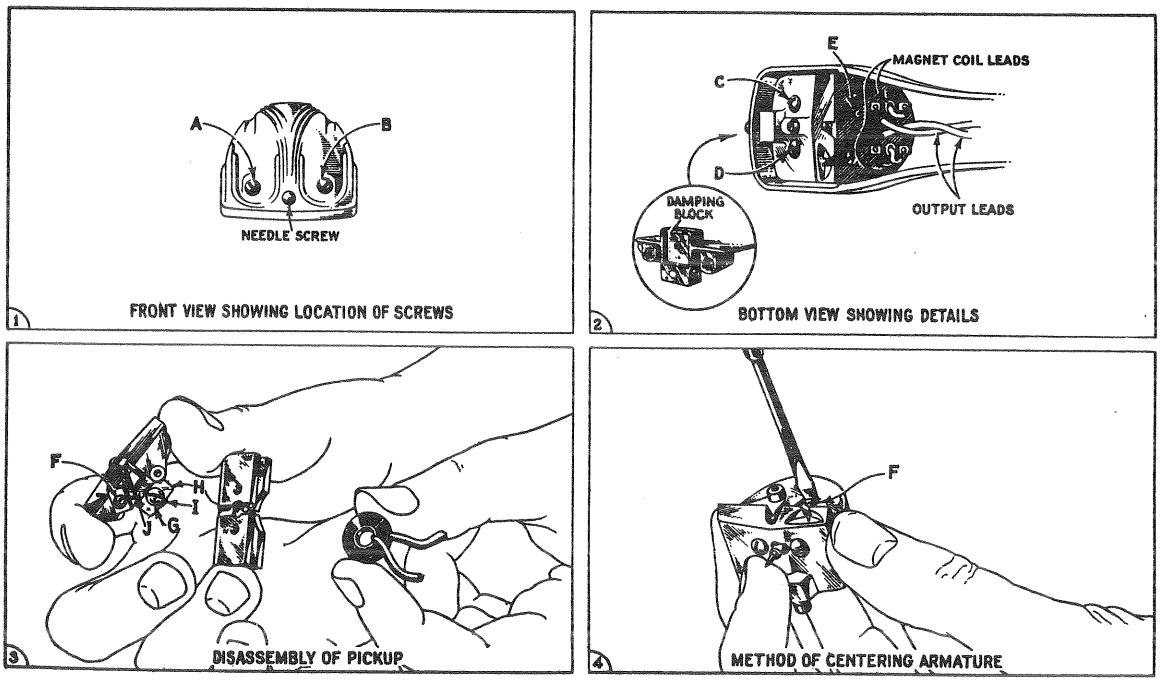


Figure 7—Details of Pickup Assembly

(b) Remove the damping block from the armature and clean the armature shaft with emery paper.

(c) 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 shaft diameter. This is done so that a snug fit will be obtained.

(d) 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 8, will prove desirable for fusing the block in place. The iron should be applied only long enough to melt the block sufficiently to cause a small bulge on each side, and must be removed before any bubbling occurs. The pickup should then be reassembled.

It is important to remember that in all operations after reassembling but before placing in the tone arm, the pickup should be magnetized and the armature centered after remagnetizing. Magnetizing should be done by placing the pickup magnet on the magnetizer and sliding it onto the pole pieces, after magnetizing being careful not to break the magnetic circuit.

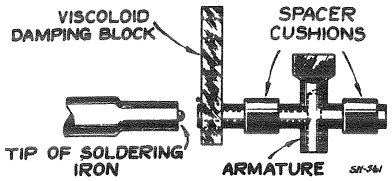


Figure 8—Special Soldering Iron Tip

REPLACEMENT PARTS

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

Stock No.	Description	List Price
	MOTOR ASSEMBLIES FIRST PRODUCTION	
10194	Ball—Steel ball bearing—Package of 20..	$0.25
7657	Base—Motor base and bearing assembly—50-60 cycle—105-125/200-250 volt operation	1.20
9523	Base—Motor base and bearing assembly—25 cycle operation	1.20
9519	Coil—Stator assembly—Comprising coil and laminations—105-125 volt, 60 cycle operation	2.50
9521	Coil—Stator assembly—Comprising coil and laminations—105-125 volt, 50 cycle operation	2.35
9524	Coil—Stator assembly—Comprising coil and laminations—105-125 volt, 25 cycle operation	2.25
9529	Coil—Stator coil assembly—Comprising coil and laminations—50 cycle, 200-250 volt operation	2.50
9515	Motor—105-125 volts—60 cycle motor..	8.80
9516	Motor—105-125 volts—50 cycle motor..	8.42
9517	Motor—105-125 volts—25 cycle motor..	9.00
9528	Motor—200-250 volts—50 cycle motor..	9.60
4456	Motor accessories—Comprising 3 nuts, 1 shield and 1 screw	.10
3813	Motor suspension assembly—Comprising one screw, one metal bushing, two rubber bushings, one flat washer, one lockwasher and one nut—Package of 3	.56
4457	Spring, screw and washer assembly—Used to mount rotor laminations to turntable—Comprising 3 springs, 3 screws and 9 washers	.15
9520	Turntable—Turntable assembly complete with rotor laminations—60 cycle operation	4.45
9525	Turntable—Turntable assembly complete with rotor laminations—25 cycle operation	4.85
9522	Turntable—Turntable assembly complete with rotor laminations—105-125/200-250 volt—50 cycle operation	4.25
4083	Washer—Leather washer—Package of 10.	.20
4084	Washer—Metal washer—Package of 10..	.26
	MOTOR ASSEMBLIES SECOND PRODUCTION	
10194	Ball—Steel ball bearing—Package of 20..	.25
11740	Base—Motor base and bearing assembly..	1.45
11733	Coil—Stator assembly—Comprising coil and laminations—105-125 volt, 60 cycle operation	2.96
11734	Coil—Stator assembly—Comprising coil and laminations—105-125 volt, 50 cycle operation	3.08
11748	Damper—Motor damper assembly—Comprising one damper, one damper plate, one screw, two rubber washers, and one "C" washer	.20
11873	Motor—105-125 volts—60 cycle motor..	9.95
11874	Motor—105-125 volts—50 cycle motor..	9.95
4456	Motor accessories—Comprising 3 nuts, 1 shield and 1 screw	.10
11876	Turntable—Turntable assembly complete with rotor laminations—60 cycle operation	4.35
11875	Turntable—Turntable assembly complete with rotor laminations—50 cycle operation	4.35
4083	Washer—Leather washer—Package of 10.	.20
4084	Washer—Metal washer—Package of 10..	.26
	PICKUP AND ARM ASSEMBLIES	
3812	Armature—Pickup armature	.32
4462	Cable—Pickup cable	.20
3810	Coil—Pickup coil	.32
5091	Cushion—Pickup armature spacer cushion—Package of 10	.50

The prices quoted above are subject to change without notice.

REPLACEMENT PARTS—Continued

Stock No.	Description	List Price
4543	Damper—Damper block complete with damper clamp, washer	.10
4503	Pickup and arm assembly complete	4.95
3811	Screw—Needle holding screw—Package of 10	.46
	CABINET ASSEMBLIES	
X-249	Bottom—Lower section of wood cabinet	2.95
X-248	Cover—Top half of wood cabinet	3.00
	MISCELLANEOUS ASSEMBLIES	
4611	Adaptor—Five-prong split cathode adaptor	1.00
4612	Adaptor—Six-prong split cathode adaptor	1.00
11957	Adaptor—Eight-prong "octal" split cathode adaptor with ground lug	1.00
4461	Cable—5-conductor—Radio-Record switch cable	.28
4459	Bracket—Volume control mounting bracket	.10
4463	Foot—Felt foot for bottom cover—Package of 10	.20
3829	Knob—Radio-Record switch knob—Package of 5	1.10
3961	Knob—Volume control knob—Package of 5	.60
4458	Post—Binding post—Package of 10	2.50
4507	Rest—Pickup rest—Package of 5	.60
4119	Screw—No. 8-32-1/4-inch headless set screw for knob—Package of 20	.38
4460	Switch—Radio-Record switch	.40
4502	Volume control (R1)	1.16

The prices quoted above are subject to change without notice.

NOTES