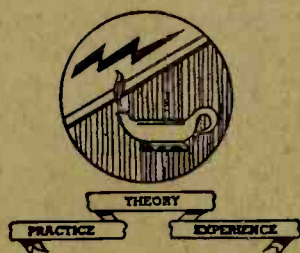


Most-Often-Needed
SERVICE NOTES

on

**RECORD PLAYERS
AUTOMATIC CHANGERS
WIRELESS UNITS
AND HOME RECORDERS**



SUPREME PUBLICATIONS

CHICAGO — 1943

RADIO DIAGRAM MANUALS

OF MOST-OFTEN-NEEDED RADIO CIRCUITS

1942

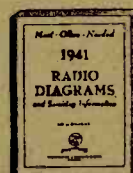
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328 S. Jefferson St., Chicago, Illinois

SERVICE NOTES

on

RECORD PLAYERS AUTOMATIC CHANGERS WIRELESS UNITS AND HOME RECORDERS

Compiled by

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MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS



FOR Several years now record playing and recording equipment has been in popularity. You know that automatic changers, wireless oscillators, and recorders get out of adjustment and become inoperative. Since these units are associated with radio receivers, radio servicemen are called to make the needed repairs. It is important for you to be able to service all types of record players, radio recorder combinations, and automatic changers. These units are expensive and the owners are able and willing to pay a fair price for your work and knowledge.

This manual of service notes will introduce you to this money-making field and give you specific detailed instructions for repairing hundreds of different machines used for reproduction and making of records. With this new manual, SUPREME PUBLICATIONS continues to serve your needs.

RECORD PLAYERS

Record players are supplied with built-in amplifiers or, more often, they are used with regular radio receivers. The pickups are of the crystal or magnetic type and all modern units are of high impedance output. Most of the turn tables are rim-driven. But other types of constant speed motors are still used at times and were very popular a short time ago.

Many of the record players, designed for use with house radio sets, include a wireless oscillator unit and the units need not be connected to the radio. Pages 7 and 8 will deal with such oscillators; the turn table and pickup, of course, are exactly the same as used in other record players.

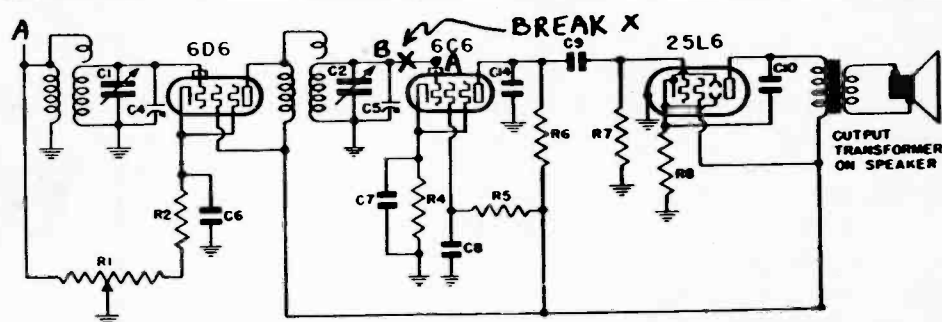
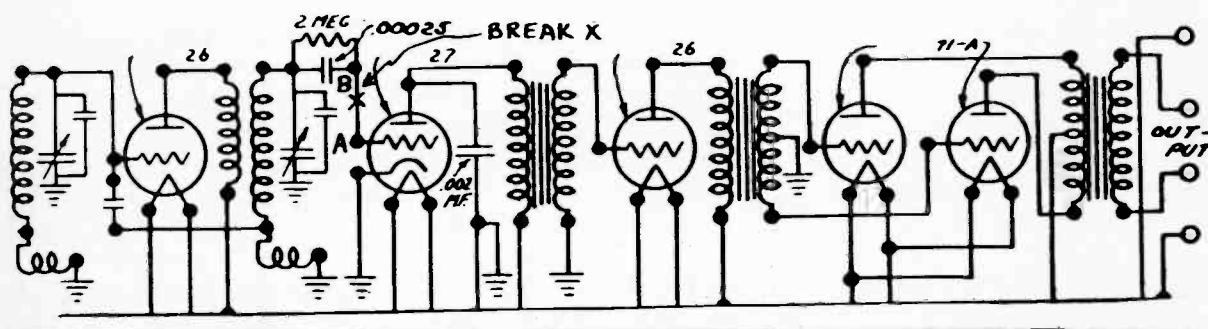
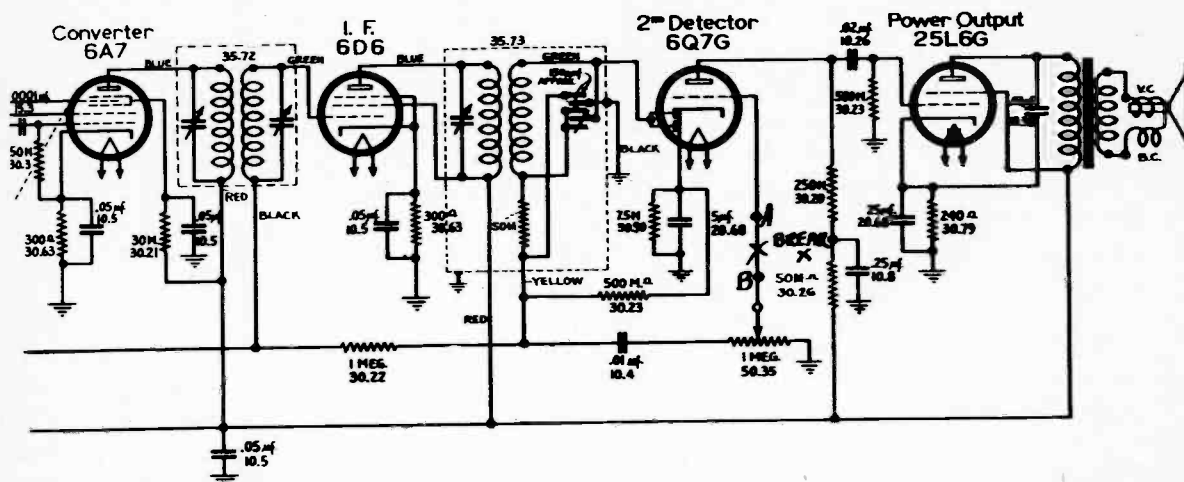
Specific instructions for servicing various automatic record changers are given later, but as an introduction some general highlights will be given now. All automatic record changers play a quantity of records placed above the turn table on an extended shaft. One record is played at a time. When a record is finished the inside "oscillating grooves" cause the pickup to trip a mechanism which starts a series of actions. The pickup lifts up and returns to a position outside of the turn table and then a new disc, next in line, drops down. The release of a single disc is accomplished by either a side push of the record on a "crooked" shaft or by side separators in some models. The playing is then repeated. If the last record is being played, it will be repeated until the machine is stopped. Records can be rejected in the middle with a special button on some automatic changers.

Automatic changers also may be used with amplifiers, with wireless units and a radio receiver, or by being connected directly to a radio set.

It is important for the radio serviceman to know how to connect a record player to any radio set. Of course, if the radio has input terminals for a phono pickup, the installation can be completed by inserting the small phone plugs. It is worth while to try these connections both ways. Usually the better way will create less hum.

Instructions for connecting record players to all other sets are given on the other side of this page. You will note that all standard sets have been divided into three classes of detector tubes (second detector in superhets). The majority of present day sets use dual-diode-triode type tubes such as 75, 6Q7, or 12Q7. Some of the older sets use triodes, as 27, 56, 6c5, or tetrodes type 24A, or pentodes 6C6, 6J7. The instructions explain the work and permit the use of a circuit which completely silences the radio receiver while the records are being played through the audio section of the radio set.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS



In all cases break connection marked X. Keep all leads short. Use a single-pole double-throw switch. Connect point A to center terminal of switch. Connect point B to one end of switch. To the other end of switch connect "hot" lead from phono pickup. Remaining lead of pick up is grounded to chassis. Switch will select radio or phono operation. If volume control is in audio section it will serve, otherwise the record player must have its own control. With triodes, tetrodes, and pentodes, as in the bottom two circuits, cathode resistor, if used, must be changed to 1,000Ω. Grid resistors, if used, should be shorted out.

HOME RECORDERS

All recording systems include a suitable turn table, recording head and arm, playback arm, amplifier, and associated microphone and loudspeaker. In majority of radio-recorders, the audio section of the radio receiver serves as the amplifier. Since low output crystal microphones are employed in many systems, the additional gain needed is obtained by using a pre-amplifier stage.

The motor used must be strong enough to keep constant speed while turning a disc which is being cut. This motor must also turn a feed-screw mechanism while the engaged gears move the recording head in regularly spaced grooves. Rim-drive is used in most modern units, but constant speed electric motors are also directly coupled to the shaft of the revolving disc drive.

Many of the recording heads use a crystal element and are of the high impedance type. All of the older models and many modern heads are of the magnetic type and have different impedances. Very common are magnetic recording heads with impedances between 4 and 8 ohms, and also 500 ohms. Recording heads, as voice coils, must be properly matched to the audio output impedance, and further must not carry any D.C.

The play-back pickups are of the standard type described in connection with record players. Crystal types predominate.

Usually a home recorder is a combination radio receiver, record player, (at times with an automatic changer), and a recorder. The inclusion of a microphone also permits the use of the equipment as a small public address system. When in use as radio set, the change-over switch on most models, disconnects the microphone pre-amplifier, recording head, and phono pickup. For recording, the R.F. (or I.F.) sections is made inoperative and the mike pre-amplifier is connected to the audio input. The speaker (for this purpose) is disconnected, silenced, or operated at reduced volume, and the recording head is connected to the output. A visual indicator, meter, tuning eye, or neon tube, helps in adjusting to correct volume level. For "of the air" recording the R.F. section is left in operation to receive the wanted program while the mike channel is shut off.

For playback of the home made discs or any other types, we have another position of the change-over switch. Now the pickup is connected to the audio input and the speaker to the output. The R.F. section of the receiver is not used.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

Specific repair hints and adjustments are given in the notes for definite models, but some general tests will be given here. First find out if the radio is functioning correctly. If not, service the set forgetting for the while that it is also used for recording and playback purposes. While using and servicing the radio section, the switch must be in the "Radio" position.

When the radio is found to be operating properly, test the unit for record playback. If the audio section of the receiver worked for radio reception, the trouble must lie in the change-over switch or the pickup. Examine and tighten the switch. Then to test the pickup, replace the pickup connections with 2 to 6 volts A.C. obtained from a filament connection of a tube in the set. A very loud hum will be heard and this will indicate that the pickup is at fault.

The recording head connects to the output in a manner similar to the speaker. Using the recorder in position for "of the air" recording, place your finger alongside of the recording needle. You should feel strong vibrations. This test also may be made by connecting low scale A.C. voltmeter to the connections of the recording head. If tests fail to show a current passing to the head, the recording head must be at fault.

Of course, the recording section may also fail to operate because of a fault in the pre-amplifier section or in the microphone itself. To see if the trouble lies here, remove phono pickup connections and connect them to audio input of the radio receiver. Page 4 has notes explaining how to do this. Pick the phono needle in the playback arm, while the equipment is set in recording position, and see if the recording needle is vibrating (moving) to correspond with your movement of the pickup needle.

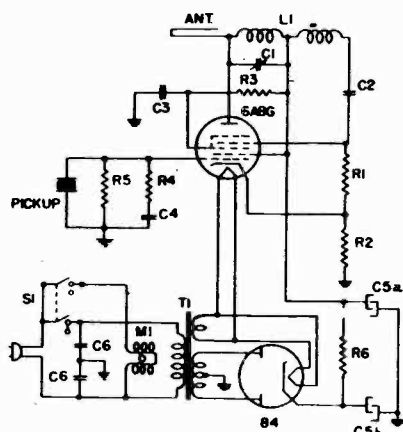
Now connect phono pickup in place of microphone and make the same test. If results explained above are obtained, the pre-amplifier and radio are functioning correctly. And the fault must lie in the microphone.

Three types of recording needles are used today. Sapphires have the finest and hardest point. They are of the low friction type and take an extremely fine polish. Good for about five hours of service and then can be resharpen.

Stellite needles are constructed of a hard metal alloy. They cut almost as well as sapphires, but give only two hours service. Can be resharpened.

Steel needles, of course, are most often used in radio-recorder combinations. Inexpensive in cost, will last about 20 minutes, and cannot be sharpened for additional use.

WIRELESS UNITS



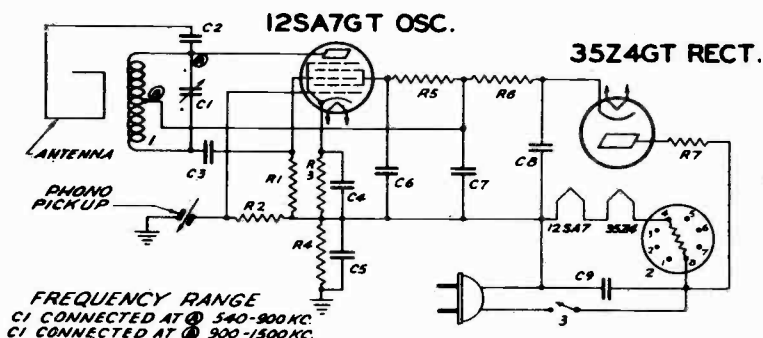
General Electric
Model HM-21

Sym- bol	Description
C-1	300-850 mmf. tuning trimmer
C-2	100 mmf. mica capacitor
C-3	0.1 mfd. paper capacitor
C-4	0.05 mfd. paper capacitor
C-5a	10 mfd. dry electrolytic
C-5b	10 mfd. dry electrolytic
C-6	.01-.01 mfd. line capacitor
L-1	Oscillator coil
M-1	Motor
R-1	120,000 ohms carbon resistor
R-2	1,200 ohms carbon resistor
R-3	47,000 ohms carbon resistor
R-4	47,000 ohms carbon resistor
R-5	1.0 megohms carbon resistor
R-6	6,800 ohms carbon resistor
S-1	Power switch
T-1	Power transformer

Wireless oscillators usually employ two tubes and are used to radiate a carrier on the broadcast band and of a frequency between the frequencies of local broadcasting stations. This frequency is adjustable by means of the padder condenser C₁ in the diagram above of a General Electric model, or in the one below of Zenith make. A pentagrid converter tube is the oscillator and is modulated with the audio signal generated by the phono pickup. The second tube is used as a rectifier in either A.C. or AC-DC circuit. The amount of energy which may be radiated must be limited to comply with FCC regulations. Antenna may be in the form of a flexible wire or a metal plate. The signal radiated by the wireless oscillator can be picked up on any nearby radio set if it is tuned to the frequency of the oscillator unit. Volume should be controlled at the radio in the usual manner.

QMB. NR	DESCRIPTION	
C1	TUNING CONDENSER	
C2	.0001 MFD.	600 V.
C3	.00025 MFD.	500 V.
C4	.05 MFD.	300 V.
C5	.1 MFD.	300 V.
C6	.01 MFD.	400 V.
C7	.05 MFD. ELECTROLYTIC	150 V.
C8	.10 MFD.	150 V.
C9	.05 MFD.	400 V.
R1	22 M OHM	1/2 W.
R2	1 MEGOHM	1/2 W.

QMB. NR	DESCRIPTION	
R3	470 OHM	1/2 W.
R4	220 OHM	1/2 W.
R5	4700 OHM	1/2 W.
R6	2200 OHM	1/2 W.
R7	57 OHM	1/2 W.
1	OSC. COIL ASSEM.	
2	BALLAST TUBE	
3	A.C. SWITCH	



Zenith Model S-8500

SERVICE NOTES

on WIRELESS OSCILLATORS

Wireless oscillators use a simple circuit to produce oscillations. An inductive feedback arrangement is employed, and semi-adjustable condenser controls the frequency of the output. The oscillator grid is used for this circuit. This grid is the cap connection of tubes such as 6A7, 6A8, and 6K8. The control grid (the one next to the cathode) is coupled to a crystal phono pickup and modulates the carrier produced with an audio frequency corresponding to the records being used. In some units, an output type pentode is used for the oscillator with the screen grid serving as the oscillator grid. Several units employ a single tube to combine the function of the oscillator and rectifier (12A7, 25A7G), but better units have a separate rectifier tube, as in the case of circuits shown.

In servicing wireless oscillator units remember that they are small transmitters. To test for carrier from the oscillator, run the antenna wire from the oscillator unit close to the lead of the radio's antenna lead for a few feet. Place the oscillator in operation, but do not operate the phono pickup. Place the radio in operation and tune in a station close to the frequency on which the oscillator is to operate. Find the trimmer adjustment in the oscillator and turn the set screw from one extreme to the other. At some point changing pitch whistling should result. If no response of this type is obtained, the oscillator is not putting out a carrier wave.

If no carrier is present, test the oscillator for voltage on plate and screen grid, and check power supply. Tube may also be tested or replaced with another for test. See that the oscillator coil is not open -- best to use an ohmmeter for this.

If carrier is being produced trouble must lie in the phono pickup or its connections. Connect signal generator instead of pickup and feed a strong audio signal. Try to obtain results with this set up. If you do not have a signal generator, disconnect the pickup leads anyway. Instead connect the lead going to the grid of the oscillator tube, to one side of a .01 mfd., 600 volt (value not critical) condenser. Connect the other side of this condenser to one of the A.C. lines. Try to use the side of the A.C. not going to the chassis of the unit. In this manner you will have a 60 cycle audio note modulating the oscillator.

Should the oscillator operate with another source of audio signal, you may assume pickup is at fault. If unit still does not work, the circuit of the pickup must be bad. Check all resistors and condensers in this sections.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

AIR-KING PRODUCTS CO., Inc.

Model 5000—Radio, Phonograph and Recorder Combination

RADIO

Always set the "PHONO-RADIO-REC" switch on position #5 when listening to radio programs. Never listen to radio programs with the switch on #3 position as this may cause damage to the recording unit.

PHONOGRAPH

To use as a phonograph whether on home recordings or standard records, set the "PHONO-RADIO-REC" switch on #4 position. Any good brand of phonograph needle may be used. CAUTION: Never play home recordings with a needle which has been used on regular records. The standard records contain a gritty substance which grinds down the needle point in such a way that if this needle is used to play home recordings, serious damage may be caused and the recording ruined.

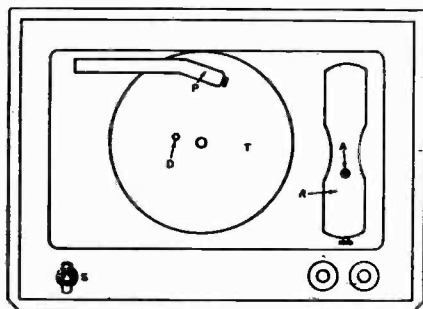


FIG. 1

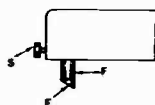


FIG. 2

RECORDING FROM RADIO

Figure 1, above, shows a view of the apparatus contained in the top of the cabinet. The part marked "S" is the switch which is used for starting and stopping the turntable, marked "T". The part marked "P" is the phonograph pickup which is used in the usual way for playing phonograph records or home recordings. The part marked "R" is the recording arm which is used when making home recordings.

To make a record of a radio program, proceed as follows: Raise the recorder arm to the vertical position, loosen the set screw projecting from the end and place a recording needle in the needle holder. Figure 2 above shows a side view of the recorder arm with an enlarged view of the needle. Note that the flat side of the needle point is on the side of the needle opposite the set screw "S". The edge of the needle point "E" must fall on a line drawn lengthwise through the set screw. These instructions apply only to needles having a round shank. A great many brands of recording needles have a flat surface on the shank and in using these, placing the needle in the holder with this flat surface directly under the set screw insures proper needle alignment.

After the needle has been properly placed in the holder, tighten the set screw firmly, being careful not to disturb the position of the needle. Place a blank disc on the turntable, making sure pin "D" in figure 1, projects through one of the three small holes near the center of the disc. Start the turntable to revolving by means of the switch, "S" shown in figure 1.

Tune in the desired radio program and adjust the volume control until the sound from the loud speaker is fairly loud and clear. If the program sounds rough or distorted, or if there is considerable static or background noise, remember that the recording will sound exactly the same way, as it is a faithful reproduction of what is received from the radio set.

Set the "PHONO-RADIO-REC" switch to position #3. The needle in the cutter arm is now vibrating in unison with the program being received and you are ready to proceed with the actual recording of this program.

Lower the recording arm until the needle almost touches the surface of the record. If this point is approximately $\frac{1}{4}$ " from the outside edge of the record, lower the recording arm gently, allow the needle to come in contact with the record, and release the arm. If the distance is not correct on the first trial, raise the recording arm approximately two inches and move it to one side or the other, until the needle position is correct. After the correct needle position has been found, the recording arm is lowered all the way and released.

It will be noted that in a short time, a line of threads collect at a point approximately $\frac{1}{2}$ " away from the position of the needle. These threads should be brushed lightly towards the center of the turntable with a handkerchief or a soft brush, and must not be allowed to collect around the needle point. No other attention need be given, except the recorder arm must be lifted as soon as the needle reaches the label in the center of the disc. If the recorder arm is allowed to remain down after this point has been passed, the needle may dig through the coating and come in contact with the metal of the disc which will ruin the recording needle and may damage the recorder as well.

RECORDING FROM MICROPHONE

Follow the directions given above for proper placing of the needle in the recorder arm as well as the directions for making the actual recording. The only difference is that the program being recorded is now picked up by the microphone and this is accomplished as follows:

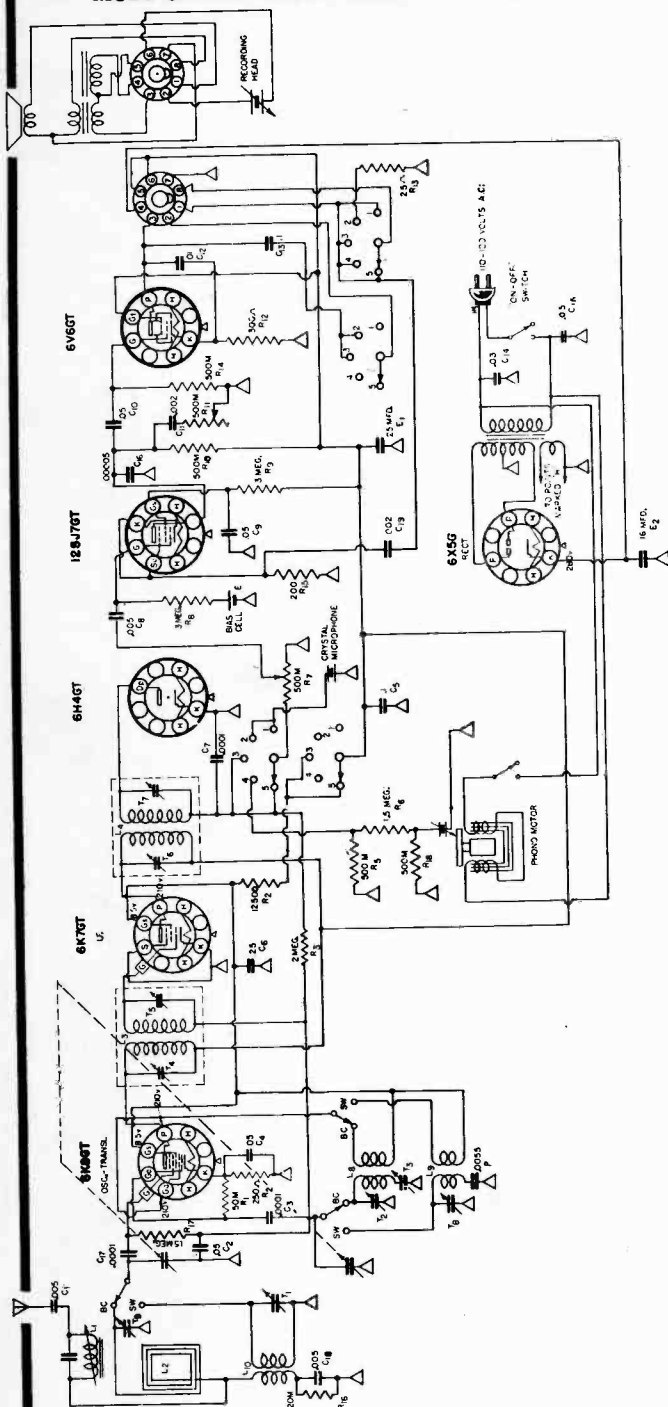
First set the switch marked "PHONO-RADIO-REC" to position #1.

Speak into the microphone and increase the volume by means of the volume control until the speech or music to be recorded is reproduced over the loud speaker in the radio set. This is

merely a check to indicate that the microphone is working properly.

Next set the "PHONO-RADIO-REC" switch on position #2 and turn both tone and volume controls to the extreme right or full on position.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS



Home recordings are made with excessive high frequencies and when playing these, use the tone control to reduce the high frequencies to normal. This is done intentionally since the surface noise on the record is also reduced when the high frequencies are brought down to normal and a more pleasing reproduction is thereby obtained.

Speak into the microphone in a normal tone of voice and at a distance of approximately six inches. The speech will then be recorded exactly as was the radio program mentioned above. It is also possible to make records of various musical instruments in exactly the same manner.

It will be noted that when the "PHONO-RADIO-REC" switch is in position #2, no sound is heard over the loud speaker. This is done intentionally so that the microphone may be used in any position with respect to the set, and without the whistling which might be present if the speaker were operating.

PUBLIC ADDRESS

To use the instrument as a Public Address unit, set the "PHONO-RADIO-REC" switch on position #1, as mentioned in the paragraph "Recording from Microphone", noted above. The instrument may now be used for amplifying the voice in exactly the same way as this is accomplished in large auditoriums or at the baseball parks, etc.

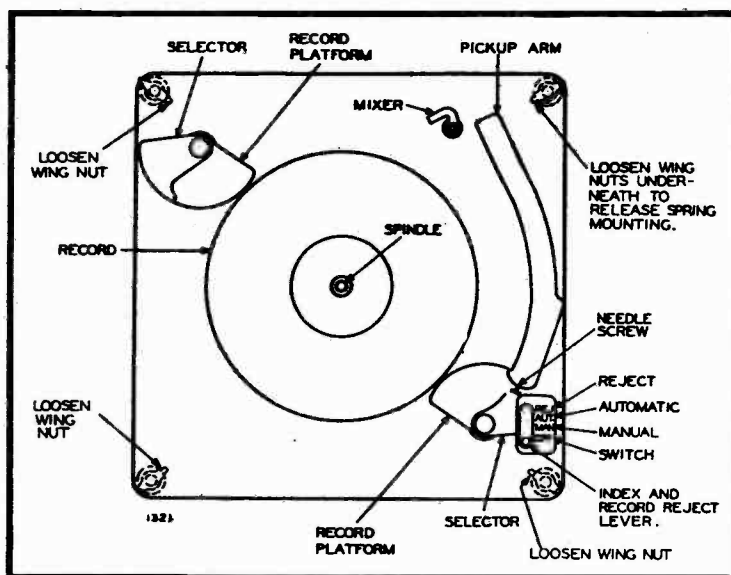
In using the equipment as a public address unit, it will be noted that if the volume control knob, #3, is turned up too far, a loud squeal or whistle will be heard with some locations of the microphone. The proper position of the microphone with respect to the set depends upon so many factors that it can only be determined by experiment. Simply change its position until that point is found which gives the loudest reproduction over the speaker without the objectionable ringing or whistling sound.

PARTS LIST

SCHEMATIC LOCATION	PART No.	DESCRIPTION
	1799	Cabinet
L1	1103110	Coil—wave trap
L2	11028104	Coil—B.C. antenna loop
L8	11028105	Coil—B.C. oscillator coil
L10	11028106	Coil—S.W. antenna coil
L9	11028107	Coil—S.W. oscillator coil
L3	1103113	Coil—I.F. input
L4	1103514	Coil—I.F. output
	1101638	Condenser—variable
E1, E2	1102054	Condenser—electrolytic, 25 mfd., 350 volt.
C1, C8	1101916	Condenser—.005, 400 volts 16 mfd., 450 volt
C2, C4, C9, C10	1101917	Condenser—.05, 400 volts
C3, C7, C17	1101921	Condenser—.0001, mica
C5, C13	1101925	Condenser—.1, 400 volts
C11	1101919	Condenser—.002, 400 volts
C12	1101936	Condenser—.01, 800 volts
C14	1101927	Condenser—.05, 600 volts
C15	1101928	Condenser—.03, 600 volts
C6	1101923	Condenser—.25, 400 volts
C16	1101942	Condenser—.00005, mica
C19	1101938	Condenser—.002, mica
P	1101943	Condenser—.0055, mica
C18	1101944	Condenser—.005, mica
	1101835	Connector—microphone, female
R7	1102435	Control—volume
R11	1102512	Control—tone, with switch
	1105574	Cord—power
	1104057	Dial—scale
	1104529	Dial—drum
	1104224	Dial—escutcheon
	1104528	Dial—cable and spring
	1104115	Dial—pointer
	1103977	Knob—volume
	1103978	Knob—phono radio-recording
	1103976	Knob—on-off, tone
	1103975	Knob—tuning
	1103979	Knob—band switch
	1104911	Lamp—pilot No. 47
	11059107	Leaflet—instruction
	1105413	Needle cup
R1	1102327	Resistor—50,000 ohms 1/4 watt
R2	1102323	Resistor—250 ohms, 1/4 watt
R3	1102337	Resistor—2 megohms, 1/4 watt
R16	1102341	Resistor—20,000 ohms, 1/4 watt
R5, R10, R14, R18	1102313	Resistor—1/2 megohm, 1/4 watt
R6, R17	1102329	Resistor—1.5 megohms, 1/4 watt
R8, R9	1102328	Resistor—3 megohms, 1/4 watt
R12	1102318	Resistor—300 ohms, 1/2 watt, wire-wound
R13	1102333	Resistor—25 ohms, 2 watt, wire-wound
R15	1102339	Resistor—200 ohms, wire-wound
R2	1102340	Resistor—1250 ohms, 1 watt

Automatic Record Changer--Operating Instructions

Belmont Radio - Model 671-B



General

This Record Changer will play automatically a series of standard 10- or 12 inch records of the type generally available today, or records of any size up to 12 inches changed manually. This Changer does not require any adjustment by operator for playing different size records. Stacks of mixed sizes may be played but this is not recommended or guaranteed. Records of the last few years with the standard eccentric or spiral finishing groove will operate the automatic mechanism.

Controls and Moving Mechanism

Index and Record Reject Lever: This lever is located near the right front corner of the phonograph with its index plate marked for four positions—

OFF-MAN-AUT-REJ.

When you desire to change record selections manually, this lever should be set in the "MAN." (MANUAL) position.

To play a series of records, the lever should be set at the "AUT." (AUTOMATIC) position.

To reject a record being played, or to start the record-changing cycle, in case the record just played does not have the standard eccentric or spiral stopping groove; simply push the lever to the "REJ." (REJECT) position and let go. The pickup arm will raise up and swing outwards and the next record will drop.

Keep the lever in its "MAN." position when not actually playing records automatically.

To start the turntable set the switch to the "MAN." or "AUT." position. To stop the turntable, set the switch to the "OFF" position.

Manual Operation

1. Insert Needle in pickup and clamp securely with needle screw protruding from front of pickup arm.
2. Lift record platforms and rotate away from turntable.
3. Place record to be played on turntable.
4. Advance index and reject lever to "MAN."
5. Place needle on blank edge of record and push pickup arm gently toward center to start needle in groove.
6. When playing is completed lift pickup arm slightly to clear record and replace same on rest.
7. Return index and reject lever to "OFF".

Automatic Operation

1. Insert long playing needle in pickup and clamp securely with needle screw protruding from front of pickup arm. Return arm to rest.
2. Rotate record platforms to index position (locked in place by pin).
3. Place records to be played over the turntable spindle and on the record platforms.

4. Push index and reject lever to "REJ." position and release.

The first record will then feed and play thru, followed by the balance of the records.

5. After last record has been played, allow pickup arm to reset on record. Return arm to rest and push lever to "OFF".

6. Raise and turn record platforms away from turntable.

7. Remove records carefully from turntable. Be careful not to strain spindle.

CAUTION—This Changer is designed and built to play standard 10- and 12-inch records in good condition automatically. To obtain the benefit of satisfactory operation it is necessary that instructions be followed explicitly and in no case use force, as this may cause damage.

Mechanism

Do not rotate turntable in reverse direction or bend or strain turntable spindle when loading or unloading records.

Do not overload with records. The maximum load is either:

- 10 - 12 inch records
- 12 - 10 inch records
- 10 - 10 and 12 inch records mixed

Do not touch pickup arm when it is in motion during automatic function or stop the mechanism until pickup arm reaches playing position and is returned to rest provided.

Do not move platforms by selector. Always raise and turn by hub of record platform.

Records

Do not use warped records; records with rough, square, or uneven edges; records that are extra thin or extra thick.

Do not use other than standard 10 inch or 12 inch records.

Do not leave records on record platforms. This will cause warpage.

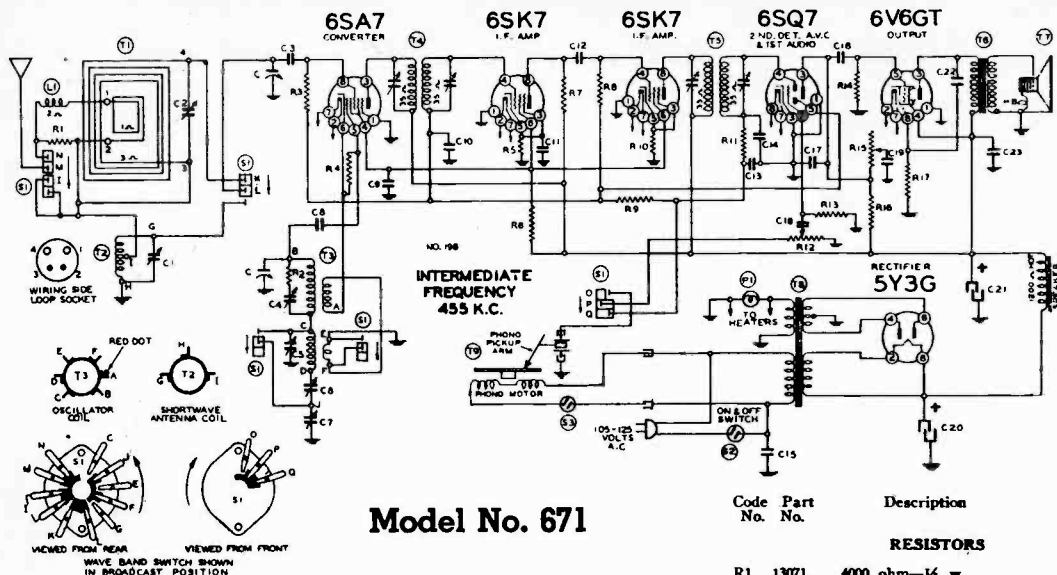
Needles

Single-playing needles may be used for manual operation, but they are somewhat inconvenient.

Multiple-playing needles are essential for automatic operation to conserve record life, as well as being a convenience for manual operation.

NEVER put a needle into pickup, once it has been removed, since this will result in unnecessary wear on the records—many times that resulting from normal use.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS



Model No. 671

Code Part
No. No.

Description

RESISTORS

R1	13071	4000 ohm— $\frac{1}{2}$ w.
R2	130128	20 ohm— $\frac{1}{2}$ w.
R3	13019	1 megohm— $\frac{1}{2}$ w.
R4	130236	30M ohm— $\frac{1}{2}$ w.
R5	130283	750 ohm— $\frac{1}{2}$ w.
R6	130324	18M ohm—1 watt
R7	130218	5M ohm— $\frac{1}{2}$ w.
R8	13020	100M ohm— $\frac{1}{2}$ w.
R9	130170	3 megohm— $\frac{1}{2}$ w.
R10	130222	350 ohm— $\frac{1}{2}$ w.
R11	13012	50M ohm— $\frac{1}{2}$ w.
R12	101232	1 megohm volume control
R13	130223	10 megohm— $\frac{1}{2}$ w.
R14	1303	500M ohm— $\frac{1}{2}$ w.
R15	101231	1 megohm tone control
R16	130172	250M ohm— $\frac{1}{2}$ w.
R17	130323	270 ohm—1 watt

CONDENSERS

C	102137	Two gang variable condenser
C1	124149	S. W. Antenna trimmer
C2	124149	B. C. Antenna trimmer
C3	1292	.0005 mica
C4	124142	S. W. Oscillator trimmer
C5	124142	B. C. Oscillator trimmer
C6	124146	B. C. Padding Condenser
C7	124146	S. W. Padding Condenser
C8	12960	150 mmfd. mica
C9	10013	.05 x 400 v.
C10	10022	.05 x 200 v.
C11	1009	.05 x 200 v.
C12	1292	.0005 mica
C13	129161	.0001 mica
C14	129161	.0001 mica
C15	10061	.02 x 600 v.
C16	10025	.002 x 600 v.
C17	12912	.00025 mica
C18	10026	.02 x 400 v.
C19	10071	.004 x 600 v.
C20	119115	16 mid. x 400 w. v. lytic
C21	119115	16 mid. x 400 w. v. lytic
C22	10019	.005 x 600 v.
C23	1001	.1 x 400 v.

C1 and C2 are in same unit C4 and C5 in same unit
C6 and C7 are in same unit C13 and C14 in same unit
C20 and C21 are in same unit

ALIGNMENT PROCEDURE

- The following equipment is required for alignment:
 - An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as indicated.
 - Non-metallic screwdriver.
 - Dummy antenna—1-mf., 200 mmfd., 400 ohms.

- Volume control—Maximum all adjustment.
- Connect radio ground to ground post of signal generator with a short heavy lead.
- Connect dummy antenna wire in series with resistor output lead.
- Connect output meter across primary of output transformer.
- Allow chassis and signal generator to "heat up" for several minutes.

BAND	SIGNAL GENERATOR Frequency	Component	Position of Band Switch	Variable Condenser Setting (Plate not grounded)	Trimmer Adjustment (See Over Sheet)	Trimmer Function	Adjustment
I. F.	455 Kc.	Grid of 6SA7	Broadcast	Short Wave	Trimmer C1	Short Wave	Adjust to maximum output
SHORT WAVE	17 Mc.	Antenna and Ground	Short Wave	Short Wave	Trimmer C1	Short Wave	Adjust to maximum output
WAVE BAND	17 Mc.	Antenna and Ground	Short Wave	Short Wave	Trimmer C1	Short Wave	Adjust to maximum output
BROAD-CAST	6 Mc.	Antenna and Ground	Short Wave	Short Wave	Trimmer C1	Short Wave	Adjust to maximum output
BROAD-CAST	1600 Kc.	Grid of 6SA7	Broadcast	Short Wave	Trimmer C1	Short Wave	Adjust to maximum output
BROAD-CAST	180 Kc.	Grid of 6SA7	Broadcast	Short Wave	Trimmer C1	Short Wave	Adjust to maximum output
LOOP ALIGN.	180 Kc.	Antenna and Ground	Broadcast	Short Wave	Trimmer C1	Short Wave	Adjust to maximum output
ALIGN.	600 Kc.	Antenna and Ground	Broadcast	Short Wave	Trimmer C1	Short Wave	Adjust to maximum output

NOTE: "C1"—Turn the dial back and forth slightly (rock) and adjust trimmer until the signal is maximum. Then adjust the trimmer to the "B" position. Repeat the above procedure for the AVC. After each band is completed, repeat the procedure as a final check.

NOTE: "A"—The signal generator is connected to the "ANT." and "GND." leads when making these adjustments. The loop antenna should be connected to the radio when making these adjustments. NOTE: "B"—Loop alignment is made with the chassis in the "ANT." and "GND." position. Connect the signal generator to the "ANT." and "GND." leads.

BOTTOM VIEW OF CHASSIS

VOLTAGES MEASURED WITH 5000 OHM PER VOLT VOLTMETER BETWEEN VOLUME TERMINALS & CHASSIS. BAND SWITCH IN BROADCAST POSITION AND VOLUME CONTROL AT MINIMUM.

(1) CURRENT MEASURED WITH VOLTMETER 0-7 OHMS IN SERIES WITH VOLTMETER 1500

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MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

CROSLEY SERVICE SUPPLEMENT

I—RECORDERS

The quality and life of instantaneous home recordings is largely dependent upon the operators working knowledge of his equipment and the type blank discs and cutting needles used. For the operation and adjustment of the various controls read the operating instructions supplied with the receiver.

The type recorders used in Crosley equipment employ low impedance magnetic cutting heads and have crystal tone arms for play back. The turntable is rim driven. The deluxe recorder also has the automatic record changer capable of playing 14 ten inch or 10 twelve inch records at one loading.

A.—CUTTING NEEDLES

The cutting needle or stylus as furnished with the Crosley recorders will cut approximately 30, 6½" records one side or 15, 6½" records both sides (one hour life cutting time).

These needles are of the hardened steel type and the cutting point and edges are extremely sharp and quite easily damaged should they be bumped or scraped against a metal surface. The point of these needles is

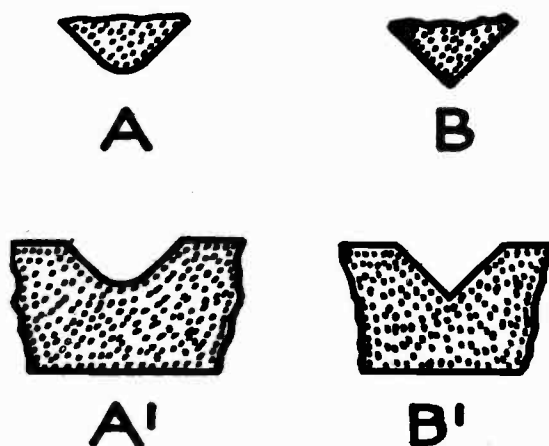


Figure 1

ground to a sharp "V" as shown in fig. 1B while the more expensive needles are of sapphire or a special metal alloy with their points having a very slight radius as shown in fig. 1A.

A simple rule of the thumb method for determining needle wear is, that the grooves cut out with a new or good needle have a high brilliance and as the needle wears the lustre of the cut section will be less and eventually appear gray.

If cutting needle tends to chatter as it is recording, it is advisable to replace it with a new one. (Also check the cutting arm height, see following paragraphs). The recording needle may be removed and replaced as desired, provided the adjustments are checked each time before recording. In all events, every precaution must be taken to protect the cutting point at all times; in

cutting it should be lowered GENTLY on the blank with turntable RUNNING.

NOTE: Most cutting needles have a flat ground on the shank. The needle screw must be tightened against this flat. Always firmly tighten the needle screw before making a recording.

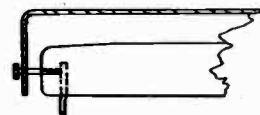


Figure 2

B.—PLAY BACK NEEDLES. (Use Recoton needles as furnished by Crosley for best results)

Instantaneous recordings (home recordings) require special play back needles if the quality and life of the record is to be retained. Needles purchased as "100% shadowgraphed" steel needles should be used at all times. This type needle is individually inspected to see that it has a perfectly rounded point of proper radius with no sharp edges or flat sides so that it will have no tendency to harm the record.

Several home recordings may be played with one needle, **PROVIDED** the needle does not touch a commercial record. Never play an instantaneous recording with a needle that has been used on a commercial record.

A rule of the thumb method for judging the amount of wear on a home recording when it is being played back it to watch the change in the color of that portion of the record which the needle has played in comparison with the rest of the record. The first time the record is played back after it has been recorded the grooves may turn slightly darker as the playback needle passes over them, but the change should not be great. Further play-back should show little or no change in color, provided the play-back is in good condition and that the record is free from dust and dirt. Whenever any great changes in color does occur, it is advisable to immediately stop the record and put in a new needle.

c.—CUTTING ARM ADJUSTMENTS.

"Recorder with Automatic Record Changer." "Seeburg Type" used on Models 28AZ, 34BH, 31BF, and 48BF.

The height of the cutting arm can be varied by means of the slotted screw head which is on top of the arm and near the back, approximately flush with the top surface of the arm. In order to make this adjustment, it is necessary to insert a cutting needle and, with the motor turned OFF and a record blank on the turntable, place the recording arm in the cutting position. Now turn cutting arm height adjusting screw UNTIL THE NEEDLE SCREW IS CENTERED IN THE

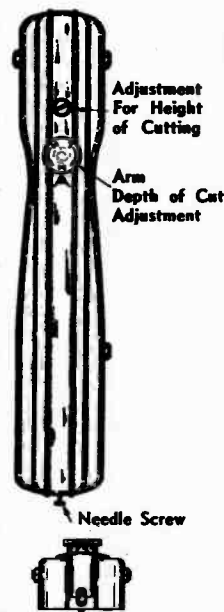


Figure 3

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

depth of cut is adjusted by rotating the screw approximately in the middle of the cutting arm and flush with the top, see fig. 4. To increase the depth of cut this screw should be turned to the right (clockwise). Conversely to decrease the depth of the cut the screw should be turned to the left (counter-clockwise). This adjustment is rather critical and should be moved only in quarter or half turns at a time.

When the cutting head is in proper adjustment, and the cutter arm is raised to the point (approximately 45°) where it can be freely moved over the record, the cutting head needle screw should **JUST REST** on the bottom of the slot in the nose of the arm,—that is, the equalizer spring tension should be such that the cutter head **ALMOST FLOATS FREELY**.

ALWAYS TRY A TEST CUT WITH A NEW CUTTING NEEDLE before making any adjustments, since often times when casual observation indicates faulty adjustment, the whole trouble may be due to a cutting needle that has been dulled either through accident or natural wear.

NOTE: Changing the arm height usually necessitates a change in cutting depth adjustment and changing the depth of cut may call for a slight variation in the arm height adjustment to prevent cutting needle chatter or reduce surface noise.

E.—CUTTING LEVEL.

The cutting level as required for instantaneous recordings as made on the two type recorders as used in Crosley equipment will vary with the type cutting needle used and its condition and the type record blank used. Provided the cutting arm height is correct and the depth of cut is correct the following cutting levels should give good results.

For those models having the cathode ray type indicator, the volume level should be adjusted until the shadow on the indicator tube forms a narrow vertical line approximately 1/32" wide for loud or peak sig-

nals. During recording this shadow will vary in width in accordance with the loud and soft passages of the program.

For the models equipped with a Neon Tube as a Cutting Level Indicator the volume level should be raised to a point where the neon tube elements give an even pinkish glow during loud or peak signals. The correct cutting level can only be found by experimentation as the level is dependent upon the type and condition of cutting needle and blank disc used.

F.—RECORDS (BLANK & CUT)

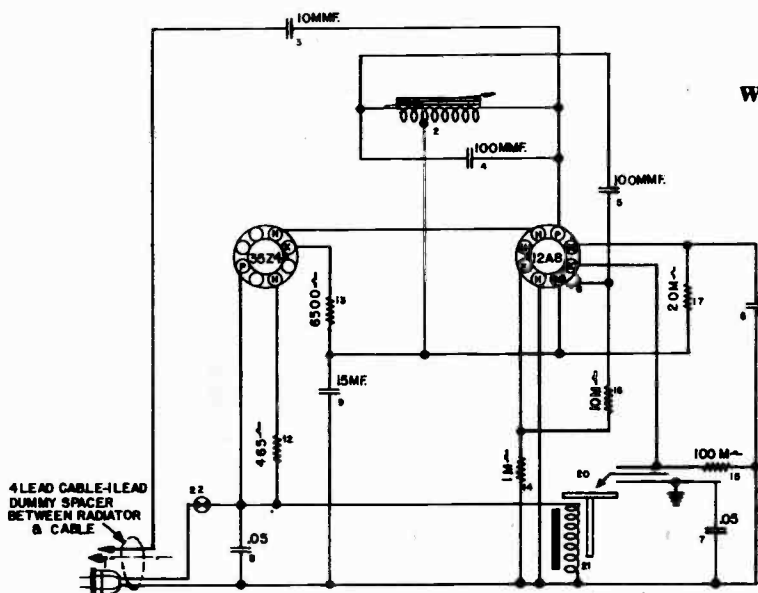
The record blanks for instantaneous home recordings differ from commercial records in many respects. Commercial records are usually made of shellac compound pressings formed under hydraulic pressure, resulting in recordings which are extremely resistant to wear but which are quite brittle and easily broken. Record blanks for instantaneous recordings are quite soft in comparison with commercial records but their durability is about as good as that of the cheaper grade phonograph record provided they are given the proper care.

NEVER USE REPRODUCING NEEDLE ON INSTANTANEOUS RECORD THAT HAS BEEN USED TO PLAY COMMERCIAL PHONOGRAPH RECORD.

The Crosley home recording disc is of the non-flammable or slow burning type. Always exercise care in the storage of home recordings. Keeping them clean, free from dust and dirt will add many hours to the life of the record.

NEVER ATTEMPT TO PLAYBACK AN INSTANTANEOUS RECORDING ON A MECHANICAL PHONOGRAPH.

NOTE: Excessive rumble which may sometimes be encountered during the playback of home recordings usually can be eliminated entirely (on Models 33BG, 28AZ, and 34BH by just turning the microphone fader or level control in a clockwise direction until the switch clicks.



WIRING DIAGRAM — MODEL CR26

Item No.	Part No.	Description
1	B-131602	Cable and Plug (4 lead)
2	L.W-131609	Osc. Coil
3	G8-34002	Condenser 10 Mmfd. Mica
4	G2-34002	Condenser 100 Mmfd. Mica
5	G2-34002	Condenser 100 Mmfd. Mica
6	W-50105	Condenser .1 Mfd. 200 V.
7	W-32380	Condenser .05 Mfd. 200 V.
8	W-32380	Condenser .05 Mf. 200 V.
9	W-131607	Condenser 2x15 Mfd. 150 V.
10	W-34736	¾ Dia. Hole Plug
11	B-131604	Chassis
12	W-131606	Resistor 465 ohm 10W.
13	35934	Resistor 6,500 Ohm ¼ W.
14	50046	Resistor 1,000 Ohm ¼ W.
15	35600	Resistor 100,000 Ohm ¼ W.
16	36317	Resistor 10,000 Ohm ¼ W.
17	36760	Resistor 20,000 Ohm ¼ W.
18		
19		
20	D-131529	Auto. Record Changer Unit
21		Motor with D-131529
22		Switch with D-131529

II—SERVICE NOTES

Recorder with Automatic Record Changer. (Models 28AZ, 34BH, 31BF, and 48BF)

1.—FUNCTION OF MANUAL CONTROL BUTTON AND RELATIVE PARTS

When Manual Control Button (Item 84, Fig. 6) is moved to the Manual Play-Back recording position, it moves the Manual Control Slide (Item 102, Fig. 7) which in turn moves Clutch Lock Slide (Item 103, Fig. 7) into a position which prevents Engagement Clutch Cam Assembly (Item 79, Fig. 8) from rotating. When Engagement Clutch Cam Assembly is in the above mentioned position and is not free to rotate, the Changer will not go into its changing cycle.

Also when the Manual Control Button is in the above mentioned position, the Manual Control Slide has moved the Locator Lock Slide (Item 106, Fig. 7) into a position where it engages the Tone Arm Locator & Bushing Assembly (Item 12, Fig. 7) and prevents same from bearing against Tone Arm Lever Assembly (Item 19, Fig. 7) allowing the Tone Arm to swing freely without hindrance and without setting Changer into its changing cycle. When the Manual Control button is in the automatic position the Changer will function normally as an automatic record changer.

2.—POSSIBLE MECHANICAL CAUSES OF POOR RECORDINGS

(A) Threads from record cuttings getting down onto Rubber Idler wheel (Item 83, Fig. 6) and between drive wheel and motor pulley. This will cause very bad speed variation of the turntable and, of course, will result in very inferior recording. Cuttings may also wrap around motor shaft and cause motor to slow down or stop.

To remove the record cuttings, the turntable should be lifted by applying an even lifting force at opposite edges of the turntable while the turntable spindle is gently tapped downward on its top end, and the record cuttings then removed. The Rubber Idler Drive Wheel should be taken off—this can be accomplished by unsnapping the small snap cotter ring and slipping Rubber Idler Drive Wheel off its shaft, after which all record cuttings can be removed.

NOTE: It is very important that no grease or oil be gotten on the surface of the Rubber Idler Drive Wheel.

(B). *Tight pivot bearings:* Check cartridge pivot screw (Item 108, Fig. 6) for binding. Also recording arm pivot screw (Item 107, Fig. 6) and Traverse arm pivot screws (Item 101, Fig. 8). These bearings should all be free, but have no looseness or play.

If the pivot screw, (Item 108, Fig. 6) of the Cutter Cartridge is tight, the Cutter Cartridge cannot follow a slight up and down variation of the record or turntable. A record cut in this manner will, when played back, have a high scratch level, rough cutting and a tendency for the needle to jump from one groove to another.

(C) *Damaged Rubber Idler Drive Wheel* (Item 83, Fig. 6) *Rubber Idler Drive Wheel may have become*

damaged by:

1. Allowing oil or grease to come in contact with same.
2. By allowing turntable to drop and cut into the outside surface of the Rubber Idler Drive Wheel.
3. Stopping the turntable by hand while the motor is running will cause a flat spot on the surface of the Rubber Idler Drive Wheel.

NOTE: If the Rubber Idler Drive Wheel has been damaged in any of the above mentioned ways, it should be replaced with a new one.

(D) *Vibration Reaching the Recorder While A Blank is Being Cut:*

It is very important the floor or the surface upon which the Recorder rests remain quiet as any vibration such as people walking across the floor or shaking of the instrument in which the recorder is mounted will seriously affect the quality of the finished recording.

(E) *Recorder Not Level:* It is very important that the Recorder is standing Level. This can be checked by placing a small level on the turntable and checking same in two positions at right angles to each other and then leveling instrument in which Recorder is mounted.

(F) *Bent or Damaged Turntable Spindle:* If the Turntable Spindle (Item 59 Fig. 6) has been bent in shipment, or by someone exerting a heavy pressure on one side, it should be replaced with a new one. A bent Turntable Spindle will cause the surface of the Turntable to move up and down while it is turning and, of course, will seriously effect the quality of both recording and play-back.

NOTE: When removing the Turntable an even upward lifting force should be applied at opposite edges of the Turntable while Turntable Spindle is gently tapped downward on its top end.

(G) *Record Cutting Causing A Bind Between Turntable Spindle* (Item 59, Fig. 6) *and Its Bearing:*

It is very important that all record cuttings are removed from Turntable Spindle and its bearing.

(H) *Tension On Rubber Idler Drive Wheel* (Item 83, Fig. 6) *Too Great:*

If the tension on the Rubber Idler Drive Wheel is too great, this will result in a "wow" or a rumble in the recording. To decrease the tension on Rubber Idler Drive Wheel, loosen the screw holding the lug which is located beneath the Rubber Idler Drive Wheel and turn it slightly in a clockwise direction. This will reduce the spring tension on the Rubber Idler Drive Wheel. When the spring tension is correct, the spring will be approximately at right angles to the lug.

(I) *Tension On Rubber Idler Drive Wheel* (Item 83, Fig. 6) *Too Weak:*

This will cause very bad speed variation. Turntable

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

will slow down and then speed up as audio current of varying intensity reaches the cutter cartridge.

RECORDER AS USED IN MODEL 33BG

(a) Possible Mechanical causes of Poor Recordings.

Thread from record cuttings getting down on to Turntable Drive Wheel (Fig. 4, Section I). This will cause very bad speed variation of turntable. Cuttings may also wrap around motor shaft and cause motor to slow down or stop. To remove record cuttings, the turntable should be lifted by applying an even lifting force at opposite edges of the turntable. The rubber drive wheel should be taken off—Remove hairpin re-

tainer and fibre washer and left wheel off, remove all cuttings and replace wheel.

NOTE: It is very important that NO GREASE or OIL be gotten on the surface of the rubber on drive wheel.

Turntable Drive Wheel may become damaged by—

1. By permitting turntable to drop and cut into the outside surface of the rubber drive wheel.
2. Stopping the turntable by hand while the motor is still running is liable to cause a flat spot on the surface of rubber drive wheel.
3. Permitting oil or grease to come in contact

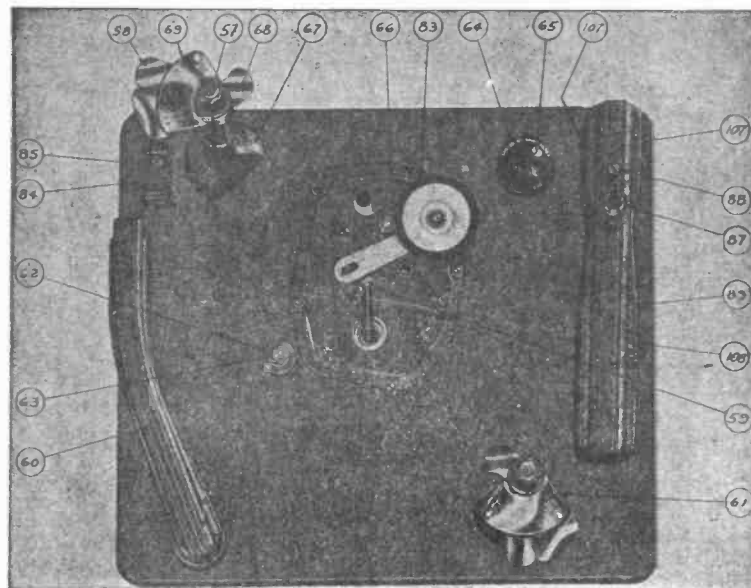


Figure 6

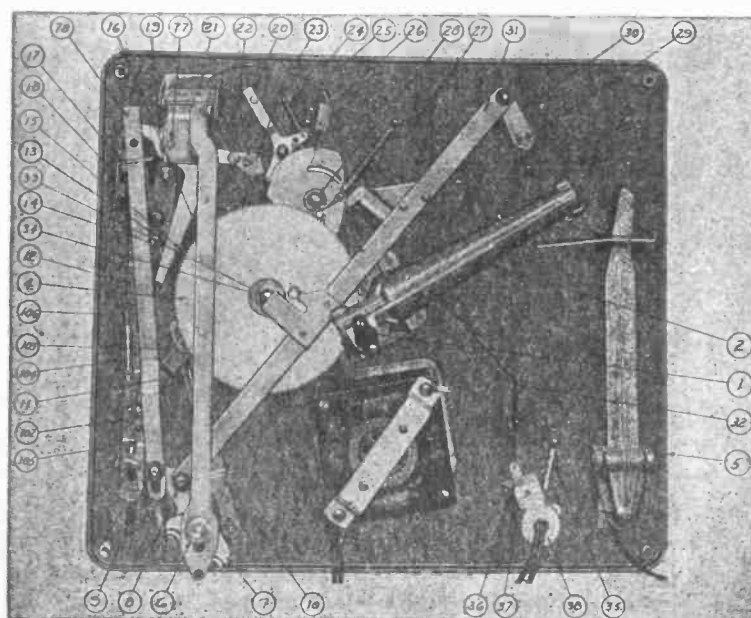


Figure 7

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

with the rubber surface of drive wheel.

NOTE: If the rubber drive wheel has been damaged in any of the above ways, replace with a new one.

(b) *Mechanical Vibration Transmitted to Recorder while a record is being cut.*

It is VERY IMPORTANT THAT THE BASE UPON WHICH RECORDER RESTS REMAINS QUIET, as any vibration such as people walking across the floor or shaking of instrument will seriously affect the quality of the finished recording.

(c) *Recorder Not Level.*

It is very important that recorder is standing level.

This can be checked by placing a smooth marble on uncut record.

(d) *Tension On Turntable Drive Wheel.*

If the tension on the rubber drive wheel is too great the usual result is a rumble in the recording. To decrease the tension on the drive wheel, loosen screw holding the tension spring lug, located beneath the drive wheel and turn lug a few degrees in a clockwise direction.

If the tension on the rubber drive wheel is too weak, a very marked change in the turntable speed will be noted during cutting operation. To increase tension move the tension spring lug a few degrees in a counter-clockwise direction.

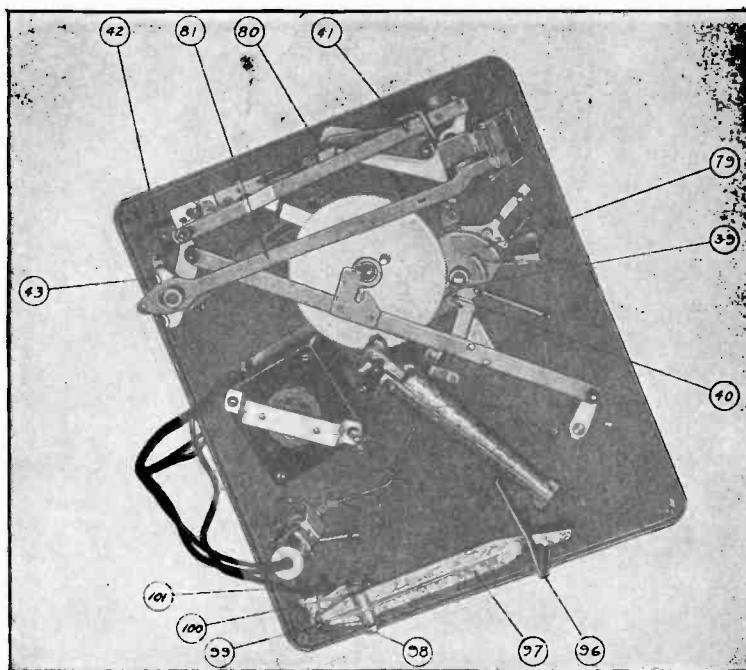


Figure 8

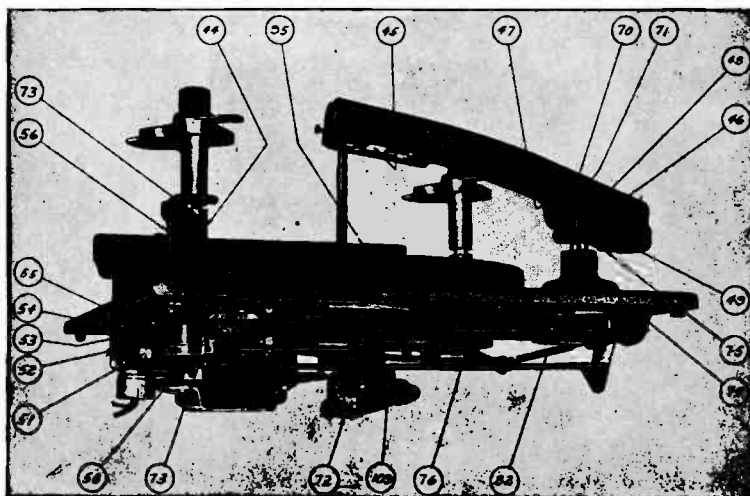


Figure 9

III—AUTOMATIC RECORD CHANGER

General Instructions

1.—FUNCTION OF RECORD CHANGER WHEN IT IS GOING THRU A CHANGE CYCLE—

The Record Changer plays and automatically changes 14 or less ten-inch records or 10 or less 12-inch records.

The Record Changer is started by turning the switch control knob, (Item 65, Fig. 11) to "ON" this starts the motor and moves trip rod (Item 32, Fig. 12), which rotates trip lever assembly (Item 20, Fig. 12), causing it to disengage from Engagement Clutch Cam, (Item 79, Fig. 12). The Engagement Clutch Cam will then rotate due to tension from spring, (Item 27, Fig. 12). This causes it to contact the pin on the top side of Drive Gear Assembly, (Item 4, Fig. 12), as it rotates, and in turn, moves the Drive Link Assembly, (Item 31, Fig. 12), and the Selector Shaft Crank Assembly No. 11 and No. 12 to the position shown in Fig. 12. Also the tone arm reset link (Item 80, Fig. 12), has moved to where it has released the latch, (Item 18, Fig. 12), and carried the tone arm to its extreme outward position. The Tone Arm lifter link (Item 81, Fig. 12), has raised the tone arm to its extreme height, by means of the Lifter Plate Assembly, (Item 21, Fig. 12). The tone arm is kept from "floating" free by the friction of the Tone Arm Brake Spring which also compresses the tone arm booster spring, (Item 13, Fig. 12) due to its very light tension.

The Drive Gear Assembly (Item 4, Fig. 12) continues to rotate which causes the top pin to disengage from the Automatic Engagement Clutch Cam which is moved back to latch with the tone arm trip lever, and the lower pin to engage the drive link assembly, moving it back to its initial position. This swings in the tone arm to either the 10-inch or 12-inch record playing position and lowers it to the record. At the same time it releases the Tone Arm Brake Spring allowing the Tone Arm Booster Spring to act.

2.—PHONOGRAPH NEEDLES

Various types and kinds of needles are available for use in phonograph tone arms.

For playing ten or more records at one setup with this Record Changer, no attempt should be made to use ordinary needles with steel or fibre points since continued use of worn needle points will damage the records being played.

Any needle can be used that is designed to play 15 or more records. It is well to keep in mind that even if the amplifying system, speaker and tone arm are of the best quality, a poor needle will result in poor reproduction of music.

There are a number of good semi-permanent types of needles on the market which are rated in number of plays. It is usually more economical to use one of these needles which is rated at 1000 plays or more.

It is very important to remember not to remove and then replace any needle that has been used.

3.—CHASSIS MOUNTING

On the bottom surface of the panel are four mounting

studs, each threaded to take a $\frac{1}{4}$ "—20 machine screw. The mounting panel rests on four tapered coil springs, the small end of each spring is pressed over a mounting stud and the large end of each spring fits into a socket in the top surface of the mounting shelf in cabinet.

Four spacing blocks $\frac{1}{2}$ " thick and with a $\frac{5}{8}$ " hole are fastened to the lower side of the mounting shelf. The $\frac{5}{8}$ " hole in each is centered with the center of the $7/16$ " screw clearance hole. These are to be provided and located on the lower side of the mounting shelf into which each of the lower mounting springs are to fit.

The $\frac{1}{4}$ "—20 machine screws are turned through the four wing nuts until the head of each screw is against the bottom side of each wing nut.

The four lower springs which are of smaller diameter than the upper springs are slipped over the ends of each of the $\frac{1}{4}$ "—20 machine screws with the tapered end toward the head and resting on the wing nuts.

OPERATING INSTRUCTIONS

1.—TO PREPARE CHANGER FOR OPERATION

(A) *Setting Record Changer to Play Ten-Inch Records:*

Turn both knobs until the arrows are pointing toward the center of the turntable. When in this position any number up to and including fourteen 10-inch records can be played.

(B) *Setting Record Changer to Play Twelve Inch Records:*

Turn both knobs until the arrows marked "12" are pointing toward the center of the turntable. When in this position any number up to and including ten 12-inch records can be played.

2.—LOADING

(A) If 10-inch records are to be played, set knobs as described in (A) above and place any number up to and including 14 records (*ten inch only*) over center pin so that they will rest on the selecting arms.

(B) If 12-inch records are to be played, set knobs as described in (B) above and place any number up to and including 10 records (*twelve inch only*) over center pin so that they will rest on the arms.

3.—STARTING THE RECORD CHANGER

1. Turn on the radio (allowing approximately 30 seconds for the tubes to warm up) and throw the phonograph-radio knob or control to the phonograph position.

2. Turn the switch knob on the Record Changer panel to "ON". The motor will then start and the

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

record changer will go into automatic operation of its own accord.

4.—PLAYING AN INDIVIDUAL RECORD

An individual record can be played in the same manner as a stack of records would be played, i. e., if it is a 10-inch record, follow the instructions pertaining to 10-inch records. If it is a 12-inch record, follow the instructions pertaining to 12-inch records.

A 10-inch record may be played manually by turning the selecting arm knobs to the unloading position and leaving them in this position—records may then be put on or taken off the turntable by merely moving the tone arm outward until it catches, and placing the 10-inch records over the spindle and down onto the turntable. The "ON" and "OFF" switch knob is then pushed down and the 10-inch record will be played and repeated if left on the turntable. To remove the record it is only necessary to move the tone arm outward until it catches, and lift the record off of the turntable.

5.—TURNING OFF RECORD CHANGER

Turn switch knob to "OFF" position while the tone arm is still on the record. If the switch knob should be turned off while Record Changer is going through a change cycle, it will be difficult to adjust the selector arms correctly for the automatic playing of 10-inch or 12-inch records.

6.—UNLOADING RECORDS

1. Turn switch knob to "OFF" position.
2. Remove any records remaining on the selector arms.
3. Move tone arm outward until it catches in outward position.
4. Turn selector arms so that records will clear them.
5. Remove records from turntable.

7.—LUBRICATION

(A) *Motor:* The motor is equipped with oilless bearing and requires no lubrication.

(B) *Turntable Spindle Bearings:* Are lubricated at the factory and do not require any lubrication for one year. After one year they should be oiled with 1 or 2 drops of a light grade oil. The top bearing can be oiled by lifting off turntable. Make sure when replacing turntable to see that pin in Turntable Spindle slips into slot on bottom surface of Turntable hub and also care should be taken not to injure Rubber Idler Drive Wheel.

Never under any circumstances allow oil to come in contact with Rubber Idler Drive Wheel.

(C) *Squeak Due To Records Rubbing On Turntable Spindle:* This can be eliminated by gently lining up the stack of records.

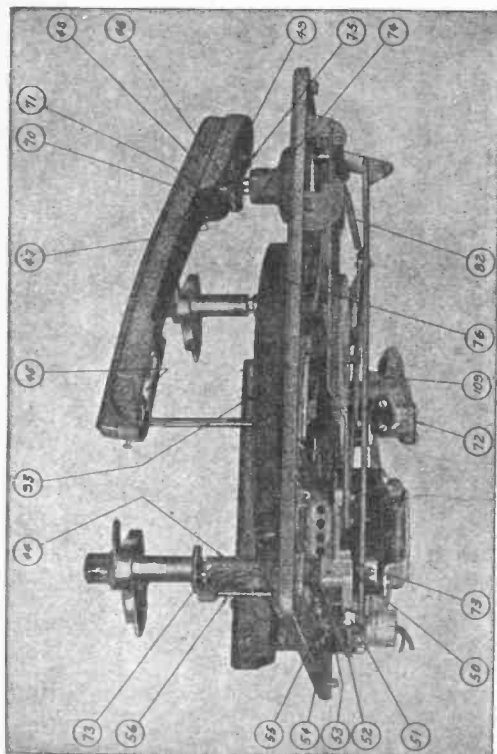


Figure 9

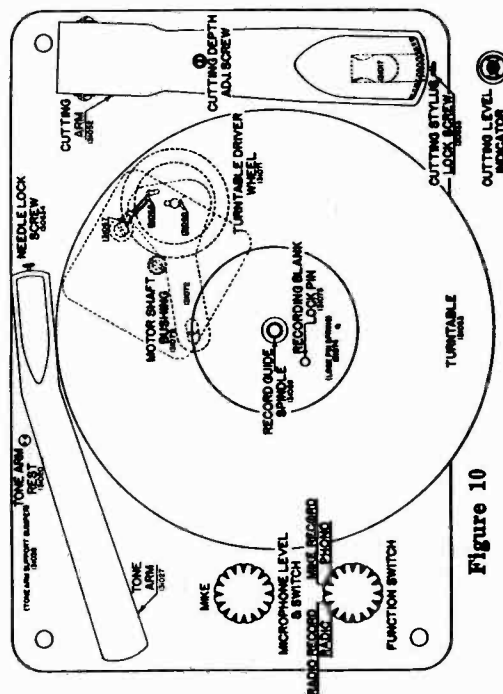


Figure 10

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

IV—SERVICE NOTES

1.—PICKUP DOES NOT INDEX PROPERLY ON TEN OR TWELVE INCH RECORDS

(A) *Adjustment for correct indexing of 10-inch records:*

1. Swing tone arm outward until tone arm lever assembly, (Item 19, Fig. 12) latches with tone arm latch lever, (Item 18, Fig. 12) which is held to the tone arm shaft, (Item 77, Fig. 13) by two setscrews.

2. Make sure these setscrews are tight and that there is a slight play between the tone arm lever assembly and the panel, (Item 5, Fig. 12). This will give proper clearance at ball race assembly, (Item 74, Fig. 13).

The tone arm lever assembly, (Item 19, Fig. 12) is held against tone arm latch lever, (Item 18, Fig. 12) by the tension of tone arm locator lever spring, (Item 16, Fig. 12).

3. Next loosen the clamping screw in the Swivel Bracket Assembly, (Item 46, Fig. 13).

4. Now move tone arm, (Item 60, Fig. 11) until its outside edge is $\frac{1}{8}$ " from the outside edge of the panel (Item 5, Fig. 12) and re-tighten screw securely.

2.—RECORD CHANGER DOES NOT GO INTO ITS CHANGING CYCLE AT END OF RECORD

(A) *Worn or Damaged Stop Groove:* If the stop groove in the record is worn out or damaged, discard such a record.

(B) *Cut-off Adjustment May Be Incorrect:* The Record Changer should go into its changing cycle when the needle enters the stop groove and has traveled to within a distance of $\frac{1}{8}$ " from the center of the turntable shaft.

If the Record Changer does not go into its changing cycle when the needle has reached the above-mentioned distance, the Tone Arm Trip Lever Shoe, (Item 23, Fig. 12), should be moved toward the outside edge of the panel. To do this, it is necessary to loosen the thumb nut, (Item 22, Fig. 12), and then retighten after adjustment has been made.

If the Record Changer goes into its changing cycle before the needle has reached a distance of $\frac{1}{8}$ " from the center of the turntable, the Tone Arm Trip Lever Shoe should be moved inward toward the center of the Record Changer.

3.—RECORD CHANGER DOES NOT GO INTO ITS CHANGING CYCLE WHEN SWITCH KNOB IS TURNED ON

When the switch is turned to "ON" the Record Changer should start its changing cycle. If it does not, the following points should be checked.

1. Make sure motor is running.

2. Check Trip Rod, (Item 32, Fig. 12), to make sure it releases Trip Lever Assembly, (Item 20, Fig. 12), from Engagement Clutch Cam Assembly, (Item 79, Fig. 12), when Switch Knob is being turned on. If Trip Lever Assembly is not released, Trip rod should be shortened

by bending until Trip Lever clears Engagement Clutch Cam Assembly, when Switch Knob is turned.

3. Make sure that Clutch Reset Pawl, (Item 40, Fig. 12) clears Drive Link Assembly, (Item 31, Fig. 12).

4.—RECORD CHANGER CONTINUES TO REPEAT ITS CHANGING CYCLE WITHOUT PLAYING RECORDS

(A) Trip Lever Assembly, (Item 20, Fig. 2) does not latch in Engagement Clutch Cam Assembly (Item 79, Fig. 12), which may be due to causes listed below:

1. Trip Rod (Item 32, Fig. 12), may be bent so that it is too short, holding Trip Lever Assembly from contacting Engagement Clutch Cam Assembly.

2. Springs (Item 24 or 35, Fig. 12) may be disconnected.

5.—NO SOUND WHEN NEEDLE IS ON MOVING RECORD

1. Muting switch (Item 26, Fig. 12), may be out of adjustment. The contacts of this switch should be open whenever its long blade is not resting on the shoe of the Engagement Clutch Cam Assembly (Item 79, Fig. 12). If the contacts remain closed after the long blade has left the shoe, they should be adjusted by bending until there is a separation of approximately $\frac{1}{32}$ ".

Switch should be checked to make sure contacts are closed when long blade is resting on the shoe of the Engagement Clutch Cam Assembly.

2. The lugs on the Muting switch may have been bent together.

3. Pickup cartridge in Tone Arm may have been damaged or may be defective.

6.—TONE ARM ADJUSTMENTS FOR 12" RECORDS

1. Turn both Control Knobs until the arrows marked "12" are pointing toward the center of the turntable.

2. Place a twelve inch record on the turntable.

3. Start Record Changer and note where needle contacts record. Correct contacting is about $\frac{1}{8}$ " from the outside edge of record.

4. Set Rod (Item 56, Fig. 13), is operated by Selector Arm (Item 61, Fig. 11). The 12" Set Link (Item 10, Fig. 11), operates as a stop when Record Changer is set for 12" records. When Tone Arm Locator Assembly (Item 12, Fig. 11) contacts 12" Set Link the Tone Arm should be in the correct position to play a 12" record.

If at this point, the position of Tone Arm is incorrect, loosen the screw which holds the Tone Arm Locator Shoe 12" (Item 14, Fig. 11) and move in either direction as required and tighten screw.

7.—TONE ARM ADJUSTMENTS FOR 10" RECORDS

1. Turn both knobs until the arrows marked "10"

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

are pointing toward the center of the turntable.

2. Place a 10" record on the turntable and start Record Changer.

3.—Note where needle contacts record. Correct contacting is about $\frac{1}{8}$ " from the outside edge of record. If contacting of needle is not correct as mentioned, loosen the screw which holds Tone Arm Locator Shoe 10" (Item 15, Fig. 13) and slide shoe in or out as required, then tighten screw.

8.—TONE ARM HEIGHT ADJUSTMENTS

Set the Record Changer for ten-inch records, turn Switch to "ON" and allow Record Changer to go thru a changing cycle with no record on the turntable. The clearance between Turntable and the bottom surface of the Tone Arm should be approximately $\frac{1}{8}$ ". Usually this clearance can be obtained by adjusting the Tone Arm Adjustment Screw (Item 70, Fig. 13). It is well to check the following points before making any adjustment.

Check clearance between Roller (Item 51, Fig. 13), and Selector Crank Shaft Assembly (Item 7, Fig. 12). There should be approximately $\frac{1}{32}$ " clearance at this point. If the clearance is greater, it would be due to the pressure on the Spring Washer (Item 50, Fig. 13) being too great. This will prevent the Tone Arm Lifter Reset Spring (Item 82, Fig. 13) from returning the Tone Arm Lifter Link Assembly (Item 81, Fig. 12) sufficiently. To relieve the pressure on the Spring Washer, lower the Selector Shaft Collar (Item 6, Fig. 11) slightly.

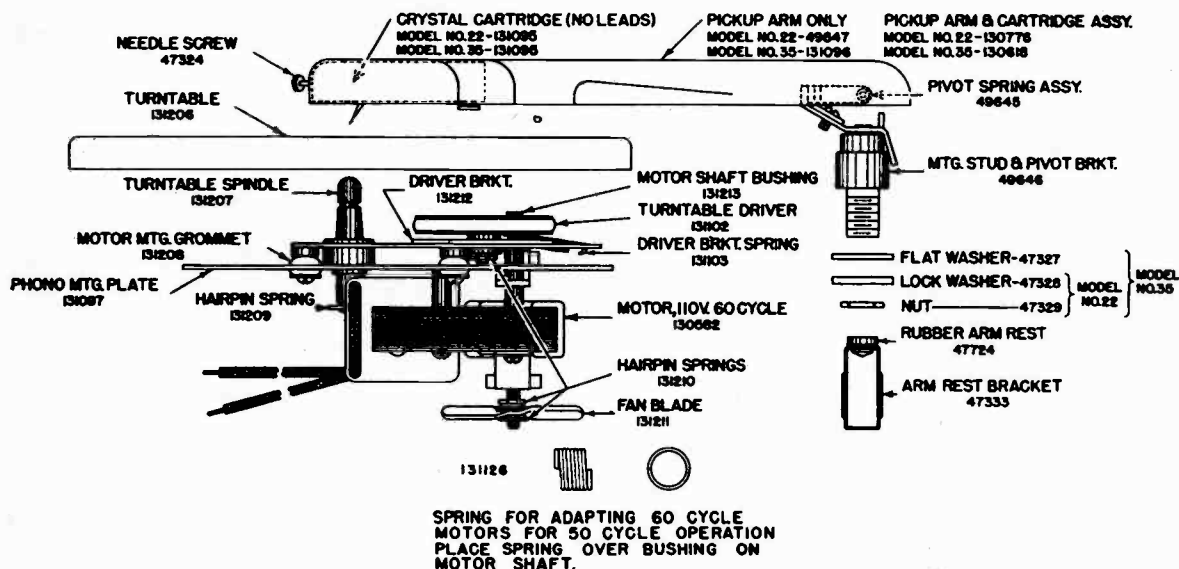
9.—TONE ARM LOWERS ON RECORD TOO SUDDENLY

If the Tone Arm lowers too suddenly, the Spring Washer (Item 50, Fig. 3) which is located between the Tone Arm Lifter Link Assembly (Item 81, Fig. 2) and Selector Crank Shaft Assembly Post (Item 7, Fig. 2) is not under sufficient pressure. The setscrews in the Selector Shaft Collar (Item 6, Fig. 2) should be loosened and the Selector Shaft Collar pressed upward slightly and set screws tightened.

V—PHONO MOTORS & TONE ARMS

As Used on Models 22AS and 35AK

The miscellaneous parts for the Phono motors and tone arms as used in models 22 and 35 combination receivers are illustrated below along with their part numbers.





Automatic Record Changer

Model N-100 and N-200



NEW GEARLESS RECORD CHANGER

This machine will play and automatically change a series of up to twelve ten-inch records or a series of up to ten twelve-inch records. Any ten or twelve-inch record of the 78 R.P.M. type with either a standard eccentric or spiral stopping groove will operate this machine automatically.

Very old records that have not a standard eccentric or spiral stopping groove can be played semi-automatically by operating the **reject lever** at the conclusion of each selection.

PLAYS HOME RECORDINGS

To provide adequate protection for your most valued recordings and at the same time relieve you of the necessity of changing needles, this machine was designed to use an "**EVERLASTING**" needle in conjunction with its "**FEATHERWEIGHT**" tonearm. This needle will faithfully reproduce many thousands of recordings with minimum wear of your records.

The **turntable** has a pin for reproducing home recording discs at a constant speed.

This machine operates on 110 volt—60 cycle current only.

Majority of Detrola combinations until 1941, used R.C.A. changers. Recent models 411, 412, 417, 427, and 428, use the changer described.

COMPILED BY M. N. BEITMAN, SUPREME PUBLICATIONS

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

FOR AUTOMATIC OPERATION

1. Turn **automatic record support** for the size of record to be played—10-inch or 12-inch—and flip the **record alignment plate** away from the turntable.
2. **Tonearm** should be moved to engage notch marked "A" (automatic) on base of **tonearm**. (See Fig. 3).
3. Place a series of up to twelve ten-inch records or a series of up to ten twelve-inch records on **center spindle** and **automatic record support**. Flip **record alignment plate** on to records.
4. Move **control lever** to "ON" position, hold for about ½ second to start automatic operation, then release.



FIG. 2

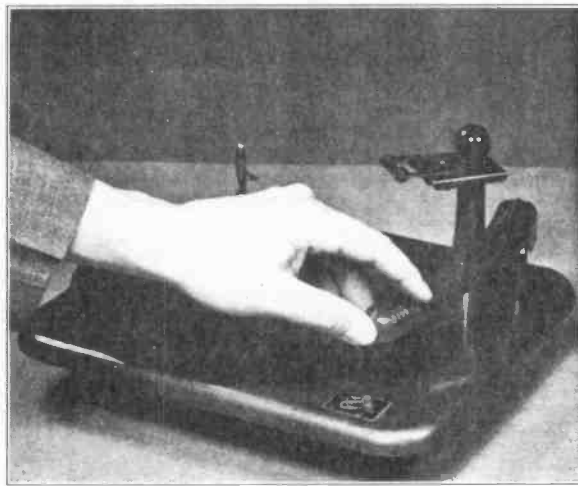


FIG. 3

THE AUTOMATIC REJECT OPERATION

If, while playing a record, you desire to skip the remainder of the recording and pass immediately to the next record of the series, move the **control lever** to "REJ" (reject) position, then release.

THE MANUAL REJECT OPERATION

If you desire to skip a number of records:

1. Lift the **tonearm** off the record and place in its normal or rest position, clear of the records.
2. Turn the **manual reject knob** clockwise, then release, dropping one record. Repeat until desired record is obtained, then carefully replace needle on edge of record.

TO REMOVE RECORDS

Always drop all the records from the **automatic record support** (see "manual-reject operation") before removing the records from the **spindle**.

1. Flip **record alignment plate** away from records.
2. Remove **tonearm** to its normal or rest position.
3. Lift records vertically.

TO PLAY HOME RECORDINGS

To play a home recording disc, up to 10 inches in diameter, move **control lever** to "OFF" position, then:

1. Turn **automatic record support** for a 12-inch record.
2. **Tonearm** should be moved to engage notch marked "H" (home recording) on base of **tonearm** (See Fig. 2).
3. Move **control lever** to "ON" position and allow **tonearm** to go through its record changing cycle. If the home recording disc is 10" in diameter, the **tonearm** will fall correctly on the record; but for smaller records, the **tonearm** must be placed on the record by hand.
4. At the conclusion of the home recording selection, either return the **tonearm** to the rest position by hand or move the **control lever** to "REJ" position, then release.

SEMI-AUTOMATIC OPERATION

Old records that have neither a standard eccentric nor spiral finishing groove do not operate the automatic trip mechanism. They may be played either in a series or singly by moving the **control lever** to the "REJ" position at the conclusion of each selection.



EMERSON RADIO AND PHONOGRAPH CORP.

AUTOMATIC CHANGER

Controls and Moving Mechanism

INDEX AND RECORD REJECT LEVER.—This lever is located near the right front corner of the motorboard with its index plate marked for four positions: "MANUAL," "12," "10" and "REJECT." When you desire to change record selections manually, this lever should be set in the "MANUAL" position. With the lever in the "12" position, the mechanism is set to play a series of 12-inch records automatically. To play either a series of 10-inch records, or 10- and 12-inch records mixed, the lever should be set at the "10" position.

To reject a record being played, or to start the record-changing cycle in case the record just played does not have the standard eccentric or spiral stopping groove, simply push the lever to the "REJECT" position and let go. The pickup will raise up and swing outwards and the next record will drop down. Upon releasing the lever, it will automatically return to the "10" position. If you are playing a series of 12-inch records, the lever should be returned to the "12" position after rejecting a record. Keep the lever in its "MANUAL" position when not actually playing records automatically.

TURNTABLE SWITCH.—The switch located just in front of the Index and Record Reject Lever controls the current to the turntable motor. To start the turntable, set the switch to the "ON" position. To stop the turntable, set the switch to the "OFF" position.

PICKUP AND TOP-LOADING NEEDLE SOCKET.—The pickup is the new crystal type, with a hole in the top for insertion of needles. When not playing records, the pickup arm should be moved to the right beyond the turntable and placed at rest on the support with the edge of the pickup arm to the right of the small extension post and the pickup over the polished needle gauge plate. The pickup must be in this position to insert a needle.

The pickup support plate with extension post, gauge plate and box holder is at the front of the motorboard on the right. The box slides in and out at the back for emptying, and is held secure by a spring piece on the bottom.

To insert a needle initially, loosen the needle screw on the front of the pickup, place needle in hole at top so that it drops down against the needle gauge plate and then tighten up the needle screw.

To change a needle, place pickup in rest position, loosen needle screw and push pickup to the right to drop the used needle into the box below. Then with pickup against extension post insert a new needle as described above.

RECORD HOLDER SHELVES.—To place a record on the turntable or to remove records, raise the record holder shelves by lifting the knobs, and swing clear of outer edge of record. Also push back vertical lever adjacent to the rear record holder post. You now have clear access to the turntable. Before loading the magazine for Automatic Operation swing the record holder shelves back into position.

Automatic Operation

1. Turn the receiver "on" in the usual way, as explained above.

2. Rotate the phono-radio switch knob counter-clockwise to the phonograph position. Wait about a minute for the tubes in the receiver to warm up.

3. See that the pickup is over the needle gauge plate with needle properly in place. If not, complete a cycle as follows: Throw the turntable switch "on." The turntable will start to revolve and the cycle of motion on the pickup arm will follow through. When the pickup arm comes down (and it can be moved by hand) the cycle is completed. Turn off the turntable switch.

4. The Index and Record Reject Lever is located near the right front corner of the motorboard. With this lever at "Manual" position, place the series of records (up to eight 10-inch or seven 12-inch records) on the record holder posts. This is shown in the illustration.

5. Set the Index and Record Reject Lever to the proper position. With this lever in the "12" position, the mechanism is set to play a series of 12-inch records automatically. To play either a series of 10-inch records, or 10- and 12-inch records mixed, the lever should be set at the "10" position. To reject a record being played, or to start the record changing cycle in case the record just played does not have the standard eccentric or spiral stopping groove, simply push the lever to the "Reject" position and let go. The pickup will raise up and swing outwards and the next record will drop down. Upon releasing the lever, it will automatically return to the "10" position. When playing a series of 12-inch records, the lever should be returned to the "12" position after rejecting a record.

6. Throw the turntable switch to the "on" position. The turntable should start to revolve.

7. When turntable has attained speed, push the Index and Record Reject Lever to the "Reject" position. The first record will drop on the turntable and the pickup will move into position on the record.

8. Adjust to the desired volume by means of the regular receiver volume control.

9. Close the cabinet lid to eliminate normal mechanical noises due to needle vibration.

The whole series of records will now play without further attention, and the last record will repeat until the turntable switch is turned off. Allow the record-changing mechanism to complete its cycle before the turntable is stopped. Then lift the pickup, swing the arm to the right beyond the edge of the record and lower it onto the pickup rest with pickup over needle gauge plate. The record player is then ready for reloading, or for manual operation.

Manual Operation

1. Proceed as in steps 1, 2 and 3 under Automatic Operation.

2. Place record on turntable with desired selection upwards.

3. Set Index and Record Reject Lever to "Manual" position. The lever should be kept in this position when not actually playing records automatically.

4. Turn the motor on. Lift the pickup and gently lower it on the record.

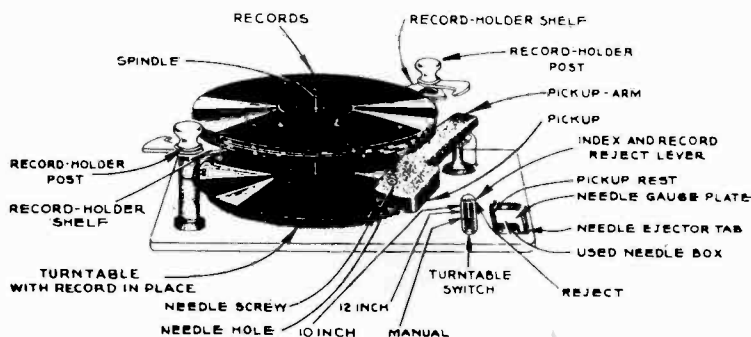
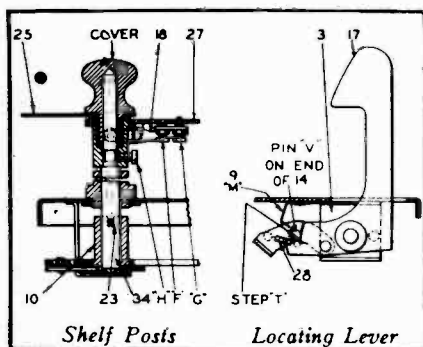
5. Adjust the volume to the desired level.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

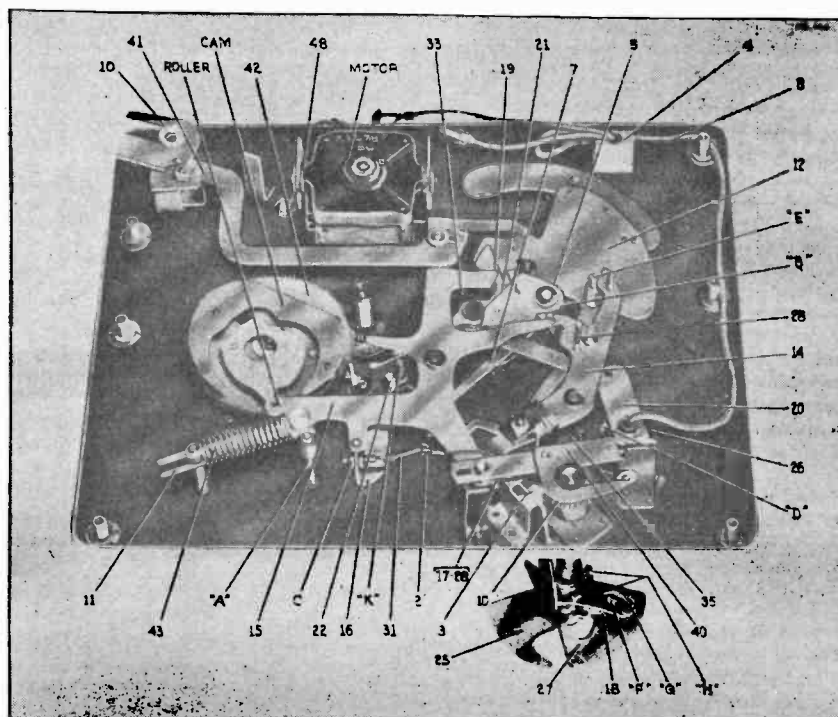
To Insert Needle

The pickup must be over the needle gauge plate to insert or change needles. To insert a needle initially, loosen the needle screw on the front of the pickup, place needle in hole at the top so that it drops down against the needle gauge plate and then tighten up the needle screw. The extending tab on the needle gauge plate operates the needle ejector. To change a needle, place pickup in rest position, loosen needle screw and press the extending tab on needle gauge plate to drop the used

needle into the box below. Release tab, allowing the needle gauge plate to swing back, and then insert a new needle in the pickup as described above. The used needle box may be taken out and emptied by first lifting the pickup off its rest and allowing it to float between the rest and the turntable. Then tilt the box upwards at the front and lift out. To replace the box, tilt it upwards at front and lower it into the hole with the lug on the back of the box in the slot in the motorboard. Slide the lug under the motorboard and push the box in place. Replace the pickup on its rest.



Top View of Automatic Record Changer



Bottom View of Record Changer with Motor-Condenser Support Bar Removed

Automatic Record Changer

GENERAL INFORMATION

Before servicing the automatic record changer, inspect the assembly to see that all levers, parts, gears, springs, etc. are in good order and are correctly assembled.

A bind or jam in the mechanism can usually be relieved by rotating the turntable in the reverse direction.

The changer can be conveniently rotated through its change cycle by pushing the index lever to "Reject" and revolving the turntable by hand. Six turntable revolutions are required for one change cycle.

If the record changer or cabinet is not perfectly level, normal operation is likely to be affected.

The 10 and 12 inch records must be absolutely flat for smooth operation when using a mixture of the two sizes.

ADJUSTMENTS

A. Main Lever.—This lever is basically important in that it interlinks the various individual mechanisms which control needle landing, tripping, record separation, etc. One adjustment is provided for the main lever. Rotate the turntable until the changer is out-of-cycle; and adjust rubber bumper bracket (A) so that the roller clears the nose of the cam plate by 1/16 inch.

B. Friction Clutch.—The motion of the tone arm toward the center of the record is transmitted to the trip pawl "22" by the trip lever "7" through a friction clutch "5." If the motion of the pickup is abruptly accelerated or becomes irregular due to swinging in the eccentric groove, the trip finger "7" moves the trip pawl "22" into engagement with the pawl on the main gear, and the change cycle is started. Proper adjustment of the friction clutch "5" occurs when movement of the tone arm causes positive movement of the trip pawl "22" without tendency of the clutch to slip. The friction should be just enough to prevent slippage, and is adjustable by means of screw "B." If adjustment is too tight, the needle will repeat grooves; if too loose, tripping will not occur at the end of the record.

C. Pickup Lift Cable Screw.—During the record change cycle, lever "16" is actuated by the main lever "15" so as to raise the tone arm clear of the record by means of the pickup lift cable. To adjust pickup for proper elevation, stop the changer "in-cycle" at the point where pickup is raised to the maximum height above turntable plate, and has not moved outward; at this point adjust locknuts "C" to obtain 1 inch spacing between needle point and turntable top surface.

D. & E. Needle Landing on Record.—The relation of coupling between the tone arm vertical shaft and lever "20" determines the landing position of the needle on a 10 inch record. Position of eccentric stud "E" governs the landing of the needle on a 12 inch record; this, however, is dependent on the proper 10 inch adjustment.

To adjust for needle landing, place 10 inch record on turntable; push index lever to reject position and return to the 10 inch position; see that pickup locating lever "17" is tilted fully toward turntable; rotate mechanism through cycle until needle is just ready to land on the record; then see that pin "V" on lever "14" is in contact with "Step T" on lever "17." The correct point of landing is 4-11/16 inches from the nearest side of the turntable spindle; loosen the two screws "D" and adjust horizontal position of tone arm to proper dimension, being careful not to disturb levers "14" and "17." Leave approximately 1/32 inch end play between hub of lever "20" and pickup base bearing, and tighten the blunt nose screw "D"; run mechanism through several cycles as a check, then tighten cone pointed screw "D".

After adjusting for needle landing on a 10 inch record, place 12 inch record on turntable; push index lever to reject and return to 12 inch position; rotate mechanism through cycle until needle is just ready to land on the record; the correct point of landing is 5-11/16 inches from nearest side of spindle. If the landing is incorrect, turn stud "E" until the eccentric end adjusts lever "14" to give correct needle landing. The eccentric end of the stud must always be toward the rear of the motor board, otherwise incorrect landing may occur with 10 inch records.

F. & G. Record Separating Knife.—The upper plate (knife) "25" on each of the record posts serves to separate the lower record from the stack and to support the remaining records during the change cycle. It is essential that the spacing between the knife and the rotating record shelf "27" be accurately maintained. The spacing for the 10 inch record is nominally .055 inch, and for the 12 inch record is .075 inch.

To adjust, rotate the knife to the point of minimum

vertical separation from the record shelf and turn screw and locknut "F" to give .052—.058 inch separation. Screw "G" must not be depressed during this adjustment. After setting screw "F" adjust screw "G" so that when its tip is depressed flush with top of record shelf, the vertical spacing between the knife, in its lowest rotational position, and the shelf, is .072—.078 inch.

H. Record Support Shelf.—The record shelf revolves during the change cycle to allow the lower record to drop onto the turntable. Both posts are rotated simultaneously by a gear and rack coupled to the main lever "15," and it is necessary that adjustments be such that the record is released from both shelves at the same instant. To adjust, place a 12 inch record on the turntable, rotate mechanism into cycle to the point where tone arm is at maximum distance outward from turntable; lift record upward until it is in contact with both separating knives, then loosen screws "H" and shift record shelves so that the curved inner edges of the shelves are uniformly spaced at least 1/16 inch from record edge. Tighten the blunt nose screw "H," run mechanism through cycle several times to check action, then tighten cone pointed screw "H".

If record shelves or knives are bent, or not perfectly horizontal, improper operation and jamming of mechanism will occur.

J. Tone Arm Rest Support (not shown).—When the changer is out-of-cycle, the front lower edge of the pickup head should be 5/16 inch above surface of motor board. This may be adjusted by bending the tone arm support bracket, which is associated with the tone arm mounting base, in the required direction.

K. Trip Pawl Stop Pin.—The position of the trip pawl stop pin "K" in relation to the main lever "15" governs the point at which the roller enters the cam. By bending the pin support either toward or away from trip pawl bearing stud, the roller can be made to enter the cam later or earlier, respectively. This adjustment should be made so that the roller definitely clears the cam outer guide as well as the nose of the cam plate.

Lubrication.—Petrolatum or petroleum jelly should be applied to cam, main gear, spindle pinion gear, and gears of record posts.

Light machine oil should be used in the tone arm vertical bearing, record post bearings, and all other bearings of various levers on underside of motor board.

The felt washer between the turntable and spindle bearing should be soaked in light engine oil whenever the turntable is removed, or as required for proper operation.

Do not allow oil or grease to come in contact with, rubber mounting of tone arm base, rubber bumper, or flexible coupling of drive motor.

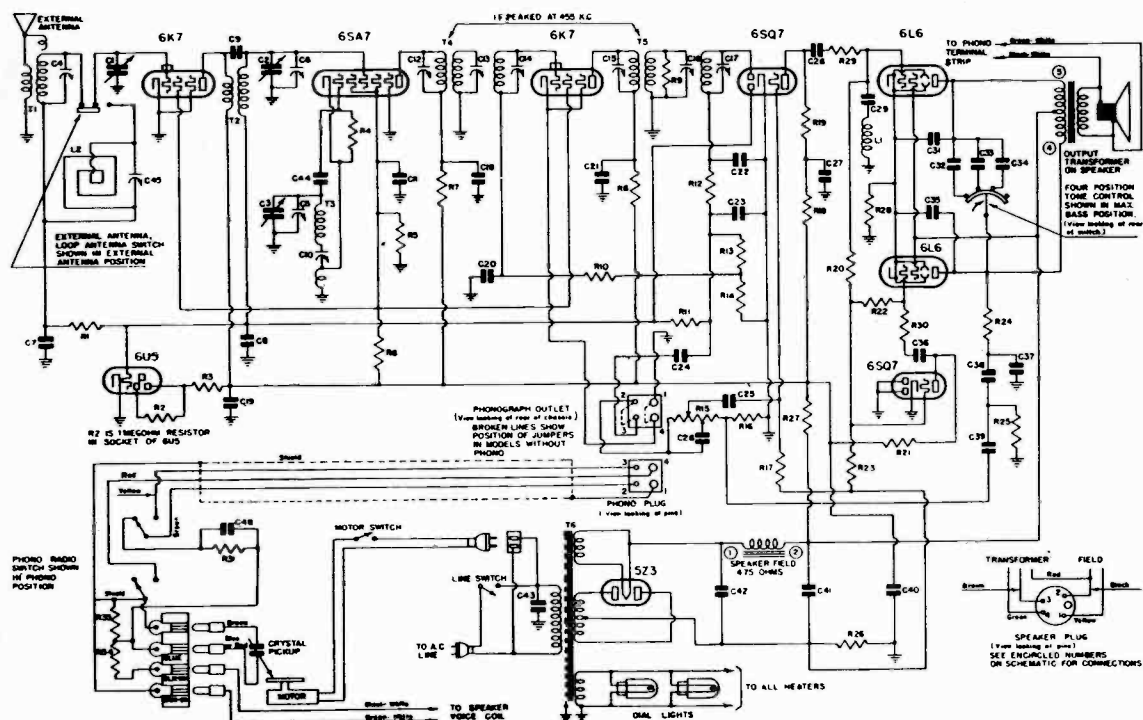
MISCELLANEOUS SERVICE HINTS

Incorrect adjustment of a particular mechanism of the changer is generally exhibited in a specific mode of improper operation. The following relations between effects on operation and the usual mis-adjustments will enable ready adjustment in most cases.

1. For any irregularity of operation, the adjustment of the main lever "15" should be checked first as in "A".
2. Needle does not land properly on both 10 and 12 inch records—Make complete adjustments "D" and "E".
3. Needle does not land properly on 12 inch record but correct on 10 inch—Effect adjustment "E".
4. Failure to trip at end of record—Increase clutch "5" friction by means of screw "B". Also, see that levers "7" and "12" are free to move without touching each other.
5. Pickup strikes lower record of stack or drags across top record on turntable—Adjust lift cable per adjustment "C".
6. Needle does not track after landing—Friction clutch "5" adjustment "B" may be too tight; bind in tone arm vertical bearing; levers "7" and "12" fouled, or pickup output cable twisted.
7. Cycle commences before record is complete—Record is defective, or adjustment "B" of friction clutch "5" is too tight.
8. Wow in record reproduction—Record is defective;
9. Record knives strike edge of records—Records warped; record edges are rough; or knife adjustments "F" and "G" are incorrect.
10. Record not released properly—Adjust record shelf assemblies in respect to shaft by means of adjustment "H".
11. Needle lands in 10 inch position on 12 inch record or misses record when playing both types mixed—Increase tension of pickup locating lever spring.

Emerson Radio

MODELS: DS-365 and DS-372



Ques	Part No.	DESCRIPTION	PRICE
L1	7ST-538	10 K.C. Shor. chokes	\$1.40
L2	7SW-218	Loop antenna (365 cabinet)	1.05
L2	7SW-298	Loop antenna (372 cabinet)	1.75
T1	7ST-533	Antenna coil	.40
T2	7ST-534	Intermediate coil	.30
T3	7ST-535	Oscillator coil	.25
T4	7ST-536	Triple-tuned 455 kc first i-f transformer	1.45
T5	7ST-537	Triple-tuned 455 kc second i-f transformer	1.60
T6	7ST-540	Power transformer	8.90
R1, R12, R29, R30	KR-53	50,000 ohm 1/4 watt carbon resistor	.16
R2	KR-57	1 megohm 1/4 watt resistor in 6U5 tube socket	.16
R3	GR-31	20,000 ohm 1 watt carbon resistor	.16
R4	LR-40	20,000 ohm 1/4 watt carbon resistor	.16
R5	3BR-247	40,000 ohm 1/4 watt carbon resistor	.16
R6	7SR-411	15,000 ohm 2 watt carbon resistor	.25
R7, R8	PR-79	1000 ohm 1/4 watt carbon resistor	.16
R9		100,000 ohm resistor, part of T6	
R10, R11	NNR-220	3 megohm 1/4 watt carbon resistor	.16
R13	LR-61	200,000 ohm 1/4 watt carbon resistor	.16
R14, R18, R19, R21	KR-54	100,000 ohm 1/4 watt carbon resistor	.16
R15	7SR-379	Volume control, 1.2 megohm, double tapped	.70
R16	3ER-262	75 ohm 1/4 watt wire-wound resistor	.16
R17	HR-42	2 megohm 1/4 watt carbon resistor	.16
R20, R22, R23	KR-55	250,000 ohm 1/4 watt carbon resistor	.16
R24	3BR-246	10,000 ohm 2 watt carbon resistor	.25
R25	7SR-404	3,500 ohm 1/4 watt carbon resistor	.16
R26	7SR-402	11 ohm 1/4 watt wire-wound resistor	.16
R27	3XR-283	1500 ohm 2 watt carbon resistor	.25
R28	7SR-403	180 ohm 3 watt carbon resistor	.30
C1, C2, C3	7SC-496	Three-gang variable condenser	5.05
C4		Trimmer, part of T1	
C5, C6		Trimmers, part of variable condenser	
C7, C8, C20	BC-12	.05 mf, 200 volt tubular condenser	.20
C9	7SC-498A	.000008 mf, mica condenser	.20
C10	2NC-231A	Single adjustable peaking condenser; range 300 to 600 mmf	.30
C11	EBC-132	.01 mf, 400 volt tubular condenser	.20
C12, C13		Trimmers, part of i-f transformers	
C14, C15			
C16, C17			
C18, C21	LC-44	.05 mf, 400 volt tubular condenser	.20
C36			
C19, C27	EBC-132	.01 mf, 400 volt tubular condenser	.20
C28			
C22, C36	3LC-410A	.000011 mf, mica condenser	.20
C48			
C23	4XC-193A	.000006 mf, mica condenser	.20
C24, C25	KC-58	.01 mf, 400 volt tubular condenser	.20
C29		.00014 mf, mica condenser; part of L1	.20
C31, C35	3VC-124	.003 mf, 600 volt tubular condenser	.20
C32	3XC-174	.01 mf, 600 volt tubular condenser	.20
C33	7BC-475	.05 mf, 600 volt tubular condenser	.20
C34	QOC-173	.0015 mf, 600 volt tubular condenser (see production change number 1)	.20
C37	7SC-497	.08 mf, 600 volt tubular condenser	.20
C38	4DC-349	.04 mf, 400 volt tubular condenser	.20
C39	BC-19	.05 mf, 200 volt tubular condenser	.35
C40, C41	7AC-444A	16 mf, 400 volt dry electrolytic condenser	.85
C42	3XC-129 or 7SC-301	30 mf, 450 volt wet electrolytic condenser	1.35
C43, C44	3LC-297A	.01 mf, 400 volt tubular condenser	1.00
C45		Trimmer, part of L2	

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

Automatic Changer used by Emerson and Fada Models 184, 185

This Changer mechanism is operated by the main cam (A) which actuates all parts. The main cam (A) is engaged with the pinion (B) on the turn table spindle (C) by release of the starting dog (D). The starting dog is released by the latch lever (E) when it is moved by the sweep assembly (F) attached to the tone arm pivot shaft (G), or by the control lever (H).

The upper side of the main cam (A) raises and lowers the tone arm thru the lift pin (I) and swings the tone arm by the sweep assembly (F). A stud in the main cam (A) resets the 10 inch (K) and 12 inch (J) stop levers and throws the mixer assembly (L) to the clear position.

The lower side of the main cam (A) drives the record feed lever (M) and has a notch at one side which latches the main cam (A) in home position by engagement with the homing lever (N).

The control lever (H) is operated by a stud in the control slide (O). In manual position one leg of this lever holds the starting dog (D) out of engagement. In automatic position the starting dog (D) is permitted to fall into engagement but is reset by another part of the control lever (H). In reject position the control lever (H) engages the latch lever (E), releasing the starting dog (D).

The sweep assembly (F) carried on the tone arm pivot shaft (G) consist of (1) positioning plate (P) which works against the stop levers (J-K). (2) Positive trip lever (Q) which strikes the latch lever (E) when tone arm is swung toward center. (3) Sweep Lever (R) which engages the pawl (S) on the latch lever (E) moving same to release starting dog (D) when tone arm swing is reversed.

These three parts are held on a bushing held on the tone arm pivot shaft (G) by a clamp. Connection between the sweep lever (R) and the positioning plate (P) is by a horseshoe spring (T). This horseshoe spring (T) deflects when the tone arm swings in to complete change cycle providing the "kick in" force to enter the needle in the playing groove.

The record feed lever (M) on the under side of the main cam (A) drives the record feed link (U) through the relief spring (V). This lever pulls on the spring in operation and rests against a stud in the record feed link (U) when at home position.

TONE ARM

If tone arm rise is incorrect, raise tone arm and adjust hexagon head screw which lift pin (I) strikes.

To adjust needle drop point remove button at right hand side of tone arm and with small screw driver rotate slotted stud slightly. Clockwise rotation causes the needle to drop closer to the edge of the record. Counter clockwise rotation causes the arm to drop farther in on the record.

The difference in drop points for 10 inch and 12 inch records is fixed by stop levers (J-K) and should not be changed unless they have been damaged. If tone arm always drops in one position, check toggle lever spring (W) inside of stop bracket (X).

The following procedure should be followed in re-installing a tone arm that has been removed. Hold sweep lever assembly (F) under tone arm pivot shaft (G) bearing with sweep lever assembly (F) roller en-

gaged in main cam (A). Insert tone arm; assemble clamp; then tighten screw just enough to hold assembly together.

Drop lift pin (I) into place.

Push control button to "REJ" and rotate turn table clockwise by hand until tone arm drops to record level with one record on turn table. Hold clamp and sweep lever assembly (F) against stop lever (K) and rotate tone arm to proper drop point for 10 inch record and tighten clamp. A maximum of .010 inch end play should be allowed in tone arm pivot shaft (G).

Change Cycle starts Early or Late.

Remove button at left hand side of tone arm and with small screw driver rotate slotted stud slightly. Rotate clockwise to start change earlier. Rotate counter-clockwise to delay change.

Positive trip lever (Q) should strike vertical tail on latch lever (E) without interference from control lever (H) or sweep lever (R).

CHANGER STALLED:

First—Rotate turn table backwards $\frac{1}{8}$ turn and release. Do not use force.

Second—Remove turn table by releasing two screws on pinion (B) and lifting turn table. See that motor runs and rubber idler wheel is free and in good condition. Lubricate turn table with light grease (high pressure automobile grease) and re-assemble. Set and lock pinion (B) with top of teeth even with top of teeth in main cam (A).

Third—Check condition of levers described in "General" and clear any jam.

CHANGER DOES NOT TRIP:

Check starting dog (D) and latch lever (E) for bind and see that springs are in place. Check pawl (S) and pawl spring. Check positive trip lever (Q) and sweep lever (R) for free action. Check horseshoe spring (T).

CHANGER REPEATS CYCLE:

Check latch lever (E) and spring. See that control lever (H) clears latch lever (E) when control button is in "Auto" position.

IMPROPER RECORD FEED:

Check records for warp, dish or poor edge condition.

Check and level platforms (Y). Use flat record and adjust platforms (Y) by tightening or loosening mounting screws.

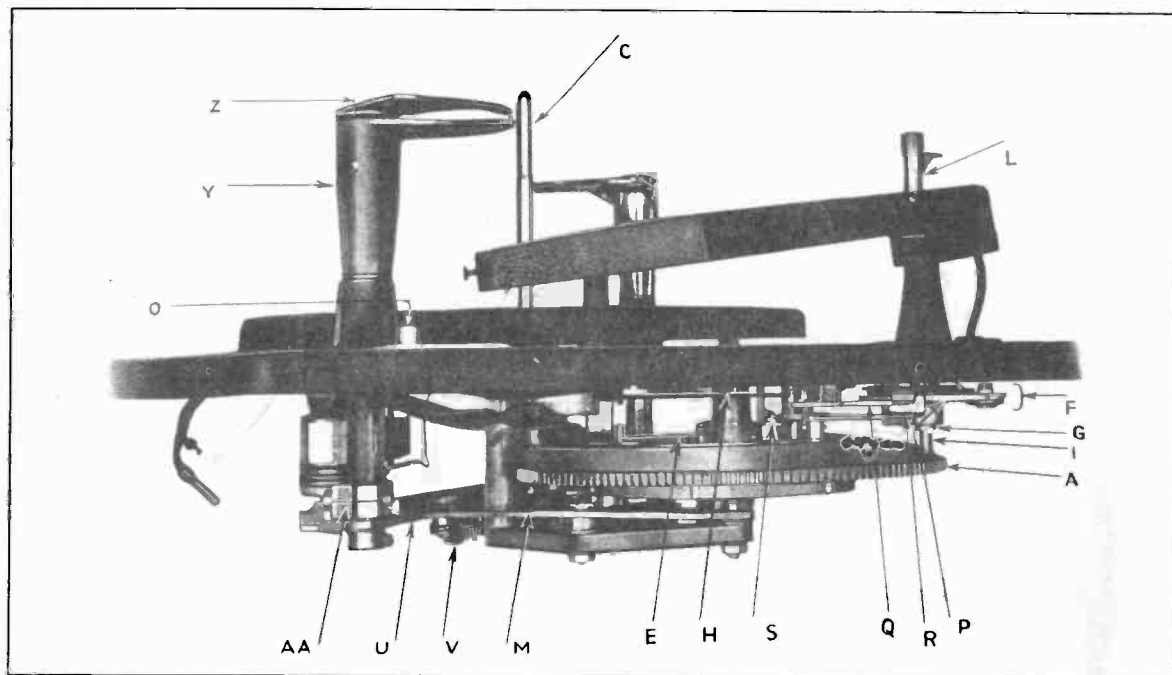
Check selector (Z) tip elevation. This should be $\frac{1}{16}$ (.062") inches. Adjust whole selector (Z) blade. Do not bend tip.

Check timing of selector (Z) tips to edge of 12" record. They should be approximately $\frac{1}{4}$ " from the edge of 12" record and should be equally distant from edge of record. To adjust loosen the clamp screw on the pinion (AA) and swing selector (Z) tip away from record. Set to correct position while approaching record and lock clamp screw.

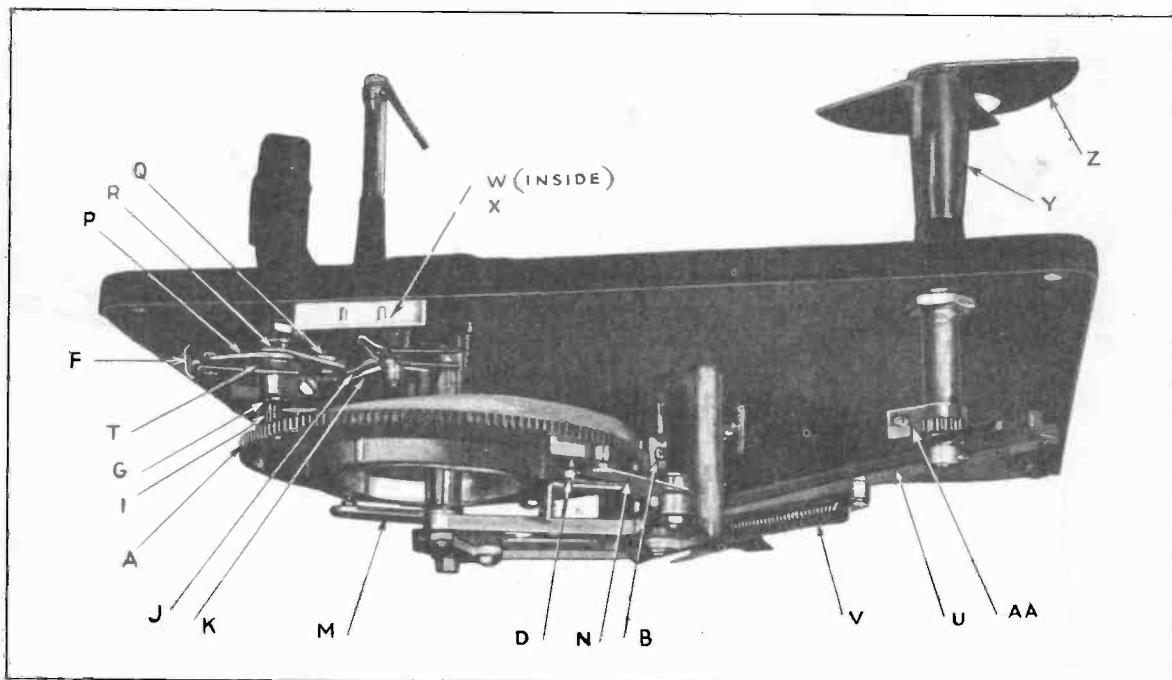
"WOW".

Remove turntable as described in "Changer Stalled" (2) and see that rubber idler wheel is not worn or oily. If idler is oily, clean with carbon tetrachloride. Re-lubricate turn table spindle (C) and re-assemble.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS



SIDE VIEW



REAR VIEW

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

Emerson Radio, Changer # 201, used in Model 207

This mechanism consists of a rim driven turntable (not shown) running on a fixed bearing (1), which supports the record spindle (2). The spindle is equipped with a rotatable cap (3) to provide for holding records in automatic operation, when in one position, and removing records or playing manually, when in the other position.

The outer edge of the record is held by record supports (4) and (5), adjustable for 10- and 12 inch, and is steadied by a rubber tipped, spring loaded finger (6).

Control of operation is by a single control button (7) having four positions "Off" - "Man" - "Aut" and "Rej".

Automatic operation starts when rubber tired drive wheel (8) is moved into contact with turntable rim by tone arm movement or control button.

All change functions are controlled by main cam (9) which is driven by drive wheel (8) thru a friction (10) and gear (11) train.

The main cam assembly consists of main cam (9) and automatic trip cam (12). The latter disengages the drive wheel (8) at the end of the change cycle.

The upper side of the main cam (9) controls tone arm swing by engagement with pin in sweep lever (13) attached to tone arm by means of clamp (14) around tone arm pivot sleeve (15). Tone arm lift is controlled by vertical section of main cam (9) operating tone arm thru lift pin (16) inside of sleeve. A boss projecting from the upper side of the main cam (9) displaces the stop lever (17) at the end of the change cycle to permit the tone arm to proceed across the record.

The lower side of the main cam (9) moves the feed lever (18) by means of a roller (19). This movement charges the feed spring (20) and at the proper time permits discharge of the spring causing the feed lever (18) to thrust the feed finger (21), (in top view), forward to feed the record. Connection between feed lever (18) and feed finger (21) is thru feed intermediate lever (22) pivoted in record support post (23). (In top view.)

The stop lever (17), normally held out of engagement by the boss on the main cam (9), swings into position at the start of the change cycle. Its selection of stop points for 10- or 12 inch records is controlled by dog (24) on the record selector shaft running up front of record support post (23) and actuated by swinging record support (4).

The drive wheel (8) is mounted on the carrier lever assembly (25) which is pivoted about the intermediate drive (11). This assembly consists of the carrier lever with its bearings and the trip lever (26). The trip lever (26) carries a pin (27) engaging the automatic trip cam (12); a pawl (28) to engage the serrated edge of sweep lever (13); a positive trip screw (29) to interfere with sweep lever (13). Engagement of pin (27) with automatic trip cam (12) pulls drive wheel (8) out of engagement with turn table at end of change cycle. Reversal of the tone arm movement rotates pawl (28) to release trip lever (26). Thrust of sweep lever (13), when tone arm approaches spindle (2), against positive trip screw (29) releases trip lever (26).

The control lever (31) operated by the control button (7), -a- turns switch on and off -b- prevents carrier lever assembly (25) from swinging when in manual

position -c- permits carrier lever assembly (25) movement to engage drive wheel (8) with turntable, when in automatic position -d- displaces trip lever (26) causing drive wheel (8) engagement with turntable, when pushed to Reject. Function (a) is accomplished by pin which engages dog of toggle switch. Functions (b) and (c) are controlled by shape of rear edge of control lever (31) and a fixed stud (32) in the carrier lever. Function (d) is accomplished by stud (33) in control lever (31) striking edge of trip lever (26) and unlatching pin (27) in same from automatic trip cam (12).

Bearings are separated and center distances maintained by aligning bracket (34) which also carries bearing for record feed lever (18).

ADJUSTMENTS

Positive Trip

The tripping point is adjusted by turning positive trip screw (29) counterclockwise to trip earlier in playing cycle and clockwise to delay tripping.

Tone Arm

The drop point is adjusted by loosening the screw in clamp (14) slightly to permit repositioning of tone arm in relation to sweep lever (13). Care must be exercised to see that tightening the screw does not cause bind in tone arm swing.

The rise and drop of tone arm is adjusted by bending short arm of lift pin (16) slightly. Long arm must not be distorted or it will bind in pivot sleeve (15).

Record Feed

The feed finger (21) should strike only the bottom record of the stack. Record supports (4) and (5) should be adjusted up or down to obtain this result. Adjustments must be checked for both 10- and 12 inch records as one of the buttons is used in both cases.

Fixed record support (5) can be adjusted for engagement with record by removing hold down finger assembly (6) and loosening two screws under feed finger (21).

Friction drive

The rubber wheel (10) engaging with the intermediate drive assembly (11) should be compressed just enough to prevent slipping or skidding at any portion of the change cycle. Compression is controlled by the nut and locknut, below the rubber wheel.

General

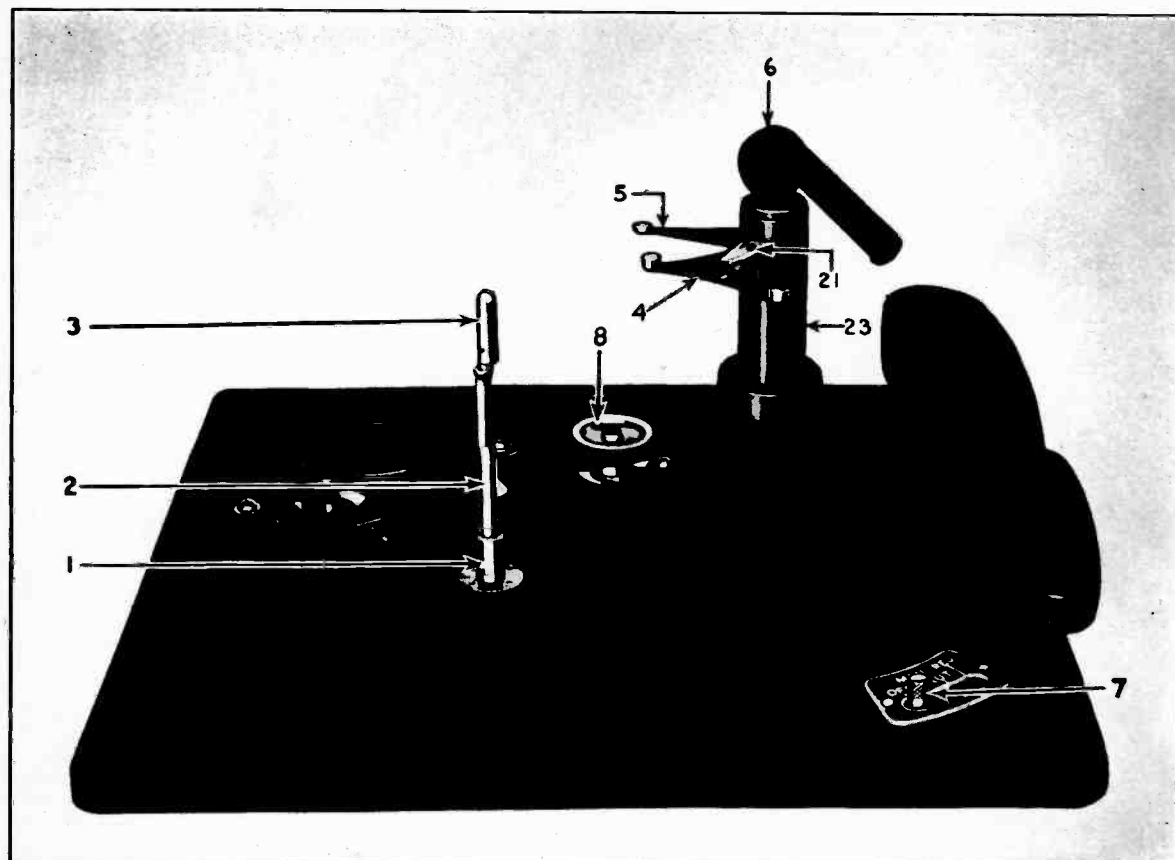
Mechanism should be checked for damaged or missing parts. Carrier lever assembly (25) must be perfectly free on its shaft and trip lever (26) must be perfectly free on the carrier lever. All moving parts should be lubricated with oil.

Rubber drive wheels under the turntable and the rim of the turntable must be free of grease or dirt.

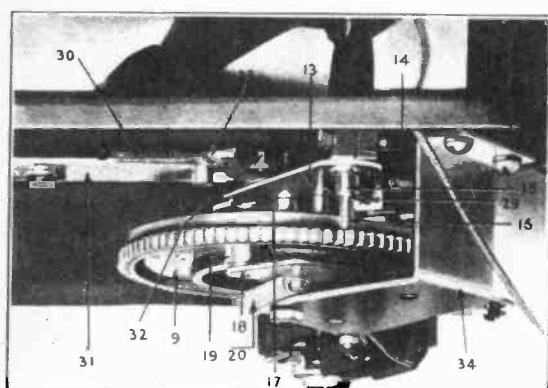
Turntable thrust bearing can be lubricated with heavy oil or light grease and radial bearing with light oil.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

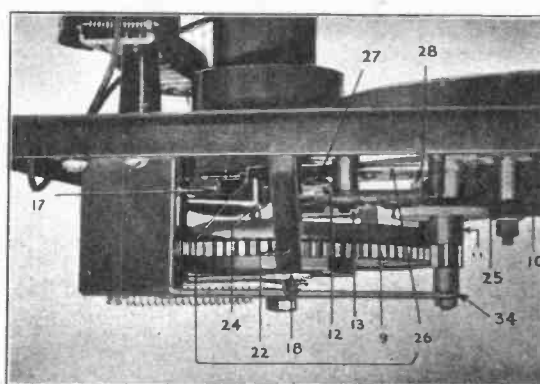
Emerson Radio, Changer # 201, used in Model 207



TOP VIEW - TURNTABLE REMOVED



VIEW LOOKING AT RIGHT SIDE



VIEW LOOKING AT BACK

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

FARNSWORTH TELEVISION & RADIO CORPORATION

In the following five illustrations we are showing the cycle of operation of a P-40 Series Capehart-Farnsworth Changer.

Figure A is known as the playing position.

In Figure B the Main Cam has advanced so the "Boss" on the Main Cam has moved the Centering Lever Return Arm away from the cam, which because of the Return Spring causes the Centering Arm thru the Rocker Levers and Plunger Shafts to move the Record Plungers toward the Spindle. Due to the motion being transmitted thru the Return Spring different diameter records are handled equally well. The equalizer spring aids in exactly centering the record in regard to the Spindle. Note, in this illustration the Tone Arm Swing Lever is part way up the Cam Shoulder.

In Fig. C the Trip Roller (part of Main Cam) has advanced to move the rear plunger rocker away from the spindle, at

the same time moving the front plunger rocker toward the spindle. Due to the Plunger Shafts, which transmit the motion of the Rockers to the Record Plungers the Record Plungers move in the opposite direction from the Rockers, i.e. Front Record Plunger moves away from the Spindle. This causes the record to be pushed off the Rear Shelf and drop to the Rear Hooks.

Between C & D the Record Plungers go through the central position and assume the position shown in Fig. D where the Rear Record Plunger moves away from the Spindle causing the record to drop to the Front Hooks.

In Fig. E the Centering Lever Return Arm has dropped into the "Slot" in the Main Cam, moving both Plungers toward the Spindle, causing the Front and Rear Hooks to snap back, permitting the record to settle flat on the turntable. In this illustration the Tone Arm Swing Lever is returning to the normal position.

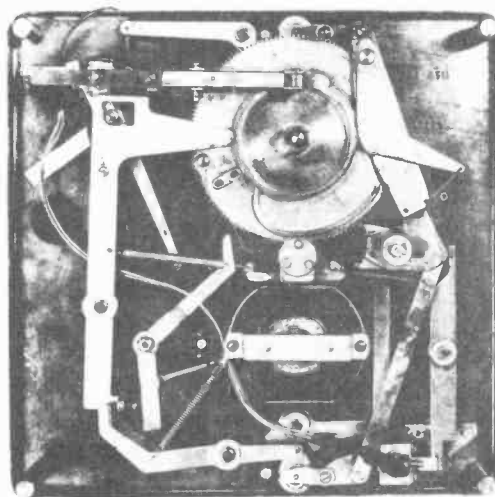
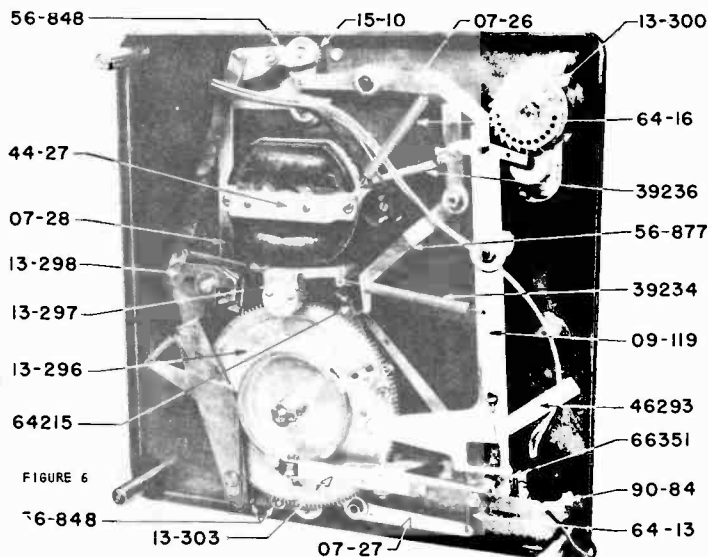


FIGURE A

**MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS
FARNSWORTH TELEVISION & RADIO CORPORATION**

RECORD CHANGER

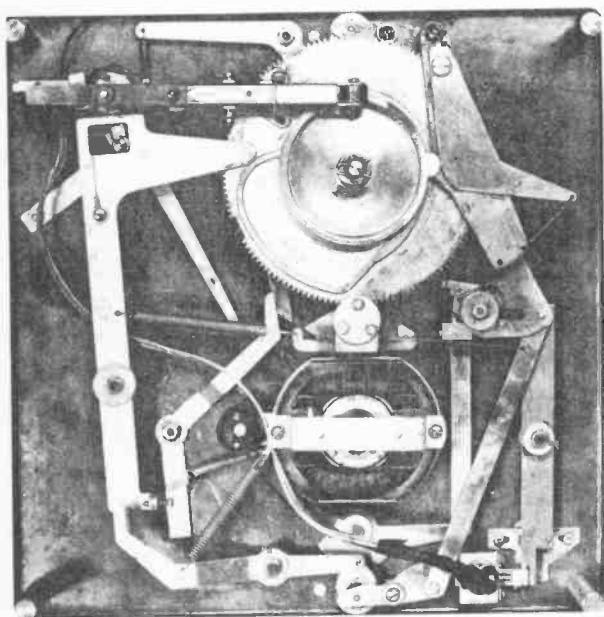


FIGURE B

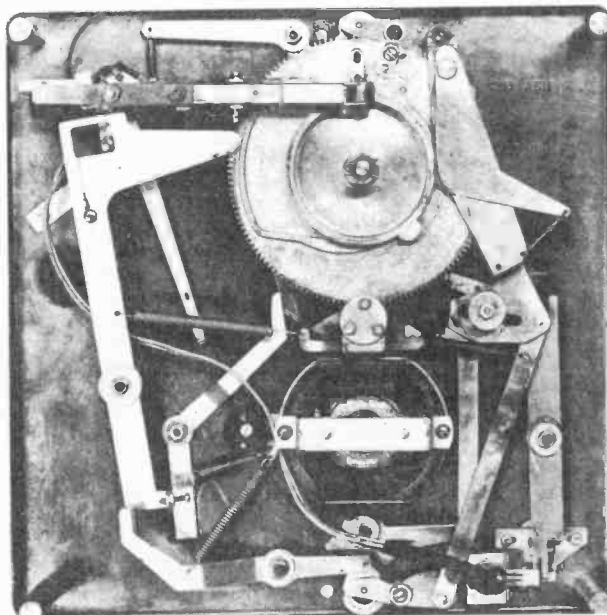


FIGURE C

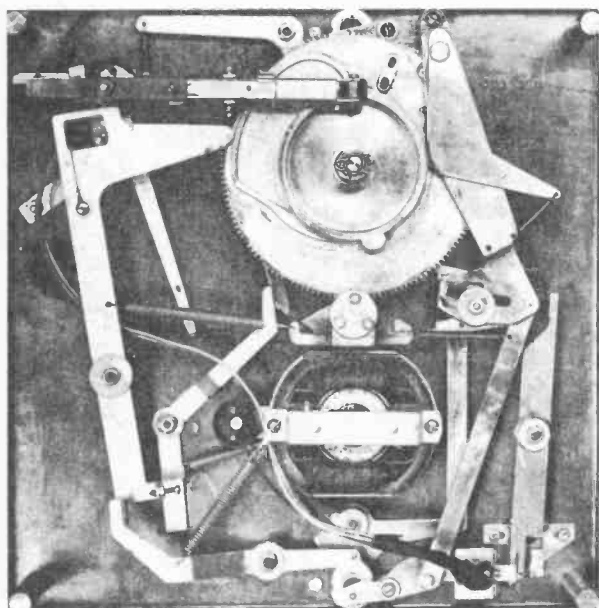


FIGURE D

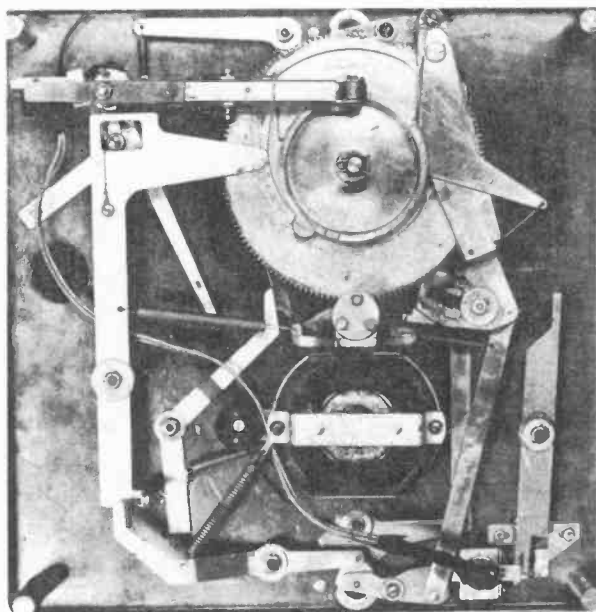


FIGURE E

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

SERVICE SUGGESTIONS

1. TO REMOVE TURNTABLE

The Spindle Gear may be wedged, by a screwdriver between it and the Main Cam, to prevent its turning, the Turntable should be unscrewed from the Spindle. When removing the Turntable make certain one of the Spacer Washers is not lost. These Washers often adhere to the Turntable because of an oil film from the Felt Washer 4949. When replacing Turntable make sure it is properly tightened. NEVER USE GAS PLIERS TO HOLD SPINDLE.

2. TO REPLACE OR ADJUST IDLER PULLEY

First remove Turntable. The Idler Pulley is used to transfer power from the Motor Pulley 3671 to the Turntable. If the Idler Spring tension is incorrect the Turntable speed may be too high or too low, it should fall between 76.59 R.P.M. and 80.00 R.P.M. This tension is adjusted by loosening the Motor Mounting Screw holding the Spring Holder 45176 and turning the Spring Holder until the required tension is secured.

If it is necessary to replace the Idler Pulley remove the Hair Pin Cotter 99-34-14 and the Thrust Washer 50209. After removing the Idler Pulley also remove the Thrust Washer used underneath the pulley. If the Idler Pulley is replaced both Thrust Washers should be also.

When replacing the Pulley a single drop of oil should be used on the Pulley Stud.

CAUTION--Do not allow oil to get on either the Idler Pulley or the Turntable Rim.

3. ALIGNMENT OF RECORD SUPPORT SHELVES

The center line of the record shelves should form a straight line, in 10" position which passes through the center of the spindle. The shelves should be exactly 9-21/32" apart and the spindle should be equidistant from both. In the event it becomes necessary to change the spacing of the record shelves it is recommended that shims be used to adjust them. In some cases if oversized or

undersized records are used it may be necessary to change the spacing of the shelves.

4. ALIGNMENT OF RECORD SPINDLE

To prevent feedback the Spindle, Gear and Bracket Assembly is rubber mounted and can shift in transit. To reposition the spindle loosen all three mounting screws, position the spindle and tighten all three mounting screws equally; so as not to force the spindle out of place which may happen if one screw is tightened first.

5. SHELF LOCKING LEVER ADJUSTMENTS

The Front Record Shelf 57-111 should be lined up with the record spindle in the 10" position. The Shelf Locking Cam 15-10 is lined up with the center line of the Gear Sector Assembly and adjusted until the Locking Lever 07-26 is properly seated in the Shelf Locking Cam. The Record Shelf should not be permitted to slip when adjusting these parts.

When aligning the Rear Shelf Locking Cam the Locking Lever Hex Head Mounting screw may be loosened to permit the necessary adjustment to properly align the Shelf Locking Cam and Shelf Locking Lever.

6. ADJUSTMENT OF NON TRIP CAM OF STARTING LEVER 13-38 (Fig. 6)

This Cam shown at "A" in (Fig. 6) should be adjusted so that when the machine is in the "Manual" position, the Starting Lever Release Trip 64215 (Fig. 6) will pass over the end of the Starting Lever 13-38 (Fig. 6) without touching. The front end of the Starting Lever must also clear the bottom of the Resetting Dog and the top of the Starting Pin both part of the Spindle Gear 57-8 (Fig. 6).

7. THE TRIP FINGER STOP

The Trip Finger Stop 46293 should be 2-1/4" from the inside of the base plate to the inside face of the 90° bend at the end of the Stop.

8. NEEDLE LANDING

In 10" position, adjust the Tone Arm Crank 66366 so the needle lands

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

4-7/8" from center of the Record Spindle. To adjust have record changer in playing position, loosen Tone Arm Set Screw 99-26-16 set needle 4-7/8" from center of Record Spindle. Hold Tone Arm Crank firmly against Tone Arm Swing Lever 09-119 (Fig. 2) at the same time hold the Tone Arm Crank firmly up against the Trip finger 46287. Tighten the Set Screw 99-26-16. There should be a small amount of play up and down in the tone arm. Next set the 12" drop. To adjust set the record shelves for 12" records and have record changer in playing position. Loosen Lock Nut 99-11-6; which is part of 09-119 and adjust Screw 36-465 until the needle drops 5-7/8" from the center of the Record Spindle. Be sure nut 99-11-6 is tightened after adjustment is made.

9. ADJUSTMENT OF TONE ARM

With records on the shelves, the top of the pickup arm at the highest point in its return should be 3/16" below the bottom of the bottom record on the shelves.

10. TRIP MECHANISM

The proper adjustment of the Trip Mechanism is, when the needle is 1-7/8" from the center of the record spindle, the Trip Finger 05-41 trips the Starting Lever Release Trip 64215 (Fig. 6).

To adjust tension loosen Bristol Set Screw 99-28-30 in Upper Collar 43185

Turn collar counter clockwise to increase friction (if changer does not trip at end of record) and clockwise to decrease friction (if changer trips before the end of the record). There should never be any more friction than is necessary to move Starting Lever Release Trip 64215 (Fig. 6) off the end of the Starting Lever 13-38 (Fig. 6).

Excessive friction will cause a loud click each revolution of the turntable after a part of the record has been played.

11. STARTING PIN 34309 AND STARTING LEVER 13-38 (Fig. 6)

The Starting Pin 34309 (Fig. 6) is normally driven into the Spindle Gear 57-8 (Fig. 6) until the square end is

flush and the pointed end projects about 1/8" and should engage the end of the Starting Lever 13-38 to allow the teeth of the Main Cam to mesh with the Spindle Gear without topping. Two adjustments are possible if the teeth do not engage properly, either drive the Starting Pin in further or bend the end of the Starting Lever.

12. MOTOR SPEED

Due to commercial tolerances it is impossible to secure motors which will run at exactly 78.26 R.P.M. Our limits are from 76.59 R.P.M. to 80.00 R.P.M.

In the event it becomes necessary to get exact speed on one of these changers choose a motor pulley that gives a slightly higher speed than required. Using a fine file reduce the diameter of the motor pulley a little at a time until the required speed is secured.

13. The following simple OILING INSTRUCTIONS will result in a minimum of service calls---

Every six months or once each year, two or three drops of oil should be put on the two felt washers in the Spindle Gear Bracket. One washer is located at the bottom of the Spindle Gear, the other is at the top of the bracket and is accessible by removing the Turntable. Two or three drops of oil on the felts in the Motor. One drop of oil on the Pin for the roller of the Tone Arm Lift Lever. A very light application of White Vaseline on the teeth of the Main Cam, also some on the face of this Cam where the Tone Arm Swing Lever rides. A single drop of oil on the 10" and 12" plungers. Care should be exercised to prevent an excess of oil being used on any part.

No further lubrication on the tone arm bearing will be necessary unless a replacement is made. In this case a thin film of vaseline may be used.

Care should be taken to see that no oil gets on the motor pulley, idler pulley or rim of the turntable. No oil should be used on the Friction Trip Assembly.

Use only a good grade of machine oil with a viscosity of SAE 10.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

Motorola

AUTOMATIC RECORD CHANGERS

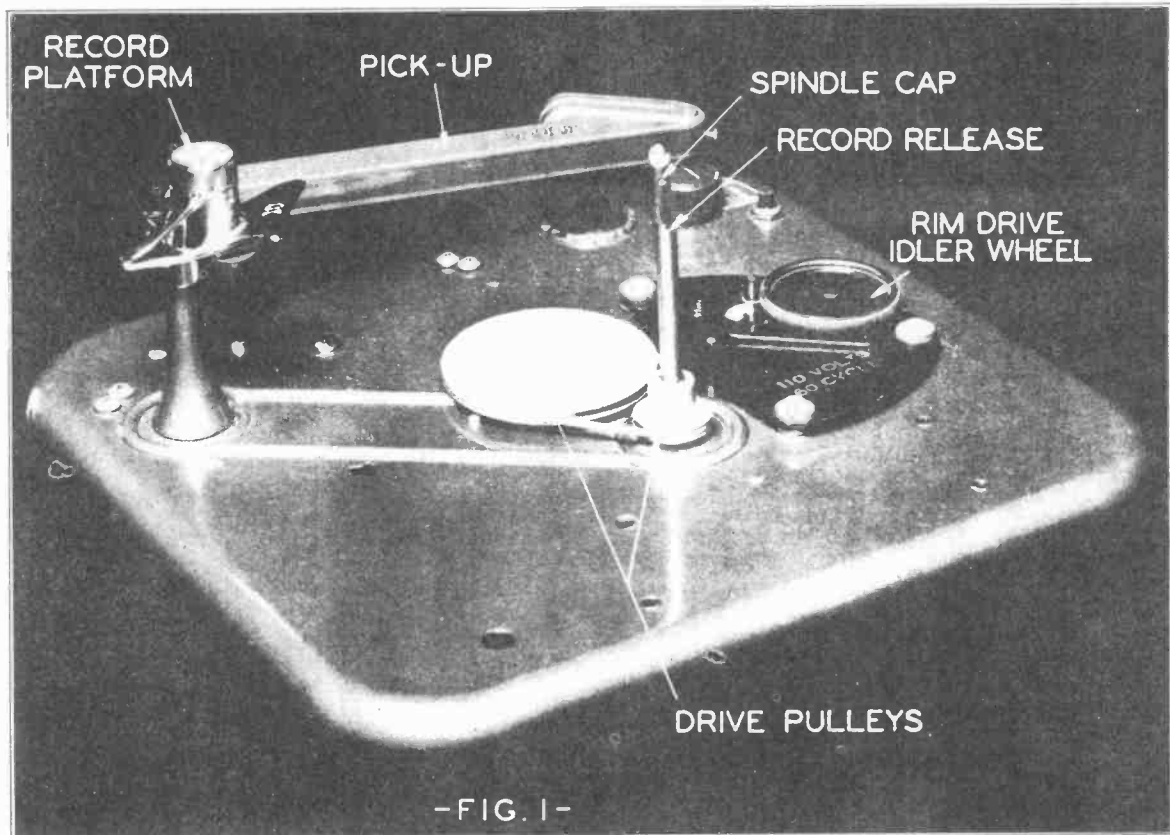
Models B2RC, B3RC and B4RC

GALVIN MANUFACTURING CORPORATION • CHICAGO

IMPORTANT

All service adjustments on Motorola Record Changers should be made with the instrument in a normal operating position.

Therefore, the instrument should be supported in such fashion that parts underneath are accessible. A jig consisting of four corner support posts would be helpful. A mirror would also permit the service man to make observations and adjustments without getting into awkward positions.



CHECK THE RECORDS FIRST

Before attempting to service or adjust this Record Changer, check the records first to make sure they are not causing the trouble. The instrument will handle most of the 10 or 12 inch records now available on the market, but it is not guaranteed to handle all of them. Records must be in good mechanical condition, and should not be chipped, particularly around the center hole. Do not try to play automatically, records that are too thick, too thin, or that are oversized or undersized, as regards diameter of record or center hole. Do not mix 10 and 12 inch records on the Changer.

Old records made before the days of automatic record changers may not change automatically, due to the differences in thickness, or to lack of a proper eccentric groove at the finish. Most of the old records, however, may be played one at a time.

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37

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

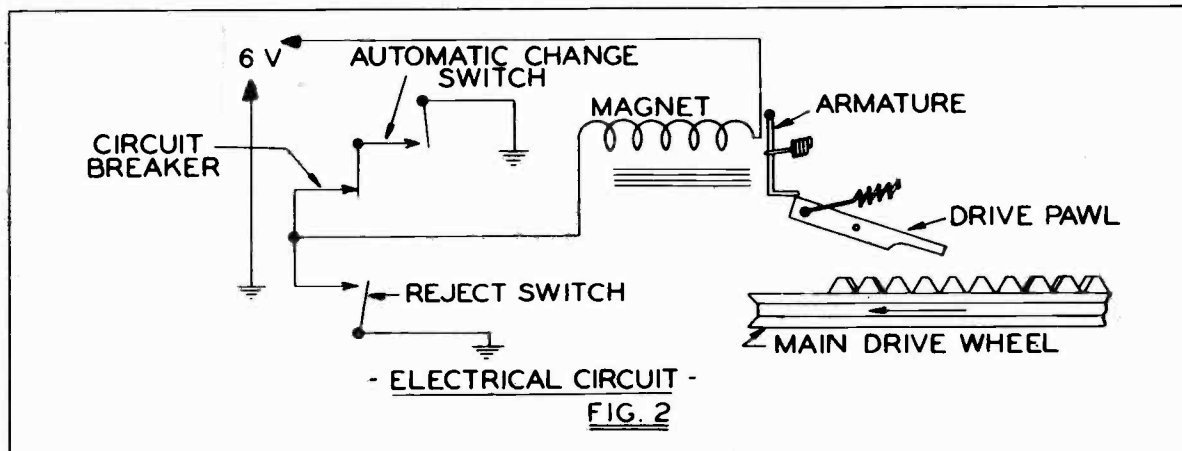
THEORY OF OPERATION

As in most modern phonograph turntables, power is derived from an electric motor. This power is transmitted to the turn-table through a geared down rim drive of the friction type.

The turntable is keyed to a small drive pulley, which in turn drives a large (3 inch) pulley, through a spring belt, both of these units being located on top of the base plate. (See Fig. 1). The 3 inch pulley transmits power by direct drive to another small pulley

located under the mounting plate. This second small pulley in turn drives the large (4 inch) main drive wheel, also located under the mounting plate.

When the turntable revolves, all of these pulleys and wheels mentioned above, also revolve-regardless of whether or not the Changer is going through a cycle of changing a record. By means of this series of pulleys, a high ratio is obtained between the motor and the changing mechanism, which assures ample power.



CHANGING CYCLE

By referring to the various photographs and figures which will be found in this Service Manual, you can readily follow through the changing cycle from the continuity given hereafter.

1. The needle in the pick-up finishes a record and enters the eccentric groove.

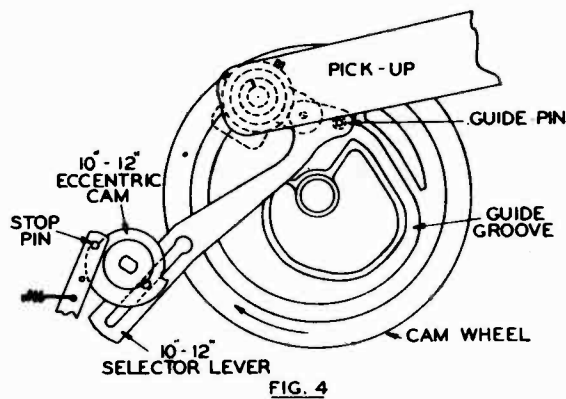
2. As the pick-up has slowly approached the eccentric groove, a phosphor bronze spring clip has gripped a fin of the automatic change switch.

3. When the needle enters the eccentric groove, the pick-up oscillates slightly, which in turn causes the automatic change switch to make contact.

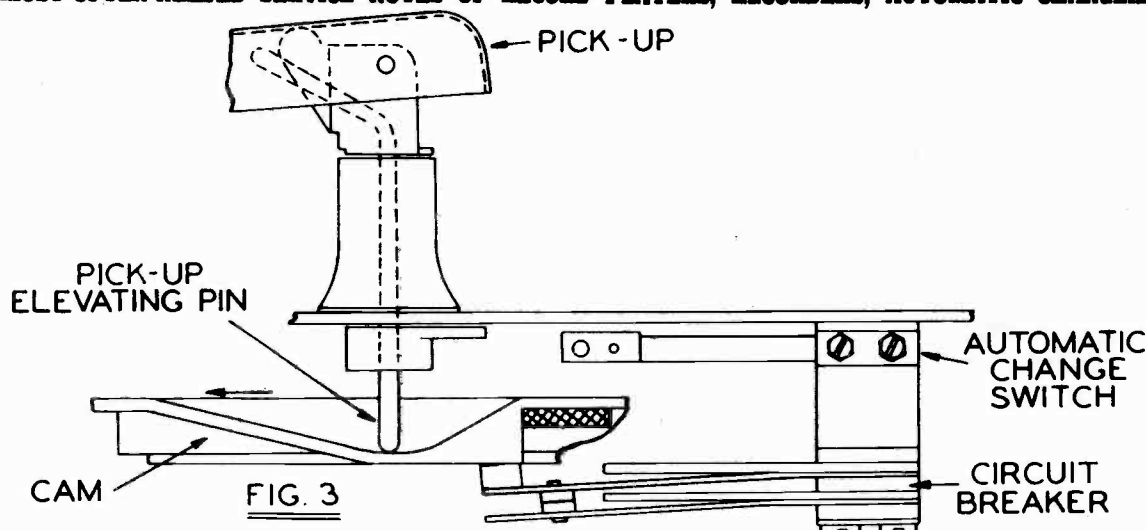
4. The first momentary contact of the automatic change switch is all that is necessary to start the changing cycle. When the switch closes, a small electro magnet is energized. The electro magnet pulls an armature back out of the way, permitting a drive pawl which is mounted on the cam wheel to fall down and engage in one of the notches which are provided on the upper surface of the main drive wheel. (See Fig. 2.)

5. Since the main drive wheel is already revolving, the engagement of the pawl now causes the cam wheel to revolve with it.

6. When the cam wheel starts to revolve, it causes several things to occur. In the first few degrees of revolution, it opens a circuit breaker switch (Fig. 3) which automatically opens the magnet circuit, thereby de-energizing it, to prevent "chattering".



MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS



7. The next few degrees of rotation causes the pick-up elevating pin to ride up on an inclined section of the cam, thereby elevating the pick-up and lifting the needle from the record which has just been played. (See Fig. 3).

8. A few more degrees of revolution cause the pick-up guide groove on top of the cam wheel. This part of the mechanism is not visible, since the cam wheel is mounted too close to the mounting plate, but Fig. 4 shows a drawing of the upper surface of the cam wheel. As the wheel revolves with the pin in the groove, it causes the pick-up to swing out beyond the edge of the record so it will be out of the way when the next record falls on the turntable.

9. The cam wheel continues its revolution, and at another point on its circumference a roller on the end of the trip-lever rides up an inclined section on the cam. This trip-lever is the copper-plated rod which is hinged approximately in the center by running through a die cast fulcrum block. As the roller on one end of the trip-lever rolls up the incline on the cam, the other end of the trip-lever bears against the push rod which operates the record release, which is located near the top of the spindle, causing it to push the next record off its support, thereby dropping it on the turntable.

10. The cam continues to revolve, the groove in the top bringing the pick-up back over the edge of the record to the proper position where the needle will fall near the first groove when it comes down.

11. A few more degrees of revolution, and the pick-up elevating pin rides down another incline, permitting the needle to settle gently on the first groove of the record. (Fig. 3).

12. At this point, the cam has completed one full revolution of 360 degrees. At the same time the needle touches the record, the drive pawl hits the magnet armature, which forces it up, thereby disengaging it from the notch in the drive wheel. The cam wheel therefore stops, the turntable continues to revolve, and the record is played.

13. During the last few degrees of revolution, the circuit breaker switch has again been closed, as its fibre stud rides up an incline on the lower surface of the cam. (Fig. 3). This switch must be closed at all times except when the instrument is going through a changing cycle, otherwise, it would be impossible to start a new changing cycle automatically.

SETTING FOR 10 OR 12 INCH RECORDS

The record support platform is adjustable for either 10 or 12 inch records, depending upon which "lip" is turned toward the center of the turntable. The platform may be swung in an arc of 180 degrees, so that either the 10 or 12 inch lip may point toward the spindle.

Underneath the mounting plate, and mounted rigidly to the record platform support shaft is an eccentric mechanism which moves

the 10" - 12" selector lever when the platform is moved. The position of this selector lever determines the point where the needle will come down on the record at the end of a changing cycle. In other words, it adjusts the pick-up for playing automatically either 10 or 12 inch records, depending upon the position to which the record support platform is turned. The eccentric cam and the selector lever are shown in Figs. 4 and 6.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

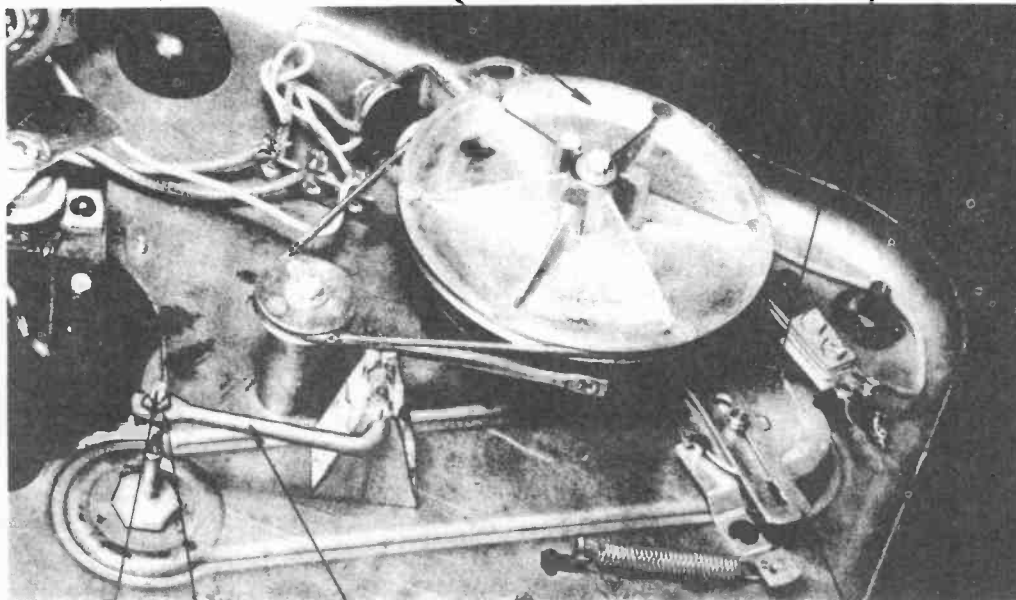
The push switch mounted near one corner of the mounting plate is connected in parallel with the automatic change switch previously discussed. When this switch is closed, it energizes the electro magnet exactly in the same fashion as does the automatic change

switch, thereby making it possible to start the changing cycle at any time, regardless of whether or not the record has been completely played. By this means a record can be "rejected". The wiring diagram showing switches and magnet can be seen in Fig. 2.

10"-12" ECCENTRIC CAM

- FIG. 6 -

MAIN DRIVE WHEEL



TRIP LEVER

LOCKNUT ©

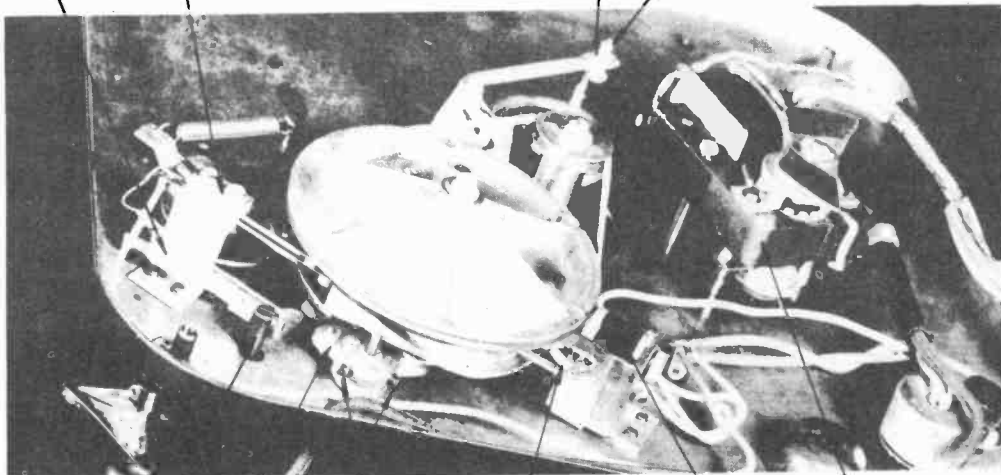
10"-12" SELECTOR
LEVER

ADJUSTMENT SCREW ④

LOCKNUT ©

AUTOMATIC CHANGE SWITCH
CIRCUIT BREAKER

ADJUSTMENT
SCREW ③



SCREW ⑥

SPRING ①

MOTOR

CASTING ②

SET SCREWS ⑤

MAGNET - FIG. 7 -

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MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

TO ADJUST RECORD RELEASE

1. Place a stack of 10 inch records on the changer, after turning the record support platform to the "10 inch" position.
2. Start the turntable revolving.
3. Press the "Start-Reject" button.
4. If the first record does not drop to the turntable, double check the record to make sure that it is not too thick, or that the diameter of the center hole is not undersized, causing it to bind.
5. If the record proves to be normal, and is not causing the failure, loosen lock nut (C) which locks adjustment screw (D), as shown in Figs. 5, 6, or 7.
6. With a slab-head wrench, turn screw

(D) a fraction of a turn clockwise, and press the "Start-Reject" button again, checking to see if record is released.

7. If the record fails to drop, tighten screw (D) a trifle at a time, testing after each adjustment, until setting is reached, which releases record.

8. Tighten lock nut (C), after which a few more records should be changed, to make sure that this did not alter adjustment of screw (D).

NOTE: If the Changer stalls during the adjustment procedure, it may be an indication that screw (D) is too tight, in which case it should be turned back (counter-clockwise).

TO ADJUST PICK-UP POSITION

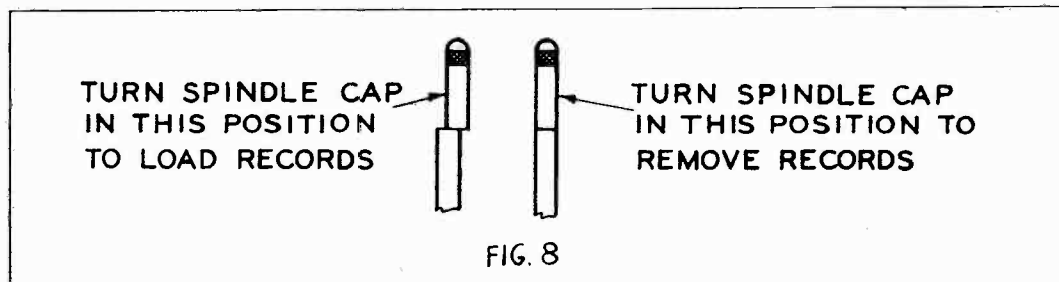
This adjustment is made to cause the needle to drop in the first groove of the record, as the Changer completes a changing cycle.

1. Turn the record support to the 10 inch position. (See Fig. 1).
2. Place a standard 10 inch record on the turntable and start it revolving.
3. Press the "Start-Reject" button. The Changer will now start a changing cycle.
4. Do not let the Changer complete the cycle, but stop it at the point where the pick-up starts to drop downward towards the

outer rim of the record. If the cycle is stopped at the right point, the pick-up will still be "in cycle" and will not be free to swing back and forth. Check this gently. Do not exert too much sidewise pressure on the pick-up.

5. Now loosen the two hex-head set screws (A) in the bell crank casting (B), which you can see in Fig. 7.

6. With the set screws loose, the pick-up arm can now be moved back and forth. Move it to the point where the needle rests directly over the first groove in the record.

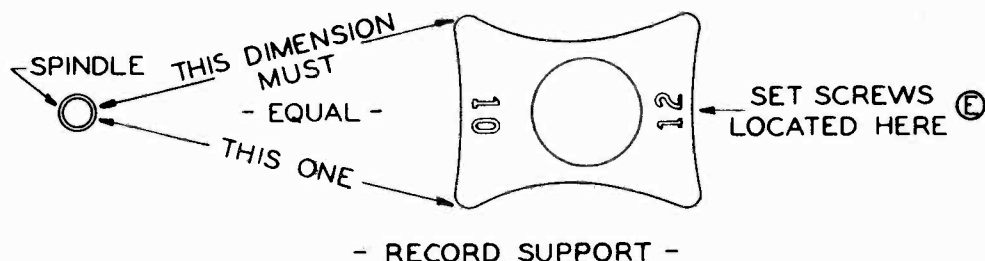


(The correct dimension for proper adjustment is 4-25/32" from the needle point to the center of the spindle.)

7. Tighten one set screw securely so that the shaft does not move while checking proper position of the pick up arm. After proper position has been located tighten both set screws securely.

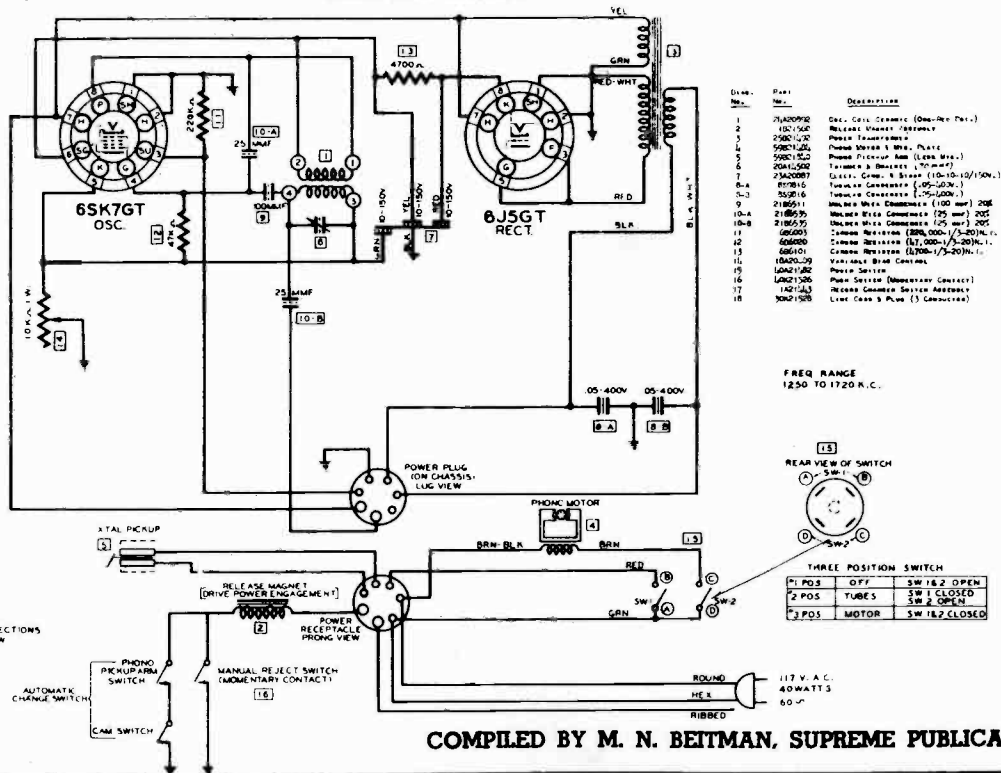
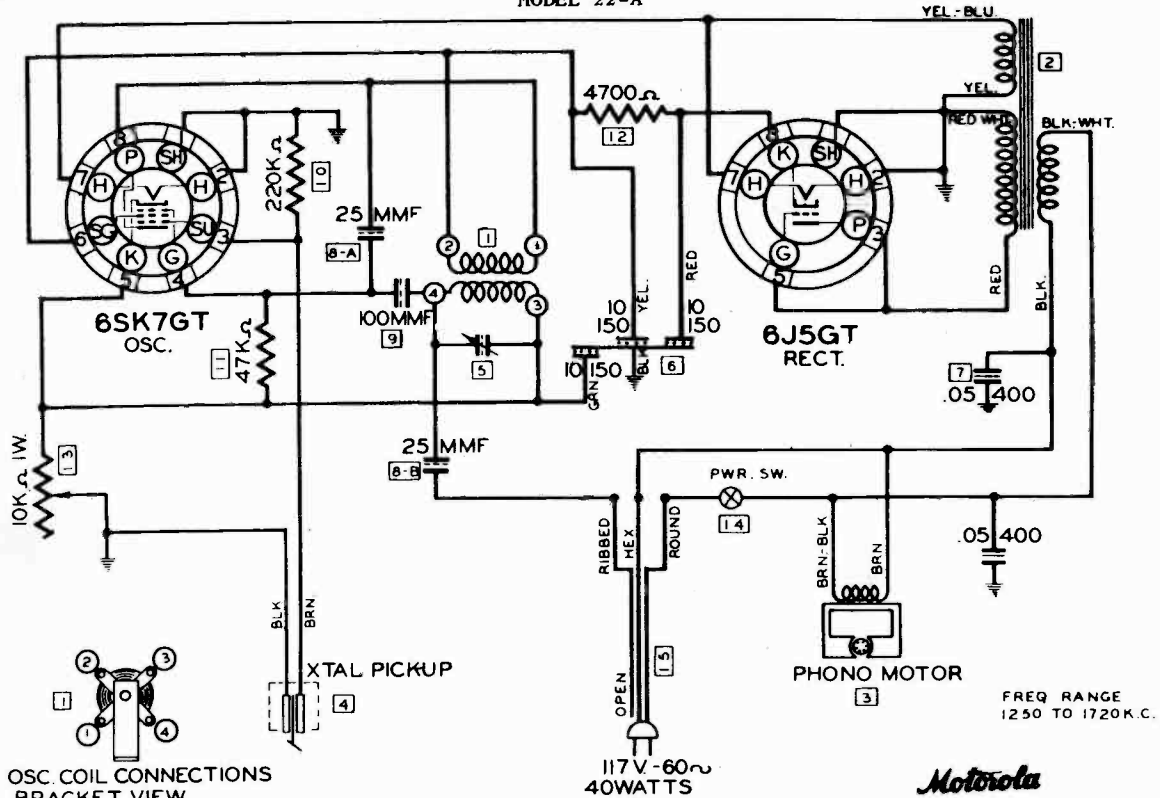
8. Now place a 12 inch record on the turntable; turn the record support to the 12 inch position.

9. Press the "Start-Reject" button and let the Changer go through another cycle, watching carefully to make sure the needle comes down on the record at the proper point. If necessary, make minor readjustment.



MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

MODEL 22-A



GENERAL ELECTRIC

SYNCHRONOUS MOTOR TYPE AUTOMATIC RECORD CHANGER

USED IN LATE PRODUCTION MODELS J-718, J-728, J-808, J-809, J-818 AND J-828

The synchronous motor type automatic Record Changer is a standard assembly in all of the above late production models. It is designed for operation on 110 volts and will automatically play a series of eight 10-inch or seven 12-inch records of the 78 revolutions per minute type. Manual operation is also provided.

Records of the last few years with the standard eccentric or spiral stopping groove will operate the automatic mechanism and change your records.

OPERATING INSTRUCTIONS

Before operating the phonograph, either automatically or manually, be sure the pick-up is down and can be moved by hand; if not, a "cycle" must be completed to bring it down. To do this, throw the turntable switch to "ON." The turntable will start to revolve and the cycle of motion on the pick-up arm will be resumed. When the pick-up arm comes down, turn the turntable switch off.

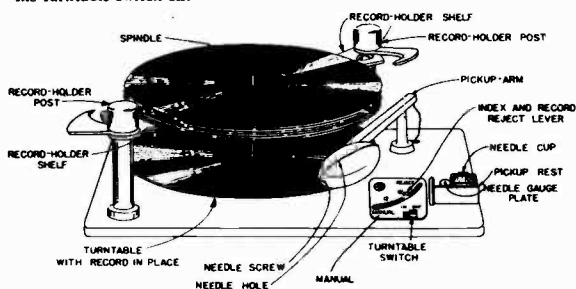


Fig. 1. Automatic Record Changer

CAUTIONS

1. Never use force to start or stop the motor or any part of the record-changing mechanism or pick-up arm.
2. The use of records which have become warped or damaged through improper care may cause the mechanism to jam and damage the instrument. In addition, records which have become warped will slide on one another when playing, resulting in unsatisfactory reproduction. When mechanism jams, turn off power and rotate turntable by hand in a reverse direction for about ten turns. This should free the mechanism.
3. This instrument is **NOT RECOMMENDED** for playing 10-inch and 12-inch records in mixed sequence. If the user desires this service he must be positive that all records are perfectly flat and free from warp. The Index and Record-reject Lever must be set at "10" and after playing the last selection the pick-up will come down in position for a 10-inch record and repeat the playing of the record on a 10-inch diameter unless the Turntable Switch is turned off. Any jamming of the mechanism under these conditions indicates that the records used are not perfectly flat or that their edges are not sufficiently smooth to permit normal operation of the separators in dropping each record in sequence onto the turntable.
4. Do not leave records on the record-holder posts, as they are liable to warp, particularly so in warmer climates. Keep your records in a record file (album or cabinet) when not in use. If any records should become warped, place them on a flat surface with a flat heavy article, such as a large book, on top, and leave them in this position for a few days.

CONTROLS AND MOVING MECHANISM

Index and Record-reject Lever

This lever is located near the right-front corner of the motorboard with its index plate marked for four positions—"Manual," "12," "10," and "Reject." When you desire to change record selections manually, this lever should be set in the "Manual" position. With the lever in the "12" position,

the mechanism is set to play a series of 12-inch records automatically. To play a series of 10-inch records, the lever should be set at the "10" position.

To reject a record being played or to start the record-changing cycle in case the record just played does not have the standard eccentric or spiral stopping groove, simply push the lever to the "Reject" position and let go. The pick-up will raise up and swing outward and the next record will drop down. Upon releasing the lever, it will automatically return to the "10" position. If you are playing a series of 12-inch records the lever should be returned to the "12" position after rejecting a record. Keep the lever in its "Manual" position when not actually playing records automatically.

Turntable Switch

The toggle switch located just in front of the Index and Record-reject Lever controls the current to the turntable motor. To start the turntable throw the switch to the "On" position. To stop the turntable throw the switch to the "Off" position. This switch will not operate unless receiver power is turned on.

Pick-up and Top-loading Needle Socket

The pickup is the new crystal type, with a hole in the top for insertion of needles. When not playing records, the pickup arm should be moved out to the right beyond the turntable and placed at rest on the support with the edge of the pickup arm to the right of the small extension post and the pickup over the polished needle gauge plate. The pickup must be in this position to insert a needle.

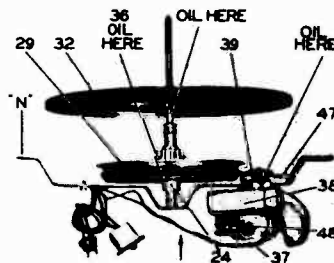
The pickup support plate with extension post, gauge plate and box holder is at the front of the motorboard on the right. The box slides in and out at the back for emptying, and is held secure by a spring piece on the bottom.

To insert a needle initially, loosen the needle screw on the front of the pickup, place needle in hole at top so that it drops down against the needle gauge plate and then tighten up the needle screw.

To change a needle, place pickup in rest position, loosen needle screw and push pickup to the right to drop the used needle into the box below. Then with pickup against extension spot insert a new needle as described above.

Record-holder Shelves

To place a record on the turntable or to remove records, raise the record-holder shelves, by lifting the knobs, and swing clear of outer edge of record. Also push back vertical lever adjacent to the rear record-holder post. You now have clear access to the turntable. Before loading the magazine for automatic operation swing the record-holder shelves back into position.



MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

MISCELLANEOUS SERVICE HINTS

Incorrect adjustment of a particular mechanism of the changer is generally exhibited in a specific mode of improper operation. The following relations between effects on operation and the usual misadjustments will enable ready adjustment in most cases.

1. For any irregularity of operation, the adjustment of the main lever "15" should be checked first as in "A."
2. Needle does not land properly on both 10- and 12-inch records—Make complete adjustments "D" and "E."
3. Needle does not land properly on 12-inch record but correct on 10-inch—Effect adjustment "E."
4. Failure to trip at end of record—Increase clutch "5" friction by means of screw "B." Also, see that levers "7" and "12" are free to move without touching each other.
5. Pickup strikes lower record of stack or drags across top record on turntable—Adjust lift cable per adjustment "C."

AUTOMATIC OPERATION

1. See that pick-up arm is in rest position (Fig. 2a) with needle properly in place. If mechanism will not allow pick-up arm to come to the rest position, complete a "cycle" as explained in the first paragraph under "Operation."

2. Place the series of records (up to eight 10-inch or seven 12-inch records) on the record-holder posts (as shown in Fig. 1). The records should be arranged in the desired order with the desired selection face up and the last selection on top.

3. Throw turntable switch to "On."

(NOTE—The radio power should be turned on or phonograph will not operate.)

SERVICE DATA

General Information

The turntable is driven through a friction drive wheel mounted on the turntable spindle. It is important that the drive motor spindle and rubber tires on the main driving wheel and idler pulley be kept clean and free from oil, grease, dirt or any foreign matter. Any quick-drying naphtha is satisfactory for cleaning these parts. The drive motor bearing is lubricated from an oil well filled and sealed at the factory. It should not require lubrication in the field. The turntable is not removable from the spindle without removing the tapered pin "24" which fastens the rubber-tired driving wheel to the spindle. Once the pin is removed, the driving wheel can be slipped off the spindle and the turntable and spindle assembly lifted upward from the motor board. Caution should be exercised not to bend the spindle. The spindle bearing should be oiled and the cup and ball thrust bearing oiled and checked for proper position.

Before servicing the automatic record changer, inspect the assembly to see that all levers, parts, gears, springs, etc., are in good order and are correctly assembled.

A bind or jam in the mechanism can usually be relieved by rotating the turntable in the reverse direction.

The changer can be conveniently rotated through its change cycle by pushing the index lever to "Reject" and revolving the turntable by hand. Six turntable revolutions are required for one change cycle.

If the record changer or cabinet is not perfectly level, normal operation is likely to be affected.

The 10- and 12-inch records must be absolutely flat for smooth operation.

Adjustments

A. Main Lever.—This lever is basically important in that it interlinks the various individual mechanisms which control needle landing, tripping, record separation, etc. One adjustment is provided for the main lever. Rotate the turntable until the changer is out-of-cycle; and adjust rubber bumper bracket (A) so that the roller clears the nose of the cam plate by 1/16 inch.

B. Friction Clutch.—The motion of the tone arm toward the center of the record is transmitted to the trip pawl "22" by the trip lever "7" through a friction clutch "5." If the motion of the pick-up is abruptly accelerated or becomes irregular due to swinging in the eccentric groove, the trip finger "7" moves the trip pawl "22" into engagement with the pawl on the main gear, and the change cycle is started. Proper adjustment of the friction clutch "5" occurs when movement of the tone arm causes positive movement of the trip pawl "22" without tendency of the clutch to slip. The friction should be just enough to prevent slippage, and is adjustable by means of screw "B." If adjustment is too tight, the needle will repeat grooves; if too loose, tripping will not occur at the end of the record.

6. Needle does not track after landing—Friction clutch "5" adjustment "B" may be too tight; bind in tone arm vertical bearing; levers "7" and "12" fouled; or pickup output cable twisted.
7. Cycle commences before record is complete—Record is defective, or adjustment "B" of friction clutch "5" is too tight.
8. Wow in record reproduction—Record is defective; or instrument is not being operated at normal room temperature; oil, grease, dirt, or other foreign matter on motor spindle, main driving disk or idler pulley rubber tire. Clean with any quick-drying naphtha.
9. Record knives strike edge of records—Records warped; record edges are rough; or knife adjustments "F" and "G" are incorrect.
10. Record not released properly—Adjust record shelf assemblies in respect to shaft by means of adjustment "H."
11. When playing both types of records mixed and needle either lands in 10-inch position on 12-inch record or misses record entirely—Increase tension of mixed record discriminating lever spring "M."

MANUAL OPERATION

To play records manually:

1. Proceed as in Step 1, under "Automatic Operation."
2. Swing record-holder shelves clear of turntable. Place record on turntable with desired selection upwards.
3. Set Index and Record-reject Lever to "Manual" position.
4. Proceed as in Step 3 under "Automatic Operation" and when turntable has attained speed, lift pick-up and lower gently onto the record so that the needle point enters the outside groove. When you have finished playing, be sure that the turntable has stopped and the pick-up is in the rest position over needle gauge plate. Never leave pick-up with needle resting on a record or on the turntable.

C. Pick-up Lift Cable Screw.—During the record-change cycle, lever "16" is actuated by the main lever "15" so as to raise the tone arm clear of the record by means of the pick-up lift cable. To adjust pick-up for proper elevation, stop the changer "in-cycle" at the point where pick-up is raised to the maximum height above turntable plate, and has not moved outward; at this point adjust locknuts "C" to obtain 1-inch spacing between needle point and turntable top surface.

D. and E. Needle Landing on Record.—The relation of coupling between the tone arm vertical shaft and lever "20" determines the landing position of the needle on a 10-inch record. Position of eccentric stud "E" governs the landing of the needle on a 12-inch record; this, however, is dependent on the proper 10-inch adjustment.

To adjust for needle landing, place 10-inch record on turntable; push index lever to reject position and return to the 10-inch position; see that pick-up locating lever "17" is tilted fully toward turntable; rotate mechanism through cycle until needle is just ready to land on the record; then see that pin "V" on lever "14" is in contact with "Step T" on lever "17." The correct point of landing is $4\frac{1}{4}$ inches from the nearest side of the turntable spindle; loosen the two screws "D" and adjust horizontal position of tone arm to proper dimension, being careful not to disturb levers "14" and "17." Leave approximately 1/32-inch end play between hub of lever "20" and pick-up base bearing, and tighten the blunt-nose screw "D"; run mechanism through several cycles as a check, then tighten cone-pointed screw "D."

After adjusting for needle landing on a 10-inch record, place 12-inch record on turntable; push index lever to reject and return to 12-inch position; rotate mechanism through cycle until needle is just ready to land on the record; the correct point of landing is $5\frac{1}{4}$ inches from nearest side of spindle. If the landing is incorrect, turn stud "E" until the eccentric end adjusts lever "14" to give correct needle landing. The eccentric end of the stud must always be toward the rear of the motor board; otherwise incorrect landing may occur with 10-inch records.

F. and G. Record Separating Knife.—The upper plate (knife) "25" on each of the record post serves to separate the lower record from the stack and to support the remaining records during the change cycle. It is essential that the spacing between the knife and the rotating record shelf "27" be accurately maintained. The spacing for the 10-inch record is nominally .055 inch, and for the 12-inch record is .075 inch.

To adjust, rotate the knife to the point of minimum vertical separation from the record shelf and turn screw and locknut "F" to give .052-.058 inch separation. Screw "G" must not be depressed during this adjustment. After setting screw "F" adjust screw "G" so that when its tip is depressed flush with top of record shelf, the vertical spacing

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

Radio Service Notes on Models J-718, J-728, J-808, J-809, J-818 and J-828

between the knife, in its lowest rotational position, and the shelf, is .072-.078 inch.

H. Record Support Shelf.—The record shelf revolves during the change cycle to allow the lower record to drop onto the turntable. Both posts are rotated simultaneously by a gear and rack coupled to the main lever "15," and it is necessary that adjustments be such that the record is released from both shelves at the same instant. To adjust, place a 12-inch record on the turntable, rotate mechanism into cycle to the point where both separating knives have turned clockwise as far as the mechanism will turn them; lift record upward until it is in contact with both separating knives, then loosen screws "H" and shift record shelves so that the curved inner edges of the shelves are uniformly spaced at least 1/16 inch from record edge. Some backlash will be present in the rotation of these shelves. They should be adjusted so that backlash permits them to move away from record but not closer than the 1/16 inch specified above. Tighten the blunt-nose screw "H," run mechanism through cycle several times to check action, then tighten cone-pointed screw "H."

If record shelves or knives are bent, or not perfectly horizontal improper operation and jamming of mechanism will occur.

J. Tone Arm Rest Support (not shown).—When the changer is out-of-cycle, the front lower edge of the pick-up

head should be 5/16 inch above surface of motor board. This may be adjusted by bending the tone arm support bracket, which is associated with the tone arm mounting base, in the required direction.

K. Trip Pawl Stop Pin.—The position of the trip pawl stop pin "K" in relation to the main lever "15" governs the point at which the roller enters the cam. By bending the pin support either toward or away from trip pawl bearing stud, the roller can be made to enter the cam later or earlier, respectively. This adjustment should be made so that the roller definitely clears the cam outer guide as well as the nose of the cam plate.

Lubrication. Petrolatum or petroleum jelly should be applied to cam, main gear, spindle pinion gear, and gears of record posts.

Light machine oil should be used in the tone arm vertical bearing, record post bearings, and all other bearings of various levers on under side of motor board.

The turntable bearing must be lubricated from the top of the motor board. Using an oil can with a long spout, reach in between the turntable and motor board and apply oil directly to the spindle.

Do not allow oil or grease to come in contact with rubber mounting of tone arm base, rubber bumper, or rubber spindle cap.

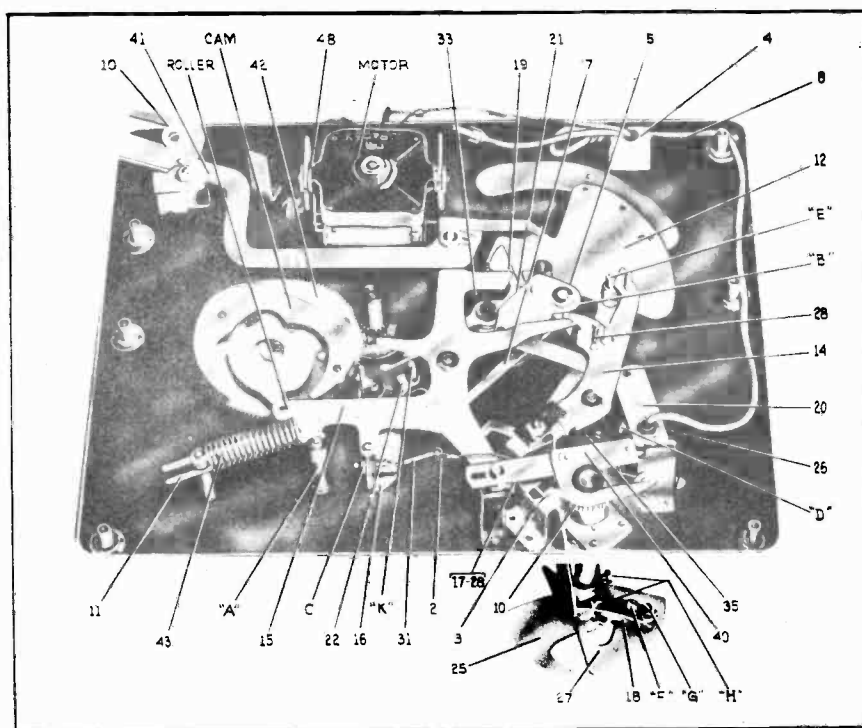


Fig. 2. Parts View of Automatic Record Changer

MOTOR SERVICE DATA

On the drive motor a 0.014-inch feeler gauge is recommended for centering the rotor in the field bore.

The field coils can be disassembled and reassembled if care is used in

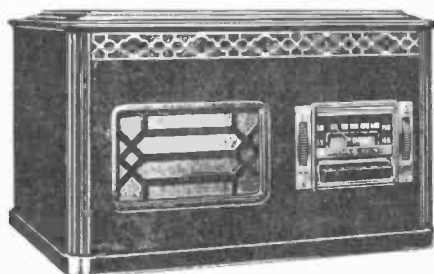
reassembling the field lamination block in a manner so that the dovetail joint will not be sprung.

When disassembling the rotor or rotor shaft bearing only, the field stacking should be held in a clamp to prevent the field springing when the bolts which hold the assembly together are loosened.

GENERAL ELECTRIC

RADIO-PHONOGRAPH-RECORDER COMBINATION

MODEL J-629



SPECIFICATIONS

Over-all Dimensions

Model	J-629
Height	12 3/4 inches
Width	19 3/4 inches
Depth	14 5/8 inches

Manual Tuning Drive Ratio

1:1

Electrical Specifications

Rating	Power Supply (Volts)	Frequency (Cycles on AC)	Power Consumption (Watts)
A-6	110-125	60	75
A-5	110-125	50	75

Tuning Frequency Range..... 550-1600 KC

Intermediate Frequency..... 455 KC

Electrical Power Output

Undistorted	2.0 watts
Maximum	2.5 watts

Loud-speaker—"Alnico" Magnetic Dynamic

Outside Cone Diameter	6.5 inches
Voice Coil Impedance (400 cycles)	3.5 ohms

Tubes

Converter-Oscillator	GE-6SA7GT
I.F. Amplifier	GE-6SK7GT
Det., Aud., AVC	GE-6Q7GT
2nd Audio Amplifier	GE-6J5GT
Power Output	GE-25L6GT
Rectifier	GE-25Z8GT
Dial Lamp	MAZDA No. 44

Phonograph-recorder

Type Pickup	Crystal
Turntable Speed	78 R.P.M.
Type Cutter	Crystal

GENERAL INFORMATION

Model J-629 is a six-tube AC receiver incorporating a combination phonograph and recording mechanism.

The selector switch under the cover, when turned to "Phonograph-Off" will disconnect the recorder from the radio circuit and will allow normal radio reception. The "Phonograph-On" setting of the switch converts the mechanism into a conventional record player and starts turntable rotation. The "Recording-Radio" position permits radio program recording. Recording through the microphone is provided on the "Recording-microphone" position.

Loud-speaker

The voice coil is accurately and permanently centered at the factory and should seldom give trouble. In case a voice coil needs recentering it will be necessary to replace the entire cone and voice-coil assembly.

NOTE.—In no case should the magnet be removed from the assembled position without remagnetizing after replacing it.

ALIGNMENT PROCEDURE

Alignment Frequencies

I.F. 455 KC R.F. 1500 and 580 KC
The location of all trimmers is shown in Fig. 1.

I.F. Alignment

Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC and keep the oscillator output as low as a readable meter reading will permit.

Apply signal to the grid of the 6SK7GT through a .05 mfd. capacitor and align the 2nd I.F. transformer. Repeat the procedure, applying the 455 KC signal to the control grid of the 6SA7GT and aligning the 1st I.F. transformer. Finish by over-all adjustments.

R.F. Alignment

With gang condenser plates completely closed, set dial pointer to the first mark at the left end of the scale. Apply a 1500-KC signal either through a standard I.R.E. dummy to the antenna terminal or through an additional loop connected to the generator output which can be magnetically coupled to the receiver Beam-a-Scope. Align (C-2) at 1500 KC and peak (C-1) for maximum output. Peak (C-3) on 580 KC while rocking the gang condenser. Retrim at 1500 KC.

Special Service Information

The following data will be very useful to servicemen equipped with vacuum-tube voltmeters or similar voltage-measuring instruments.

- (1) Stage Gains
Antenna Post to Converter Grid—6 at 1000 KC†
Converter Grid to 6SK7GT Grid—30 at 455 KC†
6SK7GT Grid to 6Q7GT Det. Plate—100 at 455 KC†
- (2) Audio Gains
.06 volts, 400 cycles signal across volume control with control set to maximum will give approximately 1/2-watt speaker output.
- (3) DC voltage developed across oscillator grid resistor (R-1) averages 12 volts.

† Variations of +10, -20% permissible.

RECORDING ADJUSTMENTS

Cutting Head Pressure

The pressure is controlled by means of the adjustment screw located midway back on top of the recording arm.

The pressure should be adjusted so that by inspection with a magnifying glass, the uncut portion of the record between the grooves is the same width as the groove. At no time should pressure be great enough to cut through the acetate surface enough to show the metal base of the record.

A clockwise rotation of the setscrew increases pressure.

Cutting Arm Adjustment

The adjustment at the rear and underneath the cutting arm, controls the height above the record blank at which the cutting arm rides. This should be adjusted so that when resting in the recording position on the record, the setscrew of the cutting head rides halfway down in the needle screw gap.

Lead Screw Follower Arm Pressure Adjustment

The pressure is varied by the phosphor bronze spring adjustment underneath the phono assembly on the follower arm. The pressure should be great enough so that when the recording head is in the recording position, this phosphor bronze spring should rest at the bottom of the lead screw groove. Too great pressure will cause binding, while too little pressure is liable to cause overlapping of the grooves.

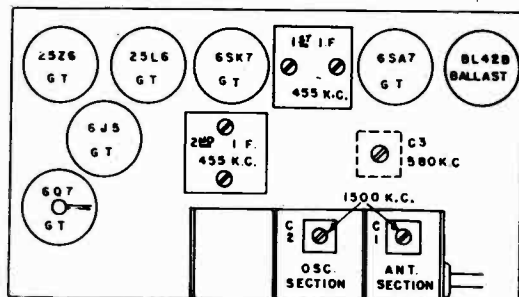


Fig. 1. Trimmer Location

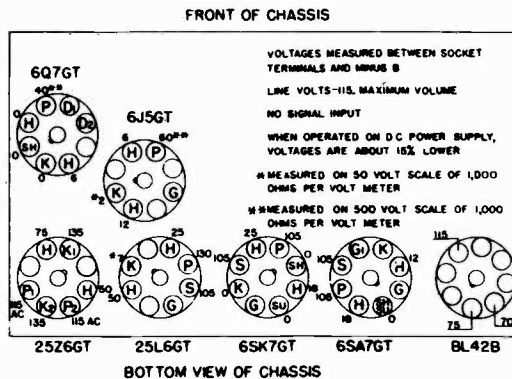


Fig. 2. Socket Voltages

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

THE GENERAL INDUSTRIES COMPANY

Model GI-R70 Home Recording and Phonograph Assembly

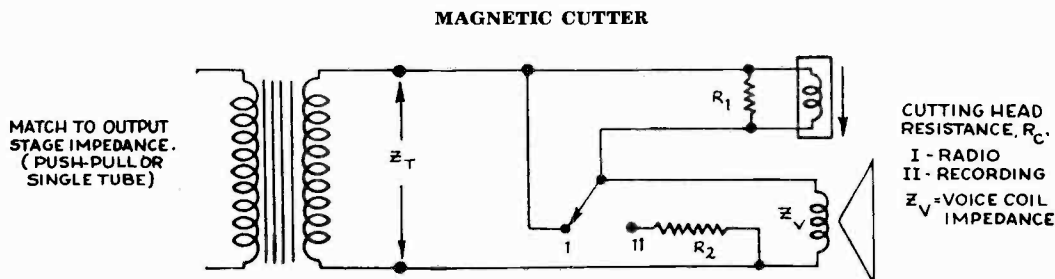


FIG. A

TYPICAL VALUES OF COMPONENTS

R_C OHMS	R_1 OHMS	Z_V OHMS	R_2 OHMS	Z_T OHMS	MONITORING ATTENUATION BELOW NORMAL PLAYING LEVEL DB.
4	10	4	1	4	20
4	12	6	1.5	6	14
4	12	8	5.3	8	8
4	12	10	11	10	6
4	12	15	26	15	5

A suggested circuit for inclusion of the magnetic cutter in the voice coil circuit is shown in Figure A. While other arrangements are equally satisfactory, this hookup can be used on all standard radio sets and amplifiers.

In connection with the table "Typical values for components", best results will be obtained where it is possible to use values between 6 and 8 ohms for Z_t and Z_v .

A volume indicator is necessary to prevent cutting too heavily. For this purpose a medium speed voltmeter can

be connected across the cutting head in parallel with R_1 . Where R_c has a value of 4 ohms as shown, the voltage peaks should be about 1 volt on speech and 1½ volts on music. **Important** when connecting a voltmeter in parallel with R_1 , the value of R_1 must be increased to the point where the effective resistance of R_1 and the voltmeter in parallel will equal the values for R_1 as shown in the table. If the voltmeter has a resistance equal to the values for R_1 it of course can be substituted for R_1 .

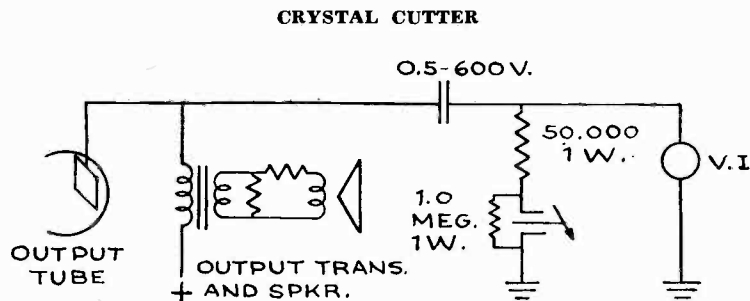


FIG. B

To cut an approximation of the standard commercial recording characteristic with the crystal cutter, a 50,000 ohm resistor should be placed in series with the cutter. To emphasize high frequencies, this resistor should be shunted with a condenser between .001 to .01 mfd. To emphasize low frequencies the series resistor should be varied up to 250,000 ohms.

A volume indicator is necessary to prevent cutting too

heavily. For this purpose a rectifier type AC voltmeter, 1,000 ohms per volt, 0-150 volts scale, can be connected as indicated by "V. I." in Fig. B. For normal recording the voltage peaks should be about 100 volts.

Important crystal cutters must be protected from temperatures higher than 120° F., voltages in excess of 350 volts RMS and from DC voltages.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

AMPLIFIER

The amplifier should be capable of at least 5 watts output in order to keep harmonic distortion down to a reasonable level and preferably have triode output or beam tubes with inverse feedback. Frequency response should be reasonably flat within the audible range. Hum level should be low enough so that hum is not discernible at the loud speaker with the volume adjusted to recording level. The amplifier should be stable at full volume and "microphonic"

tubes avoided. If the amplifier and recorder unit are to be installed in the same cabinet, all conditions of mechanical resonance and feed back must be avoided to preclude the possibility of recorded "rumble". The cabinet should be substantially built of comparatively heavy materials. If cabinet resonance is encountered, wooden braces glued to the inside surfaces of the cabinet will sometimes serve to correct this condition.

RECORDING FROM RADIO

For radio recording, it is desirable to leave the speaker connected for monitoring purposes. In Fig. A the circuit components are arranged for reducing the speaker volume during recording as shown in the table.

Referring to Fig. B, an "L" pad is shown in the voice coil circuit for reducing speaker volume during recording. When the radio is being used without recording this "L" pad should of course be disconnected.

RECORDING FROM MICROPHONE

When recording from microphone the speaker must be disconnected to prevent feed back and a resistor of the same value as the speaker voice coil substituted for the

voice coil, in order that the proper load impedance be reflected back to the output tubes.

PLAYBACK PICKUP

The crystal pickup leads may be connected directly to the phonograph input terminals provided on most amplifiers and radio receivers, or may be connected between "grid" and "ground" of the radio receiver's second detector tube if no other connection is provided. The "ground" connection

should be made to the outer conductor, or shield, of the pickup cable, while the inner wire of the cable should be connected to the "grid" of the tube. If these connections are reversed, an A. C. hum will be heard in the loud speaker when the equipment is arranged for playing records.

MICROPHONE

For making microphone recordings through the audio amplifier of a radio receiver, quite satisfactory results will usually be forthcoming by use of a diaphragm type crystal microphone of reputable manufacture, connected to the phonograph input terminals of the radio receiver. Correct polarity of connections to the microphone cable should be observed, the same as for connecting the pickup cable. The shield of the cable should connect to "ground." This ar-

rangement will usually afford sufficient volume for microphone recording, although the microphone cannot be expected to produce the same loud speaker volume as is obtained in playing records with the pickup connected to the amplifier. The phonograph pickup delivers approximately from 1 to 2 volts to the input of the amplifier, while the microphone is capable of furnishing only approximately 1/100th of this voltage or from .01 to .02 volts.

PRE-AMPLIFIER FOR MICROPHONE

If it is within the scope of the constructor's knowledge and ability, the assembly and installation of a microphone pre-amplifier will prove to be a material aid in microphone recording service. The purpose of the pre-amplifier is to amplify the impulses generated by the microphone, before

being fed into the audio frequency amplifier, so that the amplifier will produce about the same amount of volume to the recording head, or cutter, whether recordings are made from microphone or from radio reception.

RECORDING MECHANISM ADJUSTMENTS

Before attempting to make recordings, after the recorder has been set up and properly connected to the amplifier or radio receiver, first make an inspection of the various

adjustments provided on the recorder, and make whatever corrections necessary to insure correct depth and spacing of the grooves cut into the record surface, as follows:

PROPER ENGAGEMENT OF FEED SCREW

With the recording arm raised to an angle of approximately 45 degrees, the follower arm (refer to Fig. 7) should be noticed to be completely disengaged from the lateral feed so that the recording arm may be moved horizontally across the turn-table. With the recording arm lowered to a position so that the bottom of the nose of the arm is 2 inches above the turn-table, the tongue of the phosphor bronze spring should just clear the lateral feed screw. The adjustment for this height may be accomplished by an adjustment of the phosphor bronze spring screw. In making this ad-

justment, note that the end of the adjusting screw bears against the phosphor bronze spring when the recording arm is lowered to recording position.

The pressure of the phosphor bronze spring, bearing against the lateral feed screw, should be sufficiently great so that the knife-edge tongue will not have a tendency to climb out of the grooves in the feed screw. The pressure should not be too great, however, or too much power will be required from the motor, producing "wows."

ADJUSTMENT OF CUTTING ARM AND HEAD

When the recorder is packed for shipment, all adjustments are in correct order, however, as these adjustments may become altered to some extent in handling the equip-

ment during installation, some correction of the adjustments may be required to restore them to their original positions.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

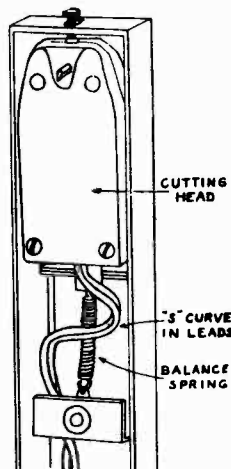


FIG. 3

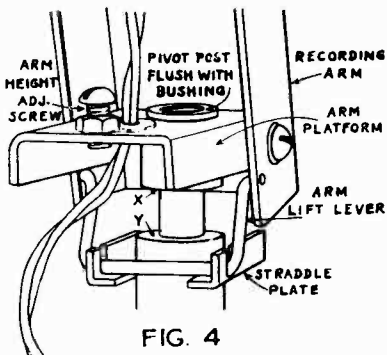


FIG. 4

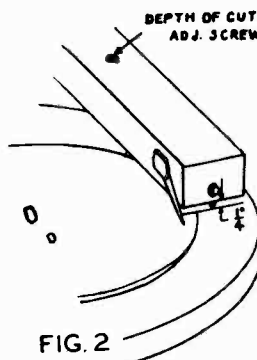


FIG. 2

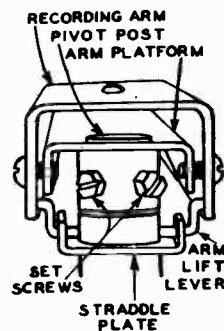


FIG. 8

MODEL GI-R70

HEIGHT OF RECORDING ARM ABOVE RECORD

By referring to Figure 7, it will be observed that the correct height of the recording arm above the surface of the record (arm lowered to recording position) is $\frac{1}{4}$ inch. As the arm height has a definite bearing upon the uniformity of the groove cut into the record, this adjustment is very important, and the $\frac{1}{4}$ inch measurement should be made with an accurately calibrated steel scale. If the height of the arm is found to be incorrect, an adjustment of the ARM HEIGHT ADJUSTMENT SCREW should be made so that the lower edge of the front end of the arm is EXACTLY $\frac{1}{4}$ inch. To make this adjustment, raise the arm to its vertical position and loosen the lock nut which holds the adjustment screw in position.

The connecting wires from the cutting head should not be allowed to double up between the arm and arm platform, but should feed freely through the hole in the plat-

form as the arm is lowered. Otherwise, the wires doubled up may prevent the arm from coming to rest on the head of the height adjustment screw.

There is little likelihood that the arm height adjusting screw will get out of adjustment due to the lock nut becoming loosened. However, there is the possibility that the recording arm may be roughly handled by the operator. If the arm were to be forced backwards after having been raised to its vertical position,— or if, while being lowered to its horizontal position to the right of the turn-table, the arm were dropped or forced downward, the plate on which all of the recording mechanism is mounted, may be bent or sprung slightly. This would destroy the $\frac{1}{4}$ inch height adjustment, and readjustment of the arm height adjusting screw would be necessary to bring the nose of the recording arm to exactly $\frac{1}{4}$ inch above the record surface.

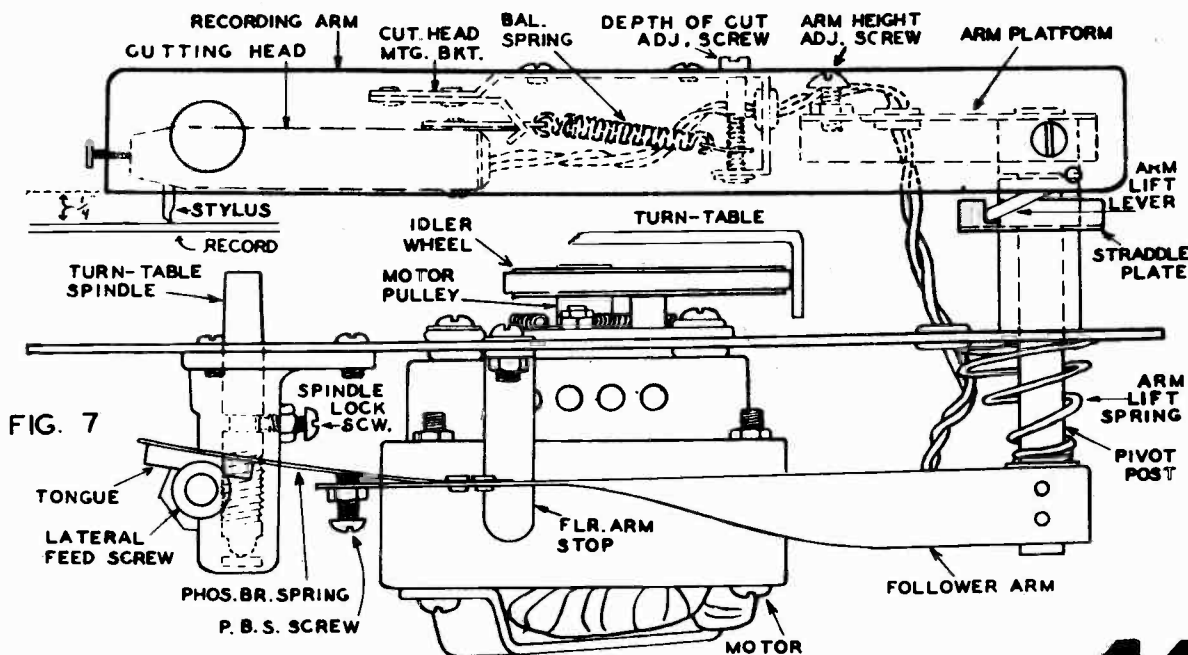


FIG. 7

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

DEPTH OF CUT ADJUSTMENT

The depth of cut is regulated by an adjustment of the flat head screw on the top of the recording arm, FIGURE 2.

Turning the screw to the right (clockwise) increases the depth of cut.

Turning the screw to the left (counter-clockwise) decreases the depth of cut.

Observe that the leads connecting to the cutting head are shaped to form an "S," FIGURE 3, and that these wires are kept in the clear—not touching the balance spring. Also, the wire leads should not be permitted to droop (arm horizontal) so that they will rub on the turn-table.

Make a trial cut of a dozen or so grooves on a blank recording disc and observe the depth of cut by use of a strong

magnifying glass. The correct depth of cut will cause the width of the groove to be about the same or slightly greater than the width of the "land" or uncut portion of record surface between grooves.

In criticalness of adjustment, one turn of the depth of cut adjustment screw makes a noticeable difference in the depth of the groove, therefore, the adjustment should be made in quarter or half turns rather than in complete turns either way.

The thread of shaving cut from the record surface should be firm, although neither coarse and stiff, nor light and "fluffy." The machine is cutting correctly if the total shaving cut from one surface of a 6½" record, when wadded up or rolled into a ball, is approximately ⅜" in diameter.

ADJUSTMENT OF RECORDING ARM MOUNTING

The recording arm assembly is mounted on the upper end of the pivot post (Fig. 7) and held in correct position by means of the two hex-head set screws as illustrated in Fig. 8. In the event the recording arm should become loosened on the pivot post, the vertical position of the arm with respect to the pivot post, and also the horizontal position of the arm with respect to the follower arm should be observed, before tightening the hex-head set screws.

(a) The end of the pivot post should be flush with the bushing on the top side of the arm platform (FIGURES 4, 7, and 9) and when the recording arm is lowered to its hori-

zontal position, a small gap should exist between the pivot post bushings X and Y, FIGURE 4.

(b) Place the follower arm in a position so that it touches the follower arm stop located close to the motor underneath the recorder suspension plate, and place the recording arm in a position which allows the cutting stylus to rest on the record approximately 1⅜ inches from the turn-table center post. This will provide a maximum playing time of approximately 2 1/5 minutes for the 6½" record, 3½ minutes for the 8", and 5 minutes for the 10" discs.

MAKING A TRIAL RECORDING

After it has been determined that all of the aforementioned adjustments are in correct order, and the machine is cutting correctly, a trial record should be made to determine the correct level of volume for recording.

During recording, the tone control should be set to its treble or high pitch position to avoid the possibility of losing high frequencies in the recording.

In making microphone recordings, place the microphone

at a distance of about 10 to 18 inches for the speaking voice, and at correspondingly greater distances for recording vocal or instrumental musical renditions. When recording speech, the microphone should not be spoken into at close range, as lip sounds and sounds of breathing will be recorded, and because of shock to the microphone diaphragm due to sudden bursts of sound impulses entering the microphone, the voice is caused to be recorded unnaturally.

INSPECTION OF TRIAL RECORDING

After the trial recording has been made, an inspection of the record should be made, both visually and aurally. In viewing the grooves cut into the record surface, it will be observed that modulation laid in the grooves due to the lateral movement of the cutting stylus, caused by amplified electrical impulses fed into the cutting head, have caused the grooves to assume a "wavy" characteristic. It is this "wavy" characteristic of the groove which produces reproduction of recorded sounds, by causing the phonograph needle, during playback, to simulate the lateral excursion of the cutting stylus during recording, resulting in a reproduction of sounds exactly as they were recorded. The magnitude of the electrical impulses reaching the cutting head, governed by the loudness of sounds entering the microphone and by the degree of amplification of sounds through the audio amplifier, determines the amplitude of the "wavy" characteristic of the groove. It can be seen that the use of too great a volume during recording would tend to cause over-cutting between grooves. If the wall of record material between grooves were cut completely through into the adjacent groove, the playback needle would readily jump

grooves and the record would be rendered useless. If the grooves are not completely overcut, although sufficient volume has been used in recording to cause a very thin wall of record material to be left between grooves, the point of the playback needle in reproducing the record would tend to push the thin wall of material over into the adjacent groove. If this occurred, "echo" or "ghost" would be perceptible in playing the record. "Echo" is the faint reproduction of recorded sound as the playback needle travels in the adjacent groove following the groove in which the actual recording is contained, while the "ghost" is the faint reproduction of recorded sound as the playback needle travels in the adjacent groove preceding the groove in which the actual recording is contained.

PROPER RECORDING LEVEL

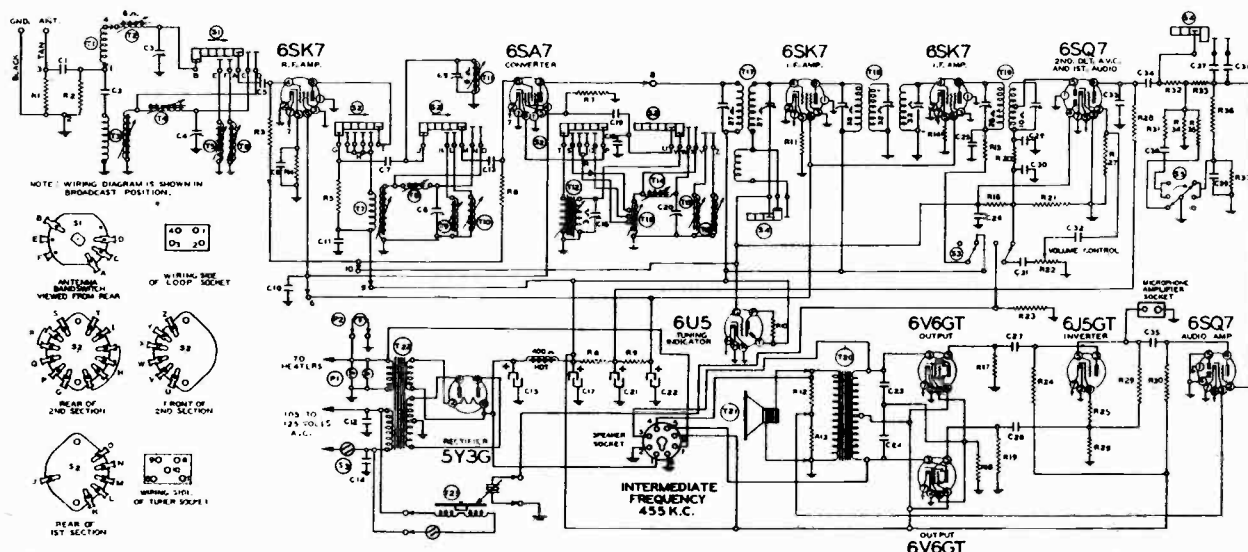
If the recording is made at too low a volume level, the modulation laid in the grooves during recording will cause the grooves to be only slightly "wavy" and the volume produced when playing the record will be inadequate. If the volume control is turned up in playing the record to compensate for the lack of recorded volume, surface noise caused by friction of the phonograph needle riding in the groove will be quite noticeable. After making a few trial recordings, the operator will be able to determine the proper setting of the volume control to provide the correct level

of volume for recording.

If the volume is controlled while recording is in progress, this should be done slowly as any abrupt change in volume will be definitely noticeable when playing the record. When recording, the volume control serves only as a means for adjusting the average volume on the record, and the expression of instrumental music or vocal selections will be impaired if loud and soft passages are compensated for by either decreasing or increasing the volume.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS WARDS AIRLINE RADIO WITH AUTOMATIC RECORD CHANGER

MODEL 04BR-1106A



Schematic Diagram

Ref. No. Part No. Description

RESISTORS

R1	BE130232	25M ohm— $\frac{1}{2}$ w.
R2	BE130232	25M ohm— $\frac{1}{2}$ w.
R3	BE13019	1 megohm— $\frac{1}{2}$ w.
R4	BE130239	250 ohm— $\frac{1}{2}$ w.
R5	BE130218	5M ohm— $\frac{1}{2}$ w.
R6	BE13019	1 megohm— $\frac{1}{2}$ w.
R7	BE130232	25M ohm— $\frac{1}{2}$ w.
R8	BE130318	6M ohm—2 watt
R9	BE130319	10M ohm—2 watt
R10		1 megohm in tuning indicator cable
R11	BE13013	110M ohm— $\frac{1}{2}$ w.
R12	BE13082	10M ohm— $\frac{1}{2}$ w.
R13	BE130235	1500 ohm— $\frac{1}{2}$ w.
R14	BE130192	2M ohm— $\frac{1}{2}$ w.
R15	BE130192	2M ohm— $\frac{1}{2}$ w.
R16	BE13019	1 megohm— $\frac{1}{2}$ w.
R17	BE1303	500M ohm— $\frac{1}{2}$ w.
R18	BE130317	250 ohm—2 watt
R19	BE1303	500M ohm— $\frac{1}{2}$ w.
R20	BE13094	50M ohm— $\frac{1}{2}$ w.
R21	BE130316	120M ohm— $\frac{1}{2}$ w.
R22	BE101229	500M ohm volume control
R23	BE1303	500M ohm— $\frac{1}{2}$ w.
R24	BE13094	50M ohm— $\frac{1}{2}$ w.
R25	BE130218	5M ohm— $\frac{1}{2}$ w.
R26	BE13094	50M ohm— $\frac{1}{2}$ w.
R27	BE130257	5 megohm— $\frac{1}{2}$ w.
R28	BE130172	250M ohm— $\frac{1}{2}$ w.
R29	BE1303	500M ohm— $\frac{1}{2}$ w.
R30	BE130172	250M ohm— $\frac{1}{2}$ w.
R31	BE130232	25M ohm— $\frac{1}{2}$ w.
R32	BE13080	150M ohm— $\frac{1}{2}$ w.
R33	BE130309	350M ohm— $\frac{1}{2}$ w.
R34	BE130172	250M ohm— $\frac{1}{2}$ w.
R35	BE13066	75M ohm— $\frac{1}{2}$ w.
R36	BE13080	150M ohm— $\frac{1}{2}$ w.
R37	BE130146	2 megohm— $\frac{1}{2}$ w.

CONDENSERS

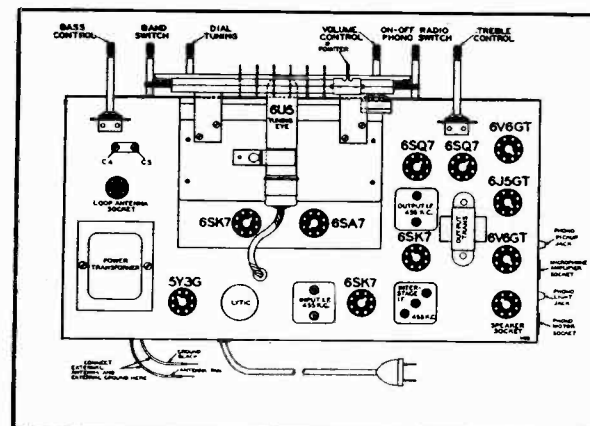
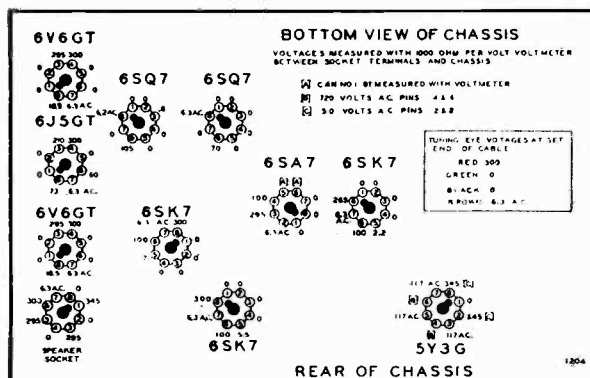
C1	BE1292	.0005 mica
C2	BE20047	.002 x 600 v.
C3	BE124143	B.C. Antenna Trimmer
C4	BE124143	9 mc. Antenna Trimmer
C5	BE1292	.0005 mica
C6	BE10020	.1 x 200 v. tubular
C7	BE129168	.0001 mica
C8	BE124138	9 mc. R.F. Trimmer
C9	BE124139	B.C. R.F. Trimmer
C10	BE10074	.1 x 400 v.
C11	BE10074	.1 x 400 v.
C12	BE10061	.02 x 600 v.
C13	BE1292	.0005 mica
C14	BE10061	.02 x 600 v.
C15	BE119112	30.0 mfd. lytic
C16	BE124144	B.C. Oscillator Trimmer
C17	BE119112	30.0 mfd. lytic x 450 v. v.
C18	BE129167	.0002 silver mica
C19	BE129165	.00005 mica
C20	BE124145	9 mc. oscillator trimmer
C21	BE119112	10.0 mfd. lytic
C22	BE11969	16 mfd. x 350 v. v.
C23	BE10065	.015 x 600 v.
C24	BE10065	.015 x 600 v.
C25	BE1001	.1 x 400 v.

C26	BE10020	.1 x 200 v.
C27	BE10013	.05 x 400 v.
C28	BE1009	.05 x 200 v.
C29	BE1295	.0001 mica
C30	BE1295	.0001 mica
C31	BE10020	.1 x 200 v.
C32	BE10019	.006 x 600 v.
C33	BE12912	.00025 mica
C34	BE1001	.1 x 400 v.
C35	BE10013	.05 x 400 v.
C36	BE10018	.008 x 600 v.
C37	BE12938	.0005 mica
C38	BE129166	.000125 mica
C39	BE10037	.003 x 600 v.

C3 and C4 in same unit
C15, C17 and C21 in same unit

PARTS

T1	BE11197	Loop Antenna Assembly
T2	BE11195	B.C. Antenna Coil
T3	BE11190	9 mc. Antenna Coil
T4	BE11189	6 mc. Antenna Coil
T5	BE11191	12 mc. Antenna Coil
T6	BE11192	15 mc. Antenna Coil
T7	BE10959	9 mc. R.F. Coil
T8	BE10958	6 mc. R.F. Coil
T9	BE10960	12 mc. R.F. Coil
T10	BE10961	15 mc. R.F. Coil
T11	BE10962	B.C. R.F. Coil
T12	BE110161	B.C. Oscillator Coil
T13	BE110157	9 mc. Oscillator Coil
T14	BE110156	6 mc. Oscillator Coil
T15	BE110158	12 mc. Oscillator Coil
T16	BE110159	15 mc. Oscillator Coil
T17	BE108181	Input I.F. Coil—455 kc.
T18	BE108155B	Interstage I.F. Coil
T19	BE108182	Output I.F. Coil—455 kc.
T20	BE108115	Output Transformer
T21	BE114209	12 in. Dynamic Speaker
T22	BE104217	Power Transformer—50/60



TOP VIEW

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

SETTING FOR SIZE OF RECORD

The Changer plays up to fourteen 10" or ten 12" records at one loading. All records must be the same size for each loading.

On each post you will see selecting arms. The position of these arms determines the setting for different size records. To set for 10 or 12 inch records, it is merely necessary to grasp the posts by the knobs at the top, lift, and turn until the 10" or 12" arrows are pointing toward the center of the turntable. When in either the 10" or 12" position, the posts will snap into place except when they are lifted by hand. Be sure to set both posts for the same size record.

LOADING

See that the selecting arms or both posts are turned toward the center of the turntable as indicated by the engraved arrows, and that both sets of arms are set for the same size (10" or 12") records as described in the preceding paragraph.

Place the stack of records (up to fourteen 10" or ten 12") over the center pin so that they will rest on the selecting arms.

STARTING THE CHANGER

1. Turn on the radio (allowing approximately 30 seconds for the tubes to

warm up) and turn the phonograph-radio knob, to the phonograph position.

2. Turn the switch knob on the Record Changer panel to "ON". The motor will then start and the record changer will go into automatic operation of its own accord.

HOW TO REJECT A RECORD

Merely press the switch knob on the Changer panel. You can do it any time after the needle has come into contact with that record.

PLAYING INDIVIDUAL RECORDS

Should it be desired to play an individual record merely set up the machine as described above for the proper size (10" or 12" as indicated on the selecting arms), place the record on top of the arms as described under "Loading", and set the machine in operation by means of the switch knob described under "Starting the Changer." In other words, play an individual record in the same manner as you would play a stack of that size.

UNLOADING

First switch off the motor. Grasp each post by its knob at the top and turn them out of the way.

Lift the played records from the turntable. Then return the posts to the

proper playing position as indicated by the arrows on the selecting arms.

The Changer may then be loaded with a new stack of records according to the size shown on the selecting arms.

TURNING OFF CHANGER

Throw Changer switch knob to "OFF" position.

Lift tone arm and place it in the rest position. (If you happen to turn off the Changer switch while the mechanism is going through a "change cycle," you will notice that it does not stop until the cycle has been completed, and the tone arm is again in playing position, at which point it is ready to be lifted to the rest position. If you prefer to turn off your Changer with the radio switch, be sure to turn it off while needle is resting upon a record; otherwise, the selecting arms cannot be correctly reset.

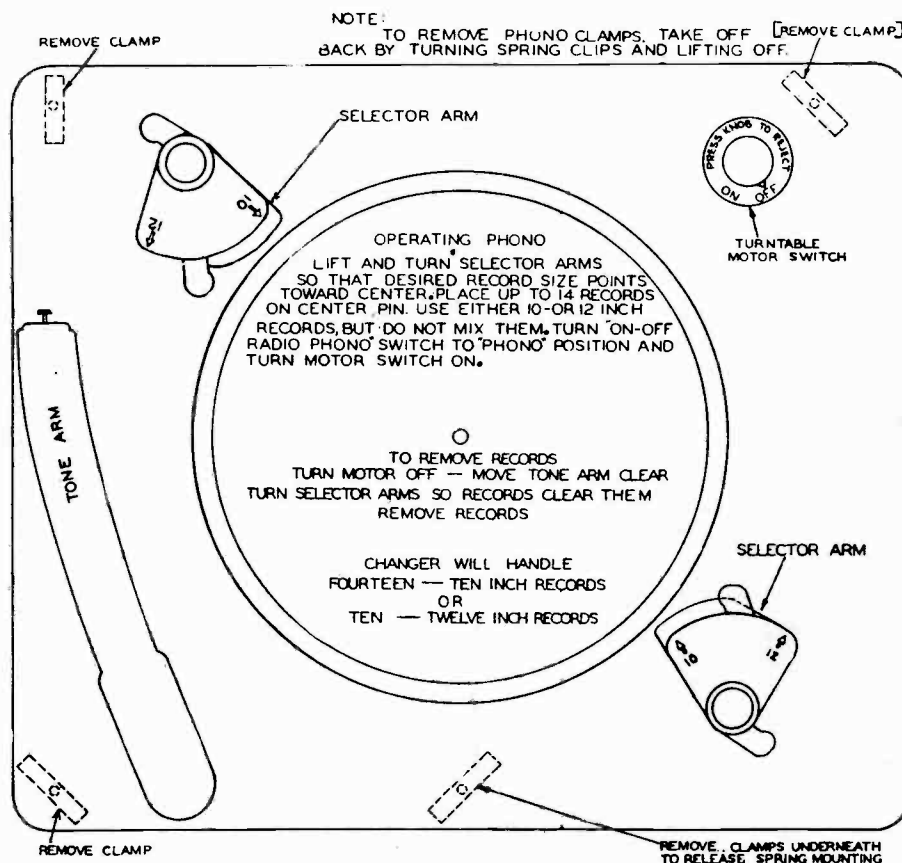
To avoid warping of records, never leave records resting on posts.

IF CHANGER IS LEFT RUNNING

No damage will be done if you forget to turn off Changer after it has played its entire load of records. It will simply repeat the last record until stopped or reloaded.

WARDS

MODEL 04BR-1106A



52

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MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

All 1941 Philco Radio-and-Phonograph combinations using this new Photo-Electric Tone Arm have been designed for easy installation of this home recording kit.

The addition of this kit to your radio-and-phonograph combination adds the following advantages:

- a. Radio Recording
 - b. Microphone Recording
 - c. Public Address (Sound Amplification)
4. Place a Philco safety recording disc on the turntable with the retractable pin projecting through the outer hole.
 5. Pick up the recording arm, making sure that the cutting needle has been properly inserted as explained, and set the needle on the disc near the outer edge.
 6. Push the "M" button on the record changer for manual operation.
 7. Turn the phonograph "ON" as outlined under manual phonograph operation in set instructions (41-616 see note on special switch).
 8. At the end of the recording, it is suggested that the volume control be turned to minimum volume position, or completely counter-clockwise, and allow the record to make a few revolutions before lifting recording arm and placing it on its rest.
 9. Remove the threads cut during the recording.
 10. This record is now ready to be played back.

TO PLAY BACK

To "play back" a home recording shift the switch on the recorder control unit to the "Play and PA" position. Then, with the main selector switch on the front panel in the "Phonograph" position, the record may be played manually by the changer. The tone and volume controls on the front panel should be operated to suit your desires.

This play-back, of course, is done by means of the Philco Photo-Electric Tone Arm and not by the Recorder Arm and Head Unit.

MICROPHONE RECORDING

1. Set the main selector switch in the "Phonograph" position.
2. Set the switch on the recorder control unit to "Record".
3. Set the switch found on the back of the microphone housing to the "On" position.
4. When the microphone is spoken into the volume control should be adjusted so that the indicator lamps should light as outlined in RADIO RECORDING.
5. The volume control setting may be different, depending upon the volume of the person's voice and the distance the person is from the microphone. For most natural results, the person should be at least one foot from the microphone.

TO PLAY BACK

To play back microphone recording, follow the above mentioned play-back in every respect, except be sure that the switch on the microphone is in the "Off" position.

In judging voice recordings it is a known fact that a person does not recognize his or her own voice. It is best to take the opinions of others on such recordings.

TO USE AS A PUBLIC ADDRESS OR SOUND AMPLIFIER SYSTEM

1. Set the main selector switch in the "Phonograph" position.
2. The switch on the recorder control unit to "Play and PA" position.
3. The switch on the microphone should be turned on.
4. The sounds picked up by the microphone will, in this instance, be amplified through the radio set and will be applied to the loud speaker. In this position, the volume and tone control may be used to control volume and tone respectively.

RADIO RECORDING

1. Tune to a desired radio station.
2. Set the bass control to the extreme counter-clockwise position.
3. Set the recording switch on the recording control to "Record Position". The sound from the loud speaker will be greatly reduced when the switch is in this position. The two indicator lights in the control unit are provided to indicate when the volume control is set correctly to make a record. One light has a line of green around it. The other has a line of red. For proper volume setting, the green indicator should light almost continuously except when there is no music or talking coming in on the program. The red light should flash occasionally. When continuously lit, this red light indicates too much volume for good, clear recordings.

*Home Recording Unit
Model HR-1*

PHILCO



MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

PHILCO HOME RECORDER UNIT

MAKING BETTER HOME RECORDINGS

When making home recordings, it is essential that the speed at which the record is cut, be kept at or near 78 RPM. The load imposed on the motor when cutting a record is much greater than when playing back the recording and, when the difference in speed between recording and playing is in excess of four RPM, it becomes quite objectionable. Increased satisfaction with home recordings will result when the following conditions are observed and adjustments are made for the most suitable operation.

1 — Allow the phonograph motor to become thoroughly warmed up before attempting to make a home recording. Play six records or more so that the grease in the gears becomes thoroughly loosened.

2 — The fiber gear on the home recording gear train that engages the spindle should mesh loosely with the spindle gear in order to avoid binding. It may be necessary to enlarge the mounting hole in the record changer base in order to obtain this condition.

3 — The cutting arm height adjusting screw should be set so that the cutting arm is just $\frac{1}{4}$ " above the record. Put the cutting needle in the crystal and place it on the record near the spindle. Check the cutting arm height — $\frac{1}{4}$ " above the record.

4 — The needle pressure is very critical. Philco Scale, Part No. 45-2851, should be used, so that needle pressure can be adjusted accurately to $1\frac{1}{4}$ ounces with the cutting needle placed near the spindle. The needle pressure must be checked just as the needle is raised from the record.

5 — The crystal "low level" stop should be adjusted, if necessary, to obtain $\frac{1}{2}$ " of free movement of the crystal in the cutting arm. With the needle resting on a record, raise the cutting arm slowly. There should be from $\frac{3}{16}$ " to $\frac{1}{4}$ " of motion of the cutting arm before the cutting needle lifts from the record. This will allow a free vertical movement of the crystal, compensating for any slight wobble in the turntable or record.

6 — At the first sign of fuzzy or poor tone when making home recordings, change the cutting needle, replacing it with a new Philco cutting needle. A cutting needle should make between ten and twenty good clear recordings before it becomes necessary to replace it.

Two types of needles have been furnished in the past. The first recording needle was of the type normally known as a plow type needle. The cutting face of this needle is curved so that it actually digs into the surface of the record. This type has been replaced with a newer type which can be distinguished very readily from the plow type because the cutting face of the needle is flat and is parallel to the axis of the needle. The plow type needle can be used to make 6" home recordings satisfactorily, but it should not be used to make 10" home recordings, since it cuts too deeply into the record and will slow up the phono motor while cutting the outer edge of the record. The new flat face needle will be satisfactory when making the 10" recordings.

MODEL

HR-1

54

Adjustment of Cutting-Needle Pressure

With Philco Safety Home Recording Blanks, a needle pressure of 1 to $1\frac{1}{2}$ oz. will give the best results. More pressure may cause over cutting of grooves and less pressure than 1 oz. will cause poor tracking or pickup will slide across record.

Adjustment of needle pressure is provided by screw adjustment H, which changes the point where the spring is hooked around adjustment screw. Moving this point toward boss K will increase needle pressure — moving it away from boss K will decrease needle pressure. To make this adjustment lift cutter vertically — turn knurled nut counter-clockwise to increase needle pressure, and clockwise to reduce this pressure.

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Selector Switch

There are four positions on the Selector Switch (the lower right knob). These positions—"Phonograph", "Push Button", "Broadcast", and "Over-sea"—are indicated by a lighted arrow on the right-hand side of the dial. The extreme counter-clockwise or left position is the "Phonograph" position.

RADIO OPERATION

To operate the radio, push the button marked "On-Off" (extreme left-hand push button). This supplies power to the radio and illuminates the dial. The radio may be turned off by again pushing the "On-Off" button.

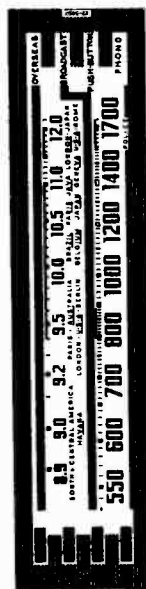
Adjust the Volume Control (upper left knob) to approximately half rotation.

For Standard Broadcast Reception, turn the "Selector Switch" (lower right knob) until arrow labeled "Broadcast" (on right-hand side of dial), is lighted. Stations in the Broadcast Band, and some police transmissions, may be tuned in by turning the dial tuning knob (upper right). Police transmissions in this band are made on frequencies from 1610 to 1710 kilocycles (kc.).

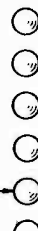
For best tone, tune the desired station with the volume turned low. This enables you to get the exact point at which the station comes in best. Then adjust the volume to the desired level with the volume control.

The Tone Control (lower left knob) may now be set to the desired tone quality by operating with the Volume Control knob. Turning the Tone Control knob counter-clockwise, giving it the extreme counter-clockwise position which gives normal reception, or by turning it clockwise, giving it the extreme clockwise position which gives the "Bass" position, which increases the low tone response with rotation of the tone control knob.

Short-wave transmissions may be received on the band spread range by rotating the Selector Switch until the arrow labeled "Overseas" is lighted. The band spread enables you to tune short wave more easily.



TELEVISION



PUSH BUTTONS



VOLUME
CONTROL



TONE
CONTROL

STATION
SELECTOR

ELECTOR
SWITCH

Observe the above illustration carefully for location of the controls.

Short-wave stations are received on certain sections of the dial according to the general schedule below:

Morning — 11.7 · 12.0 mc.
Afternoon — 9.5 · 10.8 mc.; 11.7 · 12.0 mc.
Night — 9.5 · 10.8 mc.

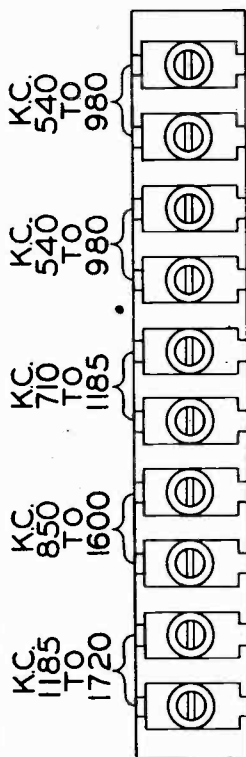
Turning the loop inside the cabinet will cause a variation in the volume of reception on weak stations. This same directional property will also cause an additional reduction in noise interference in many cases. If maximum performance is required, turn the loop until best reception is obtained. This position may vary for different stations.

ELECTRIC PUSH-BUTTON TUNING

When your set is installed, your Philco Dealer will adjust the radio to your favorite broadcast stations, and will place their call letters above the station buttons.

To tune the set with the push buttons, rotate the Selector Switch until the arrow labeled "Push Buttons" is lighted. Then push the button that is under the call letters of the desired station. Your station will be received instantly. The volume and tone of the program may be controlled by the volume and tone controls.

The frequency coverages of the buttons, together with their respective antenna and oscillator adjustments, are shown in the illustration below. This illustration shows the padder unit viewed from rear of cabinet.



OSC. ANT. OSC. ANT. OSC. ANT. OSC. ANT. OSC. ANT.

This set has been designed to receive the sound of television programs when operated in conjunction with the special type Philco Television set designed for this purpose. If at any time it is desired to use this television sound, your Philco dealer will make the necessary adjustments on the push button labeled "Television". This button may also be used for the playing of phonograph records from a Philco Wireless Record Player.

If at any time it is desired to substitute any station received well in your locality for a station appearing on the call-letter panel, consult your Philco dealer and have him make the necessary adjustments.

PHONOGRAPH OPERATION

This Philco Automatic Record Changer will multiply many-fold your enjoyment of recorded music. These instructions are written for the purpose of enabling you to get all the benefits this changer affords. With proper care, it should give many years of satisfactory service. With it, you can enjoy from one record to 45 minutes of your favorite music without interruption, and without attention to the instrument.

Pull the front section of the cabinet forward to make the changer accessible. This section is carefully designed and counter-balanced so that little force is required. This section should be pushed back again when operating the phonograph.

The Selector Switch must be in the "Phonograph" position. This is the extreme counter-clockwise position.

The tone and volume controls used in Radio Operation also may be used in Phonograph Operation.

The Philco Photo-Electric Tone Arm

This tone arm is a new and improved phonograph pickup. It rests very lightly on your records, thus increasing their life. The jewel needle is practically indestructible. An electric bulb is enclosed in the head of the tone arm and must be lighted for operation of the phonograph. This light is automatically turned on when the selector switch is in the "Phonograph" position.

CHANGER OPERATION

Setting for Record Size

This changer plays up to twelve 10" records or ten 12" records at one loading. On each post you will see two plates. The lower one, on which the records rest, is the shelf plate. The upper one is the selector blade which selects the next record to be played from the bottom of the stack.

To set for record size: (1) Clasp one of the posts underneath the shelf plate, with thumb and finger of left hand. With right hand, lift knob and turn selector plate until the figure 10 or 12 (whichever size you want to play) is opposite the pointer. Do the same with the other post. Both selector plates must be in 10 or 12 position. (2) Push button marked 10 or 12. Is required (see above illustration).

Loading

See that both shelf plates are turned toward center of turntable. As shelf plates near correct position you will feel the shelf plates drop into their indexing slots. Make sure both posts have dropped into their slots, if one is not in the slot, records may be damaged. Place the stack of records over center pin so they will rest on the two shelf plates.

Starting the Mechanism

To start motor and turntable: (1) Make sure radio is turned on. (2) Slide motor switch to "ON" position. (3) Then push button "R". This will release the first record and start the record-changing mechanism.

Rejecting a Record

To reject a record press the "R" button. This can be done any time after the needle has come into contact with the record.

Turning Off

Turn changer switch to "OFF" position. Lift pickup arm, place it on the pickup rest. To avoid warping of records, never leave records resting on the shelf plates.

Removing Played Records

To remove records make sure motor switch is off, then take hold of both posts, just below the shelf plates, and turn them out of the way. Lift the played records from the turntable. Taking hold of posts as before (below shelf plate) move plates until post again falls into indexed position as outlined under loading. The changer may then be loaded with a new stack of records.

Manual Operation

To play records one at a time as in an ordinary phonograph: (1) Remove any records remaining on the turntable, leave plates turned outward as for removing played records. Do not turn them back toward center of turntable. (2) Press button marked "M". Then place a record on the turntable, switch on motor and lift pickup into position.

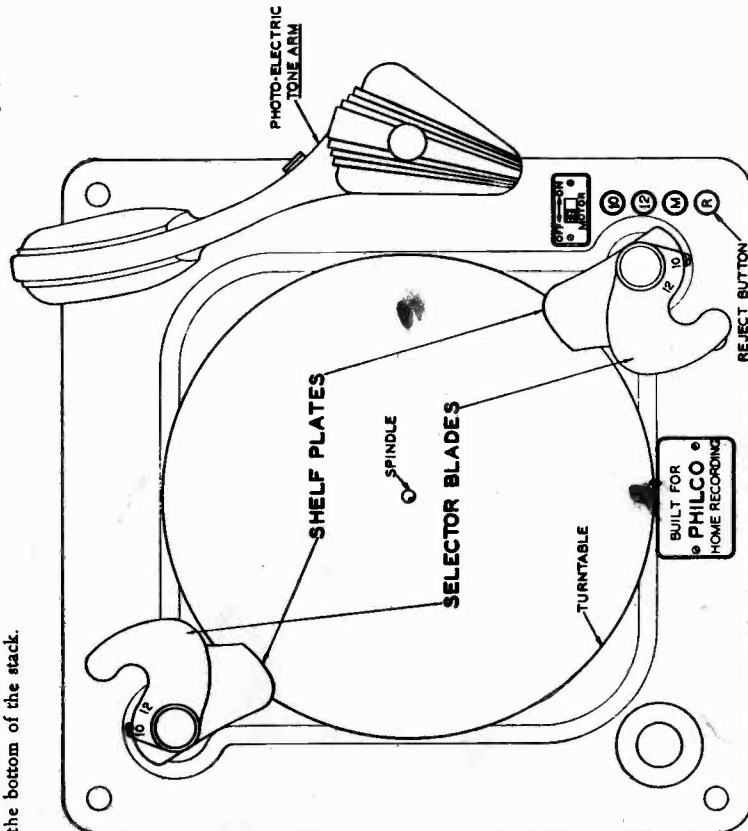
Oiling

The changer should be lubricated once a year with about a dozen drops of good light machine oil, at each of the following six points. All points can be reached from above, through holes in the mounting plate, as follows: Remove turntable by lifting off.

Nos. 1, 2, 3.—Three oil holes on motor gear housing. Reach all three through two holes under turntable.

4.—Through the other hole drop the oil upon flat surface of cam. It will distribute itself to proper points.

5, 6.—Two holes on the outer rim of the motor plate, to the left of the tone arm, and in front of the tone arm mounting.



Automatic Record Changers

Part Nos. 35-1231, 35-1233, 35-1239, 35-1241

The four changers covered in this bulletin are similar mechanically but differ as to electrical characteristics and type of reproducers:

- 35-1231 — 115 volt 60 cycle —
Crystal Reproducer
- 35-1233 — 115 volt 60 cycle —
Philco Light Beam Reproducer
- 35-1239 — 115 volt 50 cycle —
Philco Light Beam Reproducer
- 35-1241 — 115 volt 50 cycle —
Crystal Reproducer

The Changer plays twelve 10" or ten 12" records To reload, revolve the two posts slightly, grasping them underneath the Shelf Plates. Turn them back after the played records are removed; they will fall and lock when in proper position. Then place the new records on the Shelf Plates, and push "R" button to put Changer in operation To play the other size records, turn the knob at top of each post until proper figure is opposite pointer, and press the "10" or "12" button, to agree with pointer setting To reject a record (or to start a change cycle as for testing purposes)

simply press the "R" (Release or Reject) button, at any time while needle is upon a record To play manually, turn plates out of the way as for reloading, and press "M" button.

ILLUSTRATIONS

The three photos illustrate all vital parts of the Changer. Letters are used alphabetically, to refer to points on the photos; thus, Motor Oiling Holes "AI" are found simply glancing down Column A (right side of Photo A-B) to letters AI.

REPLACEMENT PARTS

When ordering parts for this mechanism, refer to the part number of the entire mechanism in addition to the letters and names of the parts shown in the figures of this bulletin.

OILING

The Changer should be lubricated once a year with about a dozen drops of a good light machine oil at each of the following 6 points. All points can be reached from above, through holes in the mounting plate as follows:

PHILCO

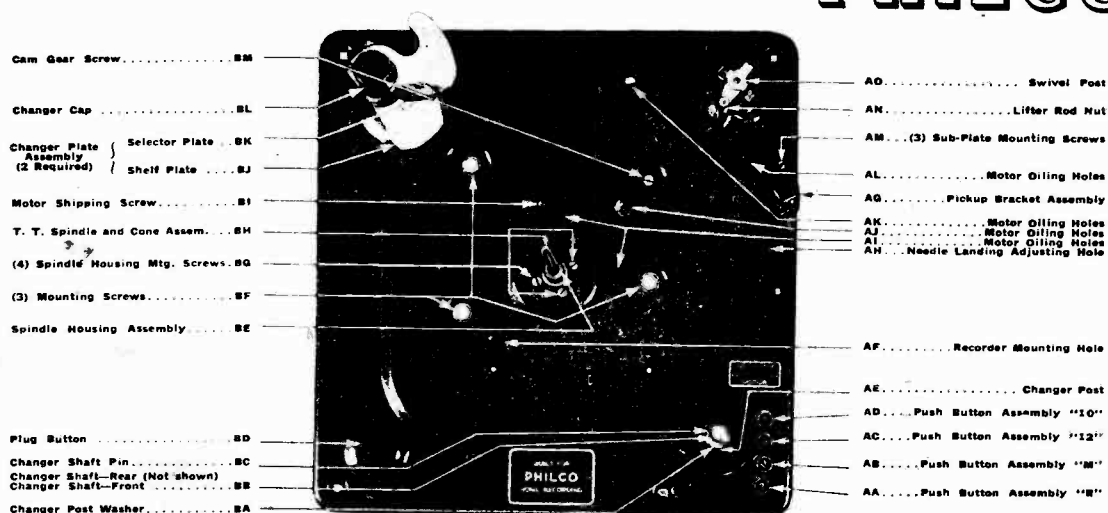


PHOTO A-B. TOP VIEW.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

Philco * Automatic Record Changer

- Nos. 1, 2, 3: Three oil holes on motor gear housing. Reach all three through two holes AI.
- No. 4: Through hole marked AJ, drop the oil upon flat surface of cam. It will distribute itself to proper points.
- No. 5: Through hole marked AM, see felt wick, and drop the oil directly upon it.
- No. 6: Through hole marked AL, see felt wick, and drop the oil directly upon it.

TO CHECK OILING

If squeaks are heard compare the squeak with and without a load of records; any stack of records in motion is likely to squeak a little against a pin through their center. See that all five wicks are in position, including three $\frac{1}{4}$ " round wicks in frame of Motor, one washer-shaped wick on Lift, and one on Cam Lever DI. See that each wick is thoroughly saturated (as it may not be if insufficient oil or too heavy oil has been used). Lift out all three motor wicks, with tweezers; see if old oil has become gummy (commonly due to use of low-grade oil or low-viscosity oil). If necessary, **clean gummed-up wicks with kerosene**. See that each is saturated with good oil; then, before replacing them, drop a little good oil into the holes. The gearbox of the Motor is packed with a semi-fluid grease at the factory, and it should never be necessary to take it apart for lubrication purposes.

GENERAL DESCRIPTION OF THE CHANGE CYCLE

An automatic record player for records of two sizes has three principal duties to perform. These duties are here performed by three mechanisms, interconnected and built together but largely separate in their operation.

(1) The record-changing mechanism — brought into operation originally by the contact of Lifter Cam DG with Pawl DI — is the simplest of the three. It is driven by the cam groove (not visible) on under side (in Photo C-D) of Cam Gear DC. As Cam Lever is forced, by the Pawl, out underneath Lift DJ (which is shown revolved to the right for visibility) the Lift rises and forces roller DE into the under groove in Cam Gear. The motion is transferred to Rear Changer Shaft (at ED) through Cam Connecting Rod EH, thence through Changer Connecting Rod FG to Front Changer Shaft at FJ.

(2) The pickup-operating mechanism — likewise brought into operation originally by the cam-and-pawl action upon Cam Lever — is driven in part by the groove in upper (visible) side of Cam Gear. As Cam Lever is forced out, at the beginning of the

change cycle, against Link at FO, it causes the Link to push upward upon Pickup Plunger CA, thus lifting needle from record. The same pressure upon Link works, through Guide Arm at FO, to force Stud on Guide Arm down into the groove on the Cam Gear. This rotates the pickup arm, while Pickup Plunger holds it up off record. It is rotated first out beyond the turntable until Selector Plates BK have dropped the next record, then rotated back to proper position to start playing.

(3) The mechanism for bringing needle into correct starting position must operate accurately for both 10" and 12" records. Partly due to this requirement, the starting position is **not determined by the cam action**. The upper groove on Cam Gear is designed so that it, acting alone, would carry the needle farther back toward record pin than would ever be desirable as a starting adjustment. Travel of pickup arm toward Record Pin is then stopped, at proper point for lowering onto the record, by action of Lever Hub at CQ. The stopping takes place as lug (upon the Lever Hub) strikes the shoulder on Rod FP. This enables the entire mechanism rotated by cam action on Guide Arm to travel on past the proper point of rotation for record-starting, while the pickup arm itself, which is held rigid to Lever Hub, is accurately stopped at proper record-starting point.

Correct adjustment for starting position of needle requires therefore only correct adjustment of Rods FL and FP; the radial difference of 1 inch between correct starting position for 10" and 12" records is taken care of by exact dimensioning, at the factory, of surfaces at right end of Rod FP which stop against the "10" and "12" key stems. Due to this, when Adjusting Cam at FM is turned (as directed below under Adjustment A) the starting position of needle is simultaneously altered for both 10" and 12" records.

ADJUSTMENTS

There are two adjustments that can be made, **FROM ABOVE: CHANGER NEED NOT BE REMOVED FROM CABINET**. All adjustments are correctly made at the factory, and ordinarily need never be altered. Should it become necessary to readjust, due to accident or tampering, proceed as follows:

A. ADJUSTING LANDING POSITION OF NEEDLE ON THE RECORD. If needle comes down on the sound track, playing of records will not start at their beginning. Insert screw driver through hole AH. Turn screw head on Needle Landing Adjusting Cam FM very slightly **counter-clockwise**. If needle comes down too close to outer edge of record, or out beyond edge of record, turn Adjusting Cam clockwise.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

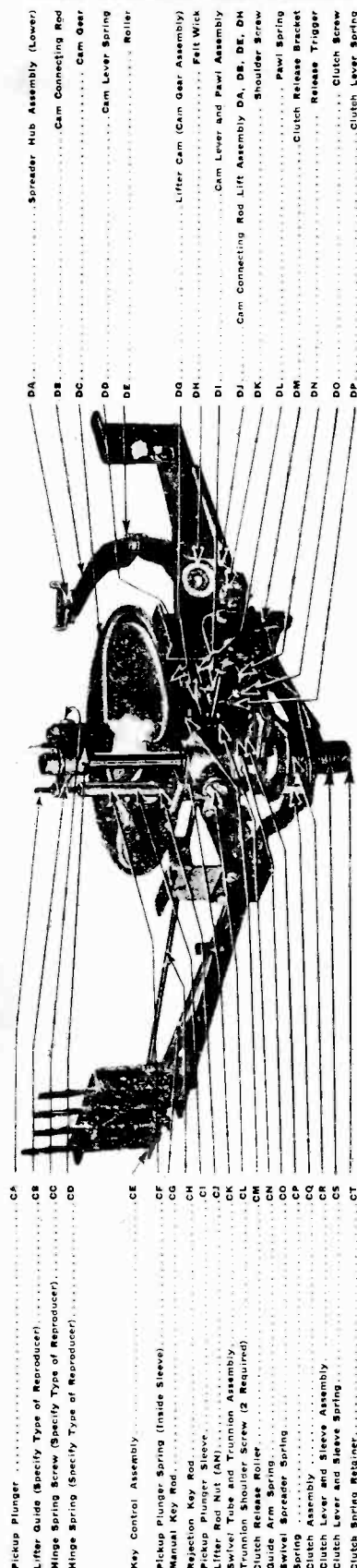


PHOTO C-D. VIEW OF SUB-PLATE ASSEMBLY, TOGETHER WITH CERTAIN OTHER ASSEMBLIES

COMPILED BY M. N. BEITMAN, SUPREME PUBLICATIONS

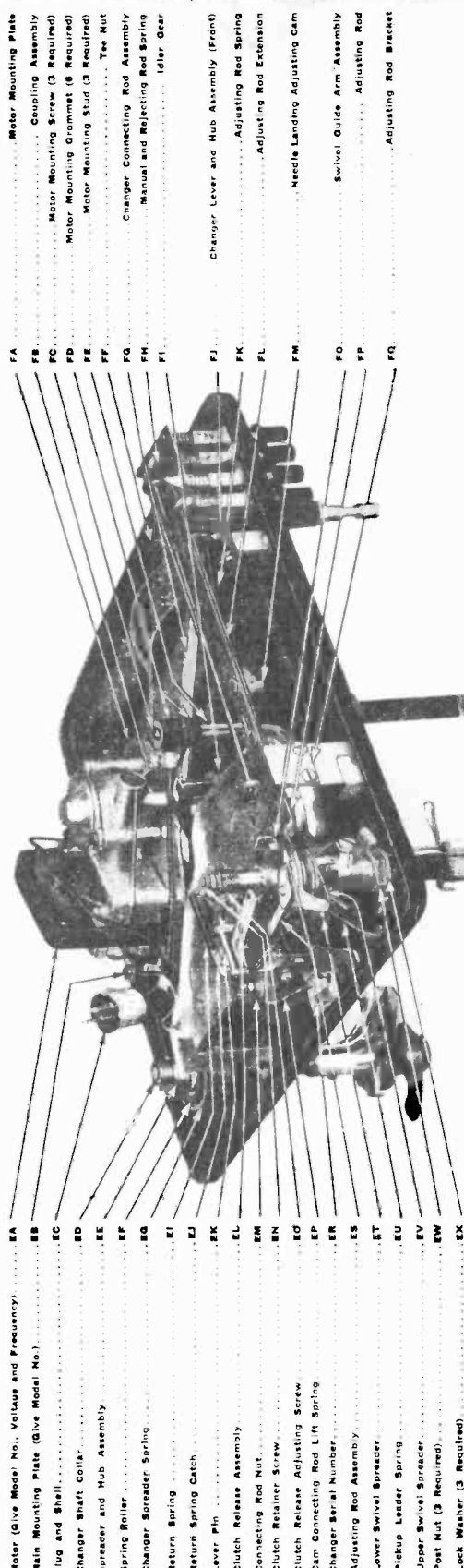


PHOTO E-F. BOTTOM VIEW

Philco * Automatic Record Changer

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

Philco * Automatic Record Changer

The factory adjustment of needle landing is $\frac{1}{8}$ " in from outer edge of record.

Compare also Paragraph 12 on page 5.

B. ADJUSTING HEIGHT TO WHICH PICKUP ARM RISES. The arm should rise, during the change cycle, high enough so that it clears by only $\frac{1}{4}$ " the record above it, next to be played. (Be careful, before deciding that readjustment is necessary, to see that the record at bottom of stack is not a warped one. To make this adjustment, loosen Lock Nut CJ and turn Pickup Sleeve CI to lengthen or shorten Pickup Plunger CA. However, if Pickup is made to rise too close to bottom record, Stud on Guide Arm at FO may not clear the groove in Cam Gear. In making this adjustment, therefore, care must be taken to see that Pickup Arm does not keep moving back and forth continuously (due to Stud remaining in engagement with groove). When correct adjustment is found, tighten Lock Nut securely.

TROUBLE SHOOTING

Cases of failure to operate satisfactorily will generally be found due either to neglect of proper lubrication, or to tampering with the mechanism after it leaves the factory, or to injuries accidentally sustained as by external vibration or by impact of some heavy object. In addition, there is always the possibility that any kind of spring may "go dead" (cease to operate without any visible breakage) even though the utmost factory precautions are taken against it — or that set screws may work loose due to some external vibration. For tightening set screws, a No. 8 size Allen (hexagon) wrench is required: Be sure that set screws are properly seated on the holes or flats provided. Damage from tampering is likely to take the form of bent parts; never bend any part during examination.

1. MECHANISM IS SLOW IN STARTING, OR MOTOR GETS HOT.

May be caused by:

- a. Failure to lubricate properly. Oil thoroughly. See oiling instructions.
- b. Check voltage. Line voltage may be abnormally low or high.
- c. Motor windings damaged. If windings are found damaged, replace motor.

2. MOTOR FAILS TO RUN, EVEN WHEN IT IS ENTIRELY DISCONNECTED FROM OTHER WIRING AND PROPER VOLTAGE IS APPLIED DIRECTLY TO THE TWO ENDS OF ITS WINDINGS.

This indicates trouble in Motor windings. Unless the damage is easily seen and repaired, replace motor.

60

3. MOTOR IS SLOW IN STARTING.

a. Check oiling, as directed on page 2. It may not have been properly done; old oil may have become gummy.

b. Changer may have been in a very cold place, and may not yet have reached room temperature. Give it a fair chance to get warmed up before concluding that Motor is defective.

4. SQUEAKS OR OTHER NOISES, DURING PLAYING OF RECORDS.

Check oiling, as directed on page 2. (If squeaks are heard, they will usually be found to come from the records — not from the mechanism.) See "To Check Oiling."

5. CHANGER IS NOISY WHEN IN CYCLE.

Check oiling. Also see if any part has become loose or bent and is rubbing against a moving part such as the Swivel Guide Arm against the Cam Gear.

6. MOTION OF PICKUP TOWARD RECORD PIN WILL NOT TRIP CHANGER MECHANISM.

If trigger is being properly actuated, probably Cam Lever at EL is binding against Sub-plate. Look for dirt or obstructions; See that Pawl and Trigger DN are working freely on their rivets. If the Lever engages the Pawl so that Lift forces roller up into the under groove on Cam Gear, and if set screws are tight, the change cycle must operate as Cam Gear turns.

7. PRESSING "R" BUTTON DOESN'T TRIP CHANGER MECHANISM.

a. Due to shipping bolts not being removed, causing a bind on manual rod, or manual button is down.

b. Check Key Control Unit CE: See whether there is an obstruction or a bent part which prevents "R" button from going clear down to the end of its travel.

c. Examine Reject Rod CH. If it does not trip, even when properly revolved by complete depressing of "R" button, the rod has probably been bent, and must be restored in some way. Grasp the two ends and twist it slightly.

d. If Trigger DN is being properly actuated but without starting a change cycle, see directions, Paragraph 6.

8. PRESSING "M" BUTTON FAILS TO PUT CHANGER MECHANISM OUT OF ACTION SO AS TO ENABLE MANUAL OPERATION.

a. First see that button goes clear down; then follow its action through Manual Rod CH.

b. Also caused by the manual rod being bent and not projecting up through Sub-plate and stopping Cam Lever when it is released from the Trigger.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

Philco * Automatic Record Changer

9. TRIPS TOO SOON OR BEFORE RECORD HAS FINISHED PLAYING.

This caused by too little clearance between the trigger and the clutch lever assembly. To get more clearance on this adjustment, turn the adjusting screw DO in a clockwise direction a half-turn or whatever is necessary to make tone arm trip on $\frac{1}{4}$ " motion.

10. TONE ARM FALLS OFF RECORD.

Needle sits down too close to edge of records, not adjusted in far enough, or needle landing adjusting cam reversed. It should contact lug on adjusting rod on the long side of cam. Check pick-up leader spring EU. It may have become loose; more tension can be given it by bending down lug.

11. TONE ARM SITS DOWN TOO FAR IN.

Due to adjusting rod bending and not measuring properly. If found to be bent, should be straightened to correct shape so that it will operate freely.

12. NEEDLE LANDS PROPERLY ON RECORD BUT FAILS TO MOVE OVER INTO RECORD GROOVE.

Pickup arm is normally impelled toward center of records by Lead Spring EU. Should a slight increase in its tension be found necessary, this can be easily obtained by slightly bending the lug, to which it is attached, down against Main Plate.

13. WOW IN RECORD REPRODUCTION.

a. Record is warped or otherwise defective or instrument is not being operated at normal room temperature, 70 F°.

b. Motor mounting plate being bent will cause "wow." Straighten it if possible or replace with new plate if too badly bent to warrant straightening. This is only found where rough handling is evident.

c. Motor shaft out of alignment with the turntable shaft (also due to rough handling). To correct, move the motor on its mounting until motor shaft is parallel to the turntable shaft and the Universal coupling is exactly at right angles to motor and turntable shafts, then tighten motor mounting screws securely.

14. LAST RECORD DROPS ON ONE SIDE ONLY.

This suggests a Changer Post bent out of perpendicular to Main Plate.

15. CHANGER CONTINUES CYCLING.

a. Probably due to failure of Lift at DJ to be drawn back out of engagement with Cam Gear. Check the various rivets at which motion occurs, to find the point where friction or binding is interfering with freedom of motion.

b. Make sure that trigger spring is not disconnected. Also that clearance between trigger and clutch lever is sufficient.

16. RECORD IS DRIVEN, BUT NOT HEARD, OR NOT HEARD WITH PROPER VOLUME.

See that Pickup cord is plugged in. Check amplifier and speaker and connections to them, thoroughly. If then trouble is still suspected in pickup, test its output with a vacuum-tube voltmeter. Playing an average record, output should test 1 to 2.5 volts if pickup cartridge is of crystal type. If pickup cartridge is found not to deliver proper output, remove it and install another.

17. RECORD JAMS.

Most slicing trouble (record jams) is due to off-size or defective records, and is no fault of the record changer or record changer adjustment. Properly manufactured records have a uniform semi-circular edge and can be successfully handled by record changers, even though the records vary considerably in thickness.



Cross section of record edge showing a perfect and three imperfect edges.

Records that prove troublesome in the selecting or slicing process can usually be corrected by using a piece of fine sand paper or emery cloth to touch up the edge.

18. AUDIO HOWL.

Record changer not floating on cushions or spring mounting. See that shipping bolts are removed. If unit still does not float, loosen the nuts or mounting assembly allowing unit to rise and float.

19. TURNTABLE IS TIGHT.

This turntable is assembled to the turntable shaft with a taper lock fit in the center. To remove, grasp turntable with both hands, turn slightly forward and backward at the same time pulling upward, or run motor and grasp the turntable while it is revolving, and pull up.

20. THUMP HEARD IN RECORD REPRODUCTION.

This is caused by the motion of the friction clutch when it is momentarily released by the motion of the release lever, which in turn is actuated by the hump on the cam gear. If thump is objectionable, it can be reduced by adjusting the clutch lever at EO to allow only a slight amount of motion of the clutch assembly; also if the clutch spring is too strong, replace with a new spring or cut one-quarter of the length of the old spring or whatever is necessary to assure satisfactory operation.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

PHILCO

Model 41-629, Code 121

Model 41-629 is a Radio-Phonograph combination consisting of a nine (9) tube super-heterodyne radio and an automatic phonograph record changer.

RADIO SECTION

The radio incorporates the Philco Built-In American and Overseas Aerial system; six electric push-buttons for automatically tuning stations in addition to manual tuning; two tuning ranges, covering 540 to 1720 K. C. and 9 to 12 M. C.; variable tone control; automatic volume control; automatic bass compensation; push-pull pentode output tubes with screen phase inversion; loktal tubes; the new noise reducing XXL converter tube and a twelve (12) inch concert grand dynamic speaker.

INTERMEDIATE FREQUENCY: 455 K. C.

POWER SUPPLY: 115 volts; 50 or 60 cycles A. C. current.

Power consumption, 75 watts. These models are shipped for operation on 115 volt, 60 cycle current. To operate on 50 cycle current, the phonograph motor must be changed to Part No. 35-1280.

PHILCO TUBES USED: 7B5, Oscillator; XXL, Converter; two 7B7, I. F. Amplifiers; 7C6, Phonograph Amplifier; 7C6,

2nd Detector, 1st Audio, A. V. C.; two 41, Audio Output and a 6X5G, Rectifier.

ADJUSTING ELECTRIC PUSH BUTTON TUNING: Five push-buttons are used for automatically tuning stations including television sound and one push-button for the power control "OFF-ON".

The procedure for setting and operating electric push-button tuning for the reception of stations is the same as that given for Model 41-260 in Radio Service Bulletin No. 360.

PHONOGRAPH SECTION

The Phonograph includes an automatic record changer which plays twelve 10-inch records or ten 12-inch records at one loading, the new Philco Photo-Electric Reproducer with floating jewel which reproduces sound on a light beam and a special phonograph amplifier stage for operation through the push-pull output tubes of the radio. Connections (No. 84 on the Diagram) are also provided for installation of the Philco Home Recording Unit Kit, Model HR-1, Part No. 45-2820, for making phonograph records in the home. The units can be obtained from your Philco Distributor with complete instructions for installation and operation.

LIGHT-BEAM REPRODUCER ADJUSTMENTS

To reproduce the sound from a record, the light beam of the reproducer must be carefully positioned on the light sensitive cell. If the light beam is not carefully set, the sound reproduction will be distorted, weak or, if the light beam is completely on or off the cell, the phonograph will be silent.

If any of these conditions exist, the following adjustment procedure should be made:—

NOTE—These adjustments should be made with the power line voltage at 118 volts A. C.

A. ADJUSTING WIDTH OF LIGHT BEAM

To make this adjustment push the lamp socket assembly into its holder until a clear image of the lamp filament appears on the light cell. The socket should then be slightly pushed in beyond this point until the rectangular spot of light is $\frac{1}{2}$ " in width. The socket assembly is now rotated so that the spot light is vertical.

B. POSITIONING THE LIGHT BEAM

To position the light beam on the light cell, turn the adjusting screw at the lower left side of the reproducer until the spot is half on the cell and half on the metal frame surrounding the cell.

C. ADJUSTING INTENSITY OF LAMP

When shipped from the factory, the lamp of the reproducer is adjusted for best operating efficiency. The intensity of the light from the lamp is adjusted by Compensator No. 37A located on the radio chassis. Under ordinary circumstances, an adjustment will not be necessary. When replacing the reproducer or lamp, however, there may be a tendency towards microphonic feedback. In this case the compensator is adjusted as follows:

1. Turn volume control on full and play a record.

2. While the record is playing, turn compensator 37A in the direction necessary to eliminate microphonic feedback. By turning the compensator the strength of the pick-up output is increased or decreased.

D. INSTALLING NEW LAMP

When installing a new lamp in the socket, there are two positions in which the lamp can be inserted. Ordinarily, either of these positions can be used. In some cases, however, due to the lamp filament being off center, the lamp must be inserted in the position that gives the best centering of the spot of light on the vibrating mirror.

Operations in Order	SIGNAL GENERATOR		RECEIVER			SPECIAL INSTRUCTIONS
	Output Connections to Receiver	Dial Setting	Dial Setting	Control Setting	Adjust Compensators in Order	
1	Ant. Section of Tuning Cond. with .1 mfd. Cond.	455 K. C.	Tuning Cond. Closed	Vol. Max. Bands Switch S. W.	27A, 27B 30A, 40A	Note A
2	Loop Signal Generator	1720 K. C.	1720 K. C.	Bands Switch "Brdcst"	11A	Note B
3	Loop Signal Generator	1500 K. C.	1500 K. C.	Bands Switch "Brdcst"	7	
4	Loop Signal Generator	550 K. C.	550 K. C.	Bands Switch "Brdcst"	37	Roll comp. to "max." Recheck Operation No. 2
5	Loop Signal Generator	12 M. C.	12 M. C.	Bands Switch S. W.	11, 6	Note C

NOTE A—Compensator (27A) must be adjusted before compensator (27B) and should be done in the following manner: Turn (27A) all the way up, then turn down selecting the first I. F. peak, compensator (27B) is now padded to maximum.

NOTE B—**DIAL CALIBRATION:** In order to adjust the receiver correctly, the dial must be aligned to track properly with the tuning condenser. To do this, proceed as follows: Turn the tuning condenser

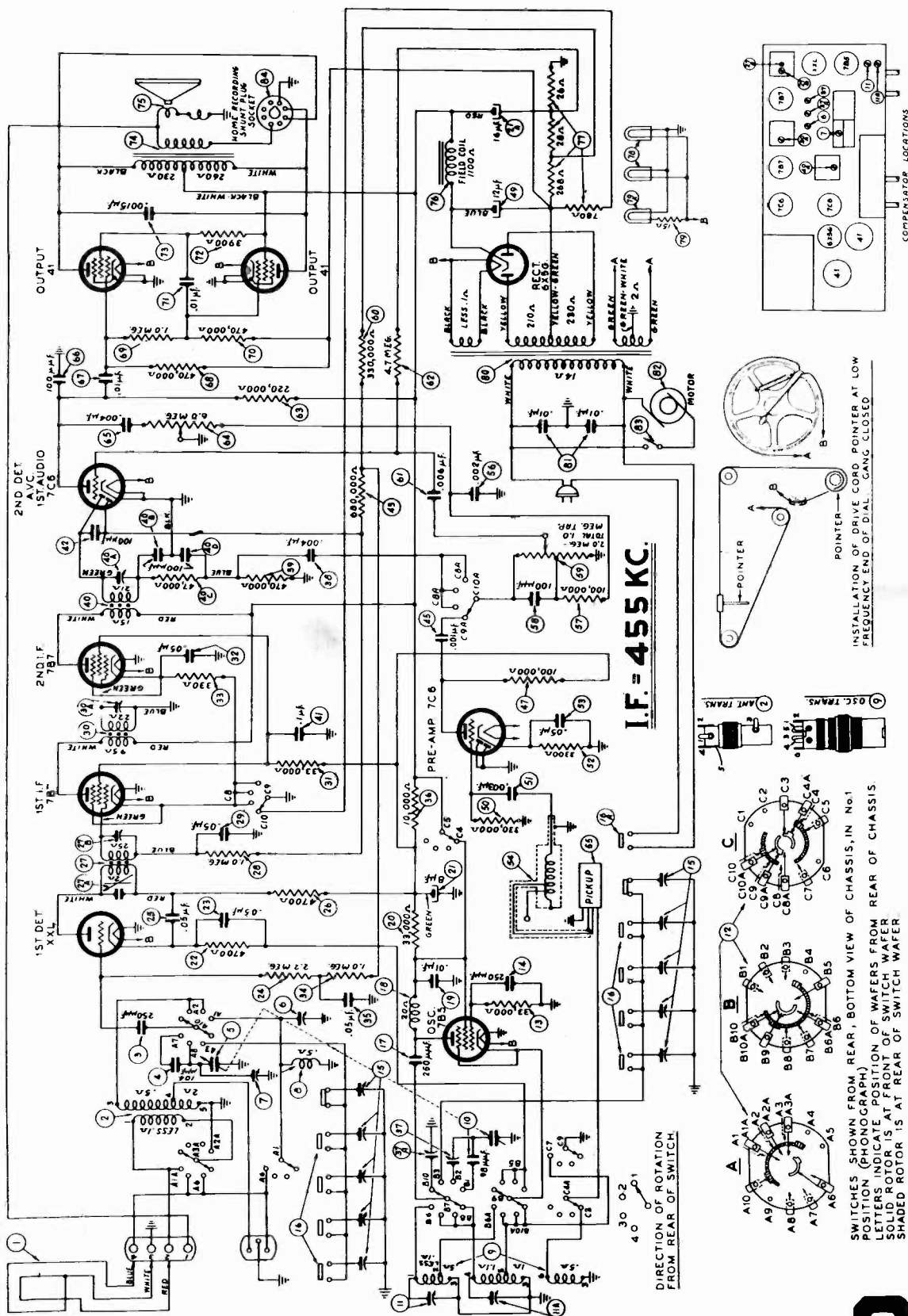
to the maximum capacity position (plates fully meshed). With the condenser in this position, set the tuning pointer on the extreme left index line at the lowest frequency end of the broadcast scale.

NOTE C—Adjust padder (11) to the first signal peak from the tight position. Roll padder (6) slowly to maximum on the second peak from loose position.

62

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MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS



COMPILED BY M. N. BEITMAN, SUPREME PUBLICATIONS

PHILCO

AUTOMATIC RECORD CHANGERS

Part No. 35-1285, 35-1286, 35-1289

The service information in this bulletin covers the adjustments and replacement parts for Philco automatic record changers Part No. 35-1285 (standard changer) and Part No. 35-1286, 35-1289 (Deluxe changers).

These record changers are identical with the exception of the color of the mounting plate, plating of parts on top of changers, motor, Light Beam Reproducer, and electrical wiring circuits for operation. The differences are indicated in the Replacement Part List, page 4, and the Electrical wiring diagrams, page 5.

CHANGERS USED IN PHILCO MODELS

Changer Part No.	Philco Models
35-1285	42-1008, 42-1009, 42-1010, 42-1011, 42-1012, 42-1013
35-1286	42-1016
35-1289	42-1015

GENERAL DESCRIPTION OF CHANGE CYCLE

An automatic record changer performs three principal functions.

- 1—Places record on turn table.
- 2—Lowers tone arm on record in playing position.
- 3—Raises tone arm at end of record or on reject.

These functions are controlled by three mechanisms, interconnected and built together, but each separate in its operation. The motion for each is originated in one central cam gear which has three different and individual cam surfaces. The cam gear is normally at rest while a record is being played, but is put into operation by a saw tooth clutch which takes its power from the turntable and drives an intermediate drive gear. This only takes place when the record changer is put into a change cycle. The cam gear then makes one full revolution to complete the change cycle and comes to rest in a normal position.

The record changing mechanism which places a record on the turntable is brought into operation by a lever with a roller at one end. The lever is attached to the shelf plate mounting post and is operated by a notch under the

cam gear. This causes the mounting post to move slightly, pushing the bottom record off the stack onto the turntable.

The pick-up operating mechanism is likewise brought into operation by the cam gear surface on the top side of the cam gear. The raising lever, when removing the pick-up from the record, receives a swinging motion from the cam gear through an eccentric track on the top outside surface of the cam gear. This eccentric track causes the pick-up to be carried out beyond the turntable while a record is being dropped on the turntable. The light beam pick-up is then brought back into playing position for 10" or 12" records (depending on the shelf positions on the shelf carrier).

The travel of the pick-up arm towards the turntable for lowering on a 10 or 12 inch record is stopped at the proper point for lowering by a movable track on the cam gear. This movable track is operated by a lever which is moved by a spring lever connected through a cord and spring attached to the 10" shelf plate. When the 10" shelf plate is lifted up the movable track is allowed to shift to the outer groove of the cam gear surface so that the pick-up needle will set properly on the outer edge of a 12" record. When the 10" shelf plate is in place for playing 10" records, the cord holds the spring lever and causes the movable track lever to shift to the inner groove as the cam gear revolves.

The electric reject trip causes the clutch to engage and allow the tone arm to be removed from the record by the cam gear. The reject trip operates through a pulsating plate and movable contact on the tone arm raising lever. When the pulsating plate and movable contact make connection, the solenoid is energized, releasing the clutch so that the cam gear can be revolved.

OILING

These record changers should be lubricated once a year with a few drops of good light machine oil at the following points: Motor bearings, drive disc bearings and cam gear bearing.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

PHILCO

CLUTCH ROLLER AND LEVER ADJUSTMENT

The teeth of the clutch should have approximately 1/16 inch clearance, when the lever roller is engaged snugly in the cam gear. If the clutch does not have 1/16 inch clearance the clutch bracket should be slightly bent as indicated in Figure 1. Place ten, 12" records on turntable when this adjustment is made.

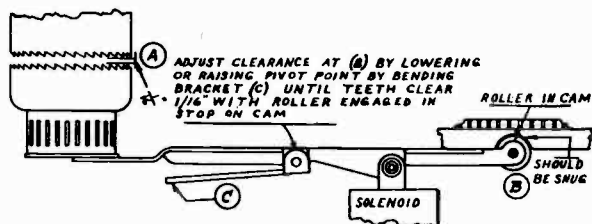


FIG. 1

SOLENOID ADJUSTMENT

The solenoid Armature should set properly in the coil in order to prevent hum and chatter when the solenoid is energized. To make this adjustment, loosen solenoid mounting bracket screws and raise or lower solenoid until armature is set correctly in the coil. See Figure 2.

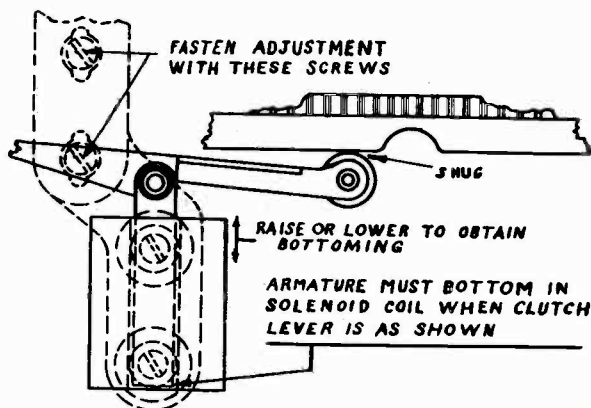


FIG. 2

BUMP LEVER ADJUSTMENT

Set 12" shelf eccentrics bumper in outer position, neutral (large part of cam away from shelf) and then equalize each Bumper to touch edge of 12" record. See Figure 3.

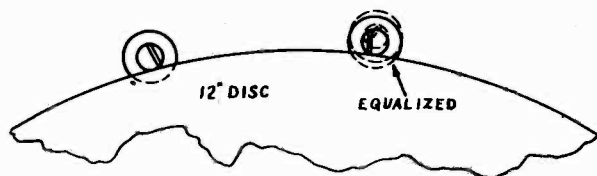


FIG. 3

FORWARD SHELF MOTION ADJUSTMENT—MINIMUM SIZE

(12" Record Push-Off)

1. Place 12" record on spindle and 12" shelf as shown in Figure 4. Start changer in cycle and then stop the change cycle when the crown on the cam gear touches the roller on the shelf lever as shown in Figure 4.

2. In this position loosen screw "A" and lock nut on screw "C"; turn out screw "C" slightly and then retighten screw "C" until eccentric record bumpers fit snugly against 12" record. Then tighten screw "A" and lock nut of screw "C."

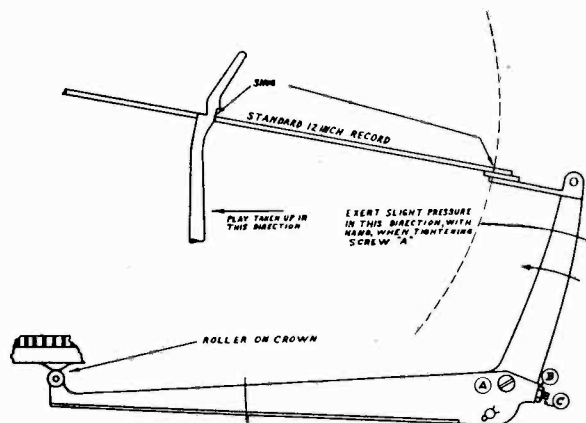


FIG. 4

NEUTRAL SHELF POSITION

(Bump Lever Eccentric)

When the changer is in Neutral position (out of change cycle) the shelf lever should be in the position as shown in Figure 5. To make this adjustment, proceed as follows:

1. Place standard 12" record on the turntable spindle and 12" record shelf plate as shown in Figure 5. The roller of the shelf lever must be off the crown of the cam gear when this adjustment is being made.
2. Hold record snugly against the spindle and shelf bumpers.
3. Loosen screw and adjust eccentric (A) Figure 5, until it touches shelf lever.

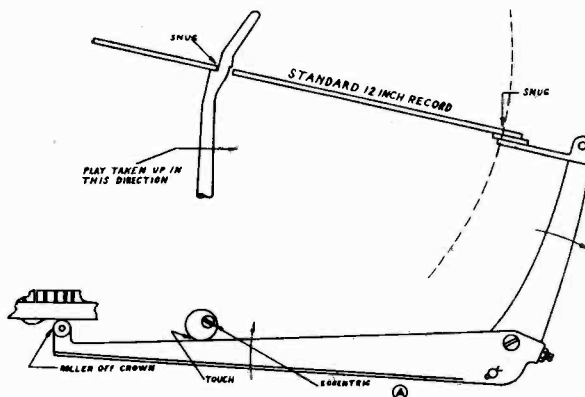


FIG. 5

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

PHILCO

10" SHELF ECCENTRIC ADJUSTMENT

The 10" shelf bump buttons are equalized as follows:
Place standard 10" record on spindle and 10" record shelf. The record should be snug against spindle notch as shown in Figure 5 for 12" records.

Adjust 10" shelf bump buttons so that they are equalized and just touch record.

Do Not Change "Bump Lever Eccentric" shown in Figure 5 and which should be adjusted as given in paragraph "Neutral Shelf Position."

tone arm height

1. Load the turntable with twelve 10" records.
2. Start changer through its cycle, then stop when tone arm is in full raised position and swinging towards records on turntable. If adjustment is correct, the jewel needle will clear the top record by $\frac{1}{8}$ " as the tone arm swings into position for landing on record. If it does not clear top record by $\frac{1}{8}$ ", adjust screw No. 14 in top of tone arm (see Figure 9) until distance is obtained.

ADJUSTING TONE ARM TO INDEX ON 10" AND 12" RECORDS

The position at which the pick-up jewel lowers on the edge of the record is controlled by a vernier adjustment screw on the raising lever. This screw is reached through the hole (12) Figure 9 in the top of the base plate near the tone arm pivot. This screw is used for normal adjustments of the tone arm set down and moves the pick-up approximately $\frac{1}{4}$ ". Adjust the screw so that the tone arm needle will set down approximately $\frac{1}{8}$ " in on record edge. When set for either size record, the adjustment will also take care of the other size record positioning point.

When the tone arm is removed for replacement or greater movement of the tone arm is desired, beyond that obtainable with the preceding vernier adjustment, the two set screws in the collar of the pull-in lever underneath the changer should be adjusted. This is done by loosening one set screw and tightening the other, depending on which way the tone arm is to be moved. Under ordinary circumstances this adjustment will not be required as it has been preset at the factory for proper positioning. When making this adjustment, a .005 shim gauge should be placed between the ball race washer and the tone shaft bearing.

PULSATING PLATE ADJUSTMENT

When the turntable is revolving the pulsating plate of the reject mechanism should clear the main plate by $\frac{1}{32}$ of inch when the crown on the cam attached to the underside of the turntable touches the pulsating lever roller as shown in Figure 6. To make this adjustment proceed as follows:

1. Rotate turntable until the crown of the cam under turntable touches roller of pulsating lever as shown in Figure 6.
2. Adjust screw on pulsating lever until pulsating plate is $\frac{1}{32}$ of an inch from main plate (use gauge).

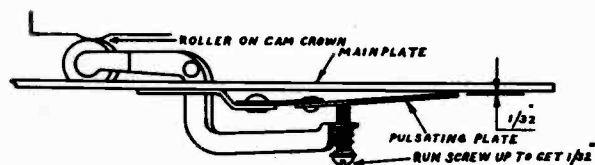


FIG. 6

TRIP ARM ADJUSTMENT

1. Rotate turntable so that the crown on the cam under the turntable is OFF roller of pulsating lever. (See Figure 7.)
2. Move tone arm in towards record until the rubber roller and contact is at the outer edge of pulsating plate. See Figure 7.
3. Turn screw (A) Figure 7 on trip arm until rubber roller just touches pulsating plate, then turn screw (A) slightly further so that the plate moves slightly.

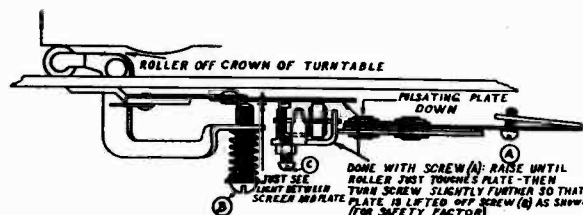


FIG. 7

REJECT CONTACT TRAVEL ADJUSTMENT

Place a record on turntable and tone arm in playing position about halfway in on playing lines of the record. In this position the contact operated by the rubber roller on the trip arm should be carried to within $\frac{1}{16}$ to $\frac{3}{32}$ of an inch of the pulsating plate as the roller moves towards center of changer. (See Figure 8). If contact does not have this spacing as the roller moves and pulls contact up, then adjust screw (C) Figure 8 until correct spacing is obtained.

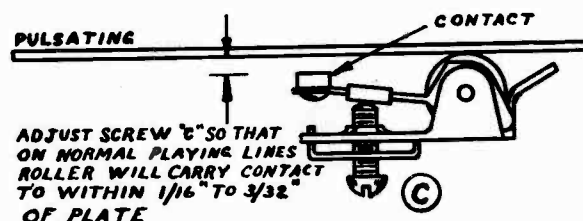


FIG. 8

TURNTABLE SPEED ADJUSTMENT

To set the turntable speed control for the speed range covered by the control, proceed as follows:

1. Push speed lever knob to the "normal" position. Turn ball knob until the motor mounting plate drops to its lowest position. In this position the turntable should be turning at approximately 77 R.P.M. This is indicated by the lines on the edge of the turntable appearing to be slightly moving backwards (counter-clockwise). In order to see these lines move the neon lamp must be energized.
2. If the lines do not travel slightly backward, the nuts on the motor mounting plate retaining shaft should be loosened and the plate moved up or down to get the proper speed, then tighten nuts.
3. After this adjustment, set ball knob to the point where lines on turntable appear to be standing still.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

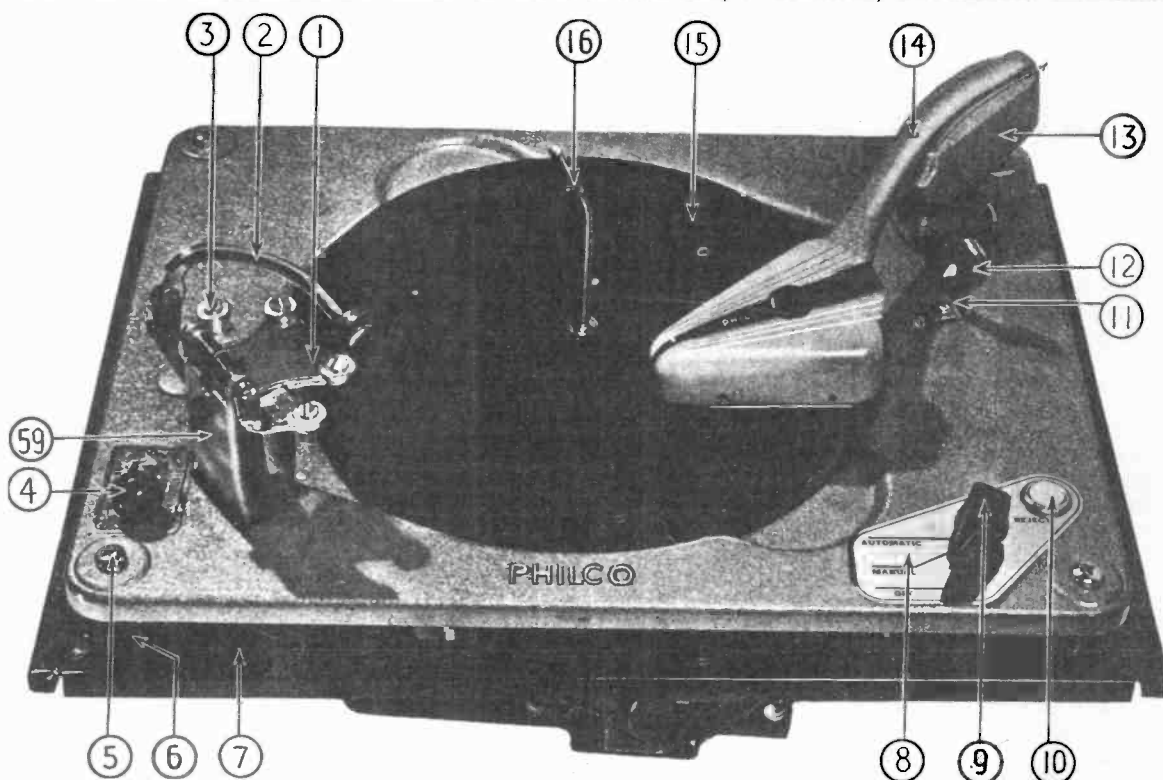
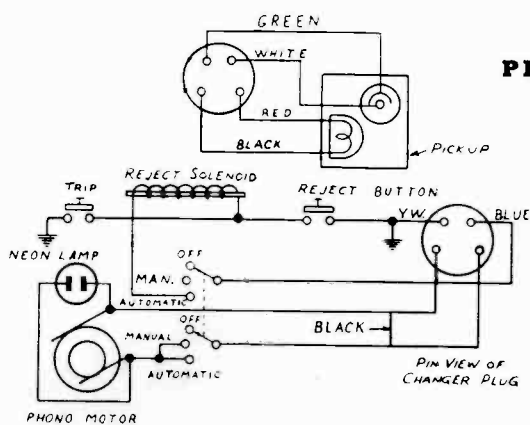
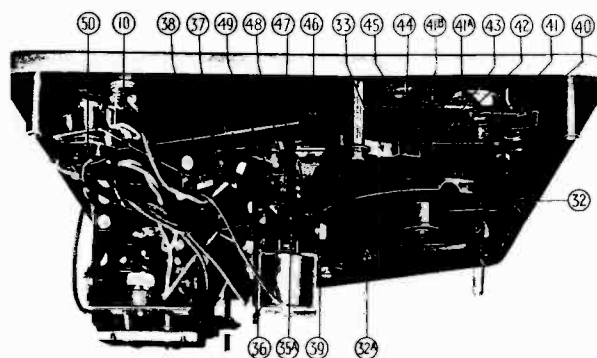
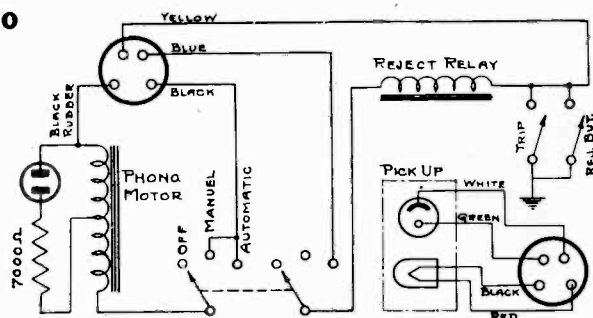


FIG. 9



PHILCO



ELECTRICAL WIRING, CHANGER PART No. 35-1286

ELECTRICAL WIRING, CHANGER PART Nos. 35-1285; 35-1289

COMPILED BY M. N. BEITMAN, SUPREME PUBLICATIONS

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

OSC-22 Wireless Oscillator

At Right—Model OSC-22
Schematic Diagram

Precautionary Lead Dress.—

1. Keep 110-volt leads away from oscillator coil.
2. Leads to oscillator coil must be short and direct.

The RCA Victor Wireless Oscillator is an adapter unit used to convert your Victrola Attachment, such as the RCA Victor Model VA-22, into a wireless record player. This permits you to play phonograph records through your radio receiver without any connecting wires from the Victrola Attachment to the Radio Receiver.

INSTALLATION

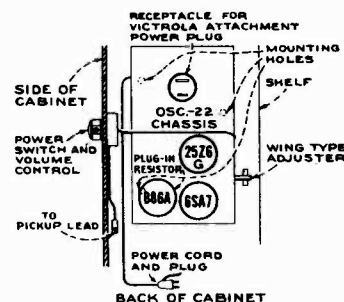
Certain RCA Victrola Attachments such as the VA-22 are provided with a side shelf inside the cabinet for mounting the Wireless Oscillator. Three holes are drilled in the shelf correctly spaced for the oscillator mounting bolts to go through and screw into the holes in the OSC-22 chassis base. To install the OSC-22 first detach the VA-22 power cord from the electric outlet, then:

1. Look in the back of the VA-22 or similar Victrola cabinet and locate the connection from the pickup to the volume control on the side of the cabinet. This is a length of wire with a connector plug on one end. Disconnect the plug from the bayonet socket and then loosen the set screw and remove the knob and the volume control on the other end of the wire, together with the wire, from the VA-22 cabinet. It is attached to the cabinet by a nut and washer.
2. Mount the OSC-22 on the cabinet shelf with the three mounting screws and washers provided.
3. Mount the OSC-22 Power Switch and Volume Control unit in the location from which the VA-22 volume control was removed, using the washer and nut taken from the VA-22 volume control. Be sure that the locating pin on the new control is in the correct position. Attach knob on shaft of Power Switch and Volume Control unit and tighten up the set screw.
4. Insert the pickup plug into the connector on the cable of the newly installed Volume Control of the OSC-22.
5. Insert the plug on the end of the VA-22 power cord into the power receptacle on the OSC-22 chassis base.
6. Insert the plug on the end of the OSC-22 power cord into the electric outlet.

OPERATION

CONTROLS AND MOVING MECHANISM

1. In order to obtain best reproduction, the



newly installed Volume Control should first be turned on about 2/3 full and the Volume Control on your radio receiver turned to the point that gives the greatest volume you are likely to require. Then all control of volume may be made with the knob on the Wireless Victrola Attachment. In particularly noisy locations it may be preferable to set the Volume Control of the Wireless Victrola Attachment at about 2/3 full and regulate with the volume control knob on the receiver.

The Victrola Adjustment.—On the back of the OSC-22 chassis is a small adjusting rod to give reproduction at the most convenient point on your radio receiver dial. With your radio receiver in operation, set the Tuning Control to bring the pointer on the Standard Broadcast Scale to a point at the low frequency end between 530 and about 630 kilocycles, 530 is preferable, at which no station can be obtained. Then set your Wireless Victrola Attachment in operation and turn the adjusting rod on the OSC-22 slowly and carefully until the record reproduction is heard at its best.

Antenna Modification.—If, due to your particular special conditions, insufficient volume or excessive noise interference affects record reproduction, a simple remedy is to connect a wire from the Wireless Victrola Attachment to your radio antenna lead. This is easily accomplished by means of a length of wire to cover the distance between the Victrola Attachment and Radio Receiver. One end of this should be wound 3 or 4 turns around the outside of the short wire projecting from the OSC-22 plug on the power cord. The other end

of the wire should be wound 3 or 4 turns around the outside of the receiver antenna lead. When an RCA Master Antenna is used, the wire should be wound around the counterpoise lead where it is attached to the A-3 terminal of your radio receiver antenna terminal board.

Radio Receiver Controls.—Your radio receiver picks up the record selection as it does a broadcast program. So after the Victrola Adjustment is made, you must tune your radio receiver to the signal from the Wireless Victrola Attachment between 530 and about 630 kilocycles. Do this according to the instructions for operating your particular receiver and turn the Tuning Control to bring the pointer on the dial scale to the low frequency end of the Standard Broadcast band, about 530 to 630 kilocycles, and tune in accurately with the Wireless Victrola Attachment playing a selection. This point is your "Victrola" station. If you have a radio with Push Button Tuning you can set a push button and label it "Victrola." The push button or switch labeled "Victrola," "Record Player" or "Phono" on RCA Victor Radio Receivers previous to 1939 is of no use with the Wireless Victrola Attachment.

PLAYING

Plug the power cord from the OSC-22 into a convenient house outlet, then to play records proceed as follows:

1. Turn on the power to your radio receiver.
2. Set the tuning knob to your new "Victrola" station (530 to 630 kilocycles), or if you have specially adjusted a push button, press it.
3. Turn on power to the Wireless Victrola Attachment.
4. Make the set-up for playing records in accordance with the original instructions accompanying the Victrola Attachment.
5. Turn the Wireless Victrola Attachment Volume Control about 2/3 fully clockwise.
6. Adjust radio receiver Tuning knob to accurately tune in the phonograph selection.
7. Turn Radio Receiver Volume Control to give the loudest reproduction you are likely to require.
8. Adjust the Wireless Victrola Attachment Volume Control to suit.
9. Adjust radio receiver Tone Control if desirable.

Replacement Parts OSC-22 Wireless Oscillator

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

STOCK No.	DESCRIPTION	Unit List Price	STOCK No.	DESCRIPTION	Unit List Price
33793	Ballast—Ballast resistor tube—Type B86A (R8)	.80	33792	Receptacle—A.C. receptacle	.45
12723	Capacitor—56 mmfd. (C2)	.35	33793	Resistor—Ballast resistor tube—Type B86A (R8)	.80
13003	Capacitor—180 mmfd. (C1)	.35	14075	Resistor—8,200 ohms, 1/2 watt (R3)	.20
12694	Capacitor—220 mmfd. (C3)	.35	12412	Resistor—47,000 ohms, 1/2 watt (R1, R2)	.20
4839	Capacitor—0.1 mfd. (C4, C8)	.30	13734	Resistor—120,000 ohms, 1/2 watt (R5, R9)	.20
33834	Capacitor—0.2 mfd. (C9, C11)	.30	13730	Resistor—1 meg., 1/2 watt (R4)	.20
32576	Capacitor—Electrolytic, one section 20 mfd., and one section 12 mfd. (C5, C6)	.80	13601	Resistor—10 meg., 1/2 watt (R6)	.20
12635	Capacitor—1,000 mfd. (C10)	.50	31251	Socket—Tube socket	.25
32501	Coil—Oscillator coil (L1, L2)	1.00	33793	Tube—Ballast resistor tube—Type B86A (R8)	.80
			33794	Volume control and switch (R7, S1)	1.50

68

RCA Victor Model OSC-22

COMPILED BY M. N. BEITMAN, SUPREME PUBLICATIONS



RCA Victor

RECORD PLAYERS

MODELS R-93-A, R-93-2, R-93-S, and R-94

Introduction

The RCA Victor Record Players Models R-93 (third production), R-93-A (first and second production), R-93-2 Deluxe, R-93-S, and R-94 Deluxe are designed to provide record reproduction to the owner of a radio receiver by utilizing the audio amplifier system and loudspeaker of the radio receiver. Methods of connecting these record players to the radio receiver are outlined in the Model R-93 Service Notes (third edition) and in this booklet. Model R-93 (first and second production) is listed in the "Specifications" tabulation of this booklet, for convenient reference.

Note

1. (Applies to Model R-93-S only). It is necessary to short the 0.1 mfd. blocking capacitor C1 in Model R-93-S (see figure 6) for cases in which the control grid d-c bias, or cathode current flow, would be removed or prevented by this capacitor when the record player switch is thrown to "Phono" position. C1 is provided to permit operation on battery receivers without shorting bias batteries, etc. Cases in which it is necessary to short C1 are indicated in "RCA Victor Receivers—Details of Lead Connections" of this booklet.

2. (Record Player Switch Jumpers) — Some record player switches do not have jumpers J1 and J2 (see figure 3) attached. When the switch is so connected and turned to phonograph position, the voltage developed by the pickup is fed into the radio receiver through the green wire and shield, and at the same time the yellow wire is connected to shield. The jumpers J1 and J2 permit the yellow lead to kill radio by connection to shield. The jumpers should be removed where the yellow lead connects in such a position as to short bias batteries, etc. Check the switch to be used for the method chosen and use the jumpers accordingly. Correct jumper connections are indicated in "RCA Victor Receivers—Details of Lead Connections" of this booklet.

To prevent confusion, replacement parts lists are provided separately in this booklet for Models R-93 (third production), R-93-A (first and second production), R-93-2 Deluxe (first production), R-93-S (first production), and R-94 Deluxe (first production), respectively, and should be consulted whenever making replacements to these various models.

Description and Service Data

MODEL R-93

(Third Production)

(Walnut, Red, White, Black)

The Model R-93 (third production) in colors of Walnut, Red, White, or Black are similar electrically to the original R-93 (first and second production) but may be identified mechanically by the curved tone arm. The original Model R-93 had a straight tone arm. Refer to Model R-93 Service Notes (third edition) Phonograph Motor Service Data (second production motors) for motor details and adjustments.

MAGNETIC PICKUP

The pickup used in the phonograph unit is of an improved design. The horseshoe magnet is rigidly welded to the pole pieces and is a centering spring attached to the armature to maintain proper adjustment and to provide a limiting effect on the movement of the armature. The frequency response is substantially uniform over a wide range. Service operations which may be necessary on the pickup are as follows:

CENTERING ARMATURE

Refer to figure 1 showing the pickup inner structure. The armature is shown in its proper relation to the magnet pole pieces, i.e., exactly centered. Whenever this centering adjustment has been disturbed it will be necessary to remove the pickup mechanism from the tone arm by removing the needle holding screw and the two mounting screws from the front of the tone arm, holding the pickup assembly to keep it from dropping. Unsolder the two leads from the lugs on the terminal board at the rear of the pickup. Insert a small rod or nail into the armature needle hole and replace the needle holding screw, tightening it to hold the rod securely. If the armature clamping screws A and B have not been disturbed, screw or screws C should be loosened which will permit the armature to be moved from side to side, the rod acting as a lever to perform this operation. The proper adjustment is obtained when the armature is moved to the extreme position on each side (the movement being limited by

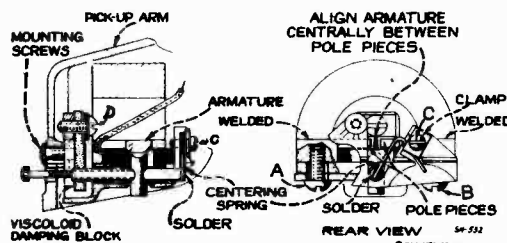


Figure 1—Details of Pickup
[Models R-93 (3rd prod.), R-93-A (1st prod.), R-93-2 Deluxe (1st prod.), and R-93-S (1st prod.)]

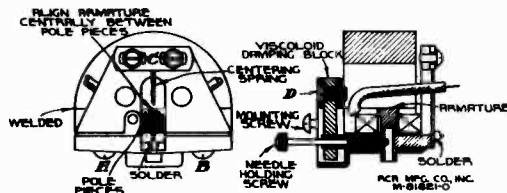


Figure 2—Details of Pickup
[Models R-93-A (2nd prod.) and R-94 Deluxe (1st prod.)]

the armature striking the pole pieces) and then brought to the mid position between these two extremes. Screw or screws C should then be tightened. The armature position should then be central between the pole pieces and at right angles to them. With a little practice, the correct adjustment of the armature will be obtained. The air gap between the pole pieces and the armature should be kept free from dust, filings, and other foreign material which would obstruct the movement of the pickup armature.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

RCA MANUFACTURING COMPANY, INC.

R-93, R-93-A,
R-93-2, R-93-S, R-94

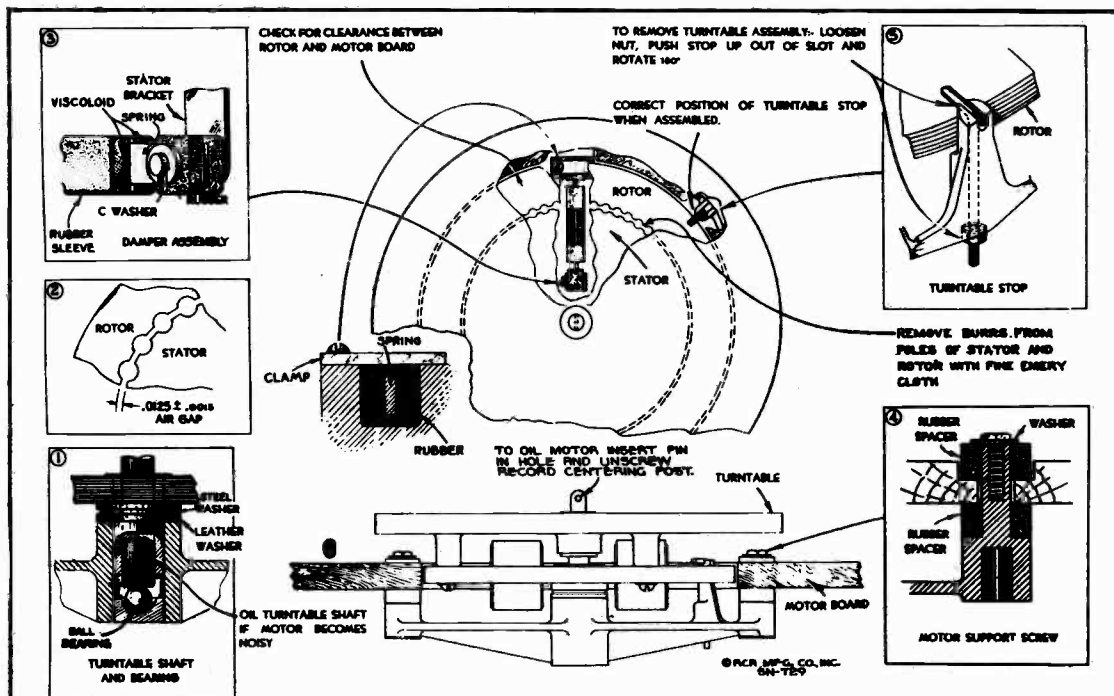


Figure 4—Details of Motor
[Model R-93-A (1st and 2nd prod.)]

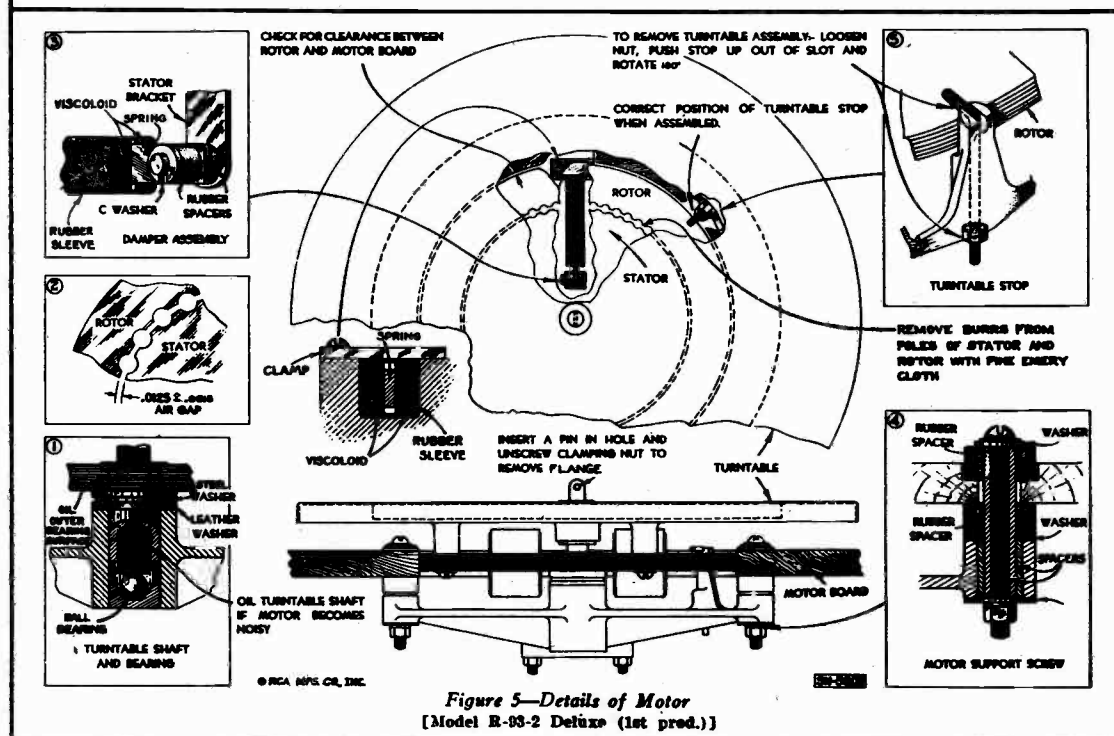


Figure 5—Details of Motor
[Model R-93-2 Deluxe (1st prod.)]

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

REPLACING COIL

Whenever there is defective operation due to an open or shorted pickup coil, this coil should be replaced. Remove the pickup mechanism and terminal board as described above. Remove screws A and B and the magnet assembly. Remove the bakelite coil support (with coil attached) and insert the new coil support assembly in its place, after which replace the magnet assembly and center the armature as described above, then re-assemble the remainder of the unit. Only rosin core solder should be used for soldering the coil leads and pickup leads to the pickup terminal board. This same type of solder should be used when necessary for soldering the centering spring to the armature.

MAGNETIZING

Loss of magnetization will not usually occur when the pickup has received normal care because the magnet and pole pieces are one unit and the magnetic circuit remains practically closed at all times. When the pickup has been mishandled, subjected to a strong a-c field, jolted, or dropped, there may be an appreciable loss of magnetic strength, in which case it will be necessary to remagnetize the entire structure. To do this, it will be necessary to first remove the pickup mechanism from the tone arm, and then remove the magnet assembly. Place the magnet assembly on the poles of a standard pickup magnetizer such as the RCA Stock No. 9549 Pickup Magnetizer and charging the magnet in accordance with the instructions accompanying the magnetizer. It is preferable to check the polarity of the pickup magnet and to remagnetize it so that the same polarity is maintained.

MODEL R-93-A

(First and Second Production)
(Walnut)

The cabinet of the Model R-93-A is similar to that of the Model R-93 Walnut finish. This model incorporates an acoustic compensated volume control, see figure 3. Model R-93-A (first production) and Model R-93-A (second production) differ only in the pickup construction, the essential difference being in the armature centering spring and spring clamps. Reference to pickup details, figures 1 and 2 will reveal the fact that the armature centering spring is respec-

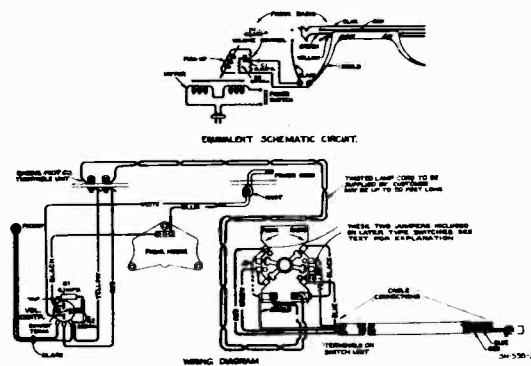


Figure 3—Wiring Diagram and Equivalent Schematic Circuit
[Models R-93-A (1st and 2nd prod.) and R-94 Deluxe (1st prod.)]

tively "V" and "T" shaped for the Model R-93-A (first and second productions). Refer to "Model R-93 (third production)" and figures 1 and 2 for pickup adjustments.

The motor differs slightly in construction and mounting details from that used in the Model R-93 (second production). Refer to figure 4 for motor details. Refer to Model R-93 Service Notes (third edition) for motor coil connections.

MODEL R-93-2 DE LUXE

(Walnut)

Model R-93-2 Deluxe is finished in walnut and is electrically identical to Model R-93 (third production), however, the cabinet is larger in size and has a hinged lid which may be closed while playing the records. The turntable is 10 inches in diameter. The motor differs slightly in construction from that used in the Model R-93 (second production). Refer to figure 5 for motor details and to Model R-93 Service Notes (third edition) for motor coil connections.

MODEL R-93-S

(Walnut)

Model R-93-S has a spring wound motor and is primarily intended for use with battery receivers. The pickup and tonearm are identical to those described in "Model R-93 (third production)," therefore the adjustments will be the

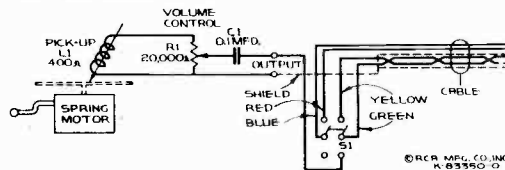


Figure 6—Schematic Circuit Diagram
[Model R-93-S (1st prod.)]

same. Reference to the Schematic diagram figure 6 will show a capacitor C1 in series with one of the leads to the binding posts. The purpose of C1 is to permit operation on battery receivers without shorting bias batteries, etc. Observe Note 1 under "Introduction" when making connections to radio receivers.

MOTOR

The drive motor is of simple design and substantial construction. It should require little or no service if properly maintained. Attention to lubrication of the moving parts and occasional cleaning of the mechanism will go far to prevent faulty operation. Should it become necessary to repair the motor, the following procedure should be applied referring to figure 7:

REMOVING MOTOR FROM CABINET—Remove the winding key. To dismount the motor, unscrew the spindle cap with a screwdriver and remove turntable, slightly tapping the spindle while exerting an upward lift on the turntable. Remove the bottom cover from the cabinet. Loosen the screw holding the speed regulating lever and remove the latter. The four nuts holding motor to motor board should then be loosened to permit removal of motor assembly.

Caution—Allow the motor mechanism to run down completely before attempting adjustment, repairs, or replacement.

REPLACING MAIN SPRING—In case of main spring failure the entire spring barrel and gear should be replaced. Remove spring barrel spindle screw by unscrewing to right. Remove the "C" washer and two pillar screws holding bottom plate. Remove plate and intermediate spindle shaft. Replace main spring barrel, intermediate spindle shaft, and bottom plates.

WINDING SHAFT SPRING—This spring functions as a friction ratchet. It may be removed by first removing pin holding winding gear on shaft, removing shaft, and then the screw holding the spring.

GOVERNOR ADJUSTMENTS—The mesh of the worm and fibre gears is adjusted by rotation of the eccentric spindle bearings. The adjustments should be made so that the worm meshes properly with the fibre gear and rotates freely without

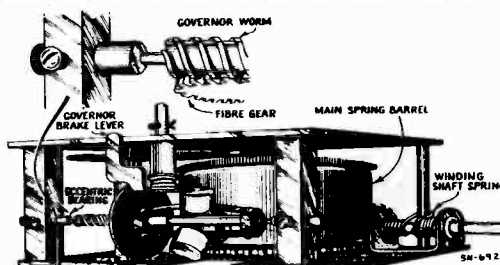


Figure 7—Details of Motor.
[Model R-93-S (1st prod.)]

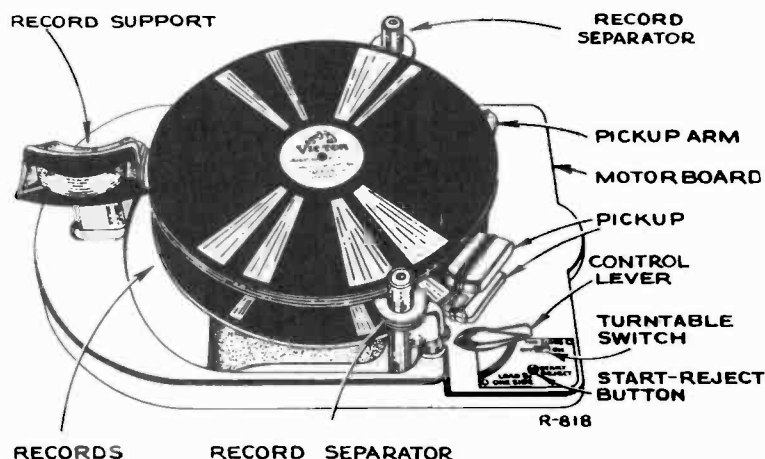
binding. The bearings should be accurately aligned with each other. The minimum of spindle end play which permits smooth operation should be used.

R-93, R-93-A,
R-93-2, R-93-S, R-94

RCA Victor

RP-151

Automatic Record Changer



Introduction

The RP-151 is an automatic record changer of revolutionary design. It will play a series of fifteen 10-inch or twelve 12-inch records on both sides, or one side, at will. The pickup arm has two light-pressure, sapphire permanent-point, crystal pickups mounted on one arm. One pickup plays the top side of each record; the other pickup plays the bottom side. The turntable rotates in reverse while the bottom side of a record is being played.

The mechanism has two motors. One motor is used solely to rotate the turntable; the cycling motor drives the mechanism during the automatic record-changing cycle.

There are three simple controls.

1. **A Record Support**—Turn it one way to load a stack of 10-inch records, the reverse way to load 12-inch records.

2. **A Control Lever**—Push the lever to load position, then back to the "two-side" position to play both sides of each record; pull it forward to play only the top side of each record.

3. **A "Start-Reject" Button**—Push the button to start the mechanism or to reject a record when the mechanism is operating.

The mechanism uses a **low-noise** crystal pickup. Objectionable "needle chatter" has been removed by utilizing a low mass wire, suitably damped, to hold the sapphire point.

Service Procedure

To remove the bottom plate assembly from the motorboard:

1. Disconnect pickup leads from terminal board.
2. Remove the motor lead plugs from their sockets.
3. Loosen the set screws "C" and lift the tone arm out. Be careful not to lose the two ball bearings at the top and bottom of the tone arm pivot shaft.
4. Remove the four bottom plate mounting screws.

To remove the tone arm, turn out the slotted-head bearing through the side of the arm. Then simply lift the arm off. When replacing the arm, do not tighten the bearing enough to cause a bind in vertical motion.

Cautions

1. Do not oil the tone arm pivot shaft.
2. Never use force to start or stop the motor or any part of the record-changing mechanism or pickup arm.
3. Warped or damaged records may cause the mechanism to jam.
4. Do not leave records on the record-holder posts as they may warp, particularly in warm climates. Warped records may be flattened by placing them on a flat surface with a flat heavy article placed on top of them for a few days.
5. If for any reason the phonograph stalls, turn off the turntable switch and remove the records from the record holder shelves. Start the turntable and allow the pickup arm to complete its cycle.
6. Packing material and special shipping brackets should be given to the customer at the time of installation. Advice as to their use may save service calls should the customer later move the instrument any considerable distance.
7. Do not interfere with the motion of the tone arm at any time.

Lubrication

1. Apply Houghton Stayput at all bearing surfaces.
2. Apply graphite grease at cam and gear surfaces on the main cam and gear, pinion gear (1), and segment gear, pivot and cam surfaces on the slide, and the spring pin on the counterweight.
3. Apply Lubriplate No. 110 at all other points.
4. The rubber tires must be kept clean and free from oil, grease, dirt, etc., at all times. Any quick-drying naphtha is satisfactory for cleaning the rubber.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

Service Hints

Last 10-inch record drops before next to last record is out of the way.

Separating knife jams on record edge.

Record on turntable strikes swivel posts.

Mechanism trips continuously.

Mechanism fails to trip.

Mechanism jams.

Sapphire jumps grooves intermittently.

Sapphire repeats grooves intermittently.

Control Lever can be pushed to only one position.

Unequal output from the two pickups.

(Trimmer Balance)

Delay the knife timing by placing a 1/8-inch spacer between the separator lever and the bottom bushing and then making adjustment B.

Record warped. Irregularities on the record separating knife and shelf teeth impeding the "elevating search" feature of the knife. Spacing washer too thick.

Tighten the belt drum springs (11) by taking off turns.

Cycle motor leads impeding movement of mercury switch.

Smooth off the end of the cycling switch trip lever and the stud against which it works.

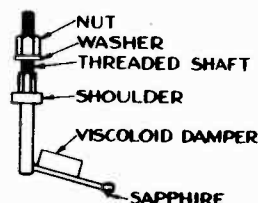
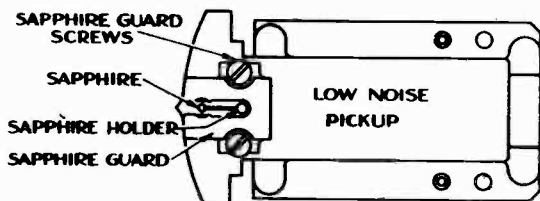
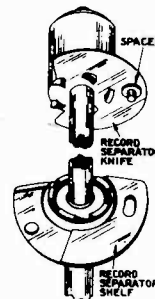
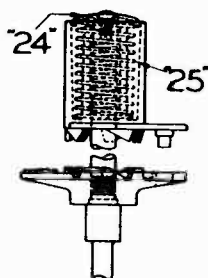
Stud on main cam and stud on star wheel have hit head on. This generally results when operator improperly positions the control lever and leaves it midway between the "One Side" and the "Two-Side" positions.

Check dress of pickup cable in motorboard slot, making certain that it is free over the full range of tone arm movement.

Feed-in spring is striking the trip lever pawl.

Check position of index lever with respect to the control lever shaft. When the control lever is in the two-side position, the star wheel lever stud should be at the end of the index lever slot nearest the control lever shaft. A set screw in the index lever hub permits positioning of the index lever.

Adjust the trimmer capacitors until the outputs are at the same level. Since there is a slight interaction between the trimmers it may be necessary to repeat the adjustment a second time.



Function of Principal Parts

Record Support.....Drives two belts which act to position the record separator posts in unison. This allows for loading 10- or 12-inch records.

Record Separators.....Provide shelves for holding stack of records and provide knives for separating bottom record from stack. Knives also support record stack during change cycle.

Control Lever Train.....Provides selection of two-side or one-side playing. Acts through index lever and star wheel lever to position star wheel.

Start-Reject Button Train..Acts through button lever, reject lever, ratchet lever, cycling switch trip lever, and cycling switch pivot lever to tilt the mercury cycling switch and begin the automatic cycle.

Ratchet Lever.....Starts the automatic cycle by releasing cycling switch trip lever when acted upon by reject lever or trip lever pawl.

Main Cam and Gear.....Directs and co-ordinates all cycle operations.

Tone Arm Lever.....Directs horizontal movement of tone arm.

Tone Arm Return Lever..Keeps tone arm moving in with receding tone arm lever and provides proper landing. Provides feed-in spring to push sapphire into music grooves after landing.

Trip Lever.....Its pawl acts on the ratchet lever to trip the mechanism.

Record Separators' Lever Train.....Directs motion of separator knives and shelves.

Tone Arm Elevating Control Lever.....Directs vertical motion of tone arm through tone arm elevating lever and elevating rod.

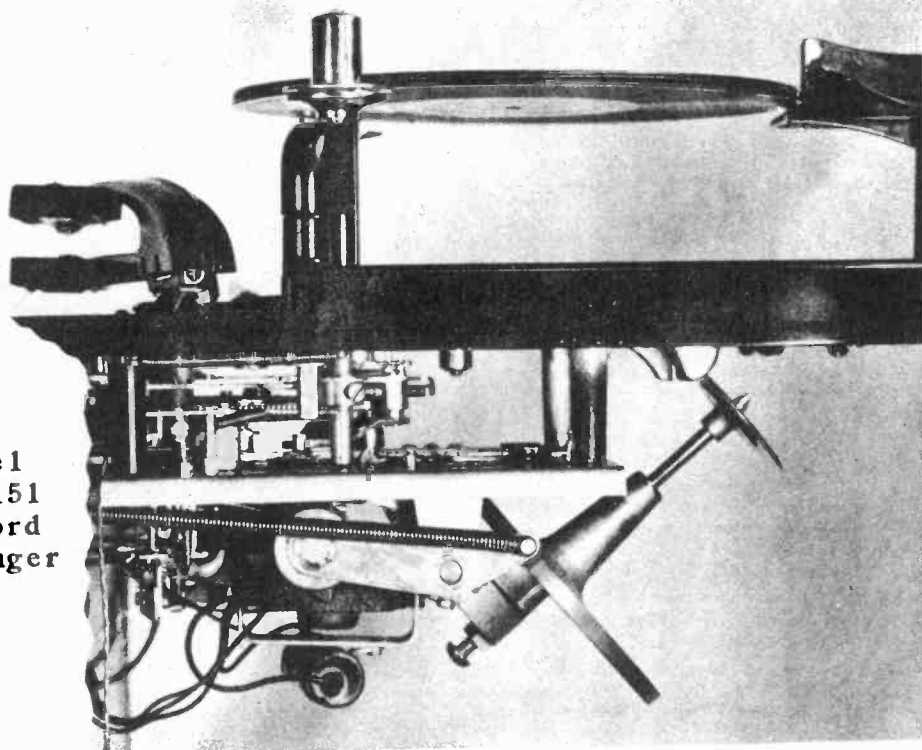
Slide Train.....The slide roller lever is directed by the main cam and acts through the slide throw-out lever and the slide control lever to move the slide.

Slide.....Directs tilting of the turntable. Directs motion of record separator lever train. Unlatches reversing switch.

Reversing Lever.....Controls turntable rotation by means of reversing switch.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

RCA
Model
RP-151
Record
Changer



Two-Side Operation

Slide Cycle

Turn Record Support to 10" or 12" position as desired.

Place Records on Posts.

Turn Control to "Load" position and return to "Two-Side" position.

Push "Start-Reject" button.

1. Record Separator posts position themselves in unison by means of belt drive.

1. Star wheel stud is rotated away from slide throw-out lever, thus insuring a "Slide" cycle. Motion is transferred from control to the index lever and the star wheel lever. Star wheel lever stud rides in the index lever slot.

1. Through button lever the reject lever is made to push on ratchet lever stud.
2. The ratchet lever moves out of the way of the cycling switch trip lever.

3. Switch trip lever moves the cycling switch pivot lever, thus tilting the switch and closing the circuit to the cycle motor.
4. Cycle motor starts.
5. Main cam is driven by cycle motor through a chain of gears.

Tone Arm Rises.

1. The elevating control lever is rotated because its stud rides on the outer guide on the bottom side of the main cam.

2. Elevating control lever closes shorting switch.
3. Elevating control lever pushes reversing lever.
4. Reversing lever rotates.
5. Elevating control lever pushes elevating lever roller.
6. Elevating lever roller moves in allowing elevating lever to rise, thus pushing up on elevating rod and tone arm.

Tone Arm Swings Out.

1. Reversing lever throws reversing switch. Then it latches and holds the switch button in position.
2. Turntable rotates counter-clockwise.

3. Tone arm lever swings outward from motion of its stud against outer guide on top of main cam.

4. It pushes against stud on trip lever.
5. Trip lever moves out and latches to return lever carrying it along.
6. Feed-in spring is depressed.
7. Cycling switch trip lever is reset by protrusion on main cam, and thus moves out of way of ratchet lever stud.
8. Ratchet lever returns to its original position.

Turntable Discards Played Record.

1. Eccentric track on top of main cam moves slide roller lever.
2. Slide roller lever pushes slide throw-out lever.

3. Slide throwout lever moves slide control lever.
4. Slide control lever moves slide.
5. Underneath stud on slide moves along edge of turntable locating lever and finally rotates it.
6. Locating lever releases turntable assembly to control of counterbalance and spring, leaving sector gear free to move.
7. Slide strikes sector gear finger and rotates sector gear.
8. Sector gear rotates segment gear.
9. Segment gear, being fastened to turntable pivot shaft, turns this shaft and tilts the turntable.
10. Reversing lever is unlatched by slide at end of its travel. Turntable motor returns to clockwise rotation.

Record Drops from Stack to Motorboard.

1. Stud on top of slide moves into claw cam of the separator lever.
2. Lever rotates, thus moving link and crank.
3. Crank rotates separator assembly.

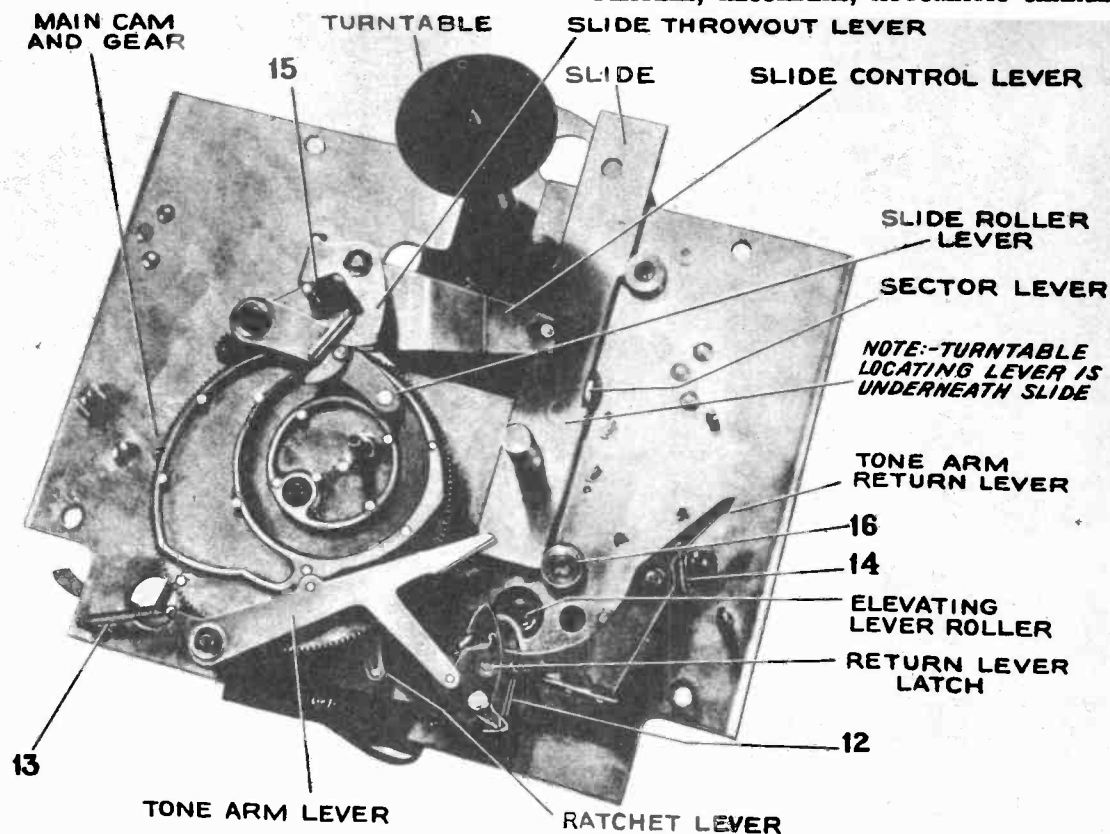
4. Record knife separates bottom record from stack.
5. Shelf rotates out from under bottom record and allows it to drop to motorboard.

Turntable picks up next record.

1. Slide reverses direction of travel.
2. Shelf and knife return to original position as top stud on slide releases separator lever.

3. Spring and counterbalance return turntable past its original position as slide recedes from sector gear finger.
4. Turntable spindle finds hole in record and picks record up.
5. Underneath stud on slide finally rotates locating lever.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS



6. Locating lever takes control and returns turntable to exact original position.
7. Turntable drive wheel again contacts drive disc and rotates it.
8. Off-center stud on the main cam and gear pushes star wheel stud.
9. Star wheel rotates 90°.
10. Stud on star wheel unlatches slide throw-out lever.

Tone Arm Returns.

1. Main cam allows tone arm lever to recede.
2. This allows return lever to follow, carrying trip lever along.
3. Return lever stops when its index finger reaches rear separator shaft.
4. Thus the trip lever and tone arm are stopped at the correct landing position.

Tone Arm Lowers.

1. Lower outside face on main cam recedes.
2. Elevating control lever returns to original position.
3. Reversing lever reaches original position.
4. Elevating lever is lowered, elevating rod follows and tone arm lowers.
5. Elevating control lever releases shorting switch.
6. Release stud on the tone arm lever pushes back the latch on the return lever.
7. Release of the latch frees the return lever from the trip lever and the tone arm.
8. Cycling switch pivot lever drops off the end of the main cam face.
9. Cycling switch returns to original position.
10. Cycle motor stops.

Sapphire is pushed into music grooves.

1. Feed-in spring returns to original position pushing stud on trip lever.
2. Trip lever carries tone arm slightly in.

Top side of Record Plays.

Non-Slide Cycle

Sapphire Reaches Eccentric Groove. Mechanism Trips.

1. Trip lever receives backward motion from tone arm.
2. Trip pawl pushes ratchet lever.
3. Ratchet lever stud moves away from cycling switch trip lever.
4. Cycling switch trip lever moves cycling switch pivot lever. Switch tilts, closing circuit.
5. Cycle motor starts.

Tone Arm Rises and Swings Out. Same as previous cycle.

Turntable Remains in Playing Position and Turntable Rotation Reverses.

1. Eccentric track on top of main cam moves the slide roller lever.
2. Slide throw-out lever is not picked up by star wheel since this lever was unlatched during previous cycle.
3. Thus the slide does not move, the reversing lever remains latched and the turntable motor continues to revolve counterclockwise.
4. Off-center stud on main cam pushes stud on star wheel.
5. Star wheel rotates 90°
6. Star wheel latches slide throw-out lever.

Tone Arm Lowers. Same as previous cycle except: 1. Reversing lever remains latched and does not return.

Bottom Side of Record Plays.

Slide and non-slide cycles continue alternately until entire stack of records has been played.

After last record is played, mechanism trips, goes through cycle, and tone arm comes to rest on "Stop" button, thus opening the a.c. circuit.

In the "One-Side" position, the star wheel is pushed out of the path of the main cam stud and all cycles are slide cycles.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

RP-151 Adjustments

Records will not fit properly on the three record posts.

(Record Post Spacing)

Turn the record support to the 10-inch position. Loosen the set screws "A." Move the front record separator post until its shaft is 1/64 from the end of the motorboard slot. Turn the belt drum to take up the slack in the belt and tighten the zinc-plated screw being certain to maintain the 1/64-inch spacing. Repeat the adjustment on the rear separator post. Check by placing a 10-inch record on the shelves posts and then tighten the copper-plated screws. Care should be taken to leave a small vertical clearance between the belt drum and the motorboard. The 12-inch position is automatically maintained.

Records fail to drop at proper time.

(Record Shelf Timing)

Place a 10-inch record on the shelves so that it contacts the front and rear record separator posts. With the changer out-of-cycle loosen the set screws (B) and turn the record separator shaft until the record separating knife is 3/32-inch away from the record edge. Position set screw collar bottom edge 1-3/32 above the bottom plate. Tighten the zinc-plated screw, run through cycle several times as a check, then tighten the copper-plated screw. Repeat the adjustment on the rear separating knife.

Sapphire fails to land at proper point.

(Tone Arm Position with Respect to Trip Lever)

Place a 10-inch record on the turntable and rotate the changer through cycle until the sapphire is just ready to land. Place a .001 feeler between the shoulder on the tone arm pivot shaft and its ball bearing as shown. Loosen the set screws (C). Make certain that the tone arm return lever is against the record separator shaft and the pin on the trip lever is against the tone arm return lever. Move the tone arm to the point of proper landing, be sure the set screw collar is up against the tone arm pivot shaft bushing, then tighten the zinc-plated screw. Run through cycle several times as a check, then tighten the copper-plated screw. Remove feeler. The 12-inch landing is then automatically correct.

Spindle fails to pick up the record or turntable fails to drop the record.

Remove the counterbalance spring. Loosen set screws (D). (See photograph for screw location.) Centrally locate the turntable with respect to the front and rear edges of the motorboard slot by sliding the turntable pivot shaft in its bearings. Mesh the sector and segment gears as shown. Holding them in this position, move the turntable assembly until the turntable is level. Tighten screws (D).

Turntable does not return to proper position.

(Turntable Vertical Position)

Loosen set screws (E). (See photograph for screw location.) Set the counterweight as shown. Check to see that there is clearance between the two set screw collars (D-E) and the turntable pivot shaft bearing. Tighten the zinc-plated screw (E), run through cycle several times as a check, then tighten the copper-plated screw (E). Replace the counterbalance spring.

Sapphire fails to clear record on turntable.

(Tone Arm Height While in Cycle)

Rotate the changer through cycle until the tone arm has moved into its cycle position. Adjust the screw (F) until the sapphires are equidistant from the two sides of the record and tighten the locknut.

Top sapphire jumps grooves or pushes too hard against record.

(Top Sapphire Pressure)

Adjust the screw (G) in the rear of the tone arm until the pressure measured at the point of the top sapphire is approximately one ounce. A suggested means of making this check is shown in the accompanying sketch.

Bottom sapphire jumps grooves or pushes too hard against record.

(Bottom Sapphire Pressure)

Adjust the eye screw and locknut (H) as shown until the pressure measured at the point of the bottom sapphire is approximately one ounce. With no-load setting of scale adjusted to read two ounces, bottom pickup should be pushed away from record by pressing down on it with the scale. Sapphire pressure should be adjusted to a scale reading of one ounce.

Sapphire lands properly but fails to feed into music grooves or feeds in too fast and jumps several grooves.

(Feed-in Spring)

Adjust the feed-in spring by means of the screw (I) until the sapphire feeds in smoothly without jumping grooves. Check to see that the spring clears the trip lever pawl and that the mounting screw is tight. Be sure to keep the viscoloid free from grease.

Turntable too high or too low.

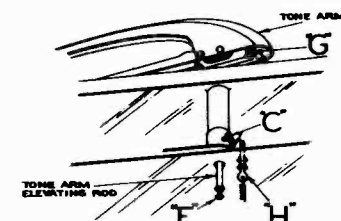
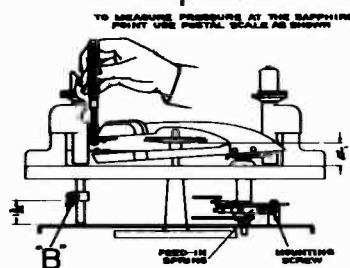
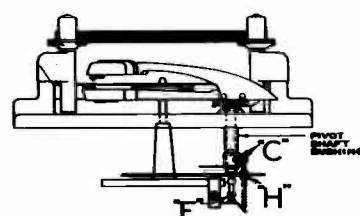
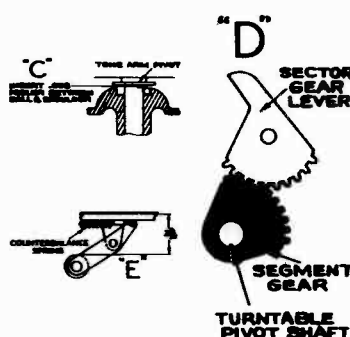
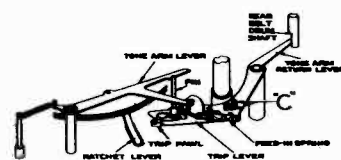
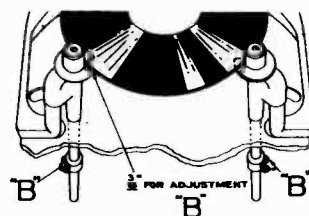
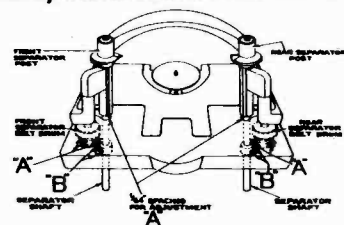
(Turntable Height)

Loosen locknut and adjust the turntable bottom bearing screw until the bottom of the turntable is above the motorboard. Tighten the locknut.

Motor fails to reverse at proper time.

(Reversing Switch Position)

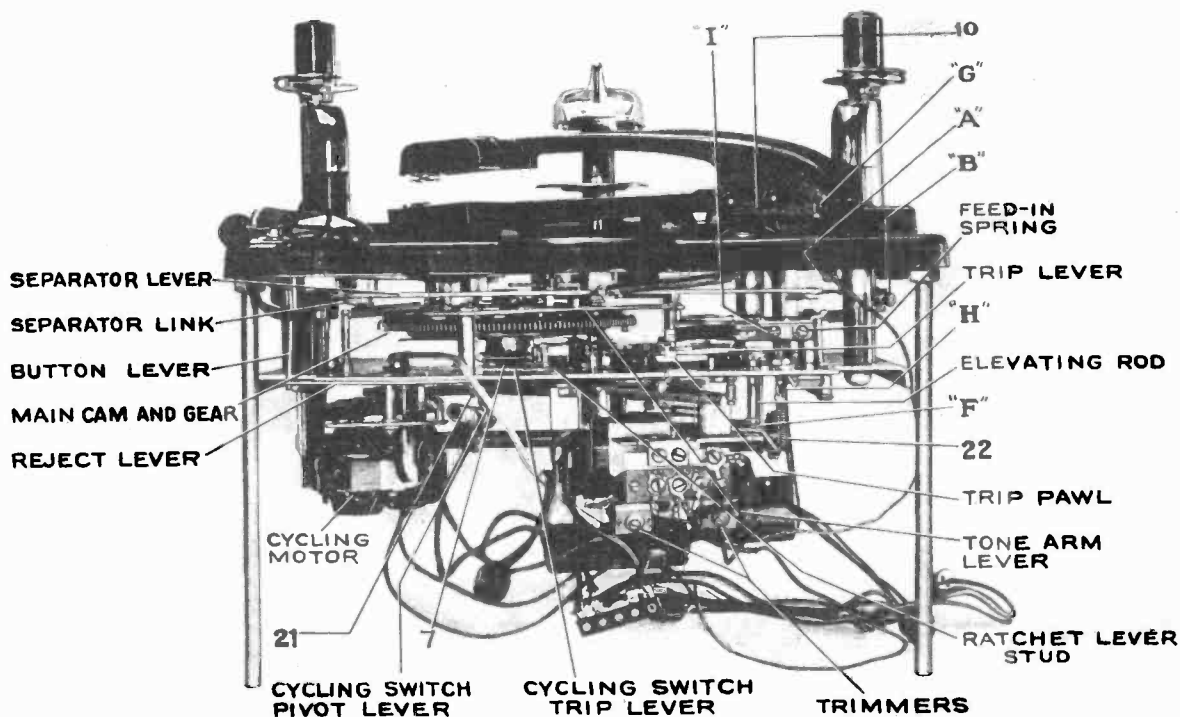
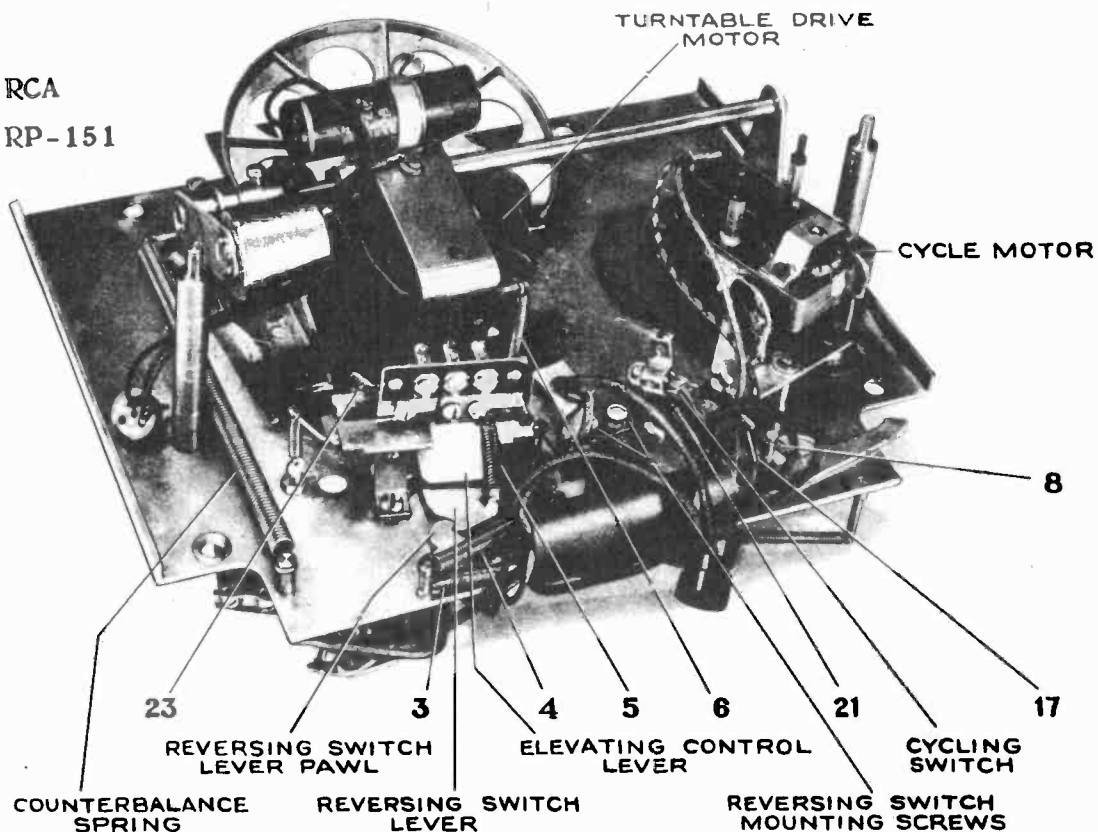
Loosen the reversing switch mounting screws. Rotate the changer through cycle until the main cam has forced the trip lever to its outermost position. Move the switch until the reversing cam has fully compressed the switch against the spring. Lock in position with the mounting screws.



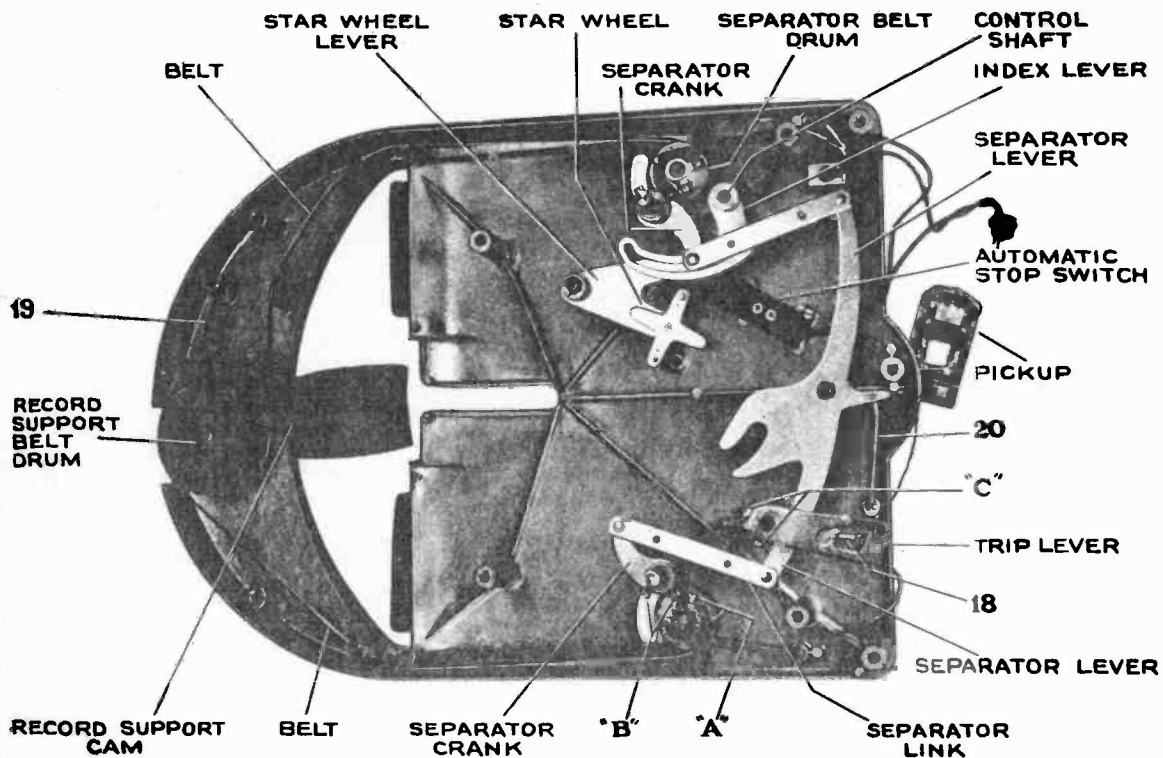
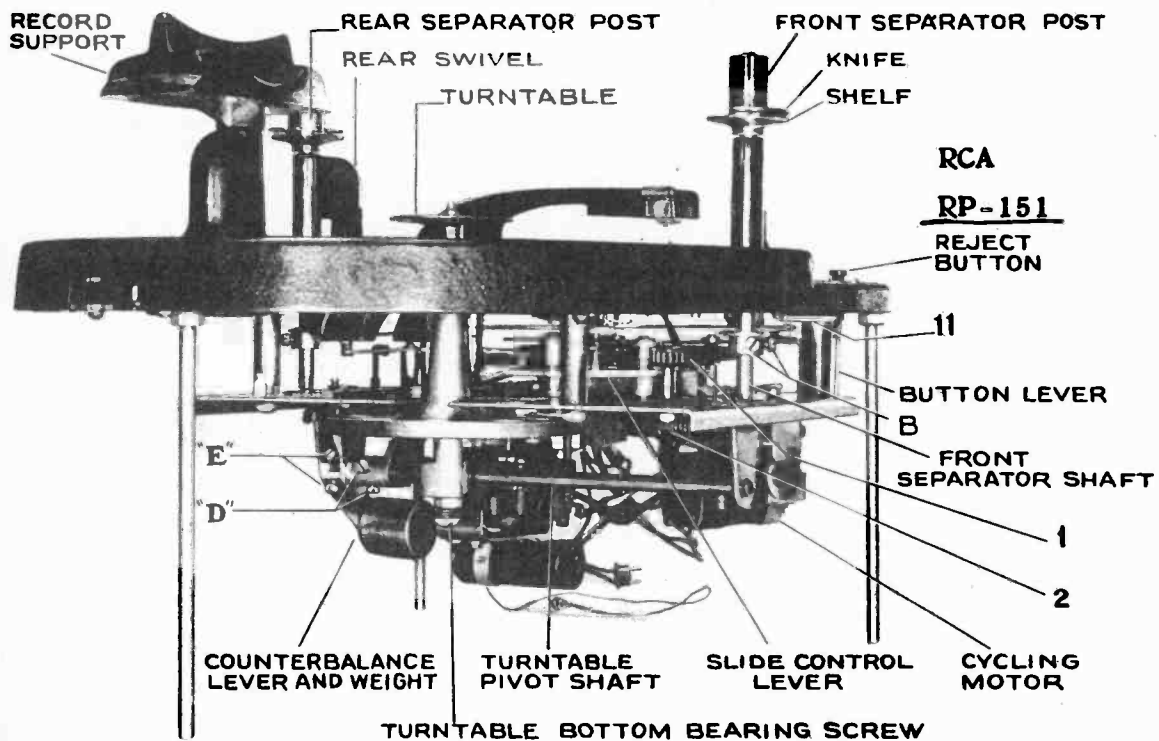
MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

RCA

RP-151



MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS



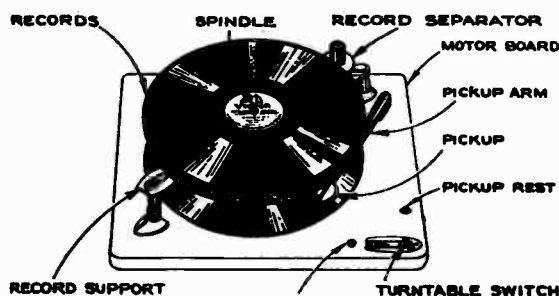


RCA Victor

RP-158

Automatic Record Changers

TECHNICAL INFORMATION AND SERVICE DATA



Operation

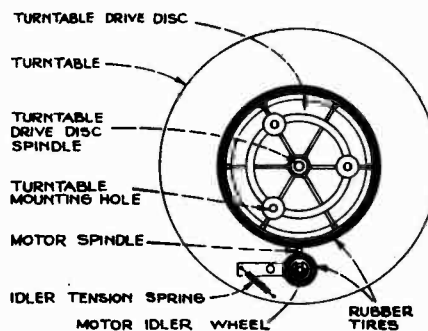
The RP-158 is a record changing mechanism designed for the automatic playing of records. It will play twelve 10-inch or ten 12-inch records at a single loading.

To Operate:

1. Turn the record support located at the left front corner to the 10-inch or 12-inch position as desired.
2. Place the records on the record support and record separator posts.
3. Push the turntable switch to the "On" position.
4. Press the "Start-Reject" button. The entire series of records will now play without further attention and the pickup will swing to its rest position at the end of the last record. (For completely automatic operation all records must have the standard eccentric tripping groove. Otherwise it may be necessary to press the "Start-Reject" button to change the record).
5. When the last record has been played, push the turntable switch to stop the turntable. The mechanism is now ready for another loading.
6. To reject a record being played, press the "Start-Reject" button.

Lubrication

The RP-158 turntables are driven by a drive disc screwed to the turntable. It is important that the drive motor spindle and the rubber tire on the friction drive disc as well as that on the idler wheel be kept clean and free from oil, grease,



dirt, or any foreign material at all times. Any quick drying naphtha is satisfactory for cleaning these parts. The drive motor bearing is lubricated from felt washers at the bottom and top. A light machine oil should be used at these points.

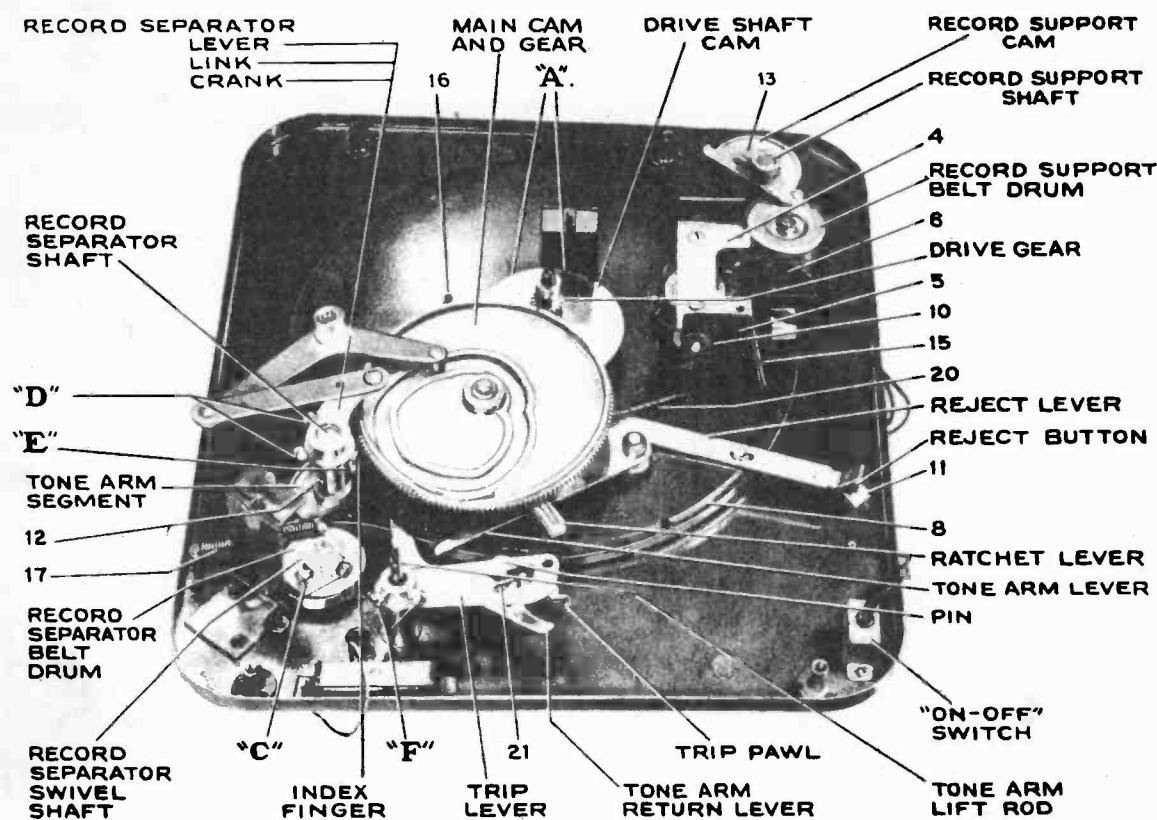
On all bearing surfaces except the motor bearings Houghton Stayput No. 320 should be used. On all other surfaces Lubriplate No. 110 is recommended.

Cautions

Before servicing the automatic changer, inspect the assembly to see that all gears, cams, springs, levers, etc., are correctly assembled and in good working order.

1. Never use force to start or stop the motor or any part of the record changing mechanism.
2. Warped or damaged records may cause the mechanism to jam.
3. A cracked or chipped record may damage the sapphire.
4. Warped records may slide on one another while playing and result in unsatisfactory reproduction.
5. Do not leave the records on the record posts or on the turntable as they may warp, particularly in warm climates. Warped records may be flattened by placing them on a flat surface with a heavy flat article placed on top of them for a few days.
6. If, for any reason, the mechanism stalls, turn off the turntable switch and remove the records from the posts. Start the turntable by turning the switch on and allow the pickup arm to complete its cycle.
7. Do not tighten copper-plated, cone-pointed screws until final adjustment has been made.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

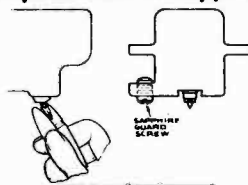


Function of Principal Levers

Main Cam and Gear	Directs and coordinates all cycle operations.	Tone Arm Elevating Lever	Directs vertical motion of tone arm.
Tone Arm Lever	Directs horizontal motion of tone arm.	Tone Arm Elevating Rod	Transfers motion of elevating lever to tone arm.
Tone Arm Return Lever	Keeps tone arm moving in with receding tone arm lever and provides proper landing.	Reject Lever	Starts automatic cycle at will of operator.
Trip Lever	Its latch acts on ratchet lever to start the automatic cycle.	Separator Knife	Separates record from stack and supports stack during cycle.
Record Separator Lever Train (Lever-Link-Crank)	Directs motion of separator knife and shelf.	Separator Shelf Drive Gear	Supports stack during playing time.
Ratchet Lever	Transfers motion from trip lever or reject lever to start automatic cycle.	Drive Cam Pawl and Wheel	Transfers motion of turntable to main cam and gear.
			Engage to connect turntable spindle to drive gear during cycle.

Replacement of Sapphire

As an additional precaution against rough handling, the top of the sapphire is dipped in a rubber cement (such as Goodrich "Plasticon") before being inserted in the pickup. To remove the sapphire, grasp it firmly with a pair of tweezers, give it a few turns to loosen the cement and then pull it out. Much easier handling of the sapphire will result if the tweezers are



notched with a file as shown. Naphtha may be used as a thinner should difficulty with the rubber cement be experienced.

Before inserting the new sapphire it should be dipped in the rubber cement previously thinned with naphtha. After insertion clean the point with naphtha if there is any doubt as to the presence of cement.

To Remove the Turntable.—

To remove the turntable, loosen set screws "A" and lift the turntable up.

To Remove Pickup Arm.—

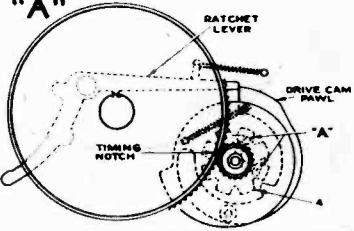
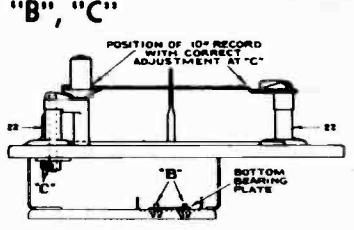
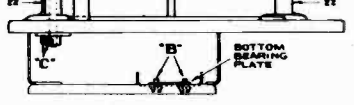
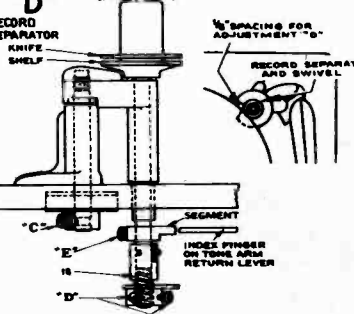
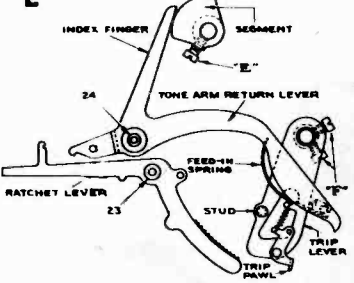

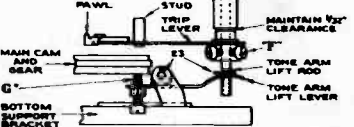
One of the tone arm bearings has a slotted head and can be turned out to facilitate removal of the tone arm. Raise the tone arm and loosen the bearing set screw. Turn the bearing partly out through the hole in the side of the tone arm and lift the arm off.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

Quick-Reference Chart for

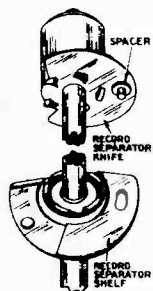
R.C.A.

Automatic Record Changer Adjustments RP-158

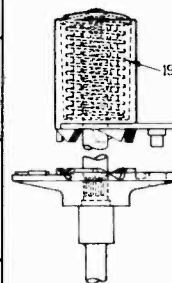
<p><i>Mechanism jams. General irregularity of operation.</i></p> <p><i>(Mechanism Timing)</i></p>	<p>With the ratchet lever and the pawl on the drive shaft cam in playing position as shown, remove the bottom support bracket. Remove the "C" washer on the main cam shaft and slip the cam down far enough that it can be rotated with respect to the drive gear. Then rotate it until the timing notch is positioned as shown. Put the main gear back in mesh with the drive gear, replace the "C" washer, place the elevating lever on the cam ridge. Make certain the separator lever train is in its correct position and replace the bottom support bracket.</p>	<p>"A"</p> 
<p><i>Turntable does not turn freely.</i></p> <p><i>(Turntable Bottom Bearing Position)</i></p>	<p>Loosen the bottom bearing screws "B" and position the bottom bearing plate until the turntable revolves freely. Tighten the screws and check by applying a.c. to the turntable motor then shutting it off and noting that the turntable continues to make at least twelve revolutions.</p>	<p>"B", "C"</p> 
<p><i>Records strike separator post or fail to stay on record shelf.</i></p> <p><i>(Spacing Between Record Posts)</i></p>	<p>Turn the record support post to the ten-inch position. Loosen set screws "C," hold the separator post against the end of its slot in the motorboard and turn the belt drum to take up any slack in the belt. Tighten the zinc-plated, blunt-nosed screw and check to see that a ten-inch record fits the posts as shown. Then tighten the copper-plated, cone-pointed screw.</p> <p>The twelve inch position is automatically maintained.</p>	<p>"B", "C"</p> 
<p><i>Records do not drop at proper time.</i></p> <p><i>(Record Shelf Tim- ing)</i></p>	<p>Place a ten-inch record on the posts. Loosen the set screws "D" and turn the record separator shaft until the edge of the record-separating knife is one-eighth inch away from the edge of the record. The teeth on the inner circumference of the knife should be resting in the bottom of their slots at the time the adjustment is made. Tighten the zinc-plated screw first, run through cycle several times as a check, then tighten the copper-plated screw.</p>	<p>"D"</p> 
<p><i>Tone arm continues to repeat playing of top record or jams when part way in on record.</i></p> <p><i>(Segment height or radial position)</i></p>	<p>Take all records off the posts. Loosen the set screw "E." Set the record separator segment so that the index finger of the pickup arm return lever rides on the middle of the segment, as shown. Rotate the cam until it is in such a position that the index finger will never ride off either end. Check to see that the index finger rides in over top of the cam when the record shelf is depressed by the weight of one record. Tighten the set screw.</p>	<p>"E"</p> 
<p><i>Sapphire does not land at correct point on 10- inch record.</i></p> <p><i>(Tone Arm Position With Respect To Trip Lever)</i></p> <p><i>Correct dimension from outside edge of spindle to sapphire 4 11/16 inches.</i></p>	<p>Place a ten-inch record on the turntable and rotate the changer through cycle until the sapphire is just ready to land. Make sure that the index finger of the pickup arm return lever is against the record separator shaft and that the tone arm trip lever stud is held firmly against the return lever. Loosen the set screws "F" and move the pickup arm to the correct landing position. See that there is a 1/32 inch clearance between the pickup arm bearing and the set screw collar. Tighten the zinc-plated screw, run the changer through cycle several times as a check, then tighten the copper-plated screw.</p> <p>The twelve-inch landing position is automatically maintained.</p>	<p>"F", "G"</p> 
<p><i>Top of pickup arm strikes stack of rec- ords or sapphire fails to clear the records on the turntable.</i></p> <p><i>(Pickup Arm Height While In Cycle)</i></p>	<p>Rotate the changer through cycle until the pickup arm has risen to its maximum height above the turntable but has not begun to move out. At this point adjust the screw "G" until the distance between the turntable and the sapphire is one and three-sixteenths inch. Tighten the locknut.</p>	<p>"F", "G"</p> 

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

Miscellaneous Service Hints



<i>Tone arm continues to repeat playing top record of the stack.</i>	Check adjustment E. Record separator shaft, or the spring on which it rests, is binding on the shaft bushing. Pin on record separator shaft is binding in its slot. Shaft spring is too weak.
<i>Improper landing on 10 and 12 inch records.</i>	Check adjustment F. Feed-in spring bent too far in front of tone arm return lever.
<i>Irregular landing on 10 and 12 inch records.</i>	Check adjustment C. Insufficient tension on belt.
<i>Loud clicking noise resulting from drive cam pawl slipping out of teeth in cam wheel.</i>	Check mechanism timing adjustment. Make certain that pickup arm lever is not binding on its stud.
<i>Mechanism Jams</i> <i>Tone arm continues to come down in rest position.</i>	Check adjustment E. Record separator shaft or the spring on which it rests is binding on the shaft bushing. Pin on record separator shaft is binding in its slot. Shaft spring is too strong.
<i>Trips continuously.</i>	Reject button is binding in its bushing. Reject lever spring is too weak or the reject lever is binding on its guide slots.
<i>Sapphire strikes motor board.</i>	Bend the pickup arm support bracket until the sapphire clears the motorboard by approximately 3/32 of an inch.



Cycle of Operation

The changer can be conveniently rotated through the change cycle by pushing the reject button and revolving the

turntable by hand. Eight turntable revolutions are required for one change cycle.

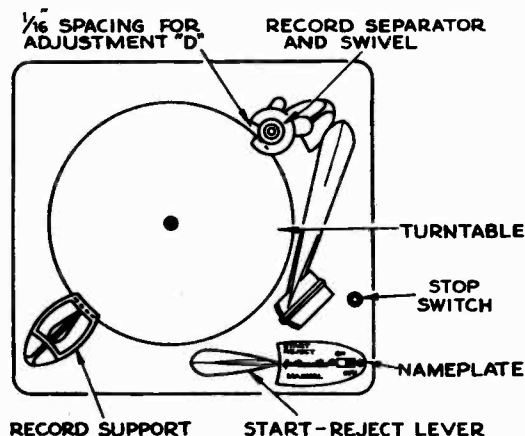
Function	Explanation
Operator Turn Record Support to 10" or 12" Position as Desired Place Records on Posts Press Start Button	<ol style="list-style-type: none"> 1. Separator post positions itself by means of belt drive. 1. Separator shaft is pushed down against its spring and carries segment out of path of index finger. 1. Reject lever moves in and pushes ratchet lever. 2. Ratchet lever is pushed out of eccentric step on main gear shaft and releases drive cam pawl. 3. Drive cam pawl engages toothed wheel and it revolves carrying drive gear with it.
Automatic Cycle Tone Arm Rises Tone Arm Moves Out Record Knife Separates Bottom Record from Stack after Gauging Thickness of Record Record Drops to Turntable Tone Arm Moves In Tone Arm Lowers Sapphire on to Record Sapphire Moves In to Music Groove Record Begins to Play	<ol style="list-style-type: none"> 1. Main cam and gear revolves with drive gear. 2. Stud on tone arm lever rides in top track on main cam and directs movement of the lever. 3. Tone arm elevating lever rides up on ridge on main cam and pushes tone arm up by means of elevating rod. 1. Tone arm lever pushes on trip lever stud. 2. Trip lever moves out. 3. Tone arm return lever is carried along by trip lever stud, and by stud on main cam top track. 1. Stud on separator lever follows main cam bottom track and directs the motion of the lever. 2. Through the separator link and crank, the separator lever turns the separator shaft. 3. Knife turns with shaft and strikes edge of bottom record. 4. Separator shaft continues to revolve and teeth on inner circumference of knife ride up on shelf teeth until knife is carried high enough against the action of spring 19 to move in over top of record. 1. Separator shaft continues to turn until knife supports stack of records and shelf moves out from under bottom record. 1. Separator shaft reverses rotation. 2. Tone arm lever moves away from trip lever stud. 3. Tone arm return lever pushes on trip lever stud. 4. Trip lever moves in. 1. Index finger on tone arm return lever moves against separator shaft to insure proper landing position. 2. Tone arm elevating lever rides down on main cam ridge thus lowering the elevating rod and the tone arm. 3. Separator shaft returns knife to original position and allows stack of records to rest on shelf. 1. Feed-in spring on tone arm return lever pushes against stud on trip lever. 1. Ratchet lever rides down into eccentric step on main gear shaft and blocks drive cam pawl. 2. Pawl is disengaged from drive cam wheel. 3. Drive gear and main gear stop.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

RCA Victor

RP-160, 160-A, and 160-B

Automatic Record Changers



This mechanism is designed to play a series up to twelve 10-inch, or ten 12-inch records of the 78 r.p.m. type. It will also play single records of any diameter up to 12 inches.

Features Include—

1. Light-pressure sapphire-point plug-in crystal pickup.
2. Positive ratchet trip, actuated by eccentric groove at end of record.
3. Safety clutch, relieves strain on mechanism due to jamming. (The clutch makes a clicking sound if the mechanism jams.)
4. Stop switch, shuts off the motor after the last record is played. This switch is the pickup "rest."
5. Pickup shorting switch, shorts pickup during record-changing cycle to prevent noise.
6. Simplified mechanism.

Manual Operation

1. See that the mechanism is out of cycle, with the pickup on its rest.
2. Set the "start-reject" lever at "manual."
3. Place record on turntable and push turntable switch "on."
4. Lift the pickup and set it down on the record.
5. When the record is finished, the pickup will swing in the eccentric groove, or run in the last groove, until the power is shut off.
6. Lift the pickup and place it on its rest.

Do not oil the record separator shaft.

It is important that the drive motor spindle and the rubber tire on the friction drive disc as well as that on the idler wheel

Before servicing the automatic changer, inspect the assembly to see that all gears, cams, springs, levers, etc., are correctly assembled and in good working order.

1. Never use force to start or stop the motor or any part of the record changing mechanism.
2. Warped or damaged records may cause the mechanism to jam. When jamming occurs, the safety clutch slips, causing a clicking sound.
3. A cracked or chipped record may damage the sapphire.
4. Warped records may slide on one another while playing and result in unsatisfactory reproduction.

Automatic Operation

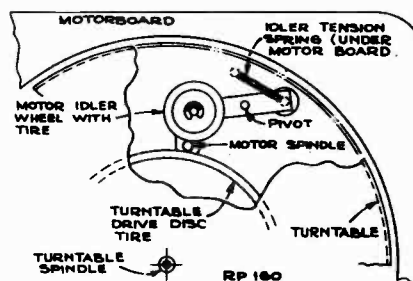
The pickup "rest" is a button on the stop switch that opens the motor circuit when the pickup comes down on the rest after completion of the cycle following the last record. Before starting automatic operation, see that the mechanism is out of cycle and that the pickup is on its rest. If it is not, start the motor and allow to run until the pickup comes down on its rest.

1. Turn the "record support" in front left-hand corner, to its position for 10-inch or 12-inch records as required. Turning the front record support automatically positions the rear support.
2. Load the records on the supports, with required selections upward, the last record to be played on top. Be sure that the rear record support is pushed down.
3. Push turntable switch "on."
4. Push the "start-reject" lever towards the back to its "start-reject" position, and let go. The first record drops on turntable, and the pickup moves onto the record.
5. When the last record is finished, the pickup moves out and comes down on its rest. This depresses the rest button and opens the stop switch, thus shutting off the motor.
6. To reject a record being played, push the "start-reject" lever to "start-reject," and let go.
7. For automatic operation, each record must have the standard eccentric groove.

Lubrication

The drive motor bearing is lubricated from felt washers at the bottom and top. A light machine oil should be used at these points.

On all bearing surfaces except the motor bearings Houghton Stayput No. 320 should be used. On all other surfaces Lubriplate No. 110 is recommended.



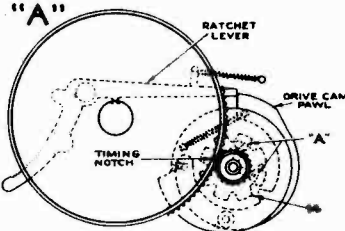
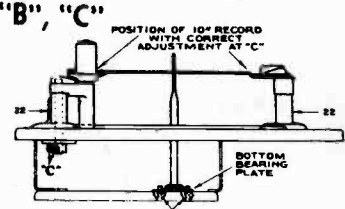
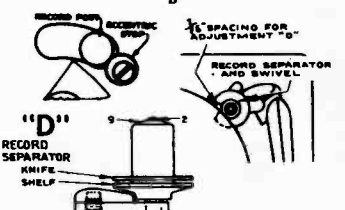
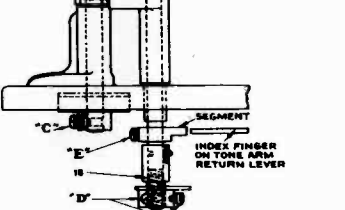
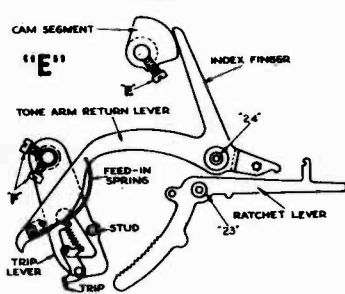
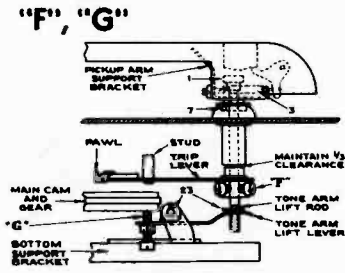
be kept clean and free from oil, grease, dirt, or any foreign material at all times. Any quick drying naphtha is satisfactory for cleaning these parts.

Cautions

5. Do not leave the records on the record posts or on the turntable as they may warp, particularly in warm climates. Warped records may be flattened by placing them on a flat surface with a heavy flat article placed on top of them for a few days.
6. If, for any reason, the mechanism stalls, turn off the turntable switch and remove the records from the posts. Start the turntable by turning the switch on and allow the pickup arm to complete its cycle.

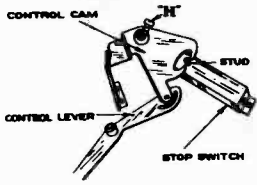
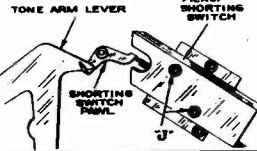
MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

Quick-Reference Chart for Automatic Record Changer Adjustments

<p><i>Mechanism jams. General irregularity of operation.</i></p> <p><i>(Mechanism Timing)</i></p>	<p>With the ratchet lever and the pawl on the drive shaft cam in playing position as shown, remove the bottom support bracket. Remove the "C" washer on the main cam shaft and slip the cam down far enough that it can be rotated with respect to the drive gear. Then rotate it until the timing notch is positioned as shown. Put the main gear back in mesh with the drive gear, replace the "C" washer, place the elevating lever on the cam ridge. Make certain the separator lever train is in its correct position and replace the bottom support bracket.</p>	 <p>"A"</p>
<p><i>Turntable does not turn freely.</i></p> <p><i>(Turntable Bottom Bearing Position)</i></p>	<p>Loosen the bottom bearing screws "B" and position the bottom bearing plate until the turntable revolves freely. Tighten the screws and check by applying a.c. to the turntable motor, allowing it to reach full speed, then pull motor away from friction drive disc and noting that the turntable continues to make at least twelve revolutions.</p>	 <p>"B", "C"</p>
<p><i>Records strike separator post or fail to stay on record shelf.</i></p> <p><i>(Spacing Between Record Posts)</i></p>	<p>Turn the record support post to the ten-inch position. Loosen set screws "C," hold the separator post against the end of its slot in the motorboard and turn the belt drum to take up any slack in the belt. Tighten the zinc-plated, blunt-nosed screw and check to see that a ten-inch record fits the posts as shown. Then tighten the copper-plated, cone-pointed screw.</p> <p>The twelve-inch position is adjusted after that of the ten-inch, by changing the support post to take the twelve-inch record, and turning the eccentric stop until the edge of the record is halfway up on the record support bevel while the other edge is against the record separator post.</p>	 <p>"D"</p>
<p><i>Records do not drop at proper time.</i></p> <p><i>(Record Shelf Tim- ing)</i></p>	<p>Place a ten-inch record on the posts. Loosen the set screws "D" and turn the record separator shaft until the edge of the record-separating knife is one-sixteenth inch away from the edge of the record. The teeth on the inner circumference of the knife should be resting in the bottom of their slots at the time the adjustment is made. Tighten the zinc-plated screw first, run through cycle several times as a check, then tighten the copper-plated screw.</p>	 <p>"E"</p>
<p><i>Tone arm continues to repeat playing of top record or jams when part way in on record.</i></p> <p><i>(Segment-cam height or radial position)</i></p>	<p>Take all records off the posts. Loosen the set screw "E." Set the record separator segment-cam so that the index finger of the tone arm return lever rides on the middle of the segment-cam, as shown. Rotate the segment-cam until it is in such a position that the index finger will not ride off either end. Check to see that the index finger rides in over top of the cam when the record shelf is depressed by the weight of one record. Tighten the set screw.</p>	 <p>"F", "G"</p>
<p><i>Sapphire does not land at correct point on 10- inch record.</i></p> <p><i>(Tone Arm Position With Respect To Trip Lever)</i></p> <p><i>Correct dimension from outside edge of spindle to sapphire 4 1/16 inches.</i></p>	<p>Place a ten-inch record on the turntable and rotate the changer through cycle until the sapphire is just ready to land. Make sure that the index finger of the pickup arm return lever is against the record separator shaft and that the tone arm trip lever stud is held firmly against the return lever. Loosen the set screws "F" and move the pickup arm to the correct landing position. See that there is a 1/32 inch clearance between the pickup arm bearing and the set screw collar. Tighten the zinc-plated screw, run the changer through cycle several times as a check, then tighten the copper-plated screw.</p> <p>The twelve-inch landing position is automatically maintained.</p>	 <p>"F", "G"</p>
<p><i>Top of pickup arm strikes back of rec- ords or sapphire fails to clear the records on the turntable.</i></p> <p><i>(Pickup Arm Height While In Cycle)</i></p>	<p>Rotate the changer through cycle until the pickup arm has risen to its maximum height above the turntable but has not begun to move out. At this point adjust the screw "G" until the distance between the turntable and the sapphire is one and three-sixteenths inch. Tighten the locknut.</p>	

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

Quick-Reference Chart (Continued)

<p><i>Mechanism fails to start, or automatic stop switch is inoperative in "automatic" position.</i> (Control Cam Position)</p>	<p>Set the control lever to "automatic." Loosen set screw "H" and move the control cam until the stud on stop switch is centrally located as shown. Tighten set screw "H."</p>	
<p><i>No output, or noise during cycle.</i> (Position of Pickup Shorting Switch)</p>	<p>Loosen screws "J." Position the switch to obtain $\frac{1}{32}$-inch clearance between the switch blades when the tone arm is in playing position. Tighten screws "J." Make certain that the pawl is on the correct side of the long leaf spring in the shorting switch.</p>	

Miscellaneous Service Hints

Mechanism trips continuously.

Check to see that the ratchet lever engages drive cam pawl at end of change cycle. Bend lever if necessary. Check adjustment "H." Bend the control cam flat spring for greater pressure.

Turntable does not stop automatically.

Check for bind in stop button bushing. Bend the flat bracket that limits outward movement of the trip lever, so that pickup lands on the stop button.

Turntable fails to start.

Check spacing of stop switch contacts to be certain that weight of stop button does not open them.

Loud clicking noise resulting from drive cam pawl slipping out of teeth in cam sprocket.

Check mechanism timing adjustment. Make certain that pickup arm lever is not binding on its stud. Any jam will cause the clutch to slip and produce clicking sound.

Mechanism jams.

Irregular landing on 10 and 12 inch records.

Check adjustment "C." Insufficient tension on belt.

Tone arm continues to repeat playing top record of the stack.

Check adjustment "E." Record separator shaft, or the spring on which it rests, is binding on the shaft bushing. Pin on record separator shaft is binding in its slot. Shaft spring is too weak. Do not tighten set screws "D" enough to distort the housing of the separator shaft spring. Do not oil the record separator shaft.

Tone arm continues to come down in rest position.

Check adjustment "E." Record separator shaft or the spring on which it rests is binding on the shaft bushing. Pin on record separator shaft is binding in its slot. Shaft spring is too strong.

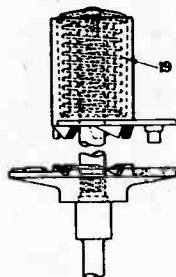
Sapphire strikes motorboard.

Bend the pickup arm support bracket until the sapphire clears the motorboard by approximately $\frac{3}{32}$ of an inch.

Separator knife jams on last record of the stack.

Check the separator knife edge. It should not be sharp enough to dig in the record and carry the record up with it.

Illustrations Show Details of Record Separator

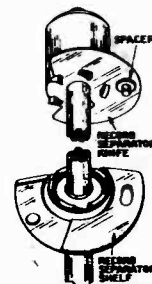


To Remove the Turntable.—

To remove the turntable, loosen set screws "A" and lift the turntable up.

To Remove Pickup Arm.—

One of the tone arm bearings has a slotted head and can be turned out to facilitate removal of the tone arm. Raise the tone arm and loosen the bearing set screw. Turn the bearing partly out through the hole in the side of the tone arm and lift the arm off.



RCA Models RP-160, 160-A, and 160-B

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85

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

Tone Arm Feed-in Spring.—

When the sapphire comes down on the record, the feed-in spring (shown in adjustment sketch "E," acts to push the tone arm toward the music grooves. The spring should be adjusted to do this without causing the sapphire to skip grooves. This action is also related to—

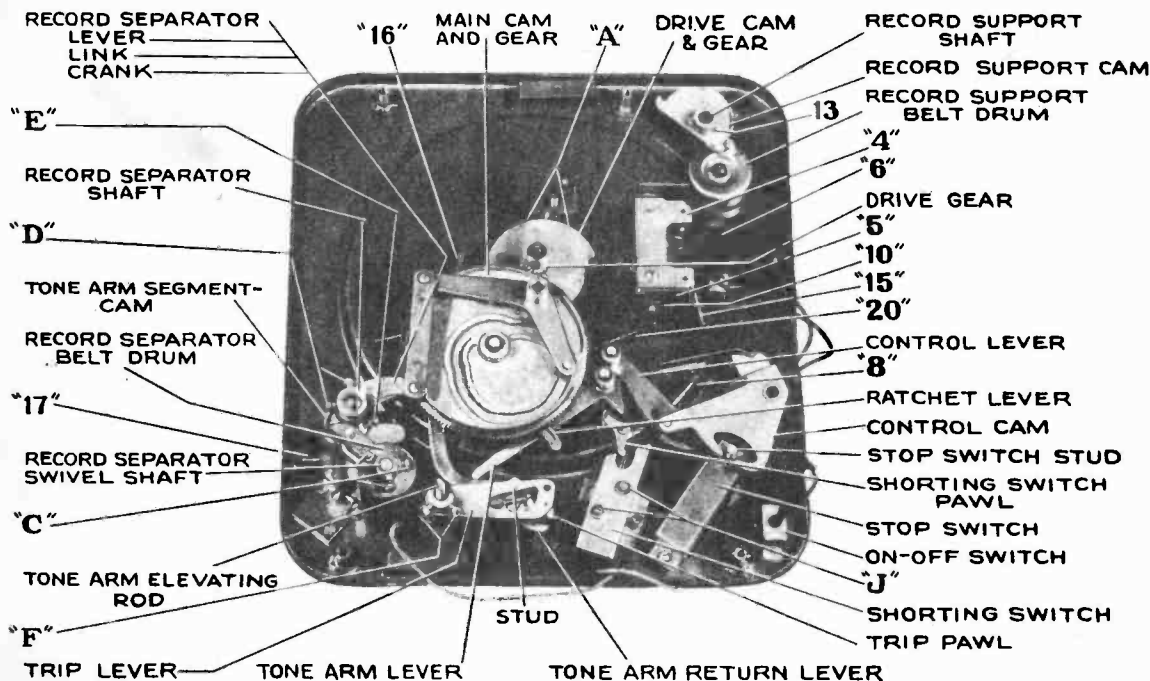
Cabinet Leveling.—

If the sapphire fails to enter the starting groove, raise the

right-hand side of the cabinet by inserting thin spacers under the legs. If the pickup slides over a few grooves, raise the left-hand side of the cabinet.

Sapphire Pressure.—

In these mechanisms, the correct pressure is from 1 to 1¼ ounces, measured at the sapphire. Adjust the spring (3) in the tone-arm base if necessary.



Trip Lever

When the tone arm swings in the eccentric groove, the trip lever latch acts on the ratchet lever to start the automatic cycle.

Ratchet Lever

Transfers motion from trip lever or control lever to start automatic cycle by allowing pawl to engage with sprocket of safety clutch.

Drive Cam Pawl and Sprocket

(This is the "safety clutch")

Engages turntable spindle to drive gear during cycle (see sketch "A").

Drive Gear

Transfers rotation of turntable spindle to main cam and gear when the clutch is engaged.

Main Cam and Gear

Has four "tracks" which control horizontal and vertical motion of tone arm,

Function of Principal Levers

and rotation of record separator knife and shelf. The bushing on this gear governs position of the ratchet lever.

Control Cam and Lever

In "manual" position, it keeps the motor stop switch closed, and disengages the ratchet lever and safety clutch so the mechanism cannot go into cycle.

In "automatic" position, it permits operation of the ratchet lever, safety clutch, and stop switch.

In "start-reject" position, it closes the motor stop switch, and moves the ratchet lever away from the drive cam pawl, permitting the clutch to engage and thus start the change cycle.

Shorting Switch Pawl

Closes the pickup shorting switch when the pickup is outside the 12-inch landing position.

Tone Arm Lever

Directs horizontal motion of tone arm.

Tone Arm Return Lever

Keeps tone arm moving in with receding tone arm lever and provides proper landing.

Tone Arm Elevating Lever

Directs vertical motion of tone arm.

Tone Arm Elevating Rod

Transfers motion of elevating lever to tone arm.

Record Separator Lever Train (Lever-Link-Crank)

Directs motion of separator knife and shelf.

Separator Knife

Separates record from stack and supports stack during cycle.

Separator Shelf

Supports stack during playing time.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

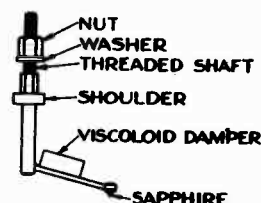
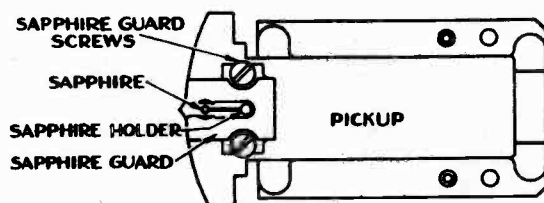
Cycle of Operation

The changer can be conveniently rotated through the change cycle by pushing the reject button and revolving the turntable by hand. Eight turntable revolutions are required

for one change cycle. Block up the motor, so it is disengaged from the drive disc, to permit easier manual rotation of the turntable.

Function	Explanation
Operator	
Turn Record Support to 10" or 12" Position as Desired	1. Separator post positions itself by means of belt drive.
Place Records on Posts	1. Separator shaft is pushed down against its spring and carries segment-cam out of path of index finger.
Press Start Button	1. Reject lever moves in and pushes ratchet lever. 2. Ratchet lever is pushed out of eccentric step on main gear shaft and releases drive cam pawl. 3. Drive cam pawl engages cam sprocket and it revolves carrying drive gear with it.
Automatic Cycle	
Tone Arm Rises	1. Main cam and gear revolves with drive gear. 2. Stud on tone arm lever rides in top track on main cam and directs movement of the lever. 3. Tone arm elevating lever rides up on ridge on main cam and pushes tone arm up by means of elevating rod.
Tone Arm Moves Out	1. Tone arm lever pushes on trip lever stud. 2. Trip lever moves out. 3. Tone arm return lever is carried along by trip lever stud, and by stud on main cam top track.
Record Knife Separates Bottom Record from Stack after Gauging Thickness of Record	1. Stud on separator lever follows main cam bottom track and directs the motion of the lever. 2. Through the separator link and crank, the separator lever turns the separator shaft. 3. Knife turns with shaft and strikes edge of bottom record. 4. Separator shaft continues to revolve and teeth on inner circumference of knife ride up on shelf teeth until knife is carried high enough against the action of spring 19 to move in over top of record.
Record Drops to Turntable	1. Separator shaft continues to turn until knife supports stack of records and shelf moves out from under bottom record.
Tone Arm Moves In	1. Separator shaft reverses rotation. 2. Tone arm lever moves away from trip lever stud. 3. Tone arm return lever pushes on trip lever stud. 4. Trip lever moves in.
Tone Arm Lowers Sapphire on to Record	1. Index finger on tone arm return lever moves against separator shaft to insure proper landing position. 2. Tone arm elevating lever rides down on main cam ridge thus lowering the elevating rod and the tone arm. 3. Separator shaft returns knife to original position and allows stack of records to rest on shelf.
Sapphire Moves In to Record Groove	1. Ratchet lever rides down into eccentric step on main gear shaft and blocks drive cam pawl. 2. Pawl is disengaged from drive cam sprocket. 3. Drive gear and main gear stop.
Record Begins to Play	4. Tone arm lever moves into cam to maintain disengagement.

Replacing Sapphire in Pickup



Specifications....Output at 400 cycles..... 0.50 volts
Impedance at 1,000 cycles... 75,000 ohms

Replacement of Complete Unit...Simply slide the unit out of the tone arm and insert a new one.

Replacement of Sapphire.....Caution: Never bend the sapphire support wire. Slide the pickup forward out of the arm.

The nut on the sapphire holder assembly is locked by a light cement (such as Glyptal). Extreme care should be used when loosening the nut so that the twisting motion does not break the crystal.

Remove the two screws holding the sapphire guard in place and take the guard off. Remove the small nut and washer on the threaded shaft of the sapphire holder and push the shaft

through the hole in the viscoloid until the sapphire holder assembly comes free.

Insert threaded shaft of replacement sapphire holder through viscoloid and replace the washer and nut. Make sure that the flat sides of the shaft are firmly in place in the clamp and then tighten the nut very carefully so as not to strip the threads nor break the crystal. Replace the sapphire guard, positioning it by means of the oversize screw slots. Make certain that the sapphire and its supporting wire are centered in the guard. Tighten the guard screws. Before using, check to see that the sapphire projects far enough beyond the guard so that the guard will not strike the record. If necessary, bend the guard a little. Apply a drop of light cement (such as Glyptal) to the sapphire nut holder.

Bend the spring contacts to make good contact with the slides in the tone arm.

RCA Models RP-160, 160-A, and 160-B

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RCA Victrola

MODELS VHR-202, VHR-207, VHR-407

Chassis No. RC-548

RC-547

RC-547A

Home-Recording Radio-Phonograph Combinations

Recorder Operating Instructions

Preliminary.—

1. See that cutter is functioning correctly as outlined on facing page.
2. Place recording disc on turntable with stud engaged in one hole.
3. Turn on power-bass control, just past the click of the power switch. Turn treble tone control full clockwise. Set radio-phonograph volume control to soft, and microphone volume control fully counter-clockwise.

Radio Recording.—

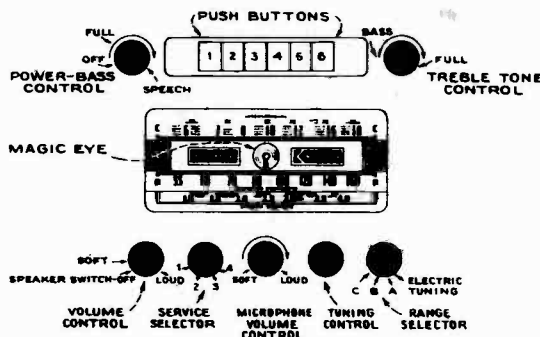
1. Tune in the desired radio program.
2. Turn service selector to position "3."
3. Turn radio-phonograph volume control so the "Magic Eye" just closes during loudest passages.
4. Push turntable switch "on."
5. Lift the recording arm, move it over so the stylus is about 1/4-inch inside the recording disc, and lower gently on the disc.
6. During the recording, listen to the loudspeaker, watch the "Magic Eye," and increase or decrease the radio-phonograph volume control if the broadcast level becomes too low or too high.
7. Use a fine hair brush occasionally to keep the area immediately ahead of the stylus free from chips and threads.
8. Before the cutter reaches its inner limit, lift the cutter head and place on rest. Turn off the turntable switch and remove the cuttings from the disc.
9. The recording may be "played-back" immediately: Turn the service selector to "Victrola," push the turntable switch "on," turn power-bass control fully clockwise, place pickup needle in outer groove of the disc, and adjust the radio-phonograph volume control. Use a new needle for play-back.

Microphone Recording.—

1. Turn service selector to position "1."
2. Turn radio-phonograph volume control to its "off" position to prevent feed-back and "howl."
3. Turn power-bass control just past the click of the power switch. Turn treble-tone control full clockwise.
4. To obtain an approximate setting of the microphone volume control before making a recording, talk into the microphone (which should be left plugged into its receptacle at all times) and adjust the microphone volume control so the "Magic Eye" just closes. By talking in a fairly level tone, and by maintaining the same distance between the microphone and lips, the microphone volume control will not require continual readjustment.
5. Start the turntable and place cutter on the disc.
6. Talk into the microphone to make the desired recording, and re-adjust the microphone volume control if required, as indicated by the "Magic Eye."
7. Stop the recorder before it reaches its inner limit, turn the microphone volume control counter-clockwise and play back the recording as described in "9" above.

Re-Recording.—

A record may be re-recorded, or duplicated (that is, a "copy" may be made from an "original") by connecting an RCA Victrola Attachment (record player) to the "re-recording jack" on the rear of the radio chassis. The "original" record is played on the RCA Victrola Attachment, and the "copy" is cut or recorded on the Home Recorder.



Controls on VHR-207 and VHR-407. Model VHR-202 Controls are identical, except "B" Band is omitted.

The procedure is as follows:

1. Turn the service selector to position "1."
2. Connect the RCA Victrola Attachment pickup cable to the jack on rear of the Home Recorder radio chassis.
3. Place the "original" record on the RCA Victrola Attachment, turn its volume control fully clockwise, and place its pickup on the "original" record.
4. Adjust the radio-phonograph volume control so the "Magic Eye" just closes on loudest passages, then lift pickup off the RCA Victrola Attachment.
5. Start the recorder by pushing turntable switch "on," and placing the recorder arm on the recording disc.
6. Put the RCA Victrola Attachment pickup arm on the "original" record. The recorder will cut a duplicate of this record, which may be played-back as described previously.

Mixed Recording.—

The RCA Home Recorders have complete flexibility for mixed recordings of radio, microphone, and phonograph. The various possible combinations are clearly shown in the illustration of the service selector control.

In mixed recordings, the radio-phonograph volume control regulates the recording level for radio, and for the RCA Victrola Attachment.

The microphone volume control regulates the recording level of the microphone only. In using the microphone on mixed recordings, or mixed PA, it should be placed as far as possible from the loudspeaker and faced away from the loudspeaker to avoid feed-back howl. (An extension cord may be added if necessary.)

"Rumble".—

1. Excessive cutting pressure will cause rumble. The width of the groove should almost equal, but not exceed, the distance between grooves.

Check the groove width each time a new stylus is used, and each time a new disc is used.

2. When recording, use the maximum bass response, by turning the power-bass control to "full" (just past the click of the power switch).

3. On play-back, use the least bass response, by turning the power-bass control to "speech" (full clockwise).

4. Be certain that the motor board and mechanism is "floating" free from the cabinet.

[illegible]

Models: VHR-207, VHR-407

When measuring R-F and I-F gain, a 3-volt bias is connected between the A.V.C. bus and chassis (plus to chassis).

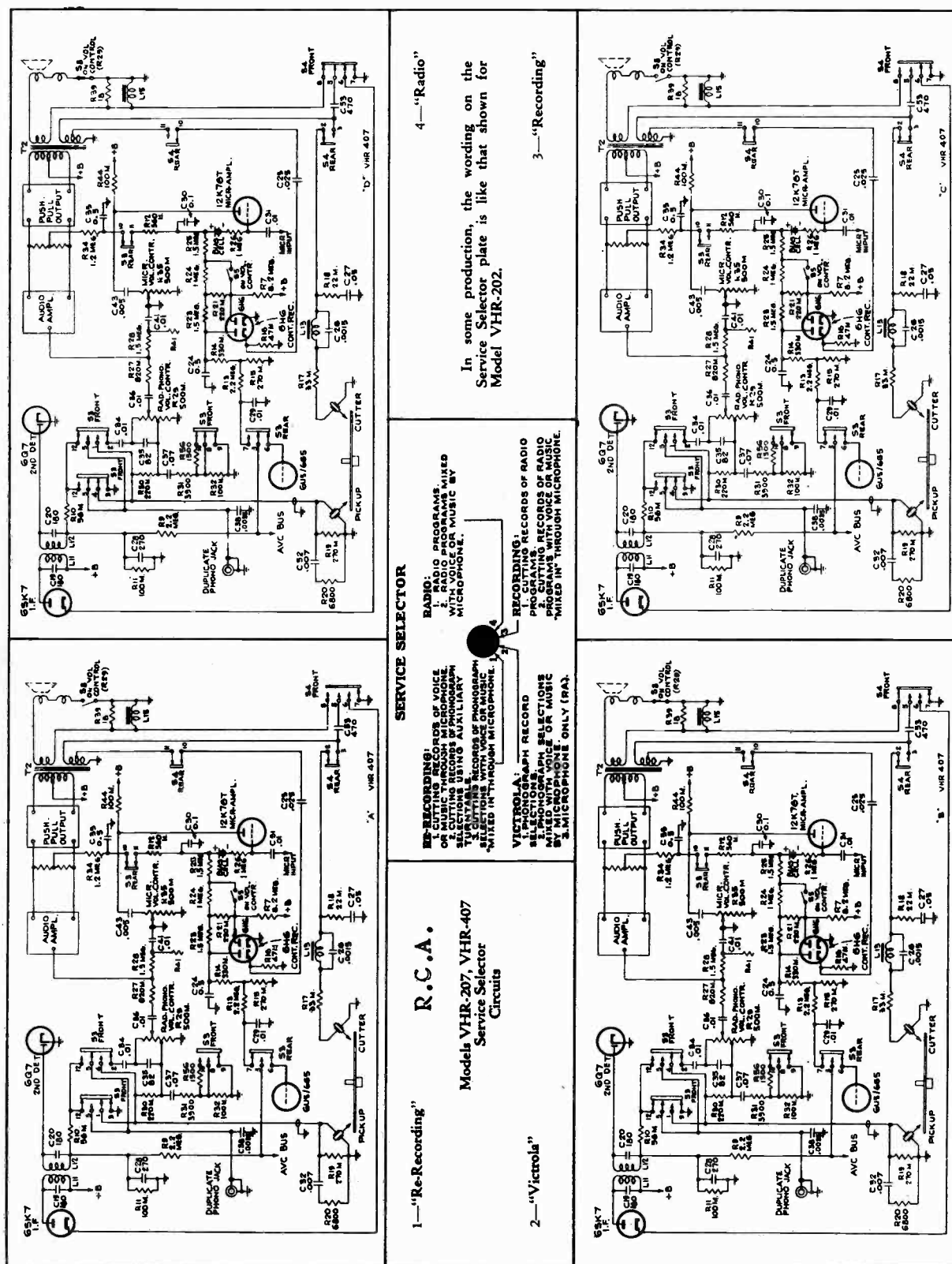
R.C.A.

RANGE SWITCH VIEWED FROM FRONT AND SHOWN IN RB. (MAX. COUNTER-CLOCKWISE) POSITION.

CATHODE CURRENTS	
(1)	98K7 - - - - - 17.4 MA.
(2)	98A7 - - - - - 9.3 MA.
(3)	98K7 - - - - - 11.8 MA.
(4)	98J7 - - - - - 4 MA.
(5)	98J7 - - - - - 7 MA.
(6)	98P8 - - - - - 22.5 MA.
(7)	98P8 - - - - - 22.5 MA.
(8)	98J8 - - - - - 1.0 MA.
(9)	18K707 - - - - - 1.4 MA.
TOTAL RECTIFIED - 136.0 MA.	

* MEASURED WITH VOLTCOMYST OR CHANNELYST.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS



MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

Sears, Roebuck and Co. Automatic Record Changer

Models 101.220, 101.221, 101.223

SUMMARY OF MECHANISM OPERATION:

The capacity of the instrument is ten 12" or twelve 10" records.

To load, turn the two large lower blades AM (in top view) towards the center of the turntable, as shown. Then place the records over the turntable shaft allowing them to rest on the blades. To start operation, trip Reject button AP. To unload after playing, grasp under lower blade, lift slightly, and turn 180 degrees allowing them to fall into the notches provided. There will then be no obstruction in taking the records off.

Set middle button AQ to 10" or 12" in accordance with size of records. All records must be of same size for each loading.

To change record anytime when needle is on the record, merely trip Reject button AP.

To play records one by one, turn changer blades back away from center of table, and set Manual-Automatic button AR for Manual operation.

DESCRIPTION OF CHANGE CYCLE:

Push Reject button AP which releases latch CF (through reject link BG) that holds pawl CH. When CH is in starting (or neutral) position it is under sub-frame BJ and upon being released from latch CF engages with lugs on pinion DG which is rotating. This turns main cam gear DQ sufficiently to engage first tooth shown at CHA and continues to rotate it for one complete revolution, which constitutes one cycle of the changer. Pinion DG is driven through the train from motor pulley AD through the idler pulley AC which drives on the rim of turntable AB keyed to turntable shaft DA.

The pickup arm movement is controlled laterally by the pickup crank CB, the end of which rides in the cam track DPA of cam gear DQ.

As the cam rim DPB slides on the head of lift pin CC raising pickup arm AJ, the roller on pickup crank CB, rolling in track DPA it forces outward (carrying outward with it pickup arm AJ) into the concentric portion of track DPA.

While the pickup arm is swung out in the raised position and the cam gear continues, the eccentric CE actuates the changer blades through eccentric arm CG, changer shafts CN and BC, and tie bar BF.

ADJUSTMENTS AND SYNCHRONIZING:

1. To set changer blades, AM and AN, loosen screws on CM, BD, and CP, and place blade in position shown in top view with top blades about 1/16" from the edge of a 12" record and cam gear in neutral or playing position. The tie bar BF should then be pivoted over to within 1/16" of sub-frame BJ with driving crank BD pointing straight out to left (machine in position shown in bottom view). Then screw clamps CM, BD, and CP tight.

2. To adjust the lift of the pickup arm, should it hit under the lower blade AM or not clear over 10-12" records, merely tighten or loosen (by small degrees) the hex head screw on the under side of the pickup arm near the pivot end.

The lateral swing is controlled by crank CB riding in groove DPA.

To adjust the swing of pickup arm loosen the screw on the hub of CB, place a record (preferably a 12" one) on the turntable, trip reject button and turn turntable by hand until pickup arm AJ lowers to record. Just before the needle touches, stop turning and push the arm sideways until the needle is about 3/32" from the edge of the record then continue to turn turntable to see if it lands that distance from the edge. Then tighten up the clamping screw on pickup crank CB.

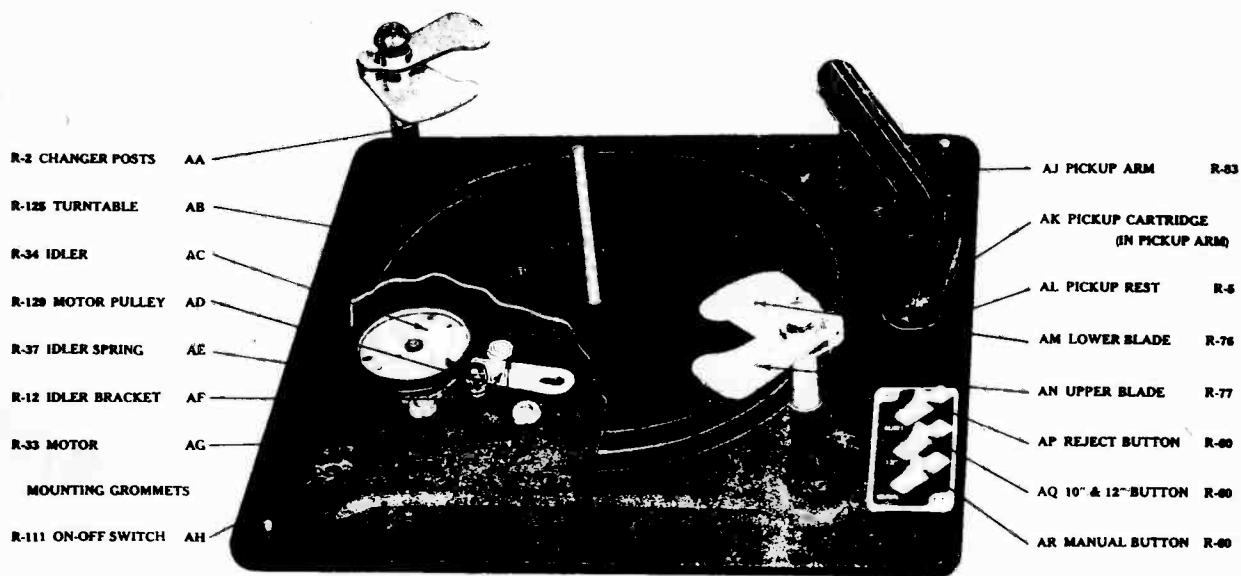
The tripping adjustment or latch adjusting screw CM controls the point at which the mechanism picks up the pickup arm AJ and removes it to allow the next record to be dropped. Should records not finish playing it is merely necessary to unscrew this screw until it completes records properly, or should machine fail to trip at end of record, turn screw in so that it will trip sooner.

REPLACING MOTOR:

Remove idler wheel AC and the three motor mounting screws AG. Be sure to save metal bushing spacers, which slip inside of rubber grommets. These prevent rubber from being squeezed out of shape which would prevent proper cushioning of motor. Place motor of proper rating in same position as present motor and replace spacers, washers and screws as before.

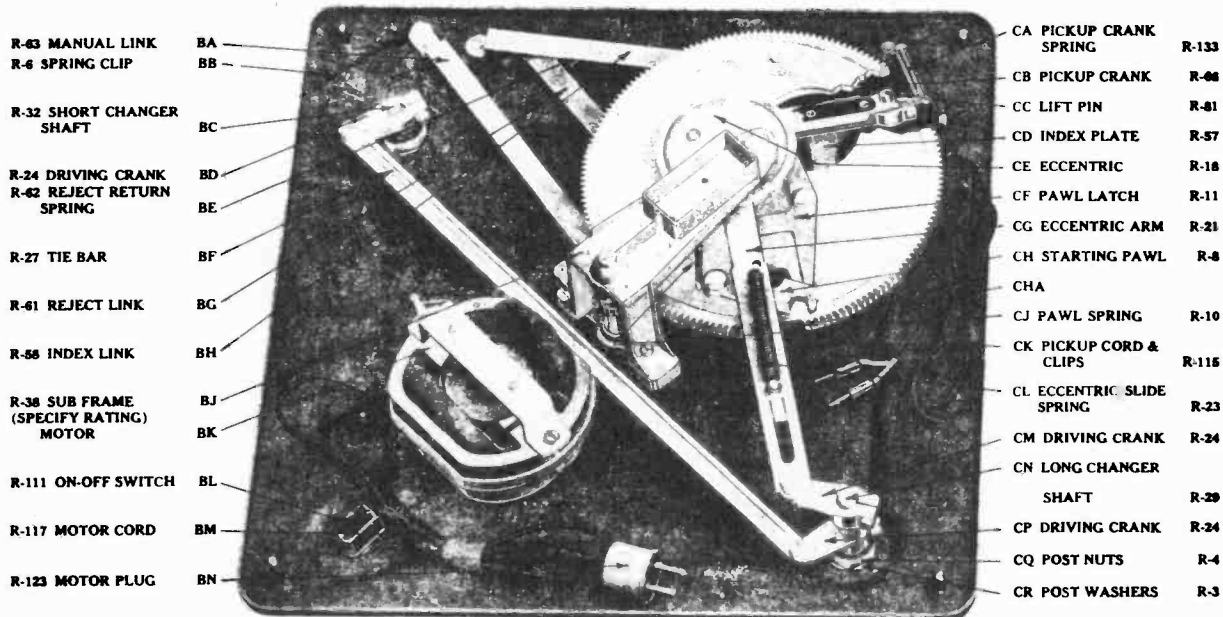
Alphabetically arranged index letters are used in the illustrations and in the description to facilitate locating of parts in the illustrations. Parts with the prefix letter "A" will be found in the illustration of the top of the record changer. Parts with the prefix letter "B" and "C" will be found in the illustration of the bottom of the changer.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS



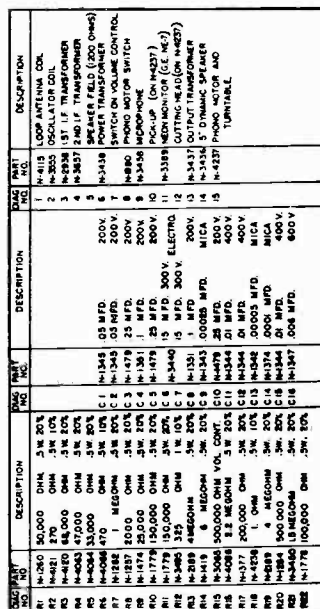
Sears, Roebuck and Co.
Automatic Record Changer

TOP OF CHANGER



BOTTOM OF CHANGER

Sonora Radio and Television Corp.



6 TUBE RADIO, PHONOGRAPH AND RECORDER COMBINATION

93

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

RADIO RECORDING

VOLUME CONTROL. Turn this control to the right until the switch clicks and the pilot light illuminates the dial. After 30 seconds when the tubes have become heated, adjust the recording volume as described below.

CUTTING HEAD. The cutting head is in the large arm located at the left of the turntable. To insert a stylus, lift the cutting head arm vertically, loosen the set screw and insert the stylus with the V-shaped point of the stylus up (See Fig. 1). Insert the stylus to the full depth of the hole and tighten the set screw securely.

CUTTING RECORDS. Place a blank disk on the turntable, making sure that the stud on the turntable projects through one of the three small holes near the center of the disk. Tune in a radio station as instructed in the section on radio operation. Turn the selector switch to position 3 to connect the set for radio recording. Increase the volume until the center and the outer ring of the recording control flash. Reduce the volume slowly until the outer ring just stops flashing on loud passages. The center of the recording control should be flashing most of the time without the outer ring flashing for the proper recording level.

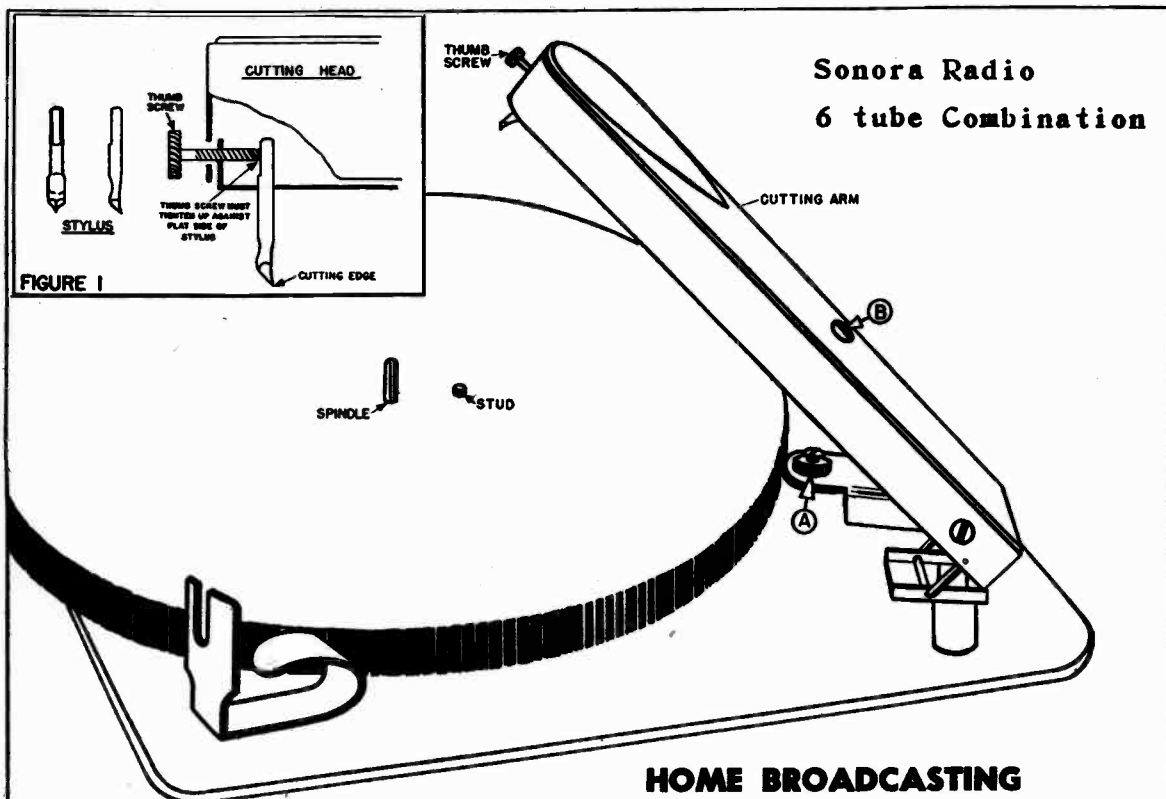
After the proper level of recording has been determined, raise the cutting head to about 45 degrees and move it to the right until it is over the edge of the record. Lower the cutting head gently to the record. The radio program is now being recorded. As the record is being cut, a small shaving will be thrown off from the stylus and gradually will move towards the center of the record. The shaving

can be pushed with the fingers towards the center and wadded up before removing. After the record is complete, raise the cutting head to about a 45-degree position, move it to the left and return it to its rest. The record is now cut and is ready for immediate playing. To play this record merely turn the selector switch to position 2 and proceed to play the phonograph as you ordinarily would for any type of commercial record.

Shavings should not be allowed to accumulate around the stylus. A soft brush will be of assistance in pushing the shavings towards the center of the record during the cutting process.

The cutting head must not be allowed to cut too close to the center of the record. The cutter should be lifted off the turntable before the stylus reaches the label or the uncoated portion of the record, as the fine point on the stylus will be damaged. Also do not allow the stylus to touch the stud on the turntable.

When placing the cutting head on a record, lift the head to a 45-degree position and move the head over the starting position on the record. Lower the head slowly to the record. If the stylus is not over the correct starting position, raise the head to 45-degrees before moving to a new position. Never move the cutting head until it is raised to a 45-degree position.



SELECTOR SWITCH. When this knob is turned to Position 5, the microphone is connected and can be used for home broadcasting purposes.

VOLUME CONTROL. Turn this control until the switch clicks and the pilot lights are illuminated. This control is used to determine the output of the microphone. In order to do home broadcasting it is necessary to have the microphone as far away as possible from

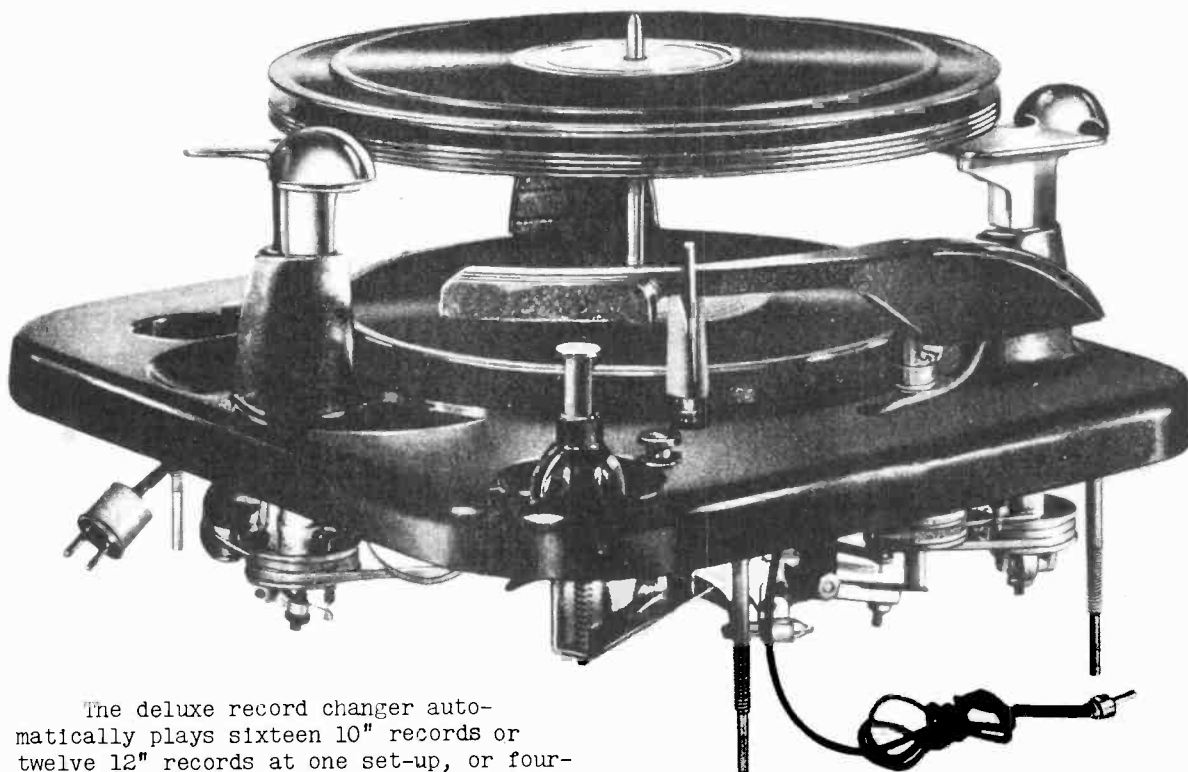
the loud speaker of the receiver. This is necessary, as the output from the speaker will be fed back into the microphone and cause a loud squeal or howl. In order to do home broadcasting successfully it is preferable to have the microphone in another room if possible. An extension cord can be obtained for use with the microphone in order to place the microphone a long distance from the loud speaker.

HOME BROADCASTING

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

STROMBERG-CARLSON TELEPHONE MANUFACTURING COMPANY
ROCHESTER, NEW YORK

DELUXE AUTOMATIC RECORD CHANGER



The deluxe record changer automatically plays sixteen 10" records or twelve 12" records at one set-up, or fourteen 10" and 12" records inter-mixed. Each of the three posts has two plates; the lower one on which the records rest is the shelf plate, the upper one is the selector plate which takes from the bottom of the stack the next record to be played and releases it to the turntable. To load for automatic operation, see that all three shelf plates are turned down toward the turntable, then place the stack of records to be played over the turntable spindle so that they rest on the three shelf plates.

Then see that pointer on control switch is set on "A" (automatic), and press "start" button to put changer in operation. (What are here called the selector plates of the changer are commonly known among service men as "blades" or "knives", names which are best avoided when talking to the user, as they may convey an exaggerated impression of sharpness or danger in the movement of these parts.)

To reject a record (or to start a change cycle as for testing purposes), simply press the "reject" button at any time while needle is upon a record. To play manually, turn shelf plates up, set

pointer on "M" (for manual), then place a record on turntable and press "start" button to switch on motor, then place pick-up arm into position on record.

The changer can be turned off at any time by pressing down on stop button. If changer is left running, no damage will be done, as it will shut off automatically after the last record has been played.

TO CHECK OILING

(a) If squeaks are heard, compare the squeak with and without a load of records; any stack of records in motion is likely to squeak a little against a pin through their center. This can be corrected by rubbing a little wax on the turntable spindle.

(b) "Caution": Do not oil felt washers on the two idler wheels as centrifugal force will throw the excessive oil out over the edge of idler wheel and cause loss of traction to turntable. (The purpose of the felt washer is to silence the idler wheel operation and should not be used as an oil wick.)

(c) Check the two oil wicks on the motor to see that they are thoroughly saturated.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

(d) Check lubrication on turntable spindle bearings. The top bearings can be oiled by removing turntable (When replacing turntable, care should be taken not to injure rubber idler wheels.) Then oil lower bearings from below.
(e) Check lubrication at all other bearing points.

TROUBLE SHOOTING:

Cases of failure to operate satisfactorily will generally be found due to either neglect of proper lubrication, to tampering with the mechanism after it leaves the factory, or to injuries accidentally sustained as by external vibration or by impact of some heavy object. In addition, there is always the possibility that any kind of spring may "go dead" (cease to operate without any visible breakage), even though the utmost factory precautions are taken against it -- or that set screws may work loose due to external vibration. For tightening set screws, an Allen (hexagon) wrench is required. Be sure that set screws are properly seated on the holes or flats provided. Damage from tampering is likely to take the form of bent parts. Never bend any part during examination.

- (1) **MECHANISM IS SLOW IN STARTING, OR MOTOR GETS HOT**
 - (a) Check lubrication. Oil if necessary. See oiling instructions.
 - (b) Check voltage. Line voltage may be abnormally low or high.
 - (c) Motor windings damaged. If windings are found damaged, remove motor and return it to factory for repair or replacement.
- (2) **MOTOR FAILS TO RUN, EVEN WHEN IT IS ENTIRELY DISCONNECTED FROM OTHER WIRING AND PROPER VOLTAGE IS APPLIED DIRECTLY TO THE TWO ENDS OF ITS WINDINGS**

This indicates trouble in motor windings. Unless damage is easily seen and repaired, replace motor, as above described.

(3) MOTOR IS SLOW IN STARTING

- (a) Changer may have been in a very cold place and may not yet have reached room temperature. Give it a fair chance to get warmed up before concluding that motor is defective and proceed as in Paragraph 2 above.

- (b) The changer is equipped with a constant speed self-starting motor. Under all normal conditions it starts automatically and runs at correct speed.

(4) SQUEAKS OR OTHER NOISES, DURING PLAYING OF RECORDS

Check oiling as directed above. (If squeaks are heard, they will usually be found to come from the records - not from the mechanism.)

See "To check oiling".

(5) CHANGER IS NOISY WHEN IN CYCLE

Check oiling. Also see if any part has become loose or bent and is rubbing against a moving part.

(6) MOTION OF PICK-UP TOWARD TURNTABLE SPINDLE WILL NOT TRIP CHANGER MECHANISM

See that control switch pointer is not set on "M" (MANUAL).

(7) PRESSING PUSH BUTTON DOES NOT TRIP CHANGER MECHANISM

- (a) See that control switch pointer is not set on "M" (Manual).
- (b) Check control switch assembly (Fig. 17) to see whether there is an obstruction or a bent or loose part. Also check for loose set screws in switch knob.
- (c) Follow through on action from the push button to switch latch (90) and see that every part is operating properly.

(8) SETTING POINTER ON "M" (MANUAL) FAILS TO PUT CHANGER MECHANISM OUT OF ACTION SO AS TO ENABLE MANUAL OPERATION

- (a) Check for loose set screw in control switch knob.
- (b) Also check for loose or bent parts and be sure that manual latch (91) is holding the trip link rod to keep it from moving.

(9) TONE ARM FALLS OFF RECORD

Needle lands too close to edge of record. Not adjusted in far enough. (Check Adjustment #1.)

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

Adjustment #1: ADJUSTING LANDING POSITION OF NEEDLE ON THE RECORD

The position at which needle lands on record can be adjusted by inserting screw driver through needle landing adjusting hole just in back of tone arm (shown in Fig. 1). For adjusting the needle landing on a 10" record, insert screw driver into slot in 10" adjusting stud. For adjusting the needle landing on a 12" record, insert screw driver into the slot in 12" adjusting stud (See Fig. 2). Turn very slightly clockwise or counter-clockwise to move needle landing in or out. The factory adjustment of the needle landing is 1/8" in from the outer edge of the record. (See Fig. 1).

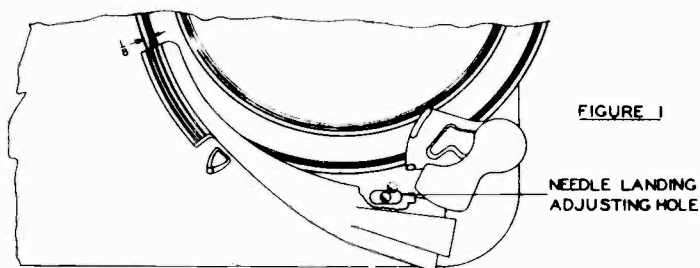


FIGURE 1

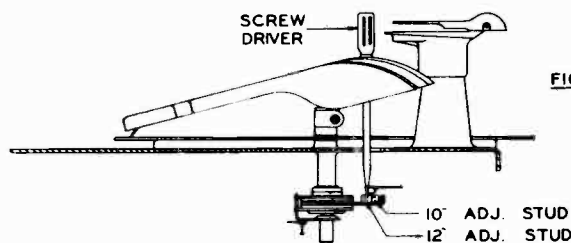


FIGURE 2

Adjustment #2: TONE ARM HEIGHT ADJUSTMENT

To adjust, insert screw driver into adjusting screw (6) through tone arm height adjusting hole in tone arm (1), shown above; to increase height to which tone arm rises, turn screw clockwise; to lower, turn counter-clockwise. The tone arm elevating pin (12) presses against this screw which should be adjusted so that the distance between the point of needle (in tone arm (1)) and the turntable is 1-3/8" to 1-1/2", which is the equivalent of approximately sixteen 10" records.

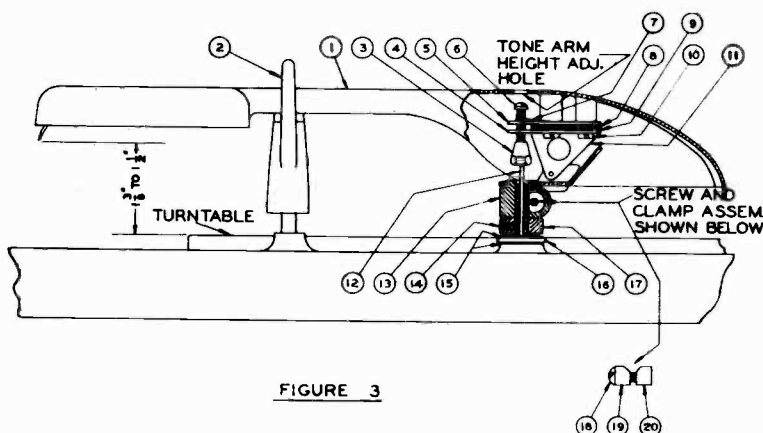


FIGURE 3

Adjustment #7: CHANGER PLATE SYNCHRONIZATION

The synchronization of changer plates can be checked by placing one 10" record on the shelf plates. Then start a change cycle allowing it to continue until plates are just about ready to release the record. It can then be determined which plate is either slow or fast (See Fig. 12). This plate can then be adjusted by loosening the tape clamp screws (49) on the tape clamp plate (48) which hold the tape (47) from slipping on the pulley (36) (See Fig. 11). Then slightly move changer plate whatever is necessary to synchronize it with the other two plates so that record will drop evenly. Then tighten tape clamp screws (49) securely. (Also check adjustment #6).

NOTE: Tape line (47) should have a very slight amount of slack. Check by grasping tape line with thumb and index finger and moving it in and out approximately 5/8" with a moderate pressure.

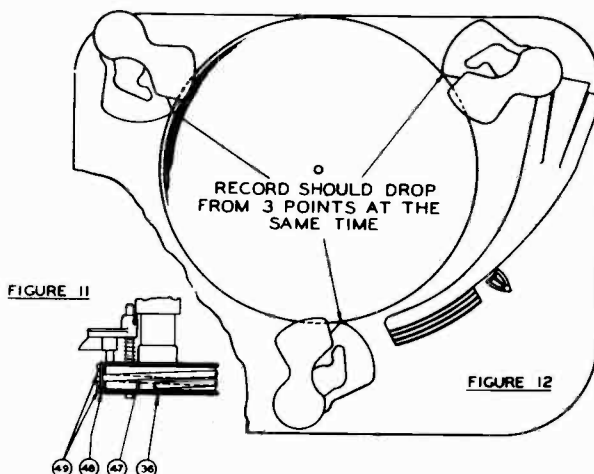


FIGURE 11

FIGURE 12

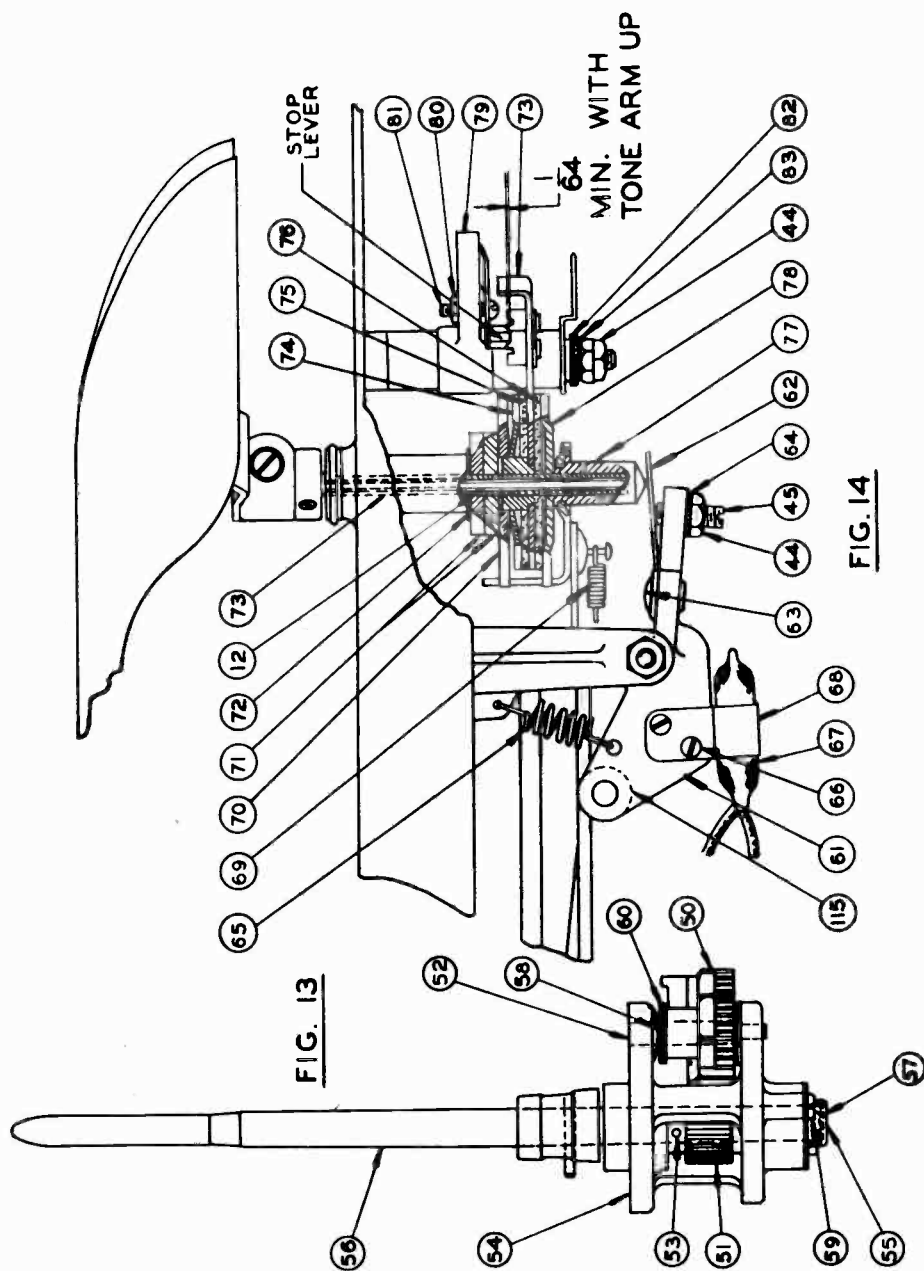


FIG. 14

FIG. 13

Adjustment #8: SETTING CAM ADJUSTMENT

First start a change cycle and release 10" record to turntable, then shut off power supply to motor when stop lever is contacting stud, on location plate (73).

Then, by means of the adjusting screw (81) set stop lever so that there will be approximately 1/64" minimum overlap on eccentric studs. If there is not enough overlap, the stop lever will slide off instead of holding onto eccentric studs, while measuring tone arm (1) landing position. If there is too much overlap, then stop lever will not release tone arm and allow it to track in on record after change cycle is completed.

WEBSTER-CHICAGO

OPERATING AND SERVICE INSTRUCTIONS No. 2025 RECORDER MECHANISM

This recording mechanism is designed to record on blanks which have not been pregrooved. The grooves are cut into a blank disc by the recording needle located in the cutter cartridge (16). Grooves are cut in the record laterally at the rate of 98 lines per inch.

The cutting arm assembly (17) is driven from below the motorboard through a gearing arrangement which operates on the friction clutch drive principle. It is most important after a record has been cut to place the recording arm in the rest to keep it from moving, as the gearing mechanism is in continuous operation while the turntable is running, and if allowed to suspend of its own free weight, the cutting arm assembly (17) will automatically travel toward the center of the turntable and damage the recording needle and turntable.

SELECTION OF RECORDING NEEDLES

This recorder uses a short type recording needle having a length of approximately 5/8" and a shank diameter of approximately 1/16". At the present time there are three common types of recording needles suitable for home recording.

A very popular needle is the low priced carbon steel type which is hardened and ground. This type of needle will cut from 6 to 30 recordings, depending on size and hardness of blank. This relatively short life is due to the inability of the hardened edge to maintain its shape and form when cutting a series of records at normal cutting depth. This needle has a "v" shaped edge and requires less pressure than the next two types which will be mentioned. One thing to remember is that a recording needle is similar to a lathe cutting tool, and the harder the point - the longer the life and the better the finished product.

The second and most popular kind of recording needle is made of various types of metal shank with special alloy or precious metal-inserted point. In recent years there have been a number of developments in applying a special hard metal insert to a softer metal shank. Among these is the Stellite. This needle will maintain a uniform cutting edge for 30 to 60 recordings, depending on size and hardness of disc. They may be resharpened from six to eight times at nominal costs.

The third recording needle is the sapphire, which is next in hardness only to the diamond. While sapphire needles have by far the hardest cutting edge; they offer a disadvantage in their brittleness. They are likely to chip if severely jarred or dropped on a medium hard surface. Be very careful when using a sapphire needle. This type can also be re-sharpened from six to eight times.

These last two types of recording needles mentioned have slightly rounded points which

requires somewhat more needle pressure than the first type. These needles, however, record with less surface noise.

One of the most important requirements of a recording needle is a highly polished cutting edge. During actual cutting, the recording needle generates an unusual amount of friction heat, causing needle wear. A recording needle is considered worn when background hiss becomes objectionable or when the cut thread is ragged.

SELECTION OF RECORD BLANKS

The same care taken in choosing needles should be used in selecting recording blanks. At present a large number of record blanks are advertised as being "the most satisfactory", but it is well to remember that the finished record is only as good as the blank on which it has been recorded. It will be found that several types of blanks can be cut with various results. If your recordings are to be short lived and there is not too much concern about frequency response or surface noise, inexpensive blanks can be used. If, however, records are to be permanent and have clarity and distinction of speech or music, with a minimum of background noise, more expensive recording discs are recommended.

Record blanks are available in 6", 8", 9", 10", and 12". These sizes can be recorded with this mechanism, provided the turntable is as large or larger than the outside diameter of the recording blank.

Past experience has proved that a steel or aluminum base disc provides the most permanent record. Inexpensive blanks invariably use paper or fibre bases which have a dipped or sprayed coating.

In selecting blanks, a visual inspection of the surface will determine whether it can be used. A soft surface that will show a lightly pressed fingernail mark, will have a tendency to gum up as the record is being cut. Considerable chatter will also be introduced into the recording if the shavings are not cleanly cut due to softness of the coating. A good recording is one in which the grooves appear shiny after they have been cut.

Some blanks are made of hard material and should be cut with a sapphire needle. The main disadvantage of a hard surface recording blank is that during the cutting process the recording needle chips the surface of the record and causes excessive needle wear. After a few experiments you will find the blank most suited to your particular needs.

OPERATING THE RECORDER

A close inspection of the recording needle will show it to have a flat spot on the shank opposite the cutting face. It is important that the needle be inserted in the cutter cartridge (See

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

16 - Fig. 2) with the flat spot toward the front, so that the "needle screw" bears against the flat spot.

First be sure that volume level and recorder level settings are satisfactory, then lift the recording arm (17) off the rest and place the recording needle on the record approximately 1/4" in from the outside edge of the record, allow the recorder to operate and cut several grooves for the beginning of the record, then turn the volume control up to a previously established setting for proper recording level, and give signal that the record is being cut. It is important that a constant level be maintained by carefully watching the volume level indicator. The recording process can be continued until the recording head comes to within approximately 1/4" of the paper label, at which time the volume control should be turned back to "0" and several blank grooves allowed to be cut. This completes the recording. Then raise recording arm (17) and return to rest.

CAUTION

To preserve the point on the recording needle, always hold cutter cartridge (16) up by needle screw when lowering cutting arm (17) to record. When cutting arm (17) stops its downward motion, lower recording needle gently to record blank while turntable is revolving.

TIMING YOUR RECORDS

The approximate length of time required for cutting the various size records at 78 RPM is as follows:

- 6" size, each side, 1.5 minutes
- 8" size, each side, 2.5 minutes
- 10" size, each side, 4.0 minutes
- 12" size, each side, 5.5 minutes

For best results, rehearse your selection and time it for recording. This will permit you to space it out on the record and insure against using up the entire record before your selection is finished. After the recording is finished, do not lift the recording needle from the record until you have cut several extra grooves with volume control turned to "0".

When cutting a record it will be noticed that the threads coming from the grooves will tend to gather toward the middle of the record. The threads may start winding up adjacent to the groove which is being cut. If so, keep a soft brush handy to brush them toward the center pin as each 1/2" of groove is cut. On small 6" or 8" records there are not enough threads present, as a rule, to cause trouble.

When cutting 10" or 12" blanks, however, there is a possibility of threads accumulating under the recording needle, which would tend to ease the needle pressure and cause a momentary skip or defect on the record. By keeping the threads brushed toward the center and away from the recording needle, the surface being cut remains clean, insuring a satisfactory recording.

PLAYING THE RECORD BACK

After the record has been completed and the threads brushed from the record, it is possible to immediately play this record back by use of the play-back pick-up.

It will be noted that the grooves of the record, after the record has been cut, will be shiny; when playing back a new recording, the grooves will turn to a slightly dull finish. This is a normal condition. Fibrous or cactus needles are not recommended, as such needles do not have a uniform point and often deposit a fibrous lint in the record grooves.

CUTTER CARTRIDGE ELECTRICAL CHARACTERISTICS

The cutter cartridge is of the crystal type and it reflects a capacitive load to the output of the amplifier stage. DC voltage should never be applied across its terminals. The amplifier should deliver from two to three watts of audio power and the cutter requires from 100 to 150 volts AC, but should never be overdriven as permanent damage will usually result.

ADJUSTMENTS

1. Cutting Needle Pressure Adjustment

The pressure on the recording needle can be varied by the pressure adjustment thumbnut (23). This adjustment determines the depth of cut or thickness of the thread cut from the record blank. All recorders are adjusted at the factory to produce approximately 1-1/4 ounce recording needle pressure. However, it may be necessary to re-adjust, due to type of recording needle or record blank used.

A good idea of the depth of cut can be had by examining the grooves in the record with a magnifying glass. When using an ordinary steel recording needle, the groove should be 30% and the space between grooves 70%. When using a sapphire recording needle, the width of the grooves should be about equal to the space between them, that is, 50% groove and 50% space.

The cut thread can be measured with a micrometer. It should be approximately .0015. It must be remembered that the depth of cut directly affects the motor speed, and RPM loss between recording and play-back is usually the result of cutting too deep.

The variation in the hardness of the record coating on different types of record blanks will have to be compensated for by correctly adjusting pressure adjustment thumbnut (23). Hard coated record blanks will need more pressure and soft coated blanks less pressure to obtain the recommended .0015 inches depth of cut.

To increase recording needle pressure or thickness of thread, turn pressure adjustment thumbnut (23) clockwise, (looking from front end of cutting arm assem. (17)). Turning thumbnut (23) counter-clockwise will decrease needle pressure and thickness of thread. Before making any pressure adjustment, be sure that a good sharp recording needle is used and that it has been properly inserted.

2. Height of Cutting Arm Adjustment

To check for proper height adjustment, raise the recording cartridge (16) by the needle screw until it is felt to touch the cutting arm (17). The recording needle point should then be approximately 1/8" above the record surface. If the height must be readjusted, loosen lock nut (13), adjust screw (12) to the proper height, and tighten nut (13).

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

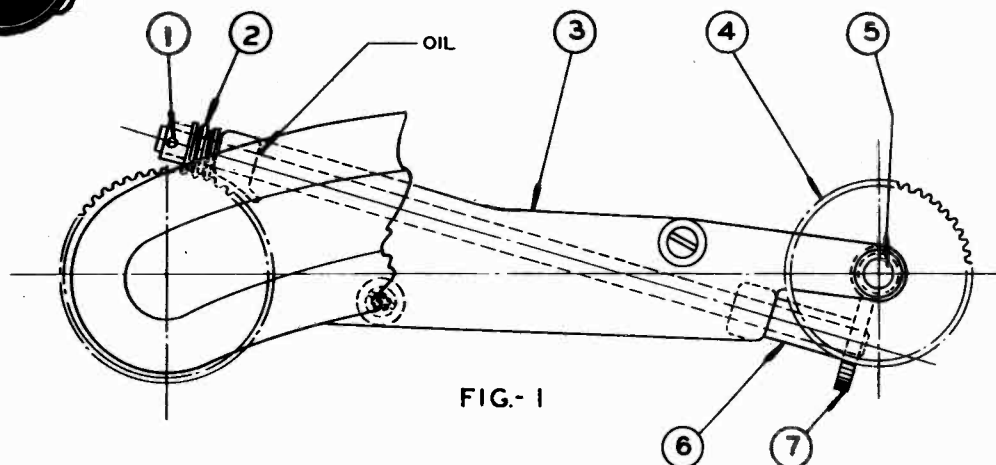


FIG. 1

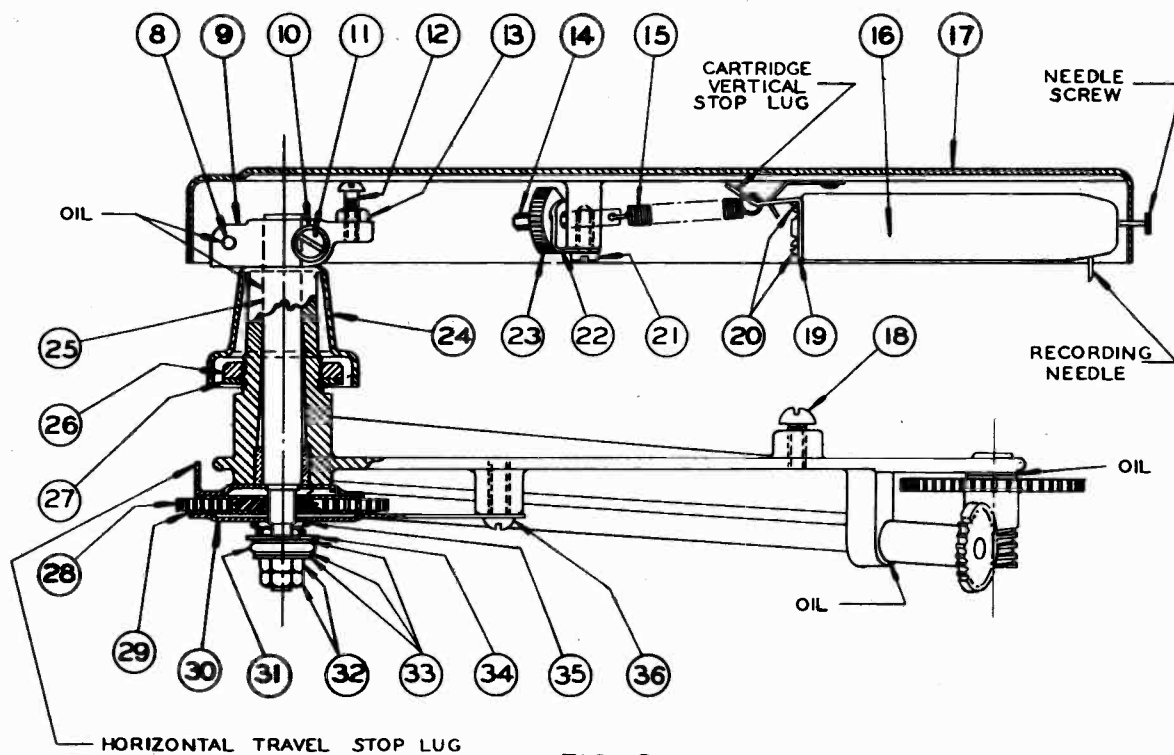


FIG. 2

WEBSTER-CHICAGO CORPORATION

COMPILED BY M. N. BEITMAN, SUPREME PUBLICATIONS

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

3. Cutter Cartridge Vertical Stop Adjustment

With the recording needle resting on a record, raise the cutting arm (17) slowly, (watching cutting arm (17) and recording needle). There should be from 3/16" to 1/4" vertical motion of the cutting arm before the recording needle lifts from record. This will allow free vertical movement of the cutter cartridge, and compensate for any slight wobble of the turntable or record. To get slightly more or less movement, bend the "cartridge vertical stop lug" on male pivot (19), which bears against cutting arm, either up or down.

4. Cutting Arm Horizontal Travel Stop Adjustment

The travel stop should be adjusted so that cutting arm (17) will stop before recording needle reaches the paper label on record blank. To adjust, first raise cutting arm (17) and slightly loosen screw (11), move arm clockwise until the "horizontal travel stop lug" bears against stop-ping point on casting, continue clockwise motion of cutting arm (17) until recording needle is 1/8" away from paper label, raise cutting arm and tighten screw (11) securely. If cutting needle cuts into paper label, then repeat procedure.

OILING

The recorder mechanism has been lubricated at the factory and should not require any lubrication for one year. After one year, oil at the five points indicated on sketch, with a few drops of good, light machine oil.

CAUTION

Never oil the friction clutch (29) at any time, as it will result in clutch slipping and cutter arm (17) standing still in one place instead of feeding in properly. If cork or felt washer (29) have become oily, remove and clean with suitable

REPLACEMENT PARTS:

When ordering replacement parts for this mechanism, refer to the part number of the entire mechanism in addition to the numbers and names of parts shown above. Where no part number is given, part cannot be separately supplied; therefore, order the assembly containing it.

REPLACEMENT PARTS LIST MODEL 25 -- RECORDER ASSEMBLY

Location	Part Number	Part Name	Location	Part Number	Part Name
1	21A044	Gear shaft drive pin.	17	21B078C	Cutting arm assembly (dark brown hammerloid finish).
2	.....	Gear shaft worm.	18	26A075	#8-32x3/4" R.H.M. screw.
3	.....	Recorder base & bushing assembly.	19	21A024	Male pivot.
4	.....	Worm & vertical shaft gear assembly.	20	26A081	#2-56x1/8" R.H.M. screw.
5	.....	Vertical shaft.	21	26A076	#6-32x1/4" S.T. screw.
6	.....	Gear shaft spacer.	22	21A149	Adjusting screw support.
7	.....	Shaft & helical gear assembly.	23	12A712	Pressure adjustment thumb nut.
Fig. 1	21B179	Recorder base sub-assembly (includes parts from 1 to 7).	24	12A764	Recorder post cover.
8	.....	Cutting arm hinge pin.) (See Note)	25	11A851	Recorder shaft & clutch assembly.
9	.....	Cutting arm hinge	26	26A071	Recorder base nut.
10	(12A625)	Swivel head clamp sleeve.	27	25A015	Recorder base washer.
11	(12A631)	Swivel head clamp.	28	21A032	Recorder arm post gear.
12	26A079	#6-32x1/2" R.H.M. screw.	(21A028)	26A072	Cork friction washer.
13	26A080	#6-32x5/8" R.H.M. screw.	29	21A027	Felt Washer.
14	26A078	#6-32 hex. nut.	30	11A781	Stationary friction plate.
15	12A994	Spring adjusting lug.	31	26A077	Ball bearing & retainer assembly.
16	21A046	Cartridge spring.	32	12A692	#10-32 hex. nut (2 required).
	21A050	Cutter cartridge (crystal type X-26U).	33	25A2519	Washer (3 required).
			34	21A045	Washer (1 required).
			35	21A045	Friction clutch spring.
			36	26A074	#8-32x1/4" R.H.S.T. screw.

fluid, then replace. If recording needle is cutting through coating on blank into the metal disc, it indicates oil on clutch, or that clutch needs more pressure. To increase clutch pressure, tighten nuts (32) slightly.

INSTALLATION OF RECORDER MECHANISM

- Loosen screw (11) and remove cutting arm assem. (17) from mechanism.
- Remove post cover (24) and screw (18).
- Remove large nut (26) and washer (27).
- Remove snap plug buttons covering mounting holes.
- Insert shaft of mechanism up through large mounting hole in base plate.
- Mesh fibre gear (4) with pinion gear on turntable spindle.
- Assemble large washer and nut on shaft threaded portion protruding up from base plate, and tighten nut thumb tight.
- Remove turntable and insert screw (18) through hole in base plate into hole in mechanism.
- Check gear mesh clearance between fibre gear (4) and pinion gear on turntable spindle. It must run freely without binding.
- Tighten screw (18) securely.
- Tighten large nut (26) securely.
- Assemble post cover (24).
- Assemble cutting arm assembly and tighten screw (11).
- Adjust as outlined in Adjustments #1 to #4.

The Webster-Chicago recording mechanism unit is constructed of a minimum number of working parts, and in operation is simple and reliable. As with all mechanical instruments, occasional minor adjustments may be necessary.

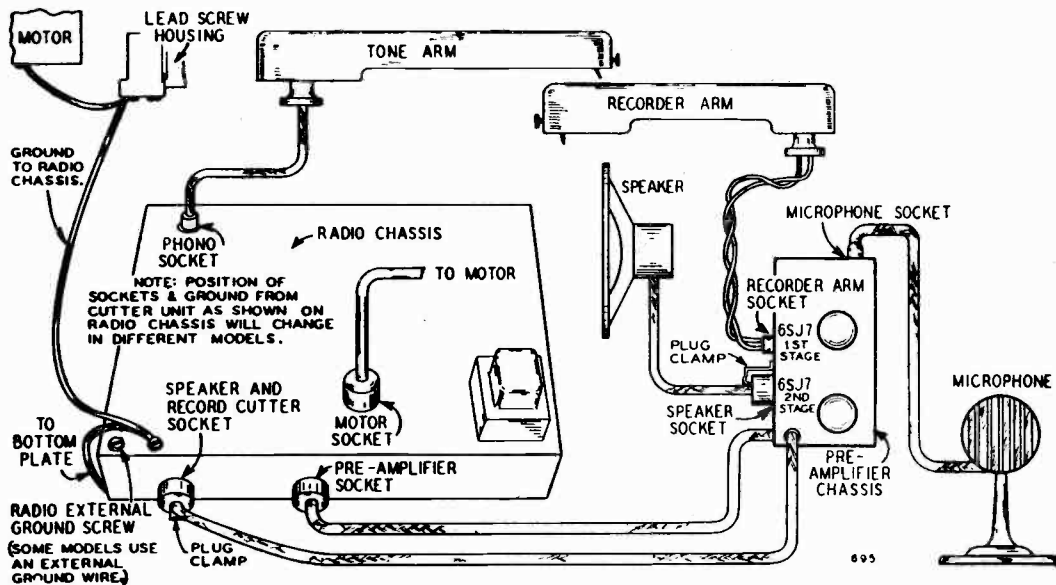
Additional information, if necessary, can be had upon application to the manufacturer.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

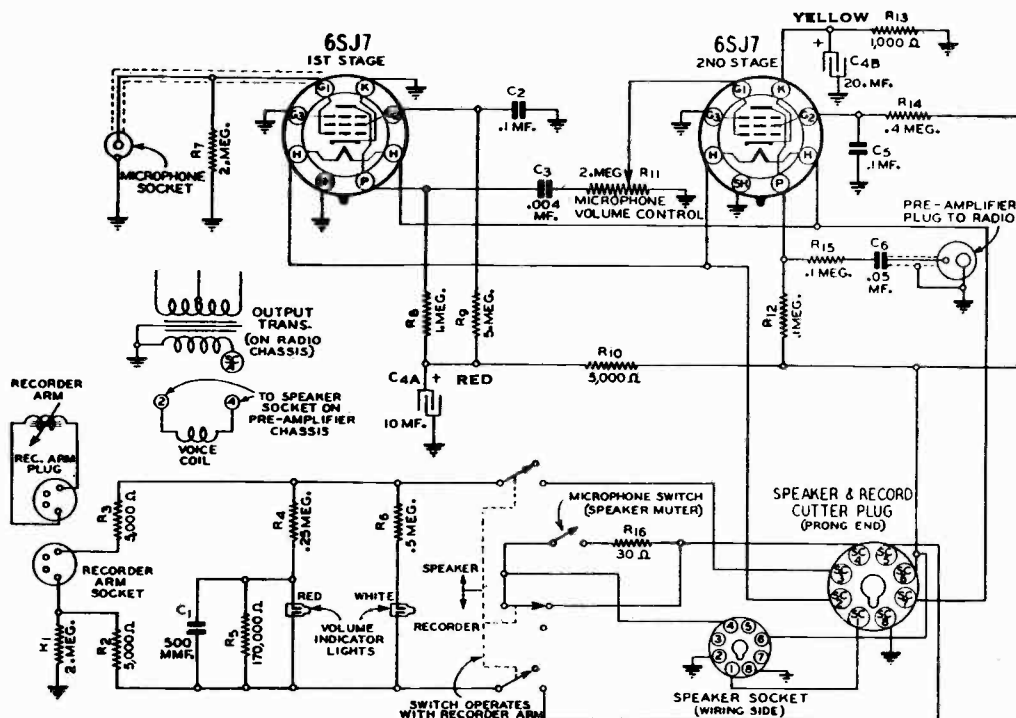
Wells-Gardner & Co.

Series 7A41-SC Record Maker

AUTOMATIC RECORD CHANGER— PUBLIC ADDRESS SYSTEM



Cable Interconnections



Pre-Amplifier Unit Schematic Circuit Diagram

RECORDING TECHNIQUE

RECORDING LEVEL

The purpose of the volume indicator lights is to provide the operator with a means of determining first that the recorded sound is sufficiently loud to give satisfactory results, and secondly to prevent any tendency to over-cut or distort.

The white indicator light will flash in response to the music or speech, the brightness varying with the intensity of the sound. It flickers almost continuously during the recording but will be out during pauses in the program or speech. The red indicator light responds only occasionally as a result of loud passages.

On soft passages, the white light will be dim but the volume control need not necessarily be increased. If the red light flashes slightly, on occasion, no harm will be done but, if this light is on almost continuously, the recording level is too high and overcutting with resultant distortion and damage to the record will result.

A little experience on the part of the operator will soon allow him to judge certain passages on which the volume control may be turned slightly higher in order to give satisfactory results or, if loud passages are being recorded, times at which the volume should be lowered slightly.

DEPTH OF CUT

After the machine has been set up and properly adjusted, careful attention should be paid to the actual

groove as it has been cut in the blank. This can best be accomplished, for home use, by means of a reading glass or magnifying glass. The depth of cut, which is determined by the needle pressure on the blank, should be such that the width of the groove is approximately the same as that of the "land" or the width between grooves. The importance of the depth of the cut cannot be over-emphasized, since too light a cut, or too heavy a cut will tend to distort. Too light a cut may cause the play-back needle to jump out of the groove, while too heavy a cut may produce "wows" due to slowing down the speed of the turntable, and will tend to allow the needle to cut completely through the side walls.

Fig. 6 shows a groove which is cut too light, and Fig. 7 a groove of approximately fifty-fifty cut, which is generally preferred.

When the cutter is actually recording sound or music, the needle has a sidewise movement and the result is to cut or modulate the side of the groove. Under a reading or magnifying glass this shows up as an irregular "wavy" groove. The irregularities in the groove are determined by the pitch and volume of the sound being recorded.

Fig. 8 shows a properly modulated groove. The volume at which the sound is recorded becomes particularly important because, at too low a level the music will appear thin and weak when it is played back. If the recording level is too high,

the needle will tend to cut completely through the side walls from one groove to the next, producing distortion and eventually allowing the play-back needle to jump completely through the groove wall and into the next groove. This condition is known as "over-cutting" and is shown in Fig. 9. The proper depth of cut and the proper recording level (or loudness of recording) are absolutely essential; attention to these details is just as important as the settings of a fine camera for the best results.

After further experience with the equipment is gathered, such adjustments as the depth of cut, or needle pressure, will probably be best determined by an inspection of the thread cut out of the blank. This thread, for normal cut, should have the approximate consistency of coarse human hair and should not be crinkly. An experienced operator can tell by the inspection of the thread whether the depth of cut adjustment is correctly set and can gain a good idea of the condition of the cutting needle. Further information can be gained by observing the manner in which the thread leaves the needle during the actual process of cutting. Under proper conditions, the thread should throw approximately one-sixteenth inch away from the needle toward the inside of the blank and, as the recording head nears the inside, the needle will be forced to continually push the accumulated cuttings toward the center of the turntable. Should the thread have a tendency to pile up or tangle immediately ahead of the recording

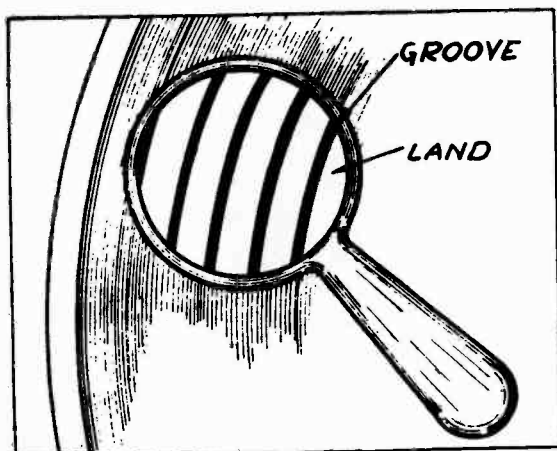


Fig. 6—Groove Too Light

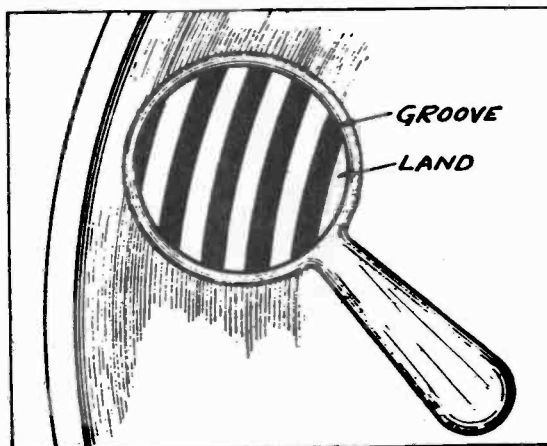


Fig. 7—Correct Groove

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

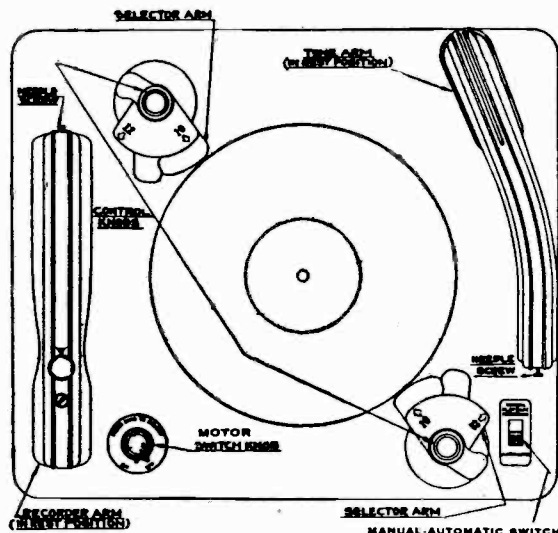


Fig. 10—10 inch Record Setting

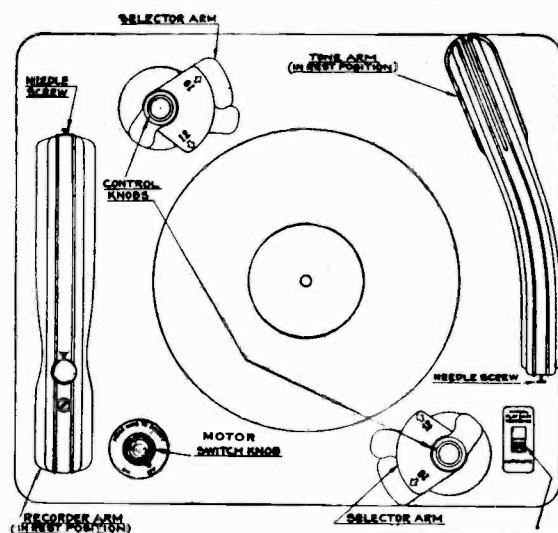


Fig. 11—12 inch Record Setting

needle, lift the recording arm off the blank, loosen the needle screw, and retighten; the resulting minute change in the angular position of the needle will probably correct the trouble.

Experience will also show that when recording from the radio or from the microphone slight adjustments of the Radio Tone Control will be helpful in order to achieve the best and most uniform results. This follows from the fact that some broadcasting stations and certain programs are broadcast with few low frequencies or with excessive high frequencies. The more experienced operator can compensate for these differences as he becomes familiar with the various programs

and stations. In a similar manner, differences in tone quality when the microphone is used can be partially compensated for.

CARE OF HOME RECORDINGS

Too much emphasis cannot be placed on the necessity of protecting home recordings from dirt, dust, or abuse by mishandling. The higher the quality of the blank itself, the more susceptible it is to damage from any of the above factors.

Ordinary phonograph records are much harder than home recordings and the dirt and dust affects them only as an abrasive. In the case of home recordings, the material is softer, and the dirt and dust is

actually embedded in the material itself by the pressure of the playback tone arm so that it cannot then be removed. The effect of this embedded dirt and dust is to quickly add scratch or hiss. In addition, a high quality home recording blank should not be touched on the surface to be recorded and should be kept in a cool dry place both before and after recording.

The tone arm on your phonograph operates at a 2 ounce needle pressure and is of a newer, more expensive type than is found on other machines. Because home recording blanks are softer than regular records, this light needle pressure will do much to preserve their life even after many play-backs.

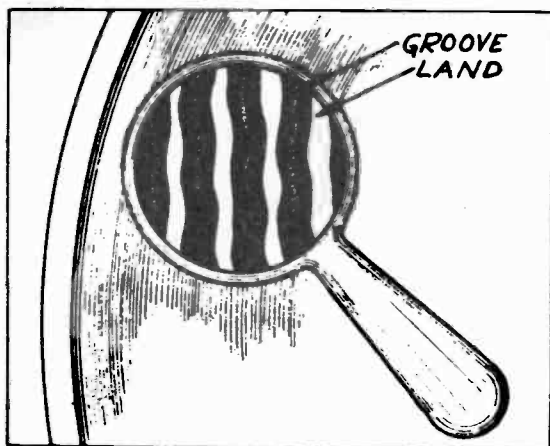


Fig. 8—Groove Properly Modulated

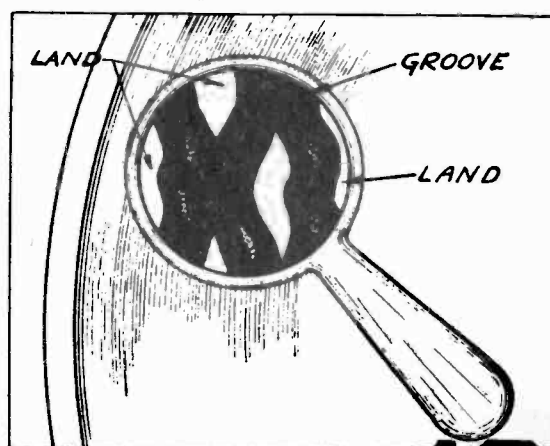
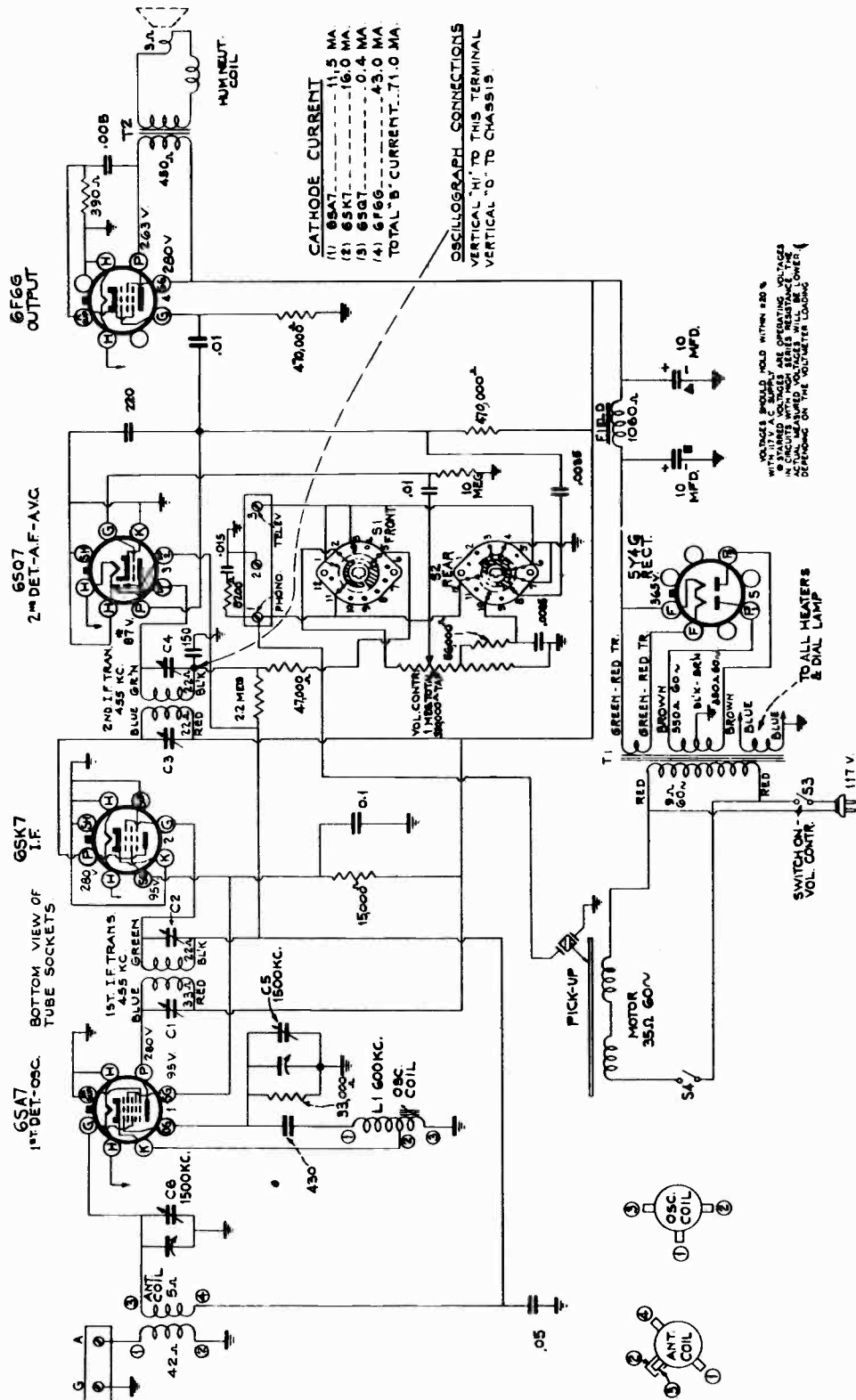


Fig. 9—Groove Overcut

Westinghouse Radio Model WR-470

Five-Tube, Single-Band, A-C, Superheterodyne Radio-Phonograph



MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

Alignment Procedure

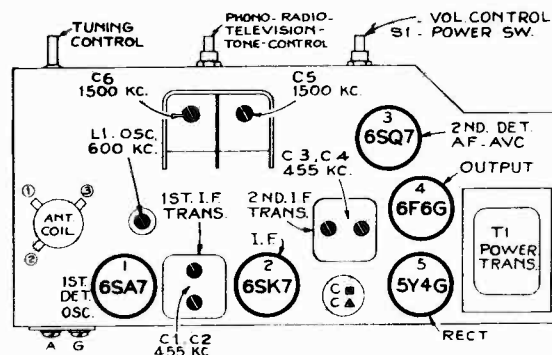
Cathode-Ray Alignment is the preferable method. Connections for the oscillograph are shown on the schematic drawing.

Output Meter Alignment.—If this method is used, connect the meter across the voice coil, and turn the receiver volume control to maximum.

Test Oscillator.—For all alignment operations, connect the low side of the test oscillator to the receiver chassis, and keep the oscillator output as low as possible to avoid a-v-c action.

Calibration Marks.—The tuning dial is fastened in the cabinet and can not be used for reference during alignment. Therefore calibration marks have been stamped in the plate on the front of the chassis as shown in the accompanying drawing. These marks are used for reference during alignment.

Dial Indicator Adjustment.—With the gang condenser in full mesh, the indicator should point to the extreme left (low frequency) mark on the dial scale.



Tube and Trimmer Locations

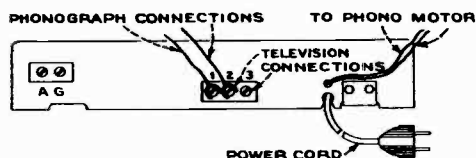
Steps	Connect the high side of the test-osc. to—	Tune test osc. to—	Turn radio dial to—	Adjust the following for maximum peak output
1	Antenna Terminal	455 kc	Quiet Point between 1,720-1,500 kc	C3 and C4 (2nd I-F Trans.)
2				C1 and C2 (1st I-F Trans.)
3	Ant. terminal in series with 200 mmfd.	1,500 kc	1,500 kc calibration mark	C5 (osc.) C6 (ant.)
4		600 kc	600 kc calibration mark	L1 (osc.)*
5	Repeat step 3.			

Note.—Oscillator tracks above signal.

Adjustments for Push-Button Tuning

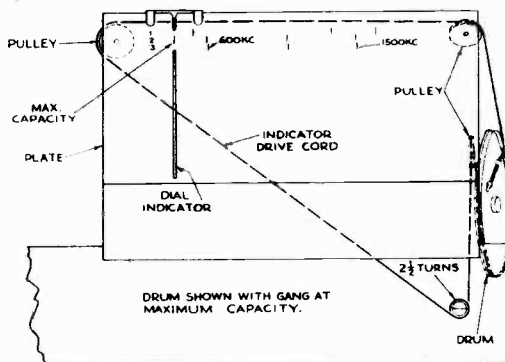
The push-buttons should be adjusted for six favorite stations after the receiver has been operating for a brief warm-up period. Each button may be set up to any standard broadcast station. The preferable arrangement is to adjust for stations in the order of frequency, from low to high. Proceed as follows:

1. Loosen the push buttons by turning counter-clockwise about one turn from their tight position so they turn freely.
2. Check to be sure the Phono-Radio Switch is in "Radio" position.
3. Press in push-button No. 1 (left) as far as it will go without undue pressure, hold in, retune station with manual control if necessary for best reception, and then carefully tighten up the button. Do not tighten more than 1/4 turn after the screw begins to grip or damage to the mechanism may result.
4. Proceed in a similar manner for the remainder of the push-buttons.
5. Insert the station marker tabs in the recesses above the push-buttons.



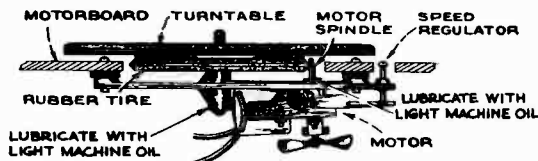
Back of Chassis

* Rock gang condenser slightly while adjusting L1.



Dial-Indicator and Drive Mechanism

Refer to "Alignment Procedure" for explanation of the "calibration marks" shown in this drawing.



Cross Section of Motor Assembly

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS



RECORDIO OPERATING INSTRUCTIONS

MODELS

A-85 TABLE TYPE
A-87 - PORTABLE
A-88 - PORTABLE
A-90 CONSOLE

Viewing the top of the RECORDIO, there are seen to be five control knobs located near the front of the equipment, labelled "MOTOR", "VOLUME", "TONE", "SW-BC", and "TUNING". There are also four other controls of the push button type, placed to the immediate left of the dial.

The control marked "VOLUME" is the volume control and off-and-on switch. The first fractional part of its clockwise turn actuates the line switch, after which the remainder of the turn increases volume. To decrease volume, the control is turned to the left.

The switch labelled "SW-BC" is the wave change switch to change from short wave to broadcast reception. Turned to the left, it is indexed for broadcast reception, turned to the right, it is indexed for short wave reception.

The control marked "TUNING" tunes the receiver over the two frequency bands, and the white pointer will be seen to travel under the edge illuminated dial.

The control marked "TONE" is for properly controlling the fidelity of radio reception and phonograph reproduction. Turned in a clockwise or right hand direction, the bass notes are emphasized--turned in a counter-clockwise direction, the treble notes are emphasized. As it serves no other purpose, the tone control does not function during recording.

The control labelled "MOTOR" is for starting and stopping the turn-table. Turning this control to the right, causes the table to rotate, and when turned to the left, the motor will stop.

The four push button controls are for the purpose of controlling the different functions of the equipment, which are, beginning at the farthest back controls: No. 1, phonograph playback; No. 2, public address; No. 3, microphone recording; No. 4, radio recording. These are all plainly indexed on the dial immediately to their right. When it is desired to have radio reception only, after the RECORDIO has served in one of its other functions, one of the buttons remaining in the "up" position should be pushed down part way. This will release any button from its down position and will adjust the equipment for simple radio reception.

Oiling

Although frequent oiling of the RECORDIO motor is not required, the use of a small amount of oil judiciously applied, two or three times a year, will suffice to maintain the equipment in good order.

1. - Remove the turn-table by applying upward pressure to the rim of the table, at the same time lightly tapping the end of the turn-table center post with a small tool.
2. - Apply several drops of electric motor oil to the side of the motor shaft, allowing the oil to run down into the upper bearing.
3. - Oil the idler wheel bearing, using only one or two drops of the oil so that it will not run out onto the rubber rim of the wheel.
4. - The lower motor bearing may be lubricated by saturating the felt wick which surrounds the lower end of the motor shaft.
5. - Make an application of two or three drops of oil to the recording arm pivot post, which may be seen by raising the arm to its vertical position. Place the oil on the pivot post between the two large metal bushings of the recording arm mounting.

RECORDING

To use this equipment as a recording mechanism, whereby radio programs and various other activities picked up by the microphone can be imperishably preserved on a record, first of all a blank RECORDIO DISC should be placed on the turn-table, so that the record driving pin engages one of the three small holes near the center of the record.

After this procedure, the cutting arm, which is the arm on the right of the equipment, should be raised up to an angle of approximately 45 degrees so that the lateral feed will be disengaged, and the arm swung over so that the cutting stylus will come in contact with the near outside of the record blank when the arm is lowered.

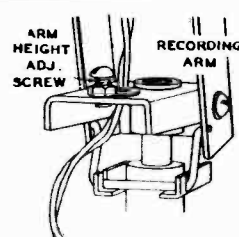
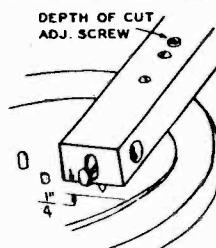
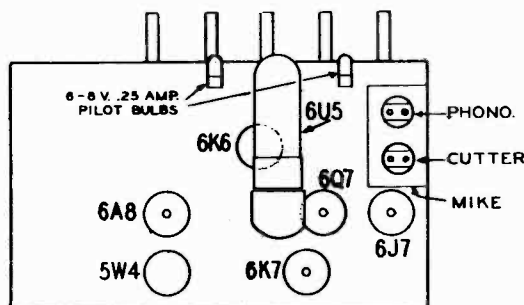
Recording Radio

After having done the above, button No. 4 should be pushed down. This button has two positions. Pushed down to its first position, the radio recording will be accomplished with normal volume from the loud speaker, which is rather high for the usual room. Pushed down in its second position, the recording will be accomplished in the same manner but the speaker output will be diminished to a comfortable volume.

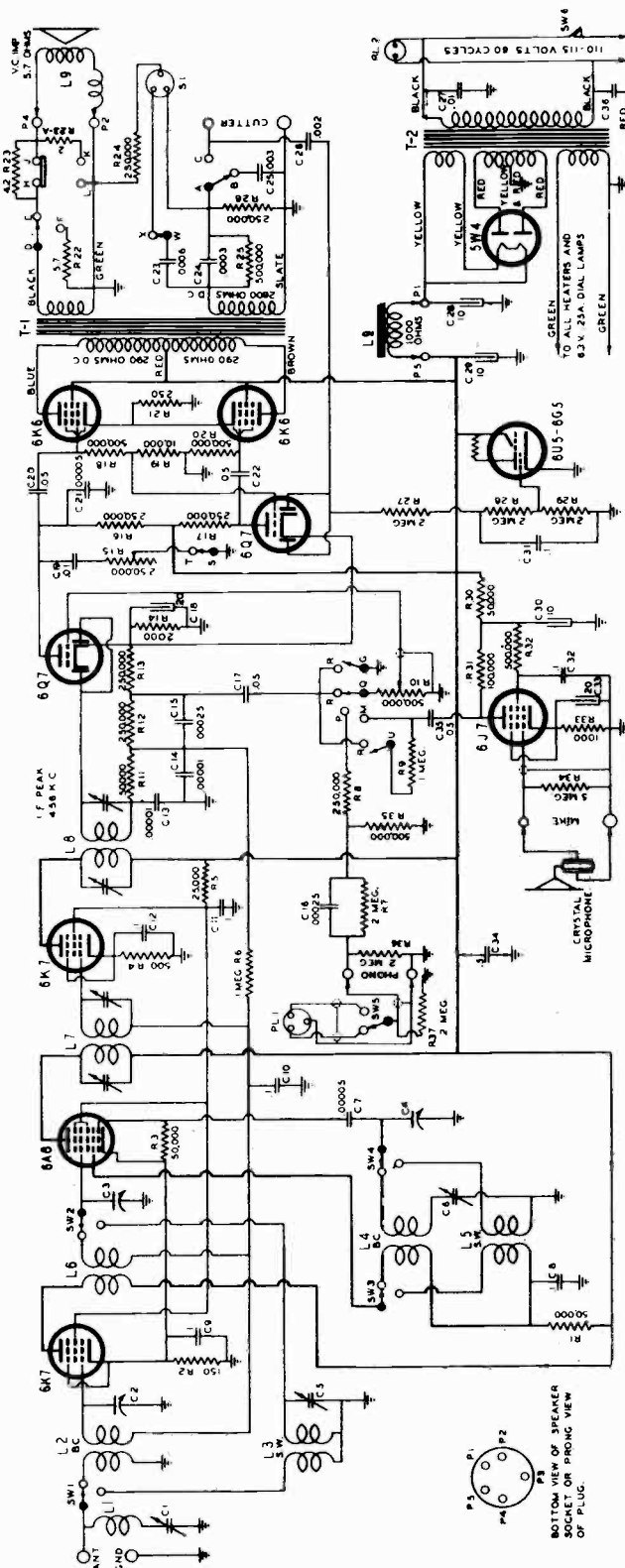
Tune in a station, the program of which it is desired to record. Adjust the volume control so that the magic eye just closes. Turn on the "MOTOR" switch and again check the amplitude of recording, being sure that the eye segment just closes without overlap, on the loudest volume passages.

If it is found necessary to readjust the setting of the volume control during a recording, this should be done slowly, as an abrupt change in volume will be definitely noticeable when playing the record. When recording, the volume control serves only as a means for adjusting the average volume on the record, and the expression of instrumental music or vocal selections will be impaired if loud and soft passages are compensated for by either decreasing or increasing the volume.

TUBE POSITIONS



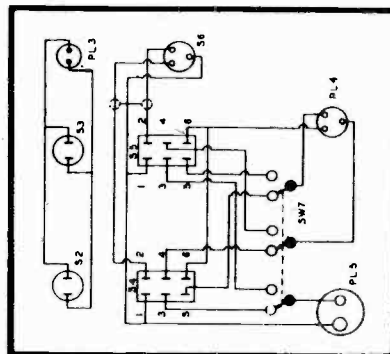
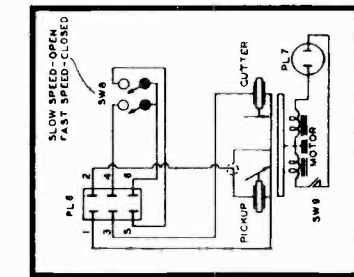
MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS



PLUG CONNECTIONS

PL1 (A-101 CHASSIS) TO S6 (A-101 PANEL)
PL2 (A-101 CHASSIS) TO PL3 (A-101 PANEL)
PL6 (A-102) TO S4 OR S5 (A-101 PANEL)
PL7 (A-102) TO S2 OR S3 (A-101 PANEL)
PL4 (A-101 PANEL) TO S1 (A-101 CHASSIS)
PL5 (A-101 PANEL) TO "CUTTER" SOCKET
(A-101 CHASSIS)

PUSH BUTTON CIRCUIT FUNCTIONS	
NORMAL "UP" POSITION OF PUSH BUTTON SWITCHES INDICATED IN SCHEMATIC DIAGRAM	
1	OPENS Q-R W-X, CLOSERS Q-P-R-G
2	OPENS Q-R, CLOSERS Q-W
3	FIRST POS. OPENS A-B-T-S, CLOSERS U-H SECOND POS. OPENS Q-R-A-B-C-T-S CLOSERS Q-W-X-C-U-P
4	FIRST POS. OPENS A-B-T-S, CLOSERS A-C SECOND POS. OPENS A-B-T-S, H-J CLOSERS A-C, K-L
NOTE - ALL OTHER CONTACT POSITIONS INDICATED IN DIAGRAM	

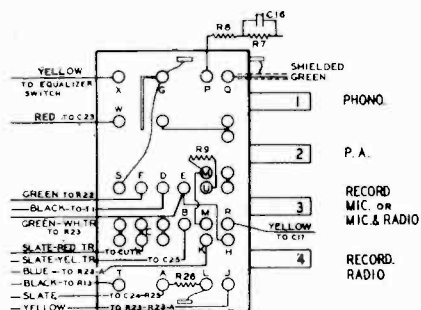


Wilcox-Gay Corporation

**Models A-89, A-91, A-92,
A-93, A-94, A-101, A-102.**

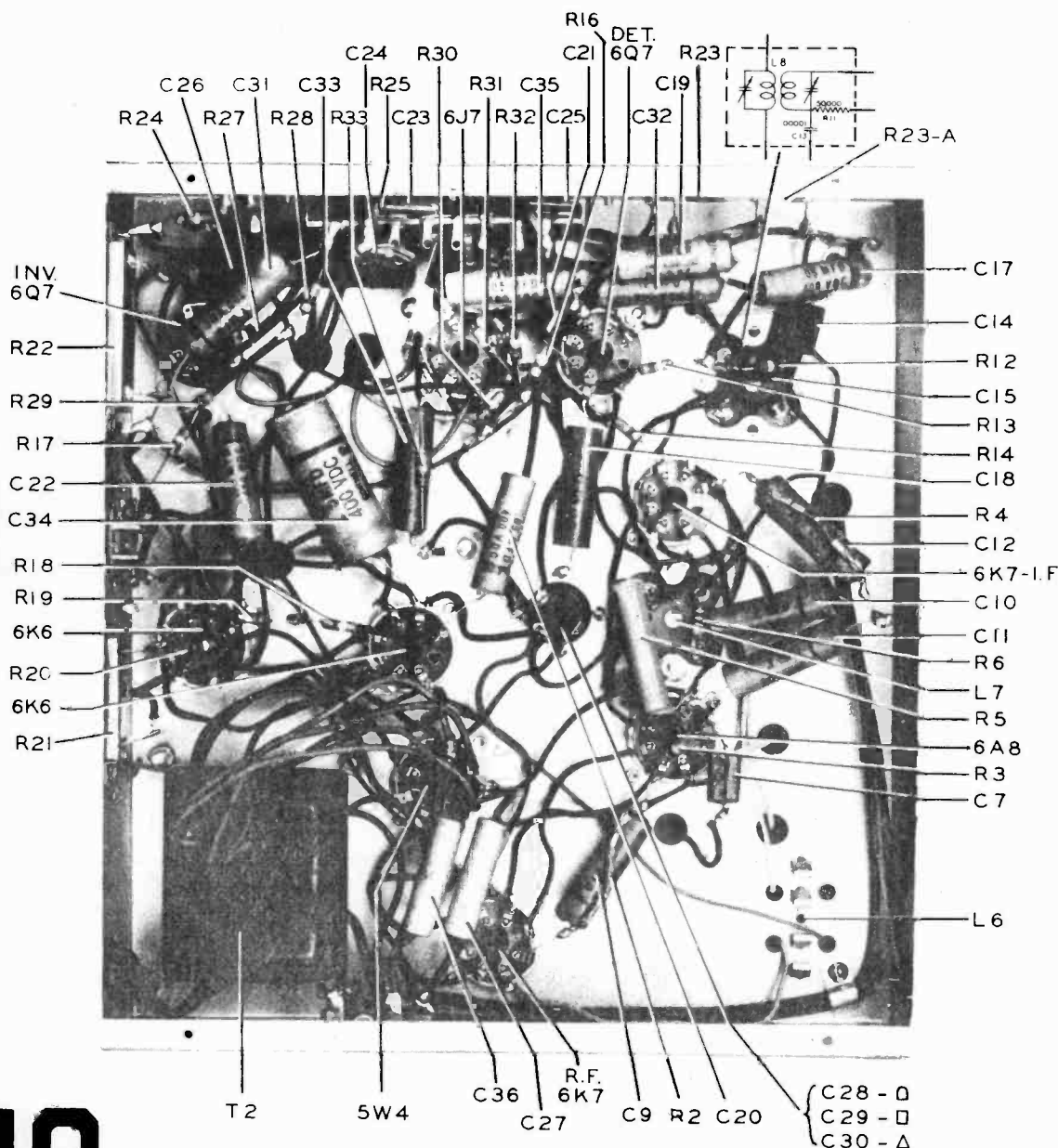
See next page for details

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS



PUSH BUTTON SWITCH

MODELS	CIRCUIT	PHONO-PLAYER
A-89	ILLUSTRATED	MANUAL
A-91	"	"
A-92	"	"
A-93	"	AUTOMATIC
A-94	"	"
A-101	SEE WIRING & NOTE A-101	USED WITH A-102
A-102	SEE NOTE A-102	DUAL TURNTABLE ONLY



AUTOMATIC RECORD CHANGER

I. SETTING UP RECORD CHANGER MECHANISM

Two screws are used to hold the record changer mechanism during shipping; these two screws (a, a, Fig. IV) MUST be removed so that the changer floats freely on its mounting springs. The two holes in the metal sub-panel can be covered by means of the two small matching plug buttons accompanying the machine. If the turntable has been packed separately, it will be necessary to place it over the center spindle and gently press it down, taking care that the motor idler wheel (Fig. IV, Item 66) is not damaged and being sure

that the turntable properly engages the drive pin (Fig. IV, point b).

The mounting parts, supplied with the standard Model "B" changer, are shown in their proper positions in Fig. VII. (NOTE: Some models use only the upper mounting springs and special studs.)

The changer panel assembly must float freely on the mounting springs at all times during normal playing operation.

II. GENERAL FUNCTION OF THE RECORD CHANGER

A. MANUAL PLAYBACK

With the switch knob (see Fig. IV, Item 67) in the "Manual" position, this changer is designed to operate as a single record-player and as such can be used to play individual records of any diameter up to and including 12". The turntable is equipped with a retractable pin (Fig. III, Item 60) so that it is possible to play home recordings as well. Moving the switch knob to the "Manual" position starts the turntable and locks out all of the automatic features of the record changer. The tone arm must be lifted by hand and placed on the record; after the record is played it is necessary to remove the tone arm by hand. During any of the time that the record is being played, it is possible to move the tone arm in or out on the record at will; it is also possible to play either "inside out" or "outside in" recordings.

B. AUTOMATIC OPERATION

The changer is designed to change automatically, EITHER fourteen 10" records or ten 12" records at one loading. After the changer has been properly loaded (see separate operating instruction sheet), moving the switch knob to the "Reject" position and releasing is all that is necessary to set the changer in automatic operation. The switch knob will return from the "Reject" position to the "Automatic" position of its own accord and the machine will change and play the entire loading of records without further attention. After playing all the records which have been loaded, the machine will continue to repeat the last record until it is turned off.

An individual record may be rejected by moving the switch knob to the "Reject" position and again releasing it. This may be done at any time after the needle has come to rest on a record.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

tion; merely move it to that position momentarily after which the knob will return to the "Automatic" position of its own accord.

A "Rest" position of the tone arm has been provided in order to facilitate unloading the changer (see separate operating instruction sheet). This position of the tone arm is obtained by lifting it from the record being played and moving it to the extreme outside position. The tone arm will latch into place along the outside edge of the changer sub-panel and remain there even though the switch knob is in the "Automatic" posi-

tion and the turntable still running. (NOTE: If the tone arm has played the record far enough, lifting the tone arm or moving it out will trip the automatic mechanism. Allow the mechanism to go through its change cycle and the needle to come down on the next record without hindrance after which the tone arm may be moved to the "Rest" position). If the tone arm is in the "Rest" position and the switch knob in the "Automatic" position, it is merely necessary to momentarily move the switch knob to the "Reject" position and release it in order to again set the changer into automatic operation.

III. METHOD OF OPERATION

The record changer belongs to the general classification of the mutilated gear type. This means that during the time that a record is being played the large die cast gear (see Fig. I, Item 1) and all associated mechanism is at rest.

Under the condition of manual operation, the automatic operation of the mechanism is locked out so that the trip mechanism

is inoperative and so that the tone arm is free.

Under automatic conditions, the tone arm is controlled during the change cycle by means of the various cams, acting through levers, on the large drive gear (see Fig. I, Item 1) which also synchronizes, through the drive link, the movement of the selector arms.

IV. LUBRICATION

A. MOTOR

The motor is equipped with oilless bearing and requires no lubrication.

B. TURNTABLE SPINDLE BEARINGS

Turntable spindle bearings are lubricated at the factory and do not require any lubrication for one year. After one year they should be oiled with one or two drops of a light grade oil. Do not over-oil!

The top bearing can be oiled by lifting off the turntable. Make sure, when replacing the turntable, that the pin in the Turntable Spindle slips into the slot on the bottom surface of the turntable hub. Also, care should be taken not to damage the Motor Idler Pulley.

Never under any circumstance allow oil to come in contact with Motor Idler Pulley.

C. SQUEAK DUE TO RECORDS RUBBING ON TURNTABLE SPINDLE

This can be eliminated by gently lining up the stack of records.

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MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

V. TONE ARM INDEXING ON 10" AND 12" RECORDS

In general the pickup indexing is accomplished by the tone arm locator lever (Fig. II, Item 31) engaging the 12" reset lever (Fig. II, Item 37). Setting the selector arms for 10" or 12" records moves the 12" reset lever so that it serves as a stop for the tone arm locator lever at either point "c" (FIG. II) for 12" records or point "d" (Fig. II) for 10" records. Since the tone arm locator lever is a single piece of metal, the distance between the 10" setting at "d" and the 12" setting at "c" is fixed; it is only necessary to properly adjust the tone arm indexing for one size record. The steps in making this adjustment are as follows:

1. With the switch knob in the "off" position, move the tone arm to the "rest" position so that its outer edge is approximately lined up with the extreme outside edge of the record changer panel.
2. Loosen the hex-head cap screw on the under side of the record changer panel (see Fig. II, Item 28) slightly.
3. Line up the outer edge of the tone arm with the outer edge of the record changer panel by eye. This is a preliminary adjustment to obtain approximately correct indexing.
4. Place a 12" record on the turntable, put the machine into automatic operation

by pulling the switch knob to the "Reject" position and releasing it and note the point at which the needle FIRST strikes the margin of the 12" record. (The word "first" is used to indicate the fact that after the needle has touched the record, the booster spring will attempt to move the needle in toward the center. Proper setting of the tone arm indexing position is concerned only with the point at which the needle first makes contact with the record; for this reason it may be advisable to slow down the movement of the tone arm by partially holding the turntable so that the action may be more readily observed during adjustment.)

5. If the needle did not strike the record approximately an eighth of an inch in from the outside edge, move the tone arm in the desired direction a slight amount by slipping the tone arm lever (see Fig. II, Item 25) which has been previously loosened at the hex-head cap screw (see Fig. II, Item 28).
6. After obtaining a correct indexing of the tone arm on the 12" diameter records, check the indexing on a 10" diameter record and tighten the hex-head cap screw firmly.

VI. TONE ARM ADJUSTMENTS (OTHER THAN INDEXING)

A. NEEDLE PRESSURE

The needle pressure is controlled by means of the counterbalance spring (see Fig. VI) at the rear of the arm. The spring tension has been set to provide

the needle pressure necessary for correct operation of the pickup. Should it be necessary to make adjustment of this counter balance spring, it is generally advisable to contact

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

your factory service department for the correct needle pressure; be sure to include the part number stamped on the under side of the crystal cartridge and the model number of the set. Care should be taken that the counter-balance spring does not rub against the inside of the tone arm skirt or any associated parts in such a way that it impedes or binds the free vertical movement of the tone arm. (CAUTION: It is a popular fallacy that it is possible to prolong needle and record life by reducing the needle pressure on a given pickup below those pressures recommended by the manufacturer. Any such attempt will probably increase record and needle wear as well as seriously impair the tone quality of the instrument. The correct needle pressure is a function of the crystal and tone arm design and cannot be satisfactorily changed for a given set of component parts.)

B. TONE ARM HEIGHT ADJUSTMENTS

The Tone Arm Height Adjustment Screw (Fig. VI) controls only the height of the tone arm when it is in the playing position with no record on the turntable. The correct setting of this adjustment screw is that which, under the above condition, allows the tone arm to descend until the needle point is very slightly below the level of the turntable surface.

The Tone Arm Adjustment Screw should not be used to adjust the height to which the tone arm rises during a change cycle; this height is controlled solely by the length of the Tone Arm Lift Pin (Fig. VI).

C. TONE ARM HINGE ADJUSTMENTS

Should the tone arm hinge show evidence of binding or impeding the free vertical movement of the tone arm, it may be necessary to replace this part (Fig. III, Item 58)

VII. "AUTOMATIC" TRIP ADJUSTMENTS

This changer incorporates a dual trip to insure positive cut-off on various types of records.

A. MINIMUM CIRCLE DIAMETER TRIP

After the tone arm has played in far enough so that the distance of the needle from the center spindle is approximately 1-7/8", the record changer will trip regardless of whether or not there is a cutoff or eccentric groove on the record. This type of trip is known as "a minimum diameter circle trip." The diameter of this minimum circle is set at the factory to be approximately 3-3/4". Variations in adjustment or readjustment of this operation can be obtained by moving the position of the trip shoe (see Fig. II, Item 29) slightly. The trip shoe is

locked in position by means of a screw when the adjustment has been satisfactorily completed. This screw must be adjusted thru a hole cut in the main drive gear, when the machine is not in a change cycle. (See point e, Fig. I.)

B. ECCENTRIC GROOVE TRIP

In order to make the trip action of the changer mechanism operate under various conditions, a second tripping device has been included which operates due to any outward movement of the tone arm after it has played to within approximately 2-1/2" of the center spindle. This trip is actuated by a small dog and ratchet combination (see Fig. II, Item 44) and is adjusted at the factory.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

VIII. "BOOSTER" SPRING ADJUSTMENTS

A. BOOSTER SPRING SETTING

The function of the booster spring (Fig. II, Item 30) is to move the needle from the margin of the record into the first groove automatically. Most present day records have what is known as a "lead-in groove" which automatically carries the needle from the margin of the record into the record grooves. In the case of the older type records, and particularly those of the mechanically recorded type which have no lead-in grooves, the booster spring supplies just enough pressure to move the needle across the margin to the record grooves. This booster spring is built into the tone arm locator lever (see Fig. II, Item 31) and consists of a single piece of light spring

wire (see Fig. II, Item 30). The side pressure exerted by this spring should be just sufficient so that the needle will move across the margin of a record which contains no lead-in groove. After any adjustment of this booster spring, check its operation on both 10" and 12" records to make sure that it functions properly. Do not increase the operating pressure of the booster spring to such a point that it tends to make the needle slide across the first few record grooves. Access to the booster spring can be obtained when the tone arm is in the "Rest" position, with the switch knob turned off, by moving the tone arm locator lever assembly out toward the edge of the changer sub-panel with the finger. Adjustment of the spring tension

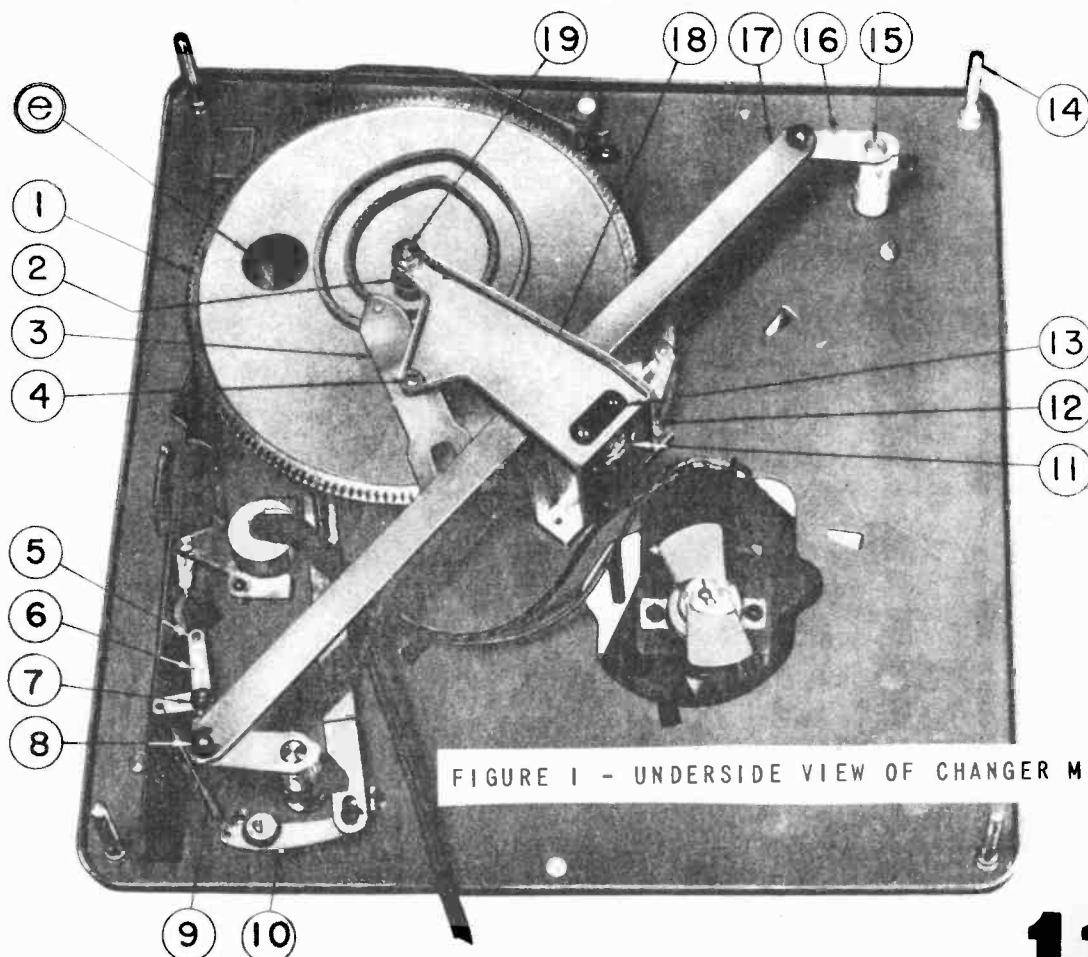


FIGURE I - UNDERSIDE VIEW OF CHANGER MECHANISM

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

should be made with a pair of light pliers or with the fingers. The tension, measured at the point of contact between the booster spring (Fig. II, Item 30) and the tone arm lever (Fig. II, Item 25) is set at the factory to values between seven and fifteen grams depending upon the type of needle and cartridge used (cartridges requiring extremely light needle pressure also require a light booster spring tension.) CAUTION: The Shielded Pickup Lead Wire (Fig. II, Item 22) must have sufficient slack between the tone arm and the point where the tone arm lead enters the sub-panel to permit free sidewise movement of the tone arm; otherwise the action of the booster spring may be overcome or overemphasized. This lead must be checked before attempting any booster spring adjustments.

B. TONE ARM RETARD LEVER ADJUSTMENTS

The function of the Tone Arm Retard Lever (Fig. II, Item 49) is to provide a smooth motion of the tone arm as it moves from the outer edge of the panel in towards the edge of the record to be played, during an automatic change cycle.

An additional function of the tone arm retard lever is to prevent action of the booster spring (Fig. II, Item 30) until the needle has lowered onto the outer edge of the record to be played. Insufficient tension of the Tone Arm Retard Lever Spring (Fig. II, Item 47) will permit action of the booster spring before the needle comes to rest on the record, giving the effect of incorrect tone arm indexing. Excessive pressure of the tone arm retard lever spring will cause rough, jerky action of the tone arm as it moves from the outer edge of the changer panel.

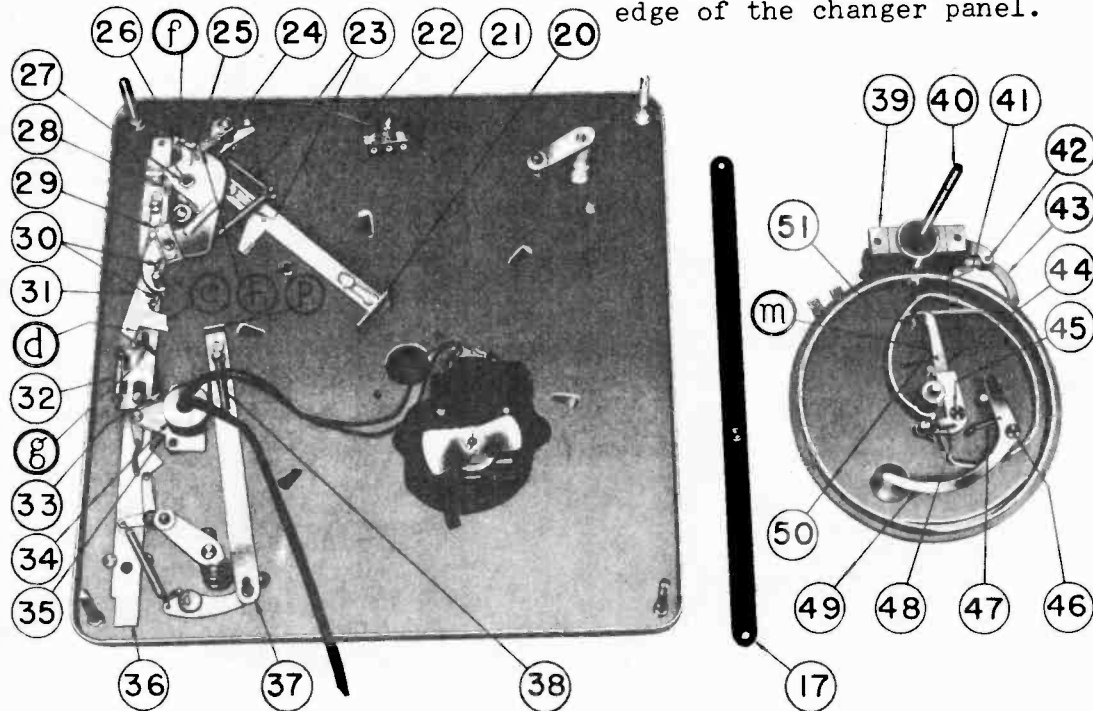


FIGURE II - UNDERSIDE VIEW OF CHANGER MECHANISM, DISASSEMBLED

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

IX. ACTION OF THE SWITCH KNOB

In general, the switch knob controls both the tone arm action and the electrical "On-Off" switch. In all positions of the switch knob, excepting the "Off" position, the electrical circuit through the switch is closed.

A. "OFF" POSITION

With the switch knob in the "Off" position, the tone arm will lock at the extreme outside edge of the changer panel. This position of the tone arm logically accompanies the "Off" position of the electrical switch in order to facilitate the loading or unloading of records either for automatic or manual operation. This locked position of the tone arm results from the engagement of the tone arm latch lever (Fig. II, Item 24) with the projection on the tone arm lever (Fig. II, Item 25, Point f).

B. "MANUAL" POSITION

When the switch knob is thrown to the "Manual" position, the electrical switch circuit is closed and the tone arm is freed from its locked position due to the action of the projection on the Manual and Reject lever (Fig. II, Item 20) which partially disengages the tone arm latch at

point "f" (see Fig. II). At the same time the tone arm locator lever (Fig. II, Item 31) is held at point "g" (Fig. II) by the upper slide (for enlarged view see Fig. VIII). In this position, it is essential that the engagement between the upper slide and tone arm locator lever be positive as shown in sketch (Fig. VIII). In all other positions of the switch knob, the upper slide is held by the main control slide (Fig. II, Item 36) so that it cannot engage the tone arm locator lever at point "g." The purpose of the spring (Fig. II, Item 32, also see Fig. VIII) attached to the upper slide is to provide a means whereby the engagement at point "g" may be made should the switch knob be moved to the "Manual" position when the tone arm lever (Fig. II, Item 25) is not in the outward position. (Such an action would occur when the switch knob is moved from the "Automatic" position to the "Manual" position while a record is being played). The tone arm locator lever (Fig. II, Item 31) would then be against either the 10" or 12" indexing stop, and as the tone arm is swung into the outside rest position, the tone arm locator (Fig. II, Item 31) must be able to catch at point "g" (see Fig. VIII).

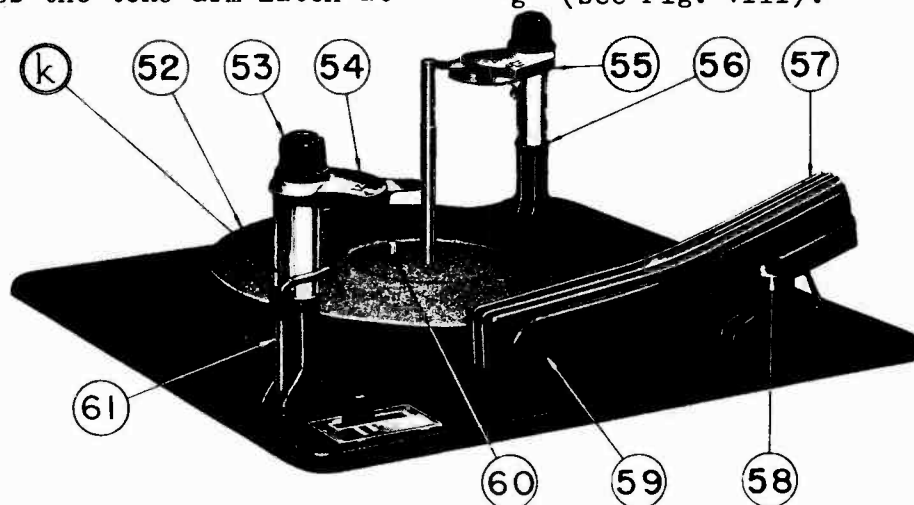


FIGURE III - TOP VIEW OF RECORD CHANGER

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

When the tone arm is in the "Rest" position and the switch knob is thrown to "Manual", it is essential that the sequence be carefully observed between the action of the latch lever (Fig. II, Item 24) and the upper slide (Fig. II, point "g"). The latter should be in a position to provide a positive stop for the tone arm locator lever BEFORE the latch lever releases the tone arm lever (Fig. II, Item 25); otherwise the tone arm will be scraped across the turntable. Also, it is essential that the engagement at "g" be such that there is a hooking action (see Fig. VIII) at this point in order to prevent the tone arm locator (Fig. II, Item 31) and tone arm from sweeping toward the center when the switch is moved out of the manual position.

In addition to the action of the switch knob on both the tone arm latch at point "f" and tone arm locator locking at point "g" when the switch knob is moved to the "Manual" position, there is an additional action of the control lever (Fig. II, Item 36) through the Manual and Reject Lever (Fig. II, Item 20) which restrains the trip-dog from acting. This latter operation results in the tone arm being freed from the automatic tripping action which occurs in all positions of the switch knob other than the "Manual" position. It is only necessary that the Manual and Reject Lever so engage the clutch engagement lever (Fig. II, Item 41) that the latter cannot drop sufficiently far to engage any of the lower projections of the pinion gear.

C. "AUTOMATIC" POSITION

With the switch knob in the "Automatic" position, the tone arm latch lever (Fig. II, Item 24) will lock the arm at point "f" (Fig. II) at any time when the tone arm is moved to the

outside position. This tone arm latch is released during a change cycle through its engagement at point "h" (Fig. II) with the drive gear. As noted above under B, the tone arm locator (Fig. II, Item 31) and the upper slide (Fig. II, Item 36) hook together at point "g" during manual operation. When the switch knob is then thrown into "Automatic" or "Reject" position, these two parts completely disengage during the next change cycle due to the cam action of the main drive gear which forces the tone arm lever to the outer edge of the sub-panel and allows the upper slide (Fig. II, Item 36) to clear the tone arm locator lever at point "g". See also Fig. VIII.

The tone arm locator lever provides the 10" or 12" indexing for the tone arm during automatic operation by its engagement with the 12" reset lever (Fig. II, Item 37). The two levers must hook securely behind the projecting tip on the tone arm locator lever (as shown at point "c" on Fig. II) when the 12" record is being played. This is to prevent the tone arm locator lever and also the tone arm from sweeping toward the center should the 12" setting of the selector arm blade be changed to 10" while the tone arm is playing on the outside of a 12" record. (See Section X also).

D. "REJECT" POSITION

When the switch knob is thrown to the "Reject" position, it acts through levers (Fig. II, Item 36, Item 20) and the trip lever (Fig. II, Item 44) clearing the clutch engagement lever (Fig. II, Item 41) so that it will drop down and engage one of the lower projections of the pinion gear and thus set into operation the automatic change mechanism. In the "Reject" position of the switch knob, the roller lever and roller assembly (Fig. I, Item 6) together with

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

its spring (Fig. I, Item 9) is intended to exert a continuous pressure on the main control slide (Fig. II, Item 36) so that as soon as the switch knob is released, the latter will be returned to the "Automatic"

position. Failure of the switch knob to return to the "Automatic" position when released can result from improper action at this point, as well as binding of the main control slide at various bearing surfaces.

X. "SELECTOR ARM" ADJUSTMENTS

Under all ordinary conditions it should not be necessary to make any adjustment of the selector blades themselves. Should such an adjustment become necessary it can best be accomplished by using a standard make of record of the proper diameter and of average thickness for gauging the selector blades (Fig. III, Items 54 and 55). The setting of these blades can be accomplished by means of a pair of long nosed pliers and is

correct when the blades lift slightly upon engaging a record of average thickness.

The position of the selector arm (Fig. III, Item 54) controls the tone arm indexing for 10" or 12" records through its engagement with the 12" set rod at point "k" (Fig. III). Motion of the 12" set rod is transmitted through the changer base panel to the 12" reset lever (Fig. II, Item 37). Sufficient tension is

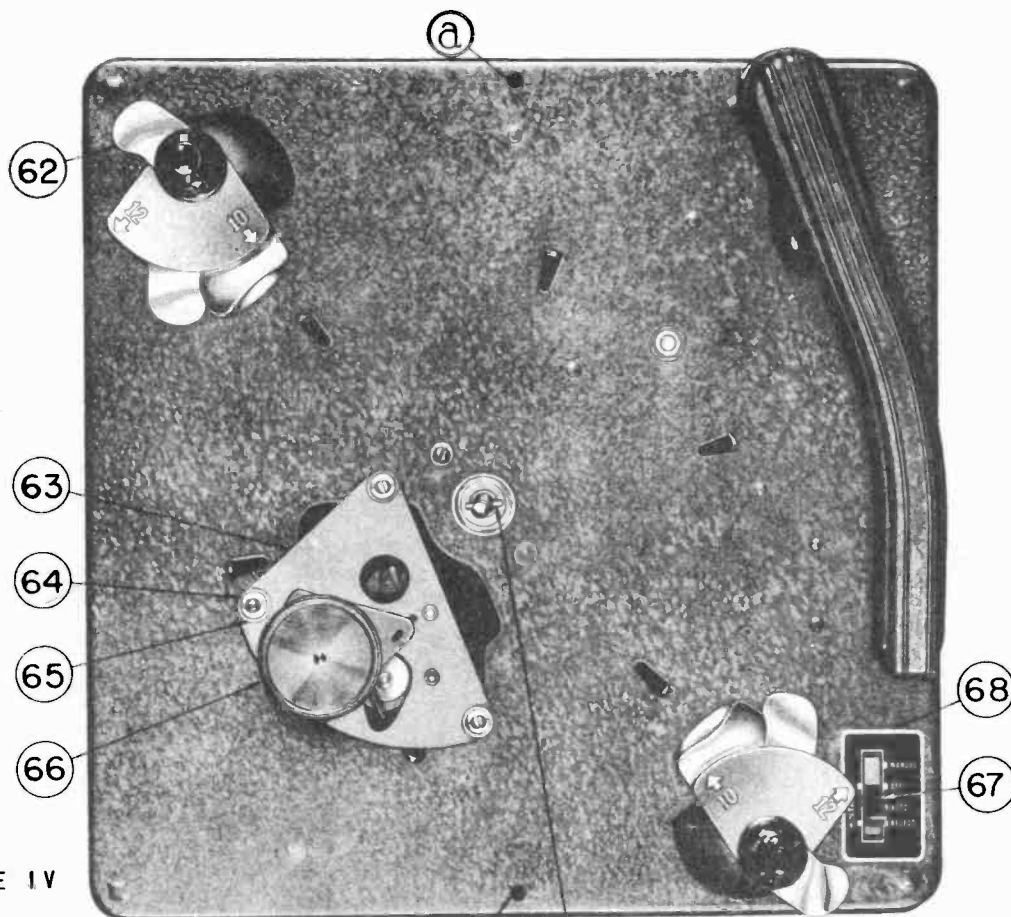


FIGURE IV

TOP VIEW OF RECORD CHANGER,
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DISASSEMBLED

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

provided through the spring (Fig. II, Item 38) to maintain a hooking action between two levers (Fig. II, Item 31 and 37) at point "p". This is to prevent the tone arm locator lever and

also the tone arm from sweeping toward the center should the 12" setting of the selector arm be changed while the tone arm is playing on the outside of a 12" record.

XI. MISCELLANEOUS MECHANICAL NOTES

A. "FEEDBACK" OR "HOWL" OR "MICROPHONISM"

1. Inspect the under side of the panel to make sure that the changer does not come into contact with any part of the cabinet at any point other than at the four corners where it rests on the mounting springs. Also check to be sure that the studs (Fig. I, Item 14) do not rub against the side of the holes of the cabinet panel.
2. A tendency toward microphonism may be due to any one or all of the four mounting springs being drawn down too tightly; loosening these mounting springs will reduce any tendency toward feedback.

It should be remembered that there is no disadvantage in any phonograph equipment which tends to become microphonic at volume control settings above those in the usable range. That is, if the set does not feed-back up to the volume control settings at which distortion appears when playing an average record, it will operate satisfactorily.

B. "RUMBLE"

1. Remove the turntable and inspect the rubber rimmed motor idler pulley (Fig. IV, Item 66) for flat or worn spots which would tend to jar the turntable.

2. With the turntable removed, rotate the turntable spindle to be sure that it turns smoothly.

C. "WOW" OR "SPEED VARIATION"

1. Remove the turntable and rotate the turntable spindle (Fig. II, Item 40) with the fingers to determine whether it tends to bind. High friction at this point may be sufficient to cause the motor to slow down instantaneously. Apply ONLY a drop or two of light oil to the two spindle bearings. If the turntable shaft is bent to such an extent that replacement is necessary, it is recommended that the entire Spindle and Pinion Gear Assembly (Fig. II, Item 39, Also Fig. V) be replaced instead of replacing only the spindle assembly. This Spindle and Pinion Gear Assembly (see Fig. V) is fitted with precision machines at the factory, thus insuring proper clearances and smooth operation.

D. REPEATED TRIPPING

1. Turn off the changer during a change cycle so that the clutch engagement lever (Fig. II, Item 41) may be moved up and down with the finger. This clutch engagement lever should lock into the up position due to its engagement with the trip lever (Fig. II, Item 44) at the point "m". If this engagement is not

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

positive, inspect the bearing point of the trip lever (Fig. II, Item 44) for evidences of dirt or binding. A more positive engagement may be obtained by strengthening the spring (Fig. II, Item 50). CAUTION: This spring tension must be JUST SUFFICIENT to lock the clutch engagement lever in the up position. Excessive tension of the spring will result in failure to trip.

2. Repeated tripping may also be due to the fact that the switch knob does not return to the "Automatic" position when released. This condition can result from binding of the roller lever (Fig. I, Item 6) on its bearing, insufficient tension in spring (Fig. I, Item 9), or excessive friction or binding in the motion of the control lever (Fig. II, Item 36).

E. FAILURE TO TRIP

1. Turn off the changer during a change cycle so that the clutch engagement lever (Fig. II, Item 41) may be actuated with the finger while the trip lever is being held away, so that the engagement lever does not lock in the "up" position. The clutch engagement lever must not stick in the up position due to binding at any point. CAUTION: It is not advisable to use any lubricant at the bearing point of the clutch engagement lever (Fig. II, Item 51); this bearing is intended to be a loose fit, run dry, and operate due to gravity.

2. Excessive pressure on spring (Fig. II, Item 50) would tend to make the needle jump out of the cut-off groove of the record (see paragraph D-1 above) and prevent tripping.

3. The Shielded Pickup Lead Wire (Fig. II, Item 22) must have sufficient slack between the tone arm and the point where the tone arm lead enters the sub-panel to permit free sidewise movement of the tone arm. The Shielded Lead should be so positioned that it loosely rests near the tone arm post immediately below the point at which it leaves the tone arm bracket. Under no circumstances should the Shielded Wire be fastened in place, pulled taut, or restrict free tone arm movement. This is particularly important in machines which use extremely light pressure pickup cartridges.

F. INSUFFICIENT POWER TO COMPLETE A CHANGE CYCLE

1. Inspect the bearing of the main drive gear (Fig. I, Item 1) for excessive friction or binding.
2. Inspect the selector arm bearings for excessive friction or binding.

G. JAMMING OF THE MECHANISM

1. Should the changer jam at any time during a change cycle for some reason other than jamming of the selector arms with the records being changed, remove the records and

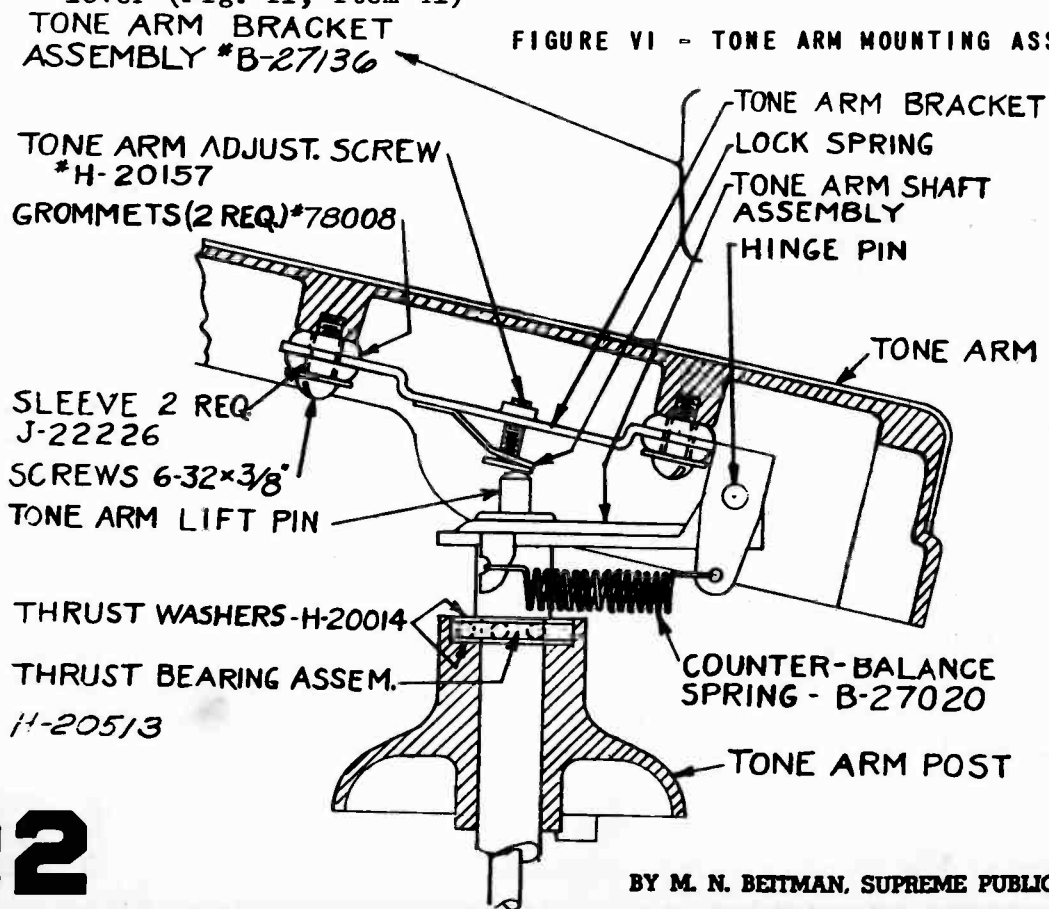
MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

attempt to free the machine by rotating the turntable in a reverse direction through a quarter turn. If the jam is apparently cleared by such action, the machine should be checked by operating it automatically several time, but with no records.

2. If the jam does not clear by rotating the turntable in a reverse direction, inspect the underside of the changer panel for damaged or missing parts.
3. Inspect the meshing of the drive gear (Fig. I, Item 1) with the pinion gear (Fig. I, Item 11). If the two gears do not mesh (that is, if they are not so timed as to fit together properly) it is probably due to the fact that the clutch engagement lever (Fig. II, Item 41)

has been damaged or bent. This clutch engagement lever is intended to so contact one of the lower projections on the pinion gear (Fig. I, Item 11) that the teeth of this pinion gear (Fig. I, Item 11) and the teeth of the main drive gear (Fig. I, Item 1) be timed to fit together properly whenever the mechanism starts a change cycle. If the clutch engagement lever (Fig. II, Item 41) is bent, it may be straightened until, by trial, the two gears mesh properly when the changer is tripped. It is advisable that the changer mechanism be operated by hand so that this timing or meshing between the two gears can be more closely observed during any adjustments or inspections.

FIGURE VI - TONE ARM MOUNTING ASSEMBLY



AUTOMATIC RECORD CHANGER 169-48

USED IN 1941 MODELS 6S596-6S597-7S591-S9000



Figure 1

GENERAL

Index letters are alphabetically arranged on the illustrations to facilitate rapid locating of parts. Prefix letters are in illustrations as follows: A in photo of top of record changer, B & C in photo of the bottom, D in the photo of the Main cam gear assembly, and E in the photo of the Ratchet trip mechanism.

The capacity of the instrument is ten 12" or twelve 10" records.

To load, turn the two large lower blades AL (in top view) towards the center of the turn table AM, as shown. Then place the records over the turn table shaft, allowing them to rest on

the blades. To start operation, trip Reject button AF. To unload after playing, grasp under lower blades, lift slightly, and turn 180 degrees allowing them to fall into the notches provided and lift records from turn table.

Set middle button AG to 10" or 12" in accordance with size of records. All records must be of same size for each loading.

To change record any time when needle is on the record, merely trip Reject button AF.

To play records manually, turn changer blades back away from center of table, and set Manual-Automatic button AH for manual operation.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

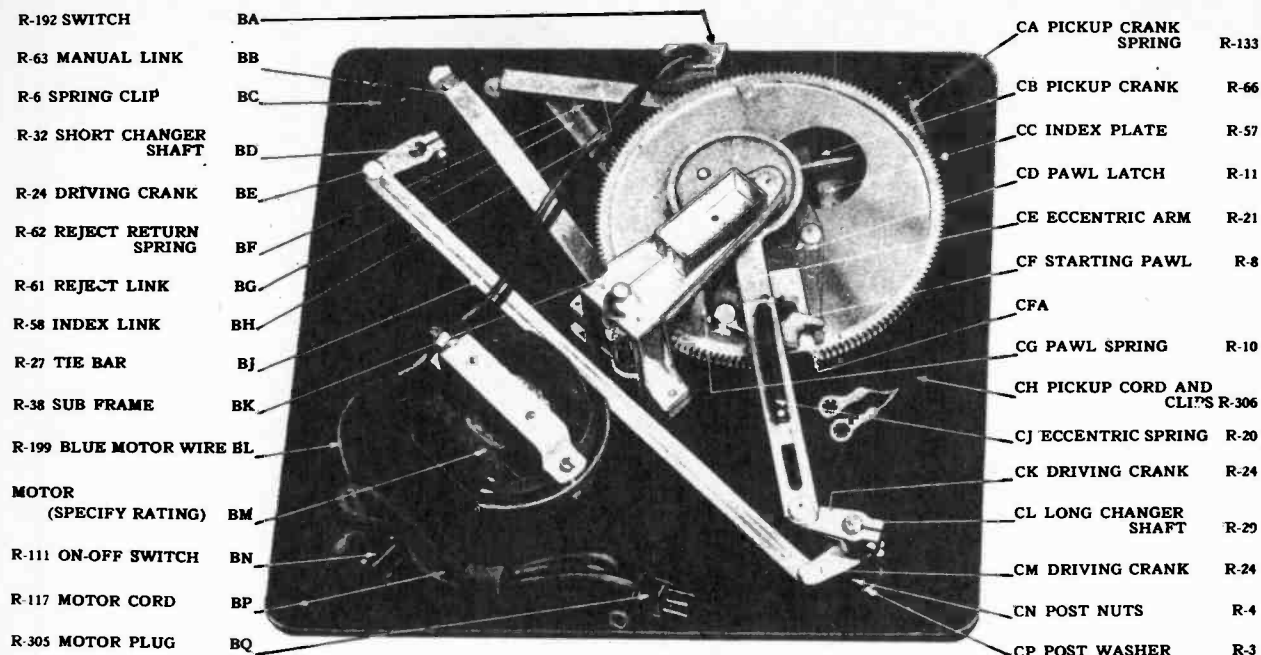


Figure 2

DESCRIPTION OF CHANGE CYCLE

Push Reject button AF which releases latch CD (through reject link BG) that holds pawl CF. When CF is in starting (or neutral) position it is under sub-frame BK and upon being released from latch CD engages with lugs on pinion DG which is rotating. This turns Main cam gear DQ sufficiently to engage first tooth shown at CFA and continues to rotate it for one complete revolution, which constitutes one cycle of the changer. Pinion DG is driven through the train from motor pulley AD through the idler pulley AA which drives on the rim of turn table AM keyed to turn table shaft DA.

The pickup arm movement is controlled laterally by the pickup crank CB, the end of which rides in the cam track DPA of cam gear DQ.

As the cam rim DPB slides on the head of lift pin raising pickup arm AN, the roller on pickup crank CB, rolling in track DPA it forces outward (carrying outward with it pickup arm AN) into the concentric portion of track DPA.

While the pickup arm is swung out in the raised position and the cam gear continues, the eccentric CE actuates the changer blades through eccentric arm CE, changer shafts CL and BD, and tie bar BU.

ADJUSTMENTS AND SYNCHRONIZING

1. To set changer blades, AU and AL, loosen screws on BE, CK, and CM, and place blade in position shown in top view with top blades about 1/16" from the edge of a 12" record and cam gear in neutral or playing position. The tie bar BF should then be pivoted over to within 1/6" of sub-frame BJ with driving crank pointing straight out to left (machine in position shown in bottom view). Then screw clamps BE, CK, and CM tight.

2. To adjust the lift of the pickup arm, should it hit under the lower blade AL or not clear over 10-12" records, merely tighten or loosen (by small degrees) the hex head screw on the under side of the pickup arm near the pivot end.

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

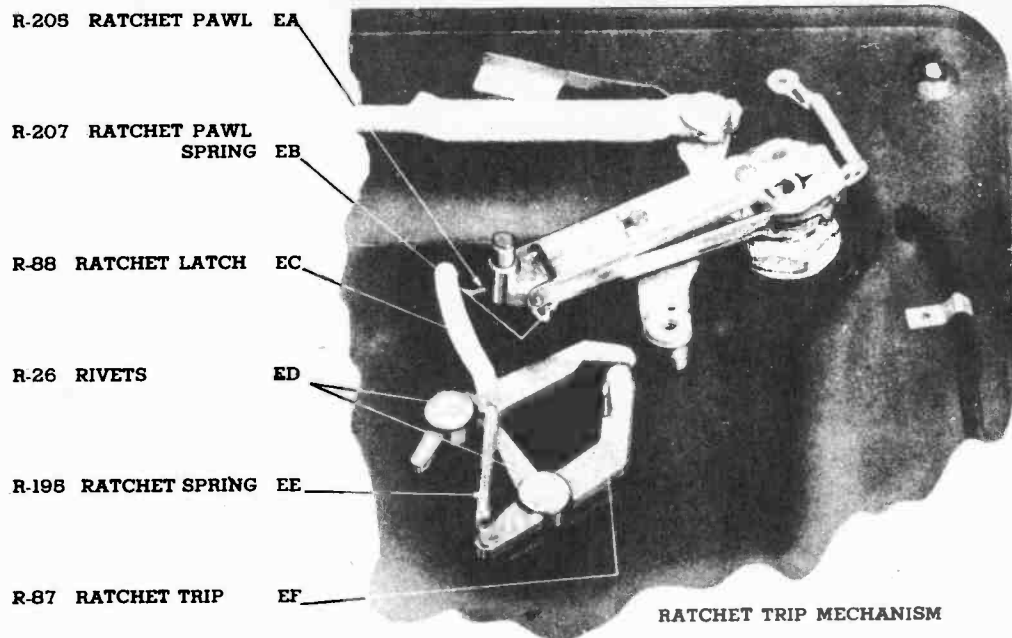


Figure 3

The lateral swing is controlled by crank CB riding in groove DPA.

To adjust the swing of pickup arm loosen the screw on the hub of CB, place a record (preferably a 12" one) on the turn table, trip reject button and turn turn table by hand until pickup arm AN lowers to record. Just before the needle touches, stop turning and push the arm sideways until the needle is about $\frac{3}{32}$ " from the edge of the record then continue to turn turn table to see if it lands that distance from the edge. Then tighten up the clamping screw on pickup crank CB.

The tripping adjustment or latch adjusting screw DM controls the point at which the mechanism picks up the pickup arm AN and removes it to allow next record to be dropped. Should records not finish playing it is merely necessary to unscrew this screw until it completes records properly, or should machine fail to trip at end of record, turn screw in so that it will trip sooner.

REPLACING MOTOR

Remove idler wheel AC and the three motor mounting screws AG. Be sure to save metal bushing spacers, which slip inside of rubber grommets. These prevent rubber from being squeezed out of shape which would prevent proper cushioning of motor. Place motor of proper rating in same position as present motor and replace spacers, washers and screws as before.

OILING

Normally, this mechanism should require no additional lubrication. However, a drop of any good machine oil on all friction surfaces, and to the oil wicks on both ends of the motor shaft, may be applied about once a year, or more often if used extensively.

RATCHET TRIP MODELS

No. 320 This model is equipped with a ratchet mechanism that serves the purpose of tripping the machine for the next record when records occur

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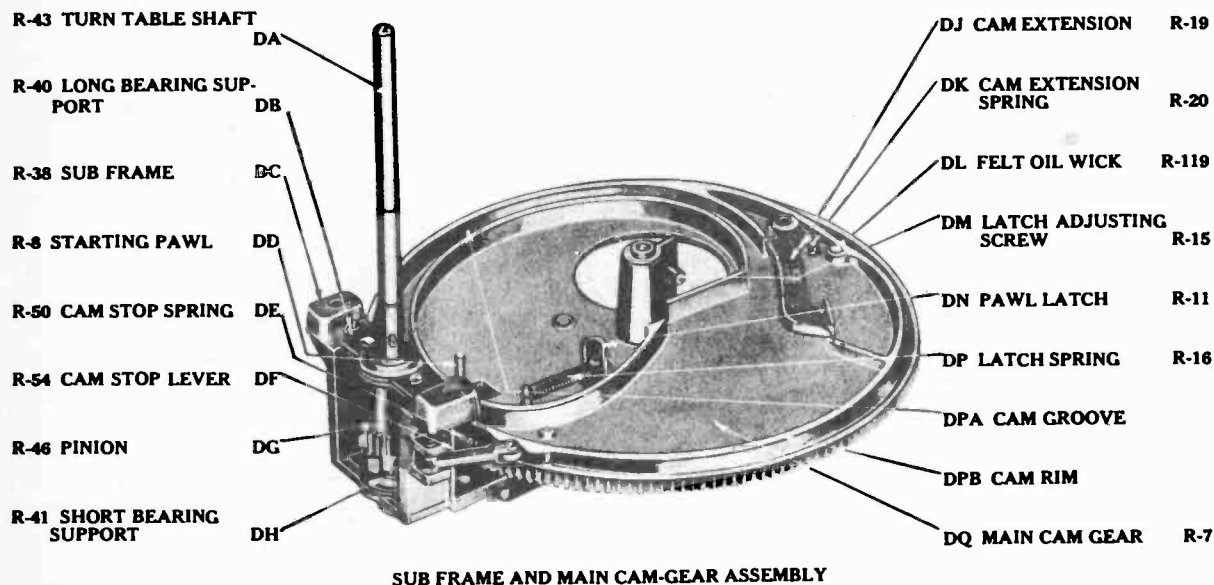


Figure 4

that end in an eccentric groove too far from the center to allow the positive stop to trip.

The Pickup arm crank CB as it swings inward with the pickup arm during the playing of a record drags the Ratchet Pawl EA across the serrations in the arm of Ratchet latch EC. The Pawl EA, which pivots about its center, tends to maintain a position pointing straight out from the end of the crank CB through the action of Ratchet Pawl Spring EB. Thus, a reversal of the direction of travel of the crank caused by the pickup arm following the eccentric groove at the end of a record, will cause the pawl EA to catch in the

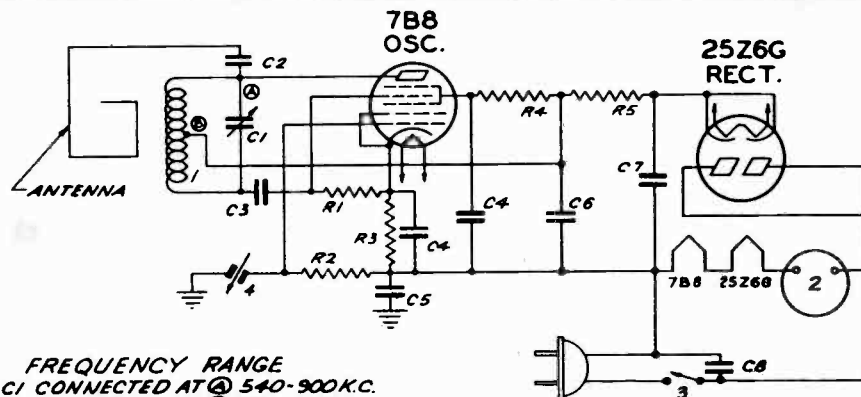
serrations in latch EC pivoting it about one of the rivets ED allowing the ratchet trip EF to pivot about the other Rivet ED through the spring action of Ratchet spring EE. The vertical protrusion on Ratchet Trip EF then trips the latch DN which starts the cycle for dropping the next record.

No. 221 & No. 321 Same as 220 and 320 except that the power supply for these models is 50 cycle 110V.

No. 223 & No. 323 Same as 220 and 320 except that power supply is 25 cycle 110V.

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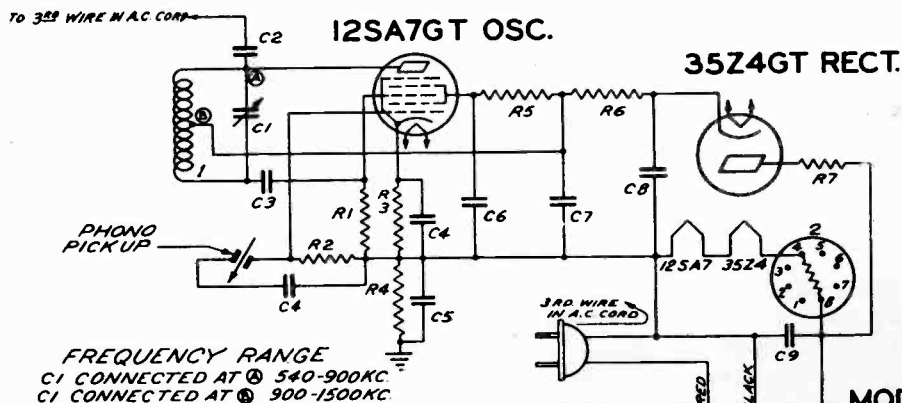


FREQUENCY RANGE
C1 CONNECTED AT 540-900 K.C.
C1 CONNECTED AT 900-1500 K.C.

MODELS
S8500Z

DIAG. NO.	PART NO.	DESCRIPTION	DIAG. NO.	PART NO.	DESCRIPTION
C1	22-690	TUNING CONDENSER	R2	63-464	1 MEG OHM 1/4 W.
C2	22-127	25 MMFD. 600 V.	R3	63-581	470 OHM 1/4 W.
C3	22-182	.00025 MFD. 600 V.	R4	63-964	4700 OHM 1/4 W.
C4	22-829	.05 MFD. 200 V.	R5	63-707	4700 OHM 1/4 W.
C5	22-827	.1 MFD. 200 V.			
C6	22-1061	.18 MFD. ELECTROLYTIC 150 V.	1	S8611	OSC. COIL ASSEM.
C7	22-1061	.16 MFD. " 150 V.	2	141-85	MOTOR (60 ~)
C8	22-869	.05 MFD. 400 V.	3	85-191	A.C. SWITCH
R1	63-593	47 M OHM 1/4 W.	4	42-30	PICKUP

PHONOGRAPH OSCILLATOR
ZENITH RADIO CORPORATION
CHICAGO ILL.



FREQUENCY RANGE
C1 CONNECTED AT 540-900 K.C.
C1 CONNECTED AT 900-1500 K.C.

MODEL
S9000

DIAG. NO.	PART NO.	DESCRIPTION	DIAG. NO.	PART NO.	DESCRIPTION
C1	22-690	TUNING CONDENSER	R3	63-701	470 OHM 1/4 W.
C2	22-127	25 MMFD. 600 V.	R4	63-296	220 M OHM 1/4 W.
C3	22-182	.00025 MFD. 600 V.	R5	63-964	4700 OHM 1/4 W.
C4	22-829	.05 MFD. 200 V.	R6	63-803	2200 OHM 1/4 W.
C5	22-827	.1 MFD. 200 V.	R7	63-575	47 OHM 1/4 W.
C6	22-243	.01 MFD. 400 V.			
C7	22-876	.18 MFD. ELECTROLYTIC 150 V.	1	S8611	OSC. COIL ASSEM.
C8	22-876	.10 MFD. " 150 V.	2	100-76	BALLAST TUBE
C9	22-828	.05 MFD. 400 V.	3	52-208	3 PRONG RECEPTACLE
R1	63-591	22 M OHM 1/4 W.			
R2	63-271	1 MEG OHM 1/4 W.			

MOST-OFTEN-NEEDED SERVICE NOTES OF RECORD PLAYERS, RECORDERS, AUTOMATIC CHANGERS

HOW TO FIND THE INFORMATION YOU NEED

The equipment described in this manual is listed in alphabetical order by manufacturers' name. The first eight pages present general information and apply to all makes. As you glance through the book, you will find many units, especially automatic changers and recorders, known to you, while listed under one specific manufacturer, actually used in combinations of other makes. This is true since many different manufacturers have used the identical record changers and recorders.

The manufacturers have asked us not to cross index the similar types employed by several factories. You can see that just a single manufacturer reference would not serve. It is best, therefore, to become familiar with all data included in this manual. This action will enable you to find quickly the material needed and also to learn all important facts dealing with automatic changers, home-recorders, phono players, and wireless oscillators, so that you will be able to repair the units of similar type not listed in this text.

There is a real profit in servicing phonograph equipment, and this single manual of most-often-needed service notes will place you at an advantage in this field.

Sincere thanks is given to the following manufacturers for their cooperation and assistance in preparing this manual.

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The Crosley Corporation
Detrola Corporation
Emerson Radio & Phono. Corp.
Fada Radio & Electric Co.
Farnsworth Tel. & Radio Corp.
Galvin Manufacturing Corp.
Gamble-Skogmo, Inc.
General Electric Co.
General Industries
Howard Radio Company
Montgomery-Ward & Co.
Noblitt-Sparks Industries, Inc.
Philco Radio & Tel. Corporation
R.C.A. Manufacturing Co., Inc.
Sears, Roebuck & Company
Sonora Radio Corporation
Stromberg-Carlson Tel. Mfg. Co.
Webster-Chicago Corporation.
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Westinghouse Electric Supply Co.
Wilcox-Gay Corporation
Zenith Radio Corporation

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