The electronic circuit is a dual Superhet designed to operate into an amplifier adjusted for acoustically flat response.

Full range bass and treble controls make it possible to diminish or augment any major portion of the audible scale allowing for an unsurpassed flexibility of tone pattern (Fig. 1.)

SR28FAM embodies such features as tuned infinite impedance type AM detection.

Electron ray tuning indicator as a visual tuning aid.

Complete shielding for the elimination of strays.

Input jacks for Magnetic phono pickup, Crystal pickup, and TV audio channel on selector Control Switch.

Average output: .4 volts.

Licensed under patents of Hazeltine Laboratories, Inc., and others.

Tubes: 3, 6BA6; 1 each 6BE6, 6C4, 6AL5, 6SL7GT, 6SA7, 6SK7, 6E5, 6X5.

Power Consumption: 50 watts, 110-125 volts, 50-60 cycles.

©John F. Rider
TUNING RANGE

This receiver is designed to operate over the standard broadcast band which extends from 530 to 1620 Kilocycles (KC) (185 to 560 Meters).

ALIGNMENT PROCEDURE

GENERAL DATA. The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 455, 600, 1400 and 1620 KC and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the AVC from operating and giving false readings.

CORRECT ALIGNMENT PROCEDURE. The intermediate frequency (I.F.) stages should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and peaked, the broadcast band should be adjusted.

I.F. ALIGNMENT. Remove the chassis and loop antenna from the cabinet and set them up on the bench so that they occupy exactly the same respective positions on the bench as they did in the cabinet. Care should be taken to have no iron or other metal near the loop. Do not make this set-up on a metal bench. With the gang condenser set at minimum, adjust the test oscillator to 455 KC and connect the output to the grid of the first detector tube (12SA7) through a .05 or .1 mid. condenser. The ground on the test oscillator should be connected to the ground bus, indicated on the circuit diagram. Align all three I.F. trimmers to peak or maximum reading on the output meter.

BROADCAST BAND ALIGNMENT. Connect the test oscillator to a dummy loop which can be made by rolling 2 turns of hookup wire about 6" in diameter. Place this dummy loop about a foot from the loop on the receiver and in the same plane as the receiver loop. With the gang condenser set at minimum, set the test oscillator at 1620 KC and adjust the oscillator (or 1620 KC trimmer) on the gang condenser. Next—set the test oscillator at 455 KC, and tune in the signal on the gang condenser. Adjust the antenna trimmer (or 1400 KC trimmer) for maximum signal. Next set the test oscillator at 600 KC, and tune in signal on condenser to check alignment of coils.

POWER SUPPLY. This receiver is designed to operate on any alternating current supply (AC) ranging from 110 to 120 volts, 50 to 60 cycles; or on any direct current supply (DC) ranging from 110 to 120 volts.

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The bottom front view of the Air King A400, showing parts layout.

**Bendix 69 Series**

This model appears on pages 15-1 through 19-8 of Rider's Manual Volume XIX. The location of trimmer C36 on gang capacitor in Figure 8. Trimmer Location Diagram should be on terminal 4, rather than terminal 3.

**Air King A400, Minstrel; Ch. 470**

This model appears on page 18-1 of Rider's Volume XVI. The following material should be added to that which appears in the Manual. The voltage and resistance measurements follow.

- **Tube PIN VTVM**
  - 20,000 to 1,000
  - 1,000 to 0
  - 200 V to 0

**Limits**

<table>
<thead>
<tr>
<th>TUBE</th>
<th>PIN</th>
<th>VTVM</th>
</tr>
</thead>
<tbody>
<tr>
<td>12AX7</td>
<td>2</td>
<td>A0</td>
</tr>
<tr>
<td>12AX7</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>550 TC</td>
<td>3-3</td>
<td>-3</td>
</tr>
<tr>
<td>550 TC</td>
<td>4-4</td>
<td>-1</td>
</tr>
<tr>
<td>640 M</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>640 M</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>640 M</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>640 M</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>640 M</td>
<td>5</td>
<td>0</td>
</tr>
</tbody>
</table>

**Observe**

- The output of the signal generator is connected to the front of the antenna transformer through a 100,000-µf capacitor.

Set the signal generator to 455 kc and fully mesh the receiver tuning capacitor.

Keep the receiver volume control at maximum and the output of the signal generator sufficient to give a readable deflection on the output meter and adjust i-f trimmers C15 and C14 for maximum.

**R.F. Oscillator Adjustment**

Keeping the same setup as used for r-f alignment, set the signal generator for 1000 kc and adjust oscillator trimmer C13 for maximum output.

Set signal generator and receiver for 1400 kc and adjust antenna trimmer C12 for maximum output.

The parts layout and alignment points are shown in the accompanying diagrams.

---

*John F. Rider*
Farnsworth Chassis C-170, C-194, C-218, C-201

These chassis are used in Models GK-100, GK-102, GK-105, and GK-104, appearing on pages 17-3 through 17-6 of Rider's Volume XVII. These chassis are listed as follows:

<table>
<thead>
<tr>
<th>Model</th>
<th>Chassis</th>
</tr>
</thead>
<tbody>
<tr>
<td>GK-100</td>
<td>C-170</td>
</tr>
<tr>
<td>GK-102</td>
<td>C-194</td>
</tr>
<tr>
<td>GK-103</td>
<td>C-216</td>
</tr>
<tr>
<td>GK-104</td>
<td>C-201</td>
</tr>
</tbody>
</table>

Farnsworth GK140 Series

This model appears in Rider's Manual XVI, pages 16-6 through 16-11. The following procedure is conducive to increased sensitivity, noise rejection, broader tuning, and reduced thermal drift of the f-m section of the GK140 series combination instrument.

To reduce drift, change the oscillator grid coupling capacitor (grid of 6C4 to the oscillator coil) from 50 µf zero temperature coefficient to 40 µf N-1400 temperature coefficient. The part number of this replacement is 25442. Change the oscillator pad capacitor (oscillator coil to f-m gang section) from 55 µf N-330 to 55 µf zero temperature coefficient. This new part number is 25441. These changes will necessitate slight realignment of the f-m converter and oscillator. To make these modifications, use the following procedure:

Clip out two 330,000-ohm, ½-watt resistors connected between the ratio detector transformer (next to the 6H6 socket) and the terminal board, one 3,000-µf mica capacitor between the BAUPPLY for the transformer and ground and two 6,000-ohm, ½-watt resistors connected to the 6H6 socket. Clip four leads connected to the transformer. Remove the ratio detector transformer and replace with the transformer No. 36879. To do this, it is necessary to drill two new holes as shown in the accompanying diagrams.

After the transformer is connected (make leads as short as possible) connect two 33,000-ohm, ½-watt resistors, Part No. 77183, one between Pin No. 8 on the 6H6 socket and ground, and the other between Pin No. 3 and ground (short leads). Connect a 1,500-µf capacitor, Part No. 25273, between the BAUPPLY to the transformer and ground. Connect a 0.006 µf, 600-volt capacitor, No. 25185, between ground and the point where the 22,000-ohm, ½-watt resistor connects to the shielded lead on the terminal board by the 6H6 socket.

The circuit of the Farnsworth GK140 series as it appears after modification:

Connect the a-m signal generator, set at 107 mc, to the grid of the 6SK7 which feeds the diode transformer. Connect the output meter across the voice coil of the speaker. Turn the bottom slug next to the chassis of the diode transformer out as far as possible. Tune the top slug for maximum output (negative voltage) on the voltmeter. Move the generator to the grid of the second if amplifier. Detune the slug under the chassis by turning it out as far as possible. Tune the top slug for maximum voltage, next tune the bottom slug for maximum voltage. In each step do not use an input greater than necessary to give three volts AVC. Move the signal generator to the grid of the first if amplifier. Detune the bottom f-m slug (nearest corner of can) by turning it out as far as possible. Tune the top slug (nearest corner of can) for maximum voltage, next tune the bottom slug for maximum voltage. Move the signal generator to the 6AG5 converter grid and tune the first if transformer as described previously. With the generator still hooked to the 6AG5 grid and modulated with 400 cycles and with about 200 microvolts input, adjust the slug next to the chassis on the diode transformer for maximum output voltage on output meter, which is across the voice coil.

Farnsworth GK-266, K-699, Chassis C-152, GK-267, C-267

Chassis C-153

These models are the same as Models GK-263 and GK-264, which appear on pages 15-7 through 15-8 of Rider's Volume X, except for the cabinets. The parts list should be amended to include the following:

<table>
<thead>
<tr>
<th>Ref.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>39</td>
<td>94235</td>
<td>Output transformer, GK-266, GK-267, K-699</td>
</tr>
<tr>
<td>41</td>
<td>38833</td>
<td>Loop antenna, EK-264, GK-267, K-669</td>
</tr>
<tr>
<td>41</td>
<td>38897</td>
<td>Loop antenna assembly, K-669</td>
</tr>
<tr>
<td>41</td>
<td>38894</td>
<td>Loop antenna assembly, GK-266, GK-267, K-669</td>
</tr>
<tr>
<td>47</td>
<td>81140</td>
<td>Speaker, K-669</td>
</tr>
<tr>
<td>47</td>
<td>81170</td>
<td>Speaker, GK-266, GK-267, K-669</td>
</tr>
<tr>
<td>3181</td>
<td>Dial glass, EK-264, GK-267, K-669</td>
<td></td>
</tr>
<tr>
<td>3120</td>
<td>Dial glass, EK-263, EK-265, GK-266, K-669</td>
<td></td>
</tr>
</tbody>
</table>

John F. Rider

Farnsworth P7, P9, P10, Capehart

These models appear on pages 19-19 through 19-43 of Rider's Volume XIX. The program control knob on these models turns a switch with detent contacts. If this knob is not pushed down to grip a substantial portion of the knurled shaft, the inside of the knob may become reamed out and in time lose its ability to grip the shaft sufficiently to actuate the switch.

A piece of metal strip ½" × ⅜" or ⅜" should be wedged tightly into the center of the knob. When the knob is placed over the shaft, the metal insert will engage the shaft slot. Improved knob gripping can sometimes be obtained by slightly spreading the shaft slot. Care must be exercised in doing this, however. If the shaft slot is spread too far, it is likely to break or be spread unevenly, thereby imparting an undesirable "wobbly motion" when turned.

If hum is encountered in the 35P7 or in any instrument using the P7, P9, or P10 chassis, it may be due to either a gossamer or aged 6TS that is used as the 1st audio amplifier, or a signal that is being picked up on the power line because of a faulty 0.005-µf, 600-volt capacitor. Part No. 25031, located between the unbuffered side of the line and ground.
Farnsworth P71

This model appears on pages RCD.CH. 18-25 through RCD.CH. 18-30 of Rider’s Manual Volume X. The change to be made in the Surfa-Sonic Control. The 0.02 µf capacitor has been changed to 0.1 µf. The 3,300-ohm resistor has been changed to 2,200 ohms.

This record changer may be found on pages RCD.CH. 18-25 through RCD.CH. 18-30 of Rider’s Volume XVII. The change to be made in the Surfa-Sonic Control. The 0.02 µf capacitor has been changed to 0.1 µf. The 3,300-ohm resistor has been changed to 2,200 ohms.

The following changes should be noted in the parts list:

**Part No.**

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 µf capacitor</td>
<td>200 V</td>
<td>23276</td>
</tr>
<tr>
<td>3,300-ohm resistor</td>
<td>2,200 ohms</td>
<td>77240</td>
</tr>
</tbody>
</table>

The following have been added to the parts list:

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
<th>Part No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,200 ohms</td>
<td>2,200 ohms</td>
<td>25152</td>
</tr>
<tr>
<td>2,200 ohms</td>
<td>2,200 ohms</td>
<td>77154</td>
</tr>
</tbody>
</table>

Farnsworth P72, P73

Model P71 appears on pages RCD.CH. 18-1 through 18-10 of Rider’s Manual Volume XVIII. Model P72 and P73 appear on pages RCD.CH. 18-14 through 18-19 of Rider’s Manual Volume XIX. They are to be some misunderstanding concerning the correct nomenclature of parts number 58854 and 64467. Part 58854 is correctly titled “Starting Lever Spring”. The function of this part is to exert the proper amount of tension on the starting lever, which in turn performs the dual purpose of transmitting the motion of the trip mechanism to the starting lever, and starting the starting lever in the proper position for starting the change cycle and also resetting the starting and reject levers, after the change cycle has started. Part 64467 is referred to in the parts list as the “Trip Spring”. In order to avoid future misunderstanding, the nomenclature of this part has been changed to read.—Part #98, Reject lever spring.

Farnsworth 41E Capehart

Record Changer

This record changer may be found on pages RCD.CH. 18-25 through RCD.CH. 18-30 of Rider’s Volume XVIII. The change cycle is geared into operation when the trip finger releases the mercury switch dog (part number 501222). If, for any reason, a changer should fail to cycle properly and, upon checking, the tripping mechanism is found to be operating normally, it is suggested that the top of the mercury switch reset lever (part number 501221) be examined to make sure that it is smooth. Many hours of operation may tend to work a groove in the top of the Reset Lever, which would tend to hold the dog in place, thus resisting the action of the trip mechanism. This condition is caused by normal wear due to friction between the two parts.

When this condition is found, it is recommended that the mercury switch Reset Lever be replaced by a new one. The new stock has been hardened to prevent longer operating life.

In an early production run, a mercury switch with a metal shell or housing was used. Due to the low action and greater angle of drop necessary to actuate this switch, it has since been replaced by one using a glass housing or bulb. Changers employing the metal-housed mercury switch should be checked for positive switch action, especially if it has been reported that the changer cycles continuously, or more than once for a single tripping action.

In such cases, it is recommended that the metal switch be replaced with the more positive glass bulb type (part number 90147). The contacts of the Play Control switch must be set so that positive contact is made when the play control knob is set in OFF position. In this position the contact points must be OPEN.

It is not necessary to remove the play control to adjust these contacts on the majority of the Model 41-E changers now in use. A 0.1” diameter observation hole has been added to the back of the play control housing for the purpose of lining up the contact points. With the changer on the service bench, it is an easy matter to insert a screwdriver or a pair of long nose pliers and bend the contact springs slightly.

This operation is a little more difficult with the changer in the cabinet, as there is only a 3-inch clearance between the back of the play control housing and the side of the cabinet. A small inspection mirror, a “knob” type screwdriver and a penknife will be helpful in making these adjustments when the changer is in the cabinet.

**Federal 1021, 1023, 1032, and 1540**

These models are the same as Model 1020, appearing on pages 15-8 through 15-8 of Rider’s Volume XVI, except for the cabinets.

**Federal 1024TB**

This model appears on pages 17-1 through 17-3 of Rider’s Volume XVIII. Some sets have been equipped with a 12SK7 tube as an i.f. amplifier instead of the 6S8T. This gives better performance.

**Federal 1027, 1035**

These models are the same as Model E1025TB, appearing on pages 16-1 through 16-4 of Rider’s Volume XVI, except for the cabinets.

**Federal 1028TB, 1029**

These models are the same as Model 1024TB, appearing on pages 17-1 through 17-3 of Rider’s Volume XVII, except for the following changes. A 12SK7 tube is used as the i.f. amplifier instead of the 6S8T. The plate resistor (R2) of the i.f. amplifier can be either 1500 ohms or 750 ohms. C17 can be either 470 µf or 1000 µf. R13 (in filament lead) has been eliminated, and pin 2 of the 20VGT type connected to pin 7 of the 35Z5GT tube.

**Federal 1034**

This model is the same as Model 1024TB, appearing on pages 17-1 through 17-3 of Rider’s Volume XVII, except for the cabinet.
General Electric 145

This model appears on pages 10-18 through 19-19 of Rider's Manual Volume XIX. The battery minus connection is made to the dummy lug 5 on the switch shown in Fig. 2.

General Electric 150

This model appears in Rider's Manual Volume XIX on pages 19-19 through 21-19. It is the condition of parasitic oscillation with strong signals and high volume setting, characterized by whistles and distorted output, is reported on late production models in the gray cabinet. The following changes will correct the condition:

- Change the output of the 1st amplifier by moving bus wire lead #2 lug of first 1f transformer to pin #5 of the rf amplifier (TT1). Instead of pin #5 of the #4 tube. This changes the bias of the 1st amplifier from zero volts to minus 14 volts.

The following replacements should be made in the catalogue numbers:

Delete the following parts:

<table>
<thead>
<tr>
<th>Old No.</th>
<th>New No.</th>
<th>Cat. No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>URD-009</td>
<td>URE-009</td>
<td>R1</td>
<td>Resistor - 330 ohms.</td>
</tr>
<tr>
<td>RCE-009</td>
<td>RCE-007</td>
<td>C1A,C2B</td>
<td>Capacitor - 0.005 μf, 600 volts.</td>
</tr>
<tr>
<td>RCW-081</td>
<td>RCW-081</td>
<td>C11</td>
<td>Capacitor - Electrolytic capacity.</td>
</tr>
<tr>
<td>RBH-004</td>
<td>RBH-009</td>
<td>C12</td>
<td>Condenser - Mono-gram But.</td>
</tr>
<tr>
<td>RLB-029</td>
<td>RLB-034</td>
<td>Loop Antenna</td>
<td></td>
</tr>
<tr>
<td>SJ-008</td>
<td>RJ-016</td>
<td>Speaker Contact</td>
<td></td>
</tr>
<tr>
<td>RAB-008</td>
<td>RAB-008</td>
<td>Cabinet Back - Plastic (ivory)</td>
<td></td>
</tr>
<tr>
<td>RAB-041</td>
<td>RAB-041</td>
<td>Cabinet Front - Plastic (ivory)</td>
<td></td>
</tr>
</tbody>
</table>

For chassis numbers up to 55,000 the capacitors C10, 100 μf and C12, 0.005 μf, were not connected according to the schematic diagram. Their B-connections were made to the left side of the switch S13, together with the capacitors C2A and C2B. This was done to prevent a howling sound when the power switch S1 is turned off.

For chassis numbers from 60,000 to 70,000 the capacitors C10 and C12 were wired according to the schematic diagram. However, the wiring of the capacitors C2A and C2B has been changed. It was found that under certain circumstances, these capacitors added their chance to the peak of the line voltage, causing a current surge which was capable of damaging any tube. Therefore, the negative sides of these two capacitors (C2A and C2B) were connected to the right side of the switch S1B (B-line) and the positive side of C2B was connected to the negative terminal of the S2A switch which is connected to the B+ line of the receiver. Now the charge can leak off after the set is disconnected from the power supply or the replacement has been made in the parts list.

Connecting pin SJ-008 to the loop antenna was changed to RIC-001.

GE 201, 202

Since there are electrically identical, these models have been added to the listing for Models 200, 208, and 205 which appears in Rider's Manual Volume XIX, pages 15-19 and 18-20. The following items have been added to the parts list:

RAU-061 Cabinet - Ivory (plastic), model 201

RAU-023 Cabinet - Brown (plastic), model 202

The Beam-a-Scope cabinet back listed as RAU-003 also applies to models 201 and 202.

General Electric 230, Krisher-Frazier

This model appears on pages 18-18 through 18-24 of Rider's Manual Volume XIX. When rough manual tuning action is experienced, it is usually traced to insufficient spacing between the end of the center shaft of the turret assembly and the guide rod bracket near the turret shaft. Production recommendations call for one or more (as required) brass slim washers at this point for smooth tuning action. When rough tuning is experienced, a thin "C" washer slipped onto the end of the center shaft of the turret in addition to the brass slim washers will relieve binding and result in smoother tuning action.

GE 230, 233

Model 230 appears in Rider's Manual Volume XIX on pages 18-26 through 18-26 and Model 233 in the same volume, pages 18-28 through 18-29. To the replacement parts list for these two models, add RMX-120. Coil Cap Retaining Spring and Screw.

A quantity of these are used to secure the antenna rf or oscillator converter coil and shield assemblies where the tabs have been broken. The spring is placed upon the assembly to form a bridge. Bending upon the coil and held by the self-tapping screw through the hole in the shield, the bridge retains the coil within its shield in lieu of tabs.

While early production receivers of Model 233 were wired as shown in the schematic, late production changes revise the power supply circuit as follows:

R24 has been deleted and the circuit for C30 is completed by connecting its free end to the secondary winding lead going to pin 5 of the rectifier V8, so that C30 appears across the secondary of T4 Resistors R26 and R27 are connected in series with one another and across the primary winding of T4. The junction of the resistors is grounded.

To conform with these production changes, Cat. Part. URF-073, R24 is deleted from the replacement parts list and item URF-023, R26 and R27, 82 ohms 1/2 w. carbon resistor is added.

Cat. No. RMX-120, pushbutton locking screw is installed to lock the pushbutton device for automatic station tuning and has a knurled head and threaded end.

General Electric 233, Kaiser-Frazer

This model appears on pages 18-29 through 18-36 of Rider's Manual Volume XVIII. In cases where the volume and tuning control shafts appear too short to accommodate the shaft parts and knobs, a turned-in lip which is bent to hold the shaft and align the counterbore opening of the instrument panel will be found to obstruct receiver installation. This lip may be removed by either filing or bending it back.

In instances where the hole for the receiver mounting bracket has not been accurately located, it is possible that the receiver may be placed too far forward for the front of the car to allow the receiver control shafts to come through instrument panel holes to their maximum extent. If the "knock out" hole for the mounting brackets screw must be drilled, make certain it is accurately positioned.

In case of pushbutton sticking, check for and remove any burrs from the bottom of the cast grille for pushbutton openings. A binding tuning shaft will also cause the pushbuttons to stick or fail to return to their normal positions. To correct shaft binding, enlarge the tuning shaft opening using a reamer, or a rat tail file.

If the receiver is dead, check installation wiring to make certain the correct lead is connected to the ignition and instrument light switch respectively. If the receiver lead that should go to the instrument light control is connected to the emission switch, the receiver will not operate through pilot lamps will light.

Check the loudspeaker plus connection. Though the plug pin receptacles in the speaker lead connector are arranged in such a manner to be polarized, it is often the operator neglects to align the receptacles with respect to the male plug pins at the speaker. Foregoing together of the incorrectly aligned parts is liable to cause the male pins to break through into the thin walls of the non-conductive adherent layer of the speaker plug, resulting in open circuit wiring to the loudspeaker.

Exposure of the radio receiver to such dampness as water drips or upon the receiver components and wiring results in voltage breakdown at tube sockets (especially the 6V6 output tube), or the shorting of capacitors and resistors. The rf Skinner strip at the center of the receiver will also be affected, causing the radio to become weak or dead. Water leaks around the windshield and door seal holding the set mounting bracket to the cowl should be well sealed against water draining upon the receiver. A thorough check for probable leaks and the necessary steps taken to prevent their occurrence should be taken at the time of the initial radio receiver installation.

A lower than normal battery voltage can be the cause of the radio to be weak or fail to operate. The receiver will not function properly if the battery voltage drops below 5.8 volts.

The following changes in production wiring should be noted in the schematic diagram.

Capacitor C28 has been changed to the left side of switch S1, at the junction of C27 and the switch connection. The ground lead of C28 is connected to chassis ground.
**General Electric 219, 220, 221**

These models appear on pages 15-8 through 15-16 of Rider's Volume XV. In the parts list, catalog number R1L-003 should be identified as a replacement loop assembly only for Models 219 and 220. Catalog number R1L-002 should be added as a loop assembly for Model 221.

**General Electric 250, 260**

Model 250 appears on pages 15-8 through 15-16 of Rider's Volume XV. Model 260 appears on pages 16-6 through 16-12 of Rider's Volume XV. The following should be added to the parts list for both models: Hinge pin for cover, catalog number RMP-011.

**General Electric 321A**

This model is the same as Model 321 Late, appearing on pages 16-10 and 16-11 of Rider's Volume XV.

**General Electric 356, 357, 358**

These models appear on pages 18-40 through 18-44 of Rider's Volume XVIII. The following changes should be made in the parts list. Under UCC-025, remove symbols C43, C65, C70. Add to UCC-026 symbols C45, C50, C70.

**General Electric 356, 357, 358; 376, 377, 378**

Models 356, 357, and 358 appear on pages 18-40 through 18-44 of Rider's Volume XVIII. The following changes should be added to the parts list for early production models, added to catalog number RLP-012 instead of the 174-turn coil that was used in early production models.

**General Electric 376, 377, 378**

These models appear on pages 18-56 through 18-64 of Rider's Volume XVIII. Model 377, appearing on pages 19-26 through 19-41 of Rider's Volume X. When an old type construction 6BE6 (date coded 8/17 or before) is replaced with a new type construction 6BE6 (dated 8/22 or later) it is necessary that the fan oscillator choke coil L8 be a 13/4-turn coil (catalogue number RLP-012) instead of the 174-turn coil that was used in early production models.

**Magnavox AMP-101C**

This model is the same as Model AMP-101A on pages 17-50 and 17-51 of Rider's Volume XVII, except for the following changes in parts values.

Ref. No. Description Part No.
21 Capacitor, paper, 0.1 µF 250152G33
22 Capacitor, paper, 0.1 µF, 600 v. 250152G33
8 Resistor, composition, 15,000 ohms ±10%, 1/4 w. 230084G76
9 Resistor, composition, 100,000 ohms, ±10%, 1/4 w. 230084G86

**Magnavox AMP 110D. AMP 111E**

These models are the same as Model AMP 111, appearing in Rider's Volume XVIII, pages 18-5 through 18-7, except for the following parts value changes.

Ref. No. Description Part No.
9 Capacitor, paper, 0.43 µF, 250152G25
22 Resistor, composition, 230841G78, 27,000 ohms ±10%, 1/4 W

**Hoffman C501 and C511. Chassis 108**

These models are the same as Model C501, Ch. 108, appearing on page 15-6 through 15-10 of Rider's Manual Volume XV, except that four 066 beam-power tubes are used in push-pull parallel in the output stage instead of the pair used in 15-6. The changes indicated in the accompanying diagrams. The alignment is still the same as given on page 15-6.

**Kotex RP5707**

This model appears in the Miscellaneous section, page 15-8 of Rider's Manual Volume XV. This model is listed in the Indexes as RP5707. It should read RP5707.

These are the same as Model AMP-109 on pages 18-12 through 18-5 of Rider's Volume XVIII, except for the following changes. In Model AMP-109D, only, the 4-ampere, 220-volt fuse has been removed from the a-c line. Pin number 1 of the changer motor receptacle is now connected to the bottom of the primary of the a-c transformer. A 4-ampere, 220-volt fuse is connected from the bottom of the primary of the a-c power transformer to the high side of the a-c power socket. This side of the a-c power socket is also connected to pin 1 of the speaker socket.

The parts list should be amended to include the following:

Table of electrical values for Magnavox CR198 Series.

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Part No.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR198C</td>
<td>32</td>
<td>250152G37</td>
<td>Capacitor, molded mica, 680 µf ± 10%</td>
</tr>
<tr>
<td>32 49, 65</td>
<td>250159G31</td>
<td>Capacitor, molded mica, 680 µf ± 10%</td>
<td></td>
</tr>
<tr>
<td>88</td>
<td>230084G90</td>
<td>Resistor, composition, 680,000 ohms ± 10%, ½ w</td>
<td></td>
</tr>
<tr>
<td>99</td>
<td>610 172G1</td>
<td>Switch, rotary band selector</td>
<td></td>
</tr>
<tr>
<td>106</td>
<td>230084G88</td>
<td>Capacitor, molded mica, 680 µf ± 10%</td>
<td></td>
</tr>
</tbody>
</table>

Magnavox CR197 Series

Models CR197, CR197A, and CR197B appear on pages 18-1, 2 through 18-5 of Rider's Manual Volume XVI. The schematics and parts lists for Models CR197C, CR197D, and CR197E are similar to those listed above except for the following changes:

- Part No. 8 is now connected from ground to the junction of 24, 83, and 99, in all models.
- Part No. 9 is now connected from ground to the junction of 25, 83, and 99, in all models.
- The value of Part No. 13 has been changed from 20 µf to 13 µf in all models.
- Resistor 61 has been deleted in Models CR197D and CR197E, as shown in the accompanying diagram.

Part No. 106, a 6-volt socket, has been added between the filament connections and the lamps in Model CR197E only.

The supplement to the parts list is as follows:

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR197A</td>
<td>32</td>
<td>Capacitor, paper, 0.02 µf, 600 v</td>
</tr>
<tr>
<td>49</td>
<td>250152G37</td>
<td>Omitted</td>
</tr>
<tr>
<td>61</td>
<td>230084G15</td>
<td>Resistor, composition, 2,200 ohms ± 10%, ½ w</td>
</tr>
<tr>
<td>65</td>
<td>230084G19</td>
<td>Resistor, composition, 10,000 ohms ± 10%, ½ w</td>
</tr>
<tr>
<td>88 89, 90, 91</td>
<td>160172G1</td>
<td>Omitted</td>
</tr>
<tr>
<td>99</td>
<td>160172G1</td>
<td>Switch, rotary band selector</td>
</tr>
<tr>
<td>106</td>
<td>230084G88</td>
<td>Capacitor, molded mica, 680 µf ± 10%</td>
</tr>
</tbody>
</table>

Magnavox CR198 Series


- Item No. 13 has been changed from 20 µf to 13 µf.
- Section 1 front of item 99 is the same for all models except J. This wafer is shown in Figure 1.

The position of item 12 has been changed for model J only. Capacitor 12 for model J has been removed from across item 4 and inserted in the wafer lead to the junction of items 4 and 43. In all other models, it is removed in parallel with item 4.

Resistor 91 has been inserted from the tap of item 97 to item 91. Its value is shown in the accompanying table.

Magnavox CR-202 Series

These models appear on pages 18-16 through 18-25,86 of Rider's Manual Volume XVIII. Two resistors, R143 and R144, have been added to Ch. CR-202C. R143 is connected between C41 and the junction of R118 and C64. R144 is located between the junction of R142, R113, and C60, and the rotary band switch 153.

The parts list should be amended to include the following:

- Item No. 106, a 6-volt socket, has been added between the filament connections and the lamps in Model CR197E only.
- The 6-volt socket, item 106, has been inserted across the filament leads in models CR198E, CR198F, CR198H, and CR198J.
- The positions of items 8 and 9 for all models have been changed from the transformer side of the R-C filter to ground, to the wafer side and to ground.

The parts list should be amended to include the following:

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR-202A</td>
<td>34</td>
<td>Capacitor, mica, 510 µf, ± 5% 250159G64</td>
</tr>
<tr>
<td>40</td>
<td>230084C15</td>
<td>Capacitor, mica, 300 µf, ± 10% 250159G88</td>
</tr>
<tr>
<td>41</td>
<td>250159G64</td>
<td>Capacitor, mica, 510 µf, ± 5% 250159G64</td>
</tr>
<tr>
<td>113</td>
<td>230084C85</td>
<td>Resistor, comp, 82,000 ohms, ½ w, ± 10%</td>
</tr>
<tr>
<td>124</td>
<td>230084C27</td>
<td>Resistor, comp, 220,000 ohms, ½ w, ± 10%</td>
</tr>
<tr>
<td>142</td>
<td>Omitted</td>
<td></td>
</tr>
<tr>
<td>143</td>
<td>Omitted</td>
<td></td>
</tr>
<tr>
<td>144</td>
<td>Omitted</td>
<td></td>
</tr>
</tbody>
</table>

The position of item 12 has been changed for model J only. Capacitor 12 for model J has been removed from across item 4 and inserted in the wafer lead to the junction of items 4 and 43. In all other models, it remains in parallel with item 4.

Resistor 91 has been inserted from the tap of item 97 to item 91. Its value is shown in the accompanying table.

Resistor 62 has been deleted from all models except CR198A, CR198B, and CR198C. The auxiliary circuit is shown in Figure 2.

The connection from item 99, section 2 rear, to the cathode and grid leads of the 6J5, 1st a-f stage, has been deleted.

Resistor 83 is now connected between pins 1 and 5 of the 6J5, in all models except CR198A. The values are given in the accompanying table.

Items 48, 90, and 91 have been added as shown in Figure 3. Item 48 appears in Models CR198H and CR198J only. Its value is 0.001 µf.

The 6-volt socket, item 106, has been inserted across the filament leads in models CR198E, CR198F, CR198H, and CR198J.

The positions of items 8 and 9 for all models have been changed from the transformer side of the R-C filter to ground, to the wafer side and to ground.

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Magnavox CR-208C

This model is the same as Model CR-208 appearing on pages 17-18 and 17-25,6 through 17-51 of Rider’s Volume XVIII, except for the following changes. Capacitor 15 has been changed in value from 110 pf to 150 pf. A 150,000-ohm resistor (80) has been connected in series with...
RCA Record Changers RP-176, RP-177 Series

Model RP-176 may be found on pages RCD.CHI. 17-1 through RCD.CHI. 17-12 of Rider's Volume XVII. The RP-177 Series appears on pages RCD.CHI. 18-1 through RCD.CHI. 18-18 of Rider's Volume XVIII. The following discussion refer to the item numbers in the service data for Model RP-176. The numbers in parentheses refer to the item numbers of the RP-177 series.

When the changer shows failure to trip, or pre-tripping characteristics, the following should be done: The engagement of items 50 (67) and 41 (93) must be 1/64" to 1/32"—file or bend positioning pin of item 59 (67) to obtain proper engagement. The engaging surfaces of items 59 (67) and 41 (93) must be smooth and free of burrs. Stone the surfaces if required—if the surfaces are rough, the tone arm jumps into the label when the mechanism trips. The overlap between the trip pawl of item 85 (29) and the ratchet of item 59 (67) must be 3/32" to 1/8".

Tone arm travel over the record label can be corrected by following these instructions. If the tone arm travels over the record label, try the following procedure. While holding the pawl of item 41 (93) disengaged from the ratchet lever 59 (67), place the tone arm in the eccentric groove of a record with the turntable running. The tone arm should swing back and forth freely. Should the tone arm jump the eccentric groove and sweep over the label, more overlap is needed between the pawl of trip lever 85 (29) and the ratchet of item 50 (67). This can be obtained by filing approximately 1/32" from the trip pawl as indicated in Fig. A.

If the spacing between the record posts need adjustment, refer to page RCD.CHI. 17-3 (RCD.CHI. 18-5), adjustments B and C, and Fig. B accompanying. Set the record separator post, as described in the service data, in the 10-inch position. Adjust the 10-inch position of the record support by means of the screws "B" so that to the 12-inch position, and adjust by means of the screws "B" so that dimension B indicated on Fig. B is obtained. Bend the stop bracket so that dimension A indicated on Fig. B is obtained.

RCA 8BX6, 8BX65, Chassis RC-1040C

These models appear on pages 18-11 through 18-14 of Rider's Volume XVIII. The parts list should be changed as follows:

Add: 71040 Socket—2 contact female socket for external loop
Delete: Speaker assembly 92577-3, 73123 Speaker—4 Pin Speaker
Use Stock No. 71068 Speaker (4" x 6") as replacement.

RCA 8BX6, Chassis RC-1040D

This is the same as the model name Chassis No. RC-1040C, appearing in Rider's Volume XVIII on pages 18-11 through 18-14, except that the external loop antenna socket is omitted on RC-1040D.

RCA 8R71, 8R72, 8R74, 8R75, 8R76; Ch. RC-1060, RC-1060A

These models appear on pages 19-10 through 19-16 of Rider's Volume XIX. The 8R76 has been modified to RC-1060A.

RCA 8R71 to 8R76, Ch. RC-1060, RC-1060A, 9W101, 9W103, Ch. RC-618B

Models 8R71 to 8R76 appear on pages 19-10 through 19-16 of Rider's Manual Volume XIX and Models 9W101 and 9W103 appear on pages 19-9 through 19-11 of the same Volume. Some ceramic capacitors C11 (5 µf) have been used which have a color code of black-green-black. The capacitor is correct, but the color code is incorrect. The normal color code of this capacitor is green-white-white.

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RCA 8V151, Ch. RK-121C

This model appears on pages 19 through 19-40 of Rider's Manual Volume XVII. In the diode load circuit, R29 (270,000) should be deleted—R20 (82,000) and R34 (180,000) should be added, as shown in the accompanying diagram.

Diode Load Circuit for RK-121C.

The wiring diagram is incorrect in the wiring of the range switch. The illustration below shows the changes which should be made.

Late production models of Chassis No. RK-121C use a crystal rectifier for a.m. detection instead of the diode plate (pin 6 of V8) of 6AT6 as shown.

Crystal Rectifier for RK-121C.

Service Caution: (1) Maintain a minimum lead length of 3/4 inch on the crystal leads. Excess heat from a soldering iron will damage the crystal; (2) the normal voltage existing in this circuit should never be exceeded when testing or trouble shooting, and (3) maintain polarity of crystal.

The following change has been made in the parts list. Add:

54374 Rectifier-crystal rectifier (CR1)

Change in Wiring of RCA 8V151.

An addition to the Parts List under Miscellaneous is:

74312 Ornament — Wood fibre ornament for front of cabinet.

RCA 8V112, Ch. RK-121C

This model appears on pages 19-17 through 19-44 of Rider's Volume XVIII. To minimize the possibility of "A" band oscillation and to reduce interference, a resistor (R35) has been added in the mixer grid circuit as shown in the accompanying diagram.

RCA 8V112. Chassis RC-616

This model appears on pages 19-17 through 19-44 of Rider's Volume XVIII. To minimize the possibility of "A" band oscillation and to reduce interference, a resistor (R35) has been added in the mixer grid circuit as shown in the accompanying diagram.

A support has been added to insure greater oscillator stability for the 5m oscillator coil. After adjustment the coil is cemented to the coil support.

The following is added to the parts list:

74202 Support—Polystyrene coil support complete with mounting bracket.

RCA 8V112. Chassis RC-616

This model appears on pages 19-17 through 19-44 of Rider's Volume XVIII. To minimize the possibility of "A" band oscillation and to reduce interference, a resistor (R35) has been added in the mixer grid circuit as shown in the accompanying diagram.

A 390-ohm resistor has been added in the mixer grid circuit of the RCA 8V112 to reduce interference.

In late production sets C42 has been changed from 22 uf to 15 uf and R18 has been changed from 22,000 ohms to 18,000 ohms. This change was made to prevent oscillation at the high end of the 5m band.

Add the following to the parts list:

Resistor — fixed composition, 390 ohms, ±10%, ½ watt (R55)

RCA 8V112. Chassis RC-616, RC-616F

The schematic diagram for this model, which is contained in pages 18-17 through 18-44 of Rider's Volume XVIII, is in error in showing the connection of R22. It should be shown connected to C18 instead of to the RED lead of the output transformer.

In order to provide adequate lead length, resistor R10 (56,000 ohms) has been changed from ½ watt to 1 watt.

Chassis RC-616F, used in the second production of these instruments, is very similar to Chassis RC-616 except for the following:

First Production RC-616

Four position selector switch

M.M.—PHONO—AM—FM

Aux. input jack is not used

Second Production RC-616F

Five position selector switch

AUX.—M.M.—PHONO—AM—FM

Aux. input jack is used.

Except for the following replacement parts, all parts are identical:

74163 Selector switch is used in place of 73608 (switch S1, S2)

74164 Control panel decal for mahogany or walnut instruments is used in place of 73704 decal.

74354 Control panel decal for blonde instruments is used in place of 73755 decal.

Fig. 1. (Above) shows the selector switch used in RCA Chassis RC-616F. Fig. 2. (Below) The simplified circuit of the selector switch in the #2 position.

Figs. 1 and 2 show the selector switch S1 used in Chassis No. RC-616F. The connections to S2 are identical in both chassis. Note that position #2 (M.M.) of RC-616F corresponds to position #1 (M.M.) of RC-616. No connections are made through S2 in AUX. position.

*R. Rider
PAGE 20-10 CHANGES

RCA 9W101, 9W103, 9W105

These models appear on pages 19-46 through 19-49 of Rider's Manual Volume XIX.

A capacitor (150 μF (C44)) has been added between the screen grid terminal of V8 (6V6GT) socket and chassis as shown in the accompanying illustration. This was done to eliminate parasitic audio oscillation.

The simplified schematic diagrams (phone position) shown on page 18-59 show C34 and C56 connected to ground. They should be connected to the cathode of the 6V6GT tubes as shown in the accompanying illustration.

To improve fan stability one dial lamp is now connected to pin #2 of V7 (6X5GT). Previously both were connected to pin #2 of V8 (6V6GT).

 Speakers stamped 92569-1WX have been used as a substitute for 92559-5W speakers in Model 9W101; 92569-1WX speakers have a 2.2-ohm voice coil; 92559-5W speakers have a 3.2-ohm voice coil.

The following additions have been made to the parts list:
- 43125 Capacitor-Ceramic, 150 μF (C44) Same as C7, C19, C35, C53, C53
- 13987 Cap—Dust cap
- 30145 Cone—Cone and voice coil assembly
- 5039 Plus—4-prong male plug for speaker
- 71145 Suspension—Metal cone suspension
- 37999 Transformer—Output transformer (T2)

Note: When replacing complete speaker order Stock No. 73335 (92559-5W).
37996 Grummet—Rubber; grummet for mounting speaker (3 required)—for Model 9W103
73896 Loop—Loop antenna complete for Models 9W101 and 9W103 (previously listed for 9W101 and 9W103)

The RP-184A record changer pickup arm cable now being used is a three wire cable (RED-WHITE-BLACK). In some instances the black wire is omitted or a shielded wire may be used as shown in Model 9W105. 9W101, 9W103 Service Data. The latest connection diagram is shown in the accompanying illustration.

RCA 8X53. 65X1, 65X2, RC-1064


The number of turns of dial cord on the tuning shaft has been increased from 2.4 turns to 4.4 turns.

RCA 87X1. 87X72

These models appear on pages 19-39 through 19-34 of Rider's Manual Volume XIX. A capacitor (0.01 μF (C28)) has been added between pin #3 of V6 (35CS) and chassis. The revised heater connection schematic diagram is illustrated in the accompanying diagram.

The following have been added to the parts list:
- 71923 Capacitor—Tubular, 0.01 μF, 200 v (C38) same as C23, C26.

RCA 75ZU, Ch. RC-1063A

This model appears on pages 19-48 and 19-49 of Rider's Manual Volume XIX. A groove approximately 1/16 inch deep by 1/4 inch wide is now included on the outer rim of the bakelite station selector indicator pulley, Stock No. 73060.

If trouble is encountered with the drive cord coming off this pulley, either of the following corrections may be applied:

(a) Position the pulley in relation to the gang drum by the adjustment provided on the long support post for the dial back plate assembly so that the drive cord occupies the position indicated in the accompanying illustration.

(b) Replace the pulley with one incorporating the groove indicated above.

The service data for the 50-cycle version of Radiola 75ZU will apply to this instrument except:

RP-178 record changer only is used.

A conversion spring (Stock No. 73158) is added to the motor spindle shaft for 50-cycle operation.

A detail ("RCA Victor" Stock No. 71984) is added to the front of the cabinet.

These changes apply to the RC-1063B also.

The following have been added to the parts list for instruments using blonde mahogany cabinets:
- 73722 Knob—Power—Phono—radio switch knob—for blonde instruments
- 73629 Knob—Tuning Knob—for blonde instruments
- 73630 Knob—Volume Control Knob—for blonde instruments

RCA 66BX, Ch. RC-1040, RC-1040A, RC-1040B: 8BX5, 8BX54, 8BX55.
Ch. RC-1059, RC-1059A; 8BX5.
Ch. RC-1040C, RC-1040D; 9BX5.
Ch. RC-1059B


The line-battery switch used in these receivers is of the "slide" type. The actual switch does not have numbered terminals, although the schematic diagrams have numbers indicated. The numbers on the schematic diagrams do not indicate the actual sequence of the terminals on the switch. The accompanying illustrations show the actual sequence of the switch terminals and the corresponding numbers which appear on the schematic diagrams. Figure 1 is the diagram for the 8BX6.
These models are the same as Model SX541 on pages 9-49 and 18-46 of Rider's Volume XVIII, except for the color of the cabinets and the parts noted here. The parts are the same, except for:

1. RC-1065, RC-1065A

Lead along the detector terminal board away from the section may eliminate the condition:

1. 19.64 through

2. RCA 8X544, 8X545, 8X546, Ch. RC-610, RC-1065, RC-1065A

Correct for any detuning 1st order. The incorrect antenna may reduce sensitivity slightly.

3. 75X1, 75X2, 75X4, 75X5, 75X6

These models appear in Rider's Manual Volume XVIII on pages 18-49 and 18-60. In some chassis a substitute drift transformer has been used. The original coil (70477) uses a capacitive winding (L4) for coupling the oscillator circuit to the oscillator grid (pin 5) of the 12SA7 tube. The substitute coil uses a 36-mu ceramic capacitor for the same purpose (L4 is not used.) The accompanying notes show how this coil is connected into the circuit.

The following changes should be made in the parts list:

Delete:

73007 Condenser—
Add:

73007 Condenser—variable tuning condenser (C3, C4, C6, C7)

RCA 610V1, Ch. RC-610C: 610V2, Ch. RC-610C

These models appear on pages 9-58 through 18-60 of Rider's Volume XIX. A small quantity of these receivers were shipped with the incorrect loop antennas. The incorrect loop contains approximately 14 turns instead of 17 turns. This reduced inductance causes low sensitivity and poor selectivity, particularly below 900 kc.

Complaints of poor sensitivity, poor selectivity, or interference in the form of local station(s) repeating at one or several places on the "A" band (except response at the image frequency) should have the loop checked as one possible cause.

The incorrect loop may peak at the high end of the "A" band but will not peak at lower frequencies. This may be checked by varying the oscillator coil inductance. The correct loop tracks normally across the band. The stock number of the antenna terminal board is 72055. It was listed incorrectly as 70255.

RCA 77U

This model appears on pages 18-53 and 18-54 of Rider's Volume XIX. The following parts should be added to the parts list:

1. 73109 Nut—Tee nut to mount rod changer—3 required.

2. 73110 Screw—1/4-20 x 1 1/4" filler head machine screw to mount rod changer.

The service data previously issued for this model also apply to instruments using blonde mahogany cabinets, except for the following parts which are used with such cabinets:

RCA 610V1, RC-610C

These models appear on pages 9-58 through 18-60 of Rider's Volume XVIII. Regulator B15 in the cathode circuit of the type 6A6E fm-driver stage has been changed from 68 ohms to 120 ohms. This change was made because certain 6A6E tubes were found to draw grid current at the bias value produced by 68 ohms, which resulted in a decrease in fm sensitivity.

Regal W800

This model is the same as Model 800 which appears on page 16-1 of Rider's Volume XVIII. The socket layout for both models is shown in the accompanying diagram.
Models 612V1 and 612V3 appear on pages 17-31 through 17-43 of Rider's Volume XVII. Model 612V4 is the same except for the cabinet. Some of these receivers have developed a howl when operating on the f-m band. Howl of this nature is generally a result of vibration from the speaker being transmitted to some component, or combination of components, in the oscillator circuit. This vibration causes the oscillator frequency to become modulated, resulting in a howl being emitted from the speaker.

The following are possible causes:

1. Loose elements in the oscillator tube.
2. Loose plates or unequal spacing of rotor and stator plates in the f-m oscillator section.
3. Capacitor C88 should be placed adjacent to the side wall of the r-f shelf and held firmly in place. This may be accomplished by melting wax against the capacitor and the chassis.
4. All oscillator, r-f, and aet. leads should be well separated and arranged to produce the least capacitance change if set into vibration.

When searching for the cause of the trouble, an alignment tool having a high dielectric constant and without a metal tip can be used as a probe in the circuit. It is important that the position of the wires and components be changed as little as possible during realignment. When probing the air column of the speaker in relation to the chassis must be as near as possible to normal operating position. Failure to maintain such relation may result in false indications of either excessive or no howl at all.

On the RK-121 chassis, starting with serial number 25,000, a 10-ohm carbon resistor has been added between C16 (70 µu) and terminal number 1 of S4. This resistor has been inserted to eliminate dead spots between 1600 and 1000 kc on the "A" band. This resistor should be added to any early model set developing dead spots, but make certain that the overall lead length, including the resistor remains the same as before.

Refer to Fig. 2 for the late production range switch coupling shaft. Looen square head set screws "C" in collar of gear. Remove nut "E" (on front apron of chassis) from bushing "D". Push shaft and bushing to the rear so that shaft and bushing are clear of the chassis apron. Flex the shaft and pull forward. To remove bushing from shaft, use procedure described for early type bushing.

The brown lead of the dial lamp for phono operation is at present dressed to contact #3 of S1. Front, then through the space between the switch rotor and the bolt spacer. This lead should be dressed between the space and the shelf cradle. The bus wire from the "C" band antenna coil to contact #9 of S1 Rear is to be dressed a distance of 14 inch from the loop load coil antenna lead (yellow). The f-m antenna lead (yellow) is to be dressed between the switch spacer through the bolt and the switch rotor, keeping clear of the shelf and cradle.

The changes indicated should be made in the parts list. The entire listing of Miscellaneous parts is given for convenience.

Add the following to the parts list:
7119 Escutcheon--Escutcheon only--less screen, window and marker strips--for blonde instruments.
Change 71908 Frame in the parts list to read 71908 Frame--Rollout carriage frame with brackets--less wheels.

The parts list for these models applies to Model 612V4 also except for the following miscellaneous parts: 73719 Buck--Cabinet back--blonde for sedges--2 required 73720 Buck--Cabinet back--blonde for center X1825 Cloth--Grille cloth--for 612V4 blonde.

The RP-17A record changer is used.

Sears 8070, Ch. 101.817-1A: 8070A, Ch. 101.817-2A

These Models are the same as Model 7070, appearing on pages 17-2, 17-3, and 17-16 of Rider's Volume XVII, except for the following changes. The appearance of the parts have been changed in Ch. 101.817-1A.

In Ch. 101.817-2A, capacitor C17 has been changed in value from 0.06 µf to 0.01 µf. Resistor R5 has been changed in value from 100 ohms to 150 ohms. The second if transformer has been changed from expeditor tuning to slug tuning. The new parts number is R03574. The location of the trimmers is shown in the accompanying diagram.

![Diagram](link)

**Parts list of the RCA 612V1, 612V3, 612V4**

*John F. Rider*
Sears 8020, Chassis 132.841

This model appears on pages 18-68 through 18-69 of Rider's Volume XVIII. It has been discovered that the dial cord on some of these receivers binds. If the dial cord is strung on page 18-68, continued turning of the tuning knob in a clockwise direction, after the pointer has reached the right-hand end of the dial, will cause the tuning shaft to turn in the cord and the cord will slide back on the shaft toward the chassis. Then, when the knob is turned in the counterclockwise direction, the cord will travel farther on the shaft and have a tendency to come in contact with the chassis and bind on the shaft.

If the cord is wound from back to front on the tuning shaft, as shown in the accompanying figure, it will travel away from the chassis when the knob is turned in a counterclockwise direction and the binding will not occur.

\[ \text{TO BACK ON SHAFT} \]

\[ \text{TO FRONT ON SHAFT} \]

When the dial cord of the Sears 8020 is wound from back to front on the tuning shaft, the cord will not bind on the chassis.

Sears 8011, Ch. 132.840

This model is the same as Model 8010, Ch. 132.840, appearing on page 18-26 of Rider's Manual Volume XIX, except for the following changes. Model 8010 has a brown cabinet and knobs, while Model 8011 has an ivory cabinet and knobs. Parts which are different from the 8010 are as follows:

- N21092-1 Cabinet less front trim assembly
- N21093-1 Knob, control, volume and tuning.

Stewart-Warner A51T Series

These models are the same as Model A51T1, appearing on pages 17-1 through 17-6 of Rider's Volume XVII. The code listings for these models are:

<table>
<thead>
<tr>
<th>Model</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>A51T1</td>
<td>9020-A</td>
</tr>
<tr>
<td>A51T2</td>
<td>9020-B</td>
</tr>
<tr>
<td>A51T3</td>
<td>9020-C</td>
</tr>
<tr>
<td>A51T4</td>
<td>9020-D</td>
</tr>
</tbody>
</table>

On chassis which have the letters H or R stamped on the rear surface adjacent to the model numbers, the rotor of the tuning capacitor is grounded instead of being connected to the A/C line. Oscillator coil 505397 (see accompanying diagram) is used on chassis which are stamped with the letters "S", "H", or "R".

Regal W900

This model is the same as Model 900 which appears on pages 16-2 and 16-5 of Rider's Volume XVI. The socket layout and voltages for both models are shown in the accompanying diagram.

Stewart-Warner A41T1. Code 9032-A

This is the same as Model A41T1 appearing on pages 17-1 through 17-5 of Rider's Manual Volume XVII, except for the following change. Resistors 0.25 ohm, formerly 270 ohms, has been changed to 560 ohms to minimize "B" supply drain. Chassis which incorporate this change have a letter "S" stamped on the rear surface. The new resistor is described as follows:

- 502127 Resistor—carbon—560 ohms, 3/4 w.
These models are the same as Model 61T16, appearing on pages 167 and 168 of Rider's Volume XV, except for some changes. The code listings for these models are:

**Model**  
61T16 9022-A  
61T16W 9022-AW  
61T26 9022-B

A 0.01-µf capacitor (45) has been added from the black lead (center tap) of the loop antenna to ground. A 0.05-µf capacitor (46) has been connected from the cathode of the 1257 tube to the AVC line. A 396-ohm resistor (44) has been connected in shunt with the pilot lamp.

The following should be added to the parts list:

<table>
<thead>
<tr>
<th>Diagram Part</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>390 changes. of 61T16, Stewart-Warner inadvertently left out Model A6ICR1, 9034-H</td>
<td></td>
</tr>
</tbody>
</table>
Tele-Tone Chassis A
Models 123, 125, 127, and 131 are the same as Model 100, Chassis A, which appears on page 182 of Rider's Volume XV.

Tele-Tone Chassis D
Models 110, 119, 124, 126, and 132 are the same as Model 117, Chassis D, appearing in Rider's Volume XV, page 164.

Tele-Tone Chassis U
Models 172 and 176 are the same as Model 156, Chassis U, which appears on pages 17-8 and 17-9 of Rider's Volume XVII.

Tele-Tone Chassis W
Models 154, 155, 173, and 177 are the same as Model 152, Chassis W, which appears on pages 17-8 through 17-9 of Rider's Volume XVII.

Temple tone H-127
This model is the same as Model H-725, appearing on pages 17-8 through 17-9 of Rider's Volume XVII.

United Motors 882421
This model appears on pages 19-43 through 19-49 of Rider's Manual Volume XIX. The following service parts have been changed after serial # 1-83000.

Watterson RC-4581
This model is the same as Model 4581 appearing on page 16-1 of Rider's Volume XV.

Western Auto D2718 Series B
Serial No. 137000 Up
This model is the same as Model D2718, appearing on pages 17-80 through 17-85 of Rider's Volume XVII, except for the following changes. Capacitor C30, formerly connected from the junction of R-48, C-29, and pin 8 of the 12SQ7 tube to pin 2 of the 3Z5GT rectifier tube, is connected from the same junction to the center tap (pin 3) of the filament of the 3Z5GT rectifier tube.

The part number of capacitor C16 and C29 should be changed from 47X46 to 47X46. The value remains the same.

Part number 17X96, cel luloid crystal, should be added to the parts list.

Western Auto D4832-B
This model appears on pages 18-49 through 18-52 of Rider's Volume XVIII. The "B", chassis by a change in the value of resistor R-4 from 220,000 ohms to 10,000 ohms.

The new part number and description are as follows: R-4 B-85103 10,000 ohms, 0.5 w.

United Motors R-705
This model appears on pages 17-7 through 17-8 of Rider's Volume XVII. The receiver may be installed in the 1949 Ford by using parts from the adapter parts package number 4428. It is necessary to use the Delco universal speaker, part number 8111-6" x 9" elliptical speaker, in place of the speaker supplied with the radio set. This speaker should be returned to your stock under part number 6104.

The parts that are to be used from adapter package 4428, are shown in the following operations.

OPERATION 1
STEERING COLUMN ADAPTER ASSEMBLED TO CONTROL HEAD

OPERATION 2
STRAP ASSEMBLED TO CONTROL HEAD

OPERATION 3
HEATER ADJUSTMENT, ASSEMBLED TO STEERING COLUMN

OPERATION 4
Removes the tips from speaker cable and solder ends to 6" x 9" speaker terminals.

OPERATION 5
ASSEMBLY TO FOUR STUDS IN PANEL.

INSTRUMENT PANEL

United Motors R-705 appears on pages 17-1 through 17-6 of Rider's Volume XVII. This receiver may be installed in the 1949 Ford by using parts from the adapter parts package number 4428. It is necessary to use the Delco universal speaker, part number 8111-6" x 9" elliptical speaker, in place of the speaker supplied with the radio set. This speaker should be returned to your stock under part number 6104.

The parts that are to be used from adapter package 4428, are shown in the following operations.

OPERATION 1
STEERING COLUMN ADAPTER ASSEMBLED TO CONTROL HEAD

OPERATION 2
STRAP ASSEMBLED TO CONTROL HEAD

OPERATION 3
HEATER ADJUSTMENT, ASSEMBLED TO STEERING COLUMN

OPERATION 4
Removes the tips from speaker cable and solder ends to 6" x 9" speaker terminals.

OPERATION 5
ASSEMBLY TO FOUR STUDS IN PANEL.

INSTRUMENT PANEL

The various operations necessary to install United Motors Model R-705 in the 1949 Ford, as well as the assembled control head are illustrated.

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Changes page 20-15

Westinghouse H-125, H-126, H-127
Models H-125 and H-126 appear in Rider's Volume XV, pages 16-8 through 16-16. Several changes were made in the chassis of these two models in late production. A 3S1GCT output tube replaces the 3S5A. The electrical characteristics of the tubes are similar except for a difference in tube bases and connections. An isolating network consisting of a 470-ohm resistor (44) and a 0.02µf capacitor (14) has been inserted in the plate and screen voltage supply line for the rf and converter stages. In the output, the rotor plates of the tuning and tune-up capacitors are now connected directly to chassis ground rather than to the AVC line.

Model H-127 is the same as the previous models with a burgundy and gold cabinet. The following items should be added to the parts list for these models:

14 RCPO10W2200A Capacitor, 0.02 µf
44 RC220AE471M Resistor, 470 ohms 0.5 watt
V-3711-2 Case Assembly, center (H-126 and H-127)
V-3991 Cover, left hand (H-127)
V-3992 Cover, right hand (H-127)
V-3405-2 Handle Assembly (H-127)
V-3491-2 Knob (H-127)
V-3353-2 Medallion (H-127)
V-3455-2 Dial (H-127)

Westinghouse H-164, H-165, H-168A, H-167
These models appear on pages 18-10 through 18-19 of Rider's Volume XVII.

To reduce hum in late production of these models, a de-coupling network was inserted in the plate circuit of the 6AT6 a-m detector, ave, and a-f amplifier tube. This network consists of a 100,000-ohm ½ watt resistor (RC20AE104K) and a 0.1 µf 400 volt resonant type capacitor (V-5420-1). The resistor is inserted between the plate load resistor (R11) and the B plus line, and the capacitor is connected from the junction of R11 and the new resistor to ground.

Westinghouse H-183, H-183A
These models appear on pages 19-15 through 19-17 of Rider's Manual Volume XIX.

An error exists in the schematic diagram. The value of R9 in the converter circuit should be 3,300 ohms instead of 300 ohms.

The position of C29 in the circuit has been changed. On some chassis this capacitor was connected across the primary of the output transformer as shown on the schematic diagram. In late production, the capacitor is connected from the plates to the cathodes of the parallel 25L6GT output tubes.

Westinghouse H-186, H-187
These models appear on pages 19-20 through 19-30 of Rider's Volume XVII.

To reduce hum in late production of these models, a de-coupling network was inserted in the plate circuit of the 6AT6 AM detector, AVC and A-F amplifier tube. This network consists of a 100,000 ohm ½ watt resistor (RC20AE104K) and a 0.05 µf 400 volt capacitor (RC10W450G). The resistor is inserted between the plate load resistor (R13) and the B plus line, and the capacitor is connected from the junction of R13 and the new resistor to ground.
Westinghouse H-202. H-204

These models appear on pages 19-84 through 19-88 of Rider’s Manual Volume XIX. The schematic diagram shows C12 and R17 in series between the S-m antenna terminal and the top of L17. R17 should connect to the bottom of L17 rather than to the top of L17.

Westinghouse H-188, Ch. V-2133

This model appears on pages 19-13 and 19-19 of Rider’s Volume XIX. Short wave interference may be reduced by replacing the 0.05 µf resonant capacitor (C7) with a 0.1 µf standard paper capacitor of 200 volts or higher rating.

The 220,000-ohm resistor, R11, which was not connected between the common negative line and the chassis, is not being used on late chassis.

The switch, SW1, is incorrectly shown on the schematic diagram and parts list as a P.S.P.R. switch. Actually, it is a P.S.P.R. switch, and it interrupts only one side of the a.c. line, the side which connects to the common negative line.

In later production, a V-6199-2 2nd i/f transformer was used in place of the V-5656 2nd i/f transformer listed. Although the new transformer is smaller than the original one, it is somewhat more expensive. A later model (C73) transformer; these parts have been reduced in size by using a smaller transformer and changing the layout and the parts are for the new transformer. The capacitor should be changed to 0.005 µf for the 2nd i/f transformer and 0.0025 µf for the 1st i/f transformer; however, the 0.005 µf transformer is not used.

These models should be changed to V-6199-2 2nd i/f transformer, V-5656 1st i/f transformer, V-5778-1 chassis, V-5778-2 baffle and grille cloth assembly for the chassis, V-5778-3 grille, and V-5778-4 cabinet. The parts list should be changed to the new model.

The following items should be added to the parts list:

Part No. Description
V-5969-2 Transformer, 2nd i/f, (L6, L7, C10, C20)
V-5426 Clip, mounting
V-5116-2 Cabinet, ivory
V-5732-2 Baffle and grille cloth assembly for the cabinet
V-5778-2 Grille, flat black cabinet
V-5778-1 Baffle and grille cloth assembly for the cabinet

Westinghouse H-190, H-191, H-191A

These models appear on pages 19-85 through 19-89 of Rider’s Manual Volume XIX. In later production, the cathode resistor, R3, for the 6BA6 1st i/f amplifier was removed and the cathode connected directly to ground. A new miniature capacitor (RMC30B222M) was connected across the 6BA6 2nd i/f amplifier cathode resistor, R4.

On some chassis, V-5596 "HI-KAP" capacitors are substituted for the following capacitors:

V-5604-15 (C7, C9, C10, C11)
V-3401-11 (C19, C20, C21)
V-5401-10 (C8, C9, C10, C11)
V-5604-10 (C9, C10, C11)
V-5778-1 Baffle and grille cloth assembly for the cabinet

Westinghouse H-204A

This model appears on pages 19-85 through 19-88 of Rider’s Manual Volume XIX. On some chassis, V-5596 "HI-KAP" capacitors are substituted for V-5604-13 (C51, C52, C53, C54, C55, C56, C57) capacitors. The substitution is made for convenience in production, and the receiver operation is not affected.

Westinghouse H-210, H-211:

Ch. V-2144, V-2144-1

These models appear on pages 19-85 through 19-85 of Rider’s Volume XIX. If the dial pointer has a tendency to bind, lubricate the two dial pulleys with record changer lubricant and move the dial cord tension spring to another hole in the drum to increase the tension.

If the dial pointer rattles, glue a piece of bumber material (cork and rubber composition) 1/8" thick and about 1/2" square between the right-hand pulley rivet on the dial background and the front of the chassis.

In later production models, the resistance of the 12BA6 2nd i/f amplifier cathode resistor, R3, was increased to 685 ohms. The part number of the new resistor is RC20A15D683. In addition, the resistor, R12, in the lead from pin 5 of the 35W4 was deleted from the circuit, and a direct connection was made in lieu of the resistor.

The tuning shafts used in later production have a wider groove for the dial cord. With these shafts, there are 3/4 turns of dial cord around the shaft rather than 2 1/4 turns as indicated on the dial-drive drawing.

Zenith S-11468

Model S-11465 may be found in the Record Changer section of Rider’s Volume XIX, pages RCD.CH. 15-1 through RCD.CH. 15-9.

The following instructions deal with repairing erasing loading of the needle of Model S-11468. In the first production of this non-interchanger record changer, a neon was used for erasing loading. Part No. S-13056, was used to stabilize the set down or loading of the needle on the arm-in groove of the record. The weight of the tone arm and the spring plate, riding on the neon output tip of the lift pin was relied on to provide effective braking action. Grease or oil on the neon output tip of the lift pin will cause erratic loading of the tone arm on the record. To remove the oil or grease, clean the pin tip and friction plate with carbon tetrachloride and wash with fine sandpaper.

Later production S-11468 changers have a spring type brake on the tone arm shaft. It is an anodized aluminum pin, Part No. S-13056. Erratic loading, where the arm swings sharply to the center of the record or beyond, may be caused by an incorrect locating bushing. Replace with a 94-415 bushing.

If the tone arm skips grooves and repeats, the vertical hinge on the tone arm may be too tight, causing the arm to hang slightly. This prevents the needle from exerting enough pressure on the record to follow the record grooves. To free the hinge, use a pair of long nose pliers and bend the horizontal spring "U" bracket until it pivots freely. Be certain that the connecting lead to the crystal cartridge is dressed so that it does not interfere with either the vertical or horizontal movement of the tone arm. This is important.

Excessive centers hole wear on record is caused by a sharp edge or burrs on the spindle shell. The edge of the record shell must be perfectly smooth and slightly rounded. Check the edge, and if sharp, smooth out with fine sandpaper.

Zenith SDO and 5RO Series, Chassis 5C01, 5C02, and 5C04

These models appear on pages 16-8 and 16-9 of Rider’s Volume XV.

Alternate tubes are used in the 5C01 chassis. A single chassis may contain octal, lock-in, and miniature button tubes. The alternate lineups are as follows:

Original Alternate Alternate
125A7GT 12B8E6 12E8E
3525GT 35W4
125K7 12A6
125Q7 12AT6
5014GT 50B5

If the oscillator should shift, replace the 220-ohm oscillator coupling capacitor (C8) with a 100-ohm resistor. When the oscillator drops out at the low end of the band, remove the 10,000-ohm grid leak resistor (R1) from the common return (B-) and connect it instead to the cathode of the converter. If audio oscillation occurs in the early model, disconnect the 0.0005 µf capacitor (C33) from the common return and connect it to the cathode of the 5014GT output tube, as shown in the late model schematic on page 16-8. Remove the 250-µf capacitor (C20) that is connected from the plate to the cathode of the 5014GT output tube. When hum and microphonics appear, check for a grounded tuning capacitor frame to the chassis venting plate.

The letter "V" after a chassis number indicates that an aluminum chassis is used.

Zenith Chassis 6C05, 6D0 Series

This chassis appears in Rider’s Volume XV, pages 18-3, 18-25, and 18-26. There will be variations in the tube line-up for different 6C05 chassis. A single chassis may contain octal, lock-in, and miniature button tubes. If an original tube is replaced with an alternate, the socket must be for an original tube.

Original Alternate Alternate
125J7GT 12B8E6 12E8E
125A7GT 12AT6 14Q7
125Q7GT 12A6 6B5
3516GT 35W5
3525GT 35W5

If the oscillator shifts, replace R3 (220 ohms) with a 1,000-ohm resistor.

If the oscillator drops out at the low end of the band, disconnect R1 (10,000 ohms) from the negative return and connect to the cathode of the converter tube.

For audio oscillation, disconnect C14 from the negative return and connect to the cathode of the 3516GT. Take out C21 (connected from the plate to the cathode of the 3516GT).

If there is oscillation at 910 kc, change C8 (negative return to chassis) from 0.05 to 0.1 µf.

Check for grounded tuning capacitor frame in case of oscillation, hum, and poor sensitivity. Correct by inserting cork or rubber pad between rear capacitor frame and chassis.

The letter "V" in Chassis number 6C05V indicates that an aluminum chassis is used.

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Zenith 4G800 Chassis 4E41

This model appears in Volume XVII of Rider's Manuals, pages 17-1 and 17-2. The On-Off switch #85-433 does not completely break contact on some receivers when the lid is closed, causing battery drain. To correct this condition, saw one plastic switch knob 46-736 into 1/16" lengths and place a length on the switch shaft, and then replace the knob. This will force the switch down far enough when the lid is closed to break contact and disconnect the batteries.

In some cases the calibration pointer touches the metal front of the cabinet, thus putting the gang at an a-c potential and causing a hum. To correct this condition place a fibre washer #93-323 between the pointer and the metal dial front. This fibre washer between the metal front panel and the dial pointer, completely prevents this "shorting" condition.

In very rare cases, when hum is encountered and cannot be corrected in any other manner, changing the 1S5 tube is suggested.

On later production the 3Q4 tube was replaced with a 3V4 tube. The circuit remains the same in this case. However, the wiring to the tube base has been altered. The 3Q4 is not interchangeable with the 3V4 because of socket connections.

In some cases when the front lid of the receiver is open, the receiver will cut in and out or sometimes be entirely dead. The wire from the wavemagnet to the front door hinge may break at the hinge connection. To correct this condition, remove the handle and resolder these leads, being quite certain that solder is not allowed to run back on the antenna lead and that enough extra antenna lead is allowed for flexing to prevent breakage when the door is open as illustrated in the accompanying diagram.

Zenith 6G801, Chassis 6E40

This model appears in Rider's Volume XVIII, pages 18-7, 18-8, and 18-10. In some cases when microphonics are encountered they can be eliminated by replacing one or more of the tubes. The offending tube can be located by turning the set on with the volume advanced and the set tuned to an off-station position. Then gently tap each tube, the one emitting the loudest "ping" is the defective item.

Zenith 8H023, 8H034, Chassis 8C01

These models appear on pages 15-71 to 16-74 of Rider's Volume XV. The rushing noise that occurs when the volume control is turned to minimum is caused by a poor connection from the grid element to the grid cap of the 6S8GT tube. A hot iron and a little flux on the grid cap will remove the high-resistance solder joint.

If the f-m oscillator drifts, check for a red dot on the oscillator tuning-slug wire. If the wire is unmarked, replace with one which has a red dot. If the receiver fluctuates on f-m, this may be cured by installing a 22.165, 20-µf, 150-V capacitor and two 1/4-watt resistors, 63-583, 1000 ohms, and 63-600, 2.2 Megohms, as indicated in the accompanying diagram.

Drift in the f-m oscillator of the Zenith 8H023 may be corrected by making the changes indicated.
Zenith 9H881, 9H882, 9H885, 9H888, Ch. 9E21

These models appear on pages 19-22 through 19-25,30 of Rider's Volume XIX.

If capacitor C-4, 0.05 µf, in series with the wavemagnet is open, the signals will be weak and the addition of an external antenna will not appreciably improve the signal strength. The replacement of this capacitor with a new 0.05 µf capacitor usually clears up the trouble.

If the phonograph is dead, check resistor R-14, 10,000 ohms, 1/2 watt, for intermittent operation. Due to movement of the r-f shelf when the band switch is operated, this resistor sometimes becomes intermittent, thus opening the phone circuit.

In most cases when aligning these models, it is not necessary to change or make any alterations in the i-f or discriminator trimmers. These trimmers are quite stable, and the only change recommended is alignment of the r-f section.

Be very sure to dress the tone control wires away from the pulley and dial cord. If these are not dressed away, binding and dial slipping will result.

If static is present when tuning in a station, check and see if the silver foil on the paper tube shield is tightly wrapped on the cardboard form. Sometimes this foil unwraps from the cardboard form and lies against the gang plates, creating static.

Zenith 6R885Z, Chassis 6D02Z

Model 6R885Z is the same as Model 6R886 which appears in Rider's Manual Volume XVII, pages 17-16 and 17-17, except that a tone control has been added, as illustrated in the accompanying diagram.

The following parts were added:

- 68-688 Tone control knob
- 57-1398 Ejector
- S-14667 Dial pointer and pulleyassy.
- S-14670 Tone control brkt. and lug assy.
- 12-1390 Cover plate support
- 22-227 0.1 uF 200 v
- 46-688 Tone control knob
- 63-1663 Tone control
- 78-793 Socket-octal tube
- 85-438 Phone-Radio switch
- 125-66 Rubber grommet
- 166-41 Rubber bumper
- 188-34 Retaining ring

Zenith Chassis 6C01, 6D0 Series

Chassis 6C01, 6D0 Series, which appears on page 15-20 of Rider's Volume XV, will contain variations in the tube line-up. A single chassis may contain octal, lock-in, and miniature button tubes. If an original tube is replaced with an alternate, the socket must also be replaced.

Original Alternates
3528G/GT 35W4
12SQ7/GT 12AT6

When replacing speakers, use a speaker with the same code letter (4U, AG etc.) as the original otherwise a low-pitch hum may be produced. If a speaker with a different code is used, R10 (feedback resistor) may have to be changed. With 4U, H, or AG speakers, R10 is 390,000 ohms. When using a 49CS49 speaker, R10 must be 680,000 ohms. R10 is 330,000 ohms for all other speakers.

To repair this set when it produces a howl, change the 14C7 tube, which is probably microphonic.

For oscillation, hum, and poor sensitivity, check for grounded tuning capacitor frame. Correct by inserting a rubber pad between the capacitor frame and chassis. Cement in place.

Zenith 8G005 Series

These models appear on pages 16-68 through 16-71 of Rider's Volume XV. All receivers of this series are similar. Different letters after the numbers 8G005 indicate differences in the cabinet only, except for Model 8G005BT. The latter is an export-standard model and employs a 220-120 volt changeover switch in the rear of the chassis. Otherwise, it is the same as the rest of the series.

8-14667 Dial pointer and pulleyassy.
8-14670 Tone control brkt. and lug assy.
12-1390 Cover plate support
22-227 0.1 uF 200 v
46-688 Tone control knob
57-1398 Ejector

63-1663 Tone control
78-793 Socket-octal tube
85-438 Phone-Radio switch
125-66 Rubber grommet
166-41 Rubber bumper
188-34 Retaining ring

Zenith 6G001, 6G001YX, Chassis 6C40, 8G005, 8G005YX, Chassis 8C40

Model 6G001 appears on pages 16-30 and 16-31 of Rider's Volume XV. Model 8G005 appears on pages 15-63 through 15-70 of Rider's Volume XV. The On-Off switch must be in the Off position whenever the line plug is inserted into the changeover switch on the rear of the chassis. Failure to do this may cause flashing and possible burn-out of the output tubes.

Intermittent operation may be caused by the wavemagnet snap connectors being sprung, causing a poor contact. Poor waveform contact is made through the cabinet hinge.

The letter "X" after the model number (6G001YX, 8G005YX) indicates that an aluminum cabinet is used.

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RC195, RC196, RC197 RECORD CHANGERS

A very small quantity of record changers with model numbers RC195, RC196, RC197 were produced. These Record Changers are early production version of the RC210, RC211, and RC212 Record Changers. The only difference between them is that on the RC195, RC196, and RC197 Record Changers, no provision was made for automatically playing 7-inch records. (Centerpost is not removable and pickup arm does not have size selector knob.)

OPERATING INSTRUCTIONS

Figure 1. RC210 Record Changer, Top View.

This Admiral Record Changer will automatically play a series of ten 7-inch, twelve 10-inch, or ten 12-inch records of either the 78 RPM, or the new 33 RPM type. The records must be of one size and type for each loading.

Models RC210 and RC211 can also be used, in connection with the Admiral 45 RPM Record Changer, to play the new 7-inch, 45 RPM records. Two plugs have been provided to allow for connecting it to the Admiral 45 RPM Record Changer.

SETTING NEEDLE SELECTOR AND SPEED CHANGE KNOBS

Rotate the pickup arm cartridge, by turning the needle selector knob which extends out from the front of the pickup arm. The small arrow next to the "33" and "78" indicates the direction in which the knob must be rotated. When turning this knob to either the "78" or the "33" position, make certain that it is turned until it reaches its stop.

For playing 78 RPM records, move the speed change knob to the "78" position; for playing 33 RPM records, move it to the "33" position. When moving the speed change knob, make certain that it clicks or snaps into position.

Be certain that the needle selector knob and speed change knob are both set for "78", or are both set for "33"

SETTING FOR SIZE OF RECORD

SELECTING CENTERPOST: This record changer is designed to be used with either of two centerposts. The centerpost which has a curved potion in the center is the centerpost for 10-inch and 12-inch records. The second centerpost is bent approximately 45 degrees and is to be used for automatically playing 7-inch records.

To change centerposts it is only necessary to lift the centerpost from its socket. Place one hand on the turntable while pulling out the centerpost with the other hand.

Figure 2. RC211 Record Changer

Figure 3. RC212 Record Changer

SETTING HEAD ASSEMBLY: In order to play 7-inch or 10-inch records, rotate the head assembly so that the embossed design is toward the centerpost. See figure 1. For 12-inch records, rotate the head assembly so that the embossed design is away from the centerpost.

SETTING RECORD SIZE SELECTOR KNOB: To play 7-inch records, turn the Record Size Selector knob to the left so that the figure "7" on the knob is adjacent to the dot on the pickup arm. To play 10-inch or 12-inch records, turn this knob to the right until the figures "10 12" are adjacent to the dot on the pickup arm.

STARTING THE RECORD CHANGER

Do not load 33 RPM records with the standard 78 RPM type. Also, the records must be of the same size (all 7-inch, all 10-inch, or all 12-inch) for each loading.

After setting the head assembly for the correct record size, move the record clip so that it is away from the centerpost before loading the changer.

Place your records over the centerpost so that they rest on its offset. The edge of the bottom record will be held up by the record support.

Move the record clip so that it rests on the top record. Turn the On-Off Reject knob to the "ON" position. Press down on the On-Off Reject knob momentarily to the "Reject" position. The bottom record will drop to the turntable and the Record Changer will play the entire stack of records automatically.

REJECTING A RECORD

If you wish to stop playing any record and start playing the next one, merely press down on the On-Off Reject knob momentarily.

STOPPING AND UNLOADING

This Record Changer cannot be turned off, by means of the On-Off Reject knob, during its change cycle. Therefore, after the last record, allow the mechanism to go through its change cycle and start playing over again.

• John F. Rider
DESCRIPTION OF CHANGE CYCLE
(See Figures 4 and 5)

If at all possible, we recommend that you carefully observe the operation of a changer that is in normal operating condition. It is a good idea to rotate the turntable by hand and repeat the changing cycle until you understand the function of each part. It is important to note that this changer employs the oscillating type trip, which depends upon the in and out movement of the pickup arm caused by the eccentric groove in the record.

The changer operates as follows: The changer mechanism is driven during its change cycle by the knurled hub of the turntable rotating the rubber-tired drive wheel (69). During normal playing, the drive wheel is held in a neutral position as illustrated in Fig. 4A, so that the indentation prevents the tire from contacting the knurled hub. The drive wheel (69) is held in this position by the trip stop wire (91A) and the cam stop stud (72A) on the control cam (72).

During the record play and as the needle enters the record eccentric groove, the pickup arm is moved in toward the centerpost. The pawl (103A) is moving across the trip serrations (94). When the eccentric groove in the record causes the pickup arm to move away from the centerpost, the pawl (103A) tends to reverse its direction but its sharp point catches in one of the trip serrations (94) and moves the trip lever (91). As the eccentric groove moves the pickup arm back in toward the centerpost, and then away from the centerpost again, the pawl (103A), again locks in one of the trip serrations, moves the trip lever (91) far enough so that the trip stop wire (91A) is no longer engaged with the cam stop stud (72A). This oscillating trip action is dependent upon the adjustment of the trip set screw (95). If it is adjusted properly, the pickup arm will move away from the centerpost, toward the centerpost, and as it comes away the second time the changer will trip and start its change cycle. (See paragraph under heading "Trip Adjustment.") The position of drive wheel (69) at this moment is shown in Figure 4B.

This allows the cycle spring (92) to pull the control cam clockwise (bottom view). Since the control cam (72) and the drive wheel (69) are on the same shaft, the drive wheel is turned so its rubber tire is against the knurled hub of the turntable (see Figure 4B). The turntable now rotates the drive wheel (69) which simultaneously rotates the control cam (72). As soon as change has been tripped, the trip cocking spring (90) causes the trip lever (91) to return the trip stop wire (91A) to the normal playing position.

Roller (85) riding on the control cam (72) moves the pivot link (84) which in turn rotates the control plate (83). The rotation of the control plate (83) causes its inclined tab (83A) to ride against the lift rod (28) which lifts the pickup arm from the record. The arm control lever roller and stud (103B) then engages the safety arm (100). Further rotation of the control cam (72) moves the pivot link (84) causing further rotation of the control plate (83) causing the pickup arm to move to the right, clearing the record. This much has taken place in approximately one-third of the total rotation of the control cam.

As the control cam rotates further, its push-off stud (72B) engages with the end of the slot in the pushoff link assembly (76), moving it. This movement is transmitted through the push-off arm (76A) and as a result, the push-off shaft (10) is rotated. This rotates the push-off cam (10A) which in turn slides the push-off plate (11) forward and drops the next record to be played. Note that the record stack rests on the record support shelf (12). The small slide at the top end of the centerpost holds back all records other than the bottom one when the push-off plate (11) moves forward.

As the control cam continues its rotation, the pivot link (84) moves back following the cam, since the roller (85) is kept in contact with the cam by the control plate spring (87). This moves the control plate (83) back, the arm control lever (103) moves the pickup arm to the set-down point for the record to be played. The pickup arm is held above the record because the lift rod (28) is still resting at the top of the inclined tab (83A) on the control plate (83). The set-down point is governed by the set-down adjusting screw (21). (See figure 6). The shoulder on the set-down arm (104A) holds the pickup arm at the set-down point until it is pushed back by the edge of the control plate engaging the set-down arm stud (104B). The pickup arm is then free and moves downward toward the record starting groove.

When the record changer is set to play 7-inch or 10-inch records, the set-down arm (104A) through the tension of the set-down spring (106) moves the arm in toward the centerpost until the return roller and stud (103C) reaches the shoulder of the set-down arm (104A). This movement is held in this position until the control plate (83) engages the set-down arm stud (104B), pushing the set-down arm back, releasing or freeing the pickup arm.

When the changer is set for 12-inch records the size change eccentric (82) moves the set-down and size change assembly (104) so that the arm return roller and stud (103C) does not travel as great a distance as along the set-down arm (104A) before it reaches the shoulder. Therefore the pickup arm cannot move in toward the centerpost as far as for 7-inch or 10-inch records, during change cycle.

When the On-Off Reject knob (1) is pressed down, the push-off cam and shaft (10) moves the reject arm (97) down. This movement causes the trip lever (91) to move which prevents the trip stop wire (91A) from engaging the cam stop stud (72A). The change cycle then proceeds in the manner described above.

The change cycle is exactly the same for either speed (33 RPM or 78 RPM) except for the fact that the change cycle time is proportional to the turntable speed (33 RPM or 78 RPM).
ADJUSTMENTS

ADJUSTMENT OF SET-DOWN POINT

Adjustment of the set-down point, for either 7-inch, 10-inch, or 12-inch records, is made by adjustment of the set-down adjusting screw (21), see Figure 6. Screw (21) is accessible through hole in right side of pickup arm. This adjustment must be made with the record size selector knob (17) in the "10.12" position. When turning this knob be sure to turn it all the way (the dot between "10.12" should line up with the indicating dot on the pickup arm) to avoid making the set-down adjustment at the wrong point, resulting in improper set-down on 7-inch records. Turning the set-down adjusting screw (21) in, moves the set-down point of the pickup arm closer to the centerpost and turning the screw out moves it away from the centerpost.

Make the set-down point adjustment as follows:

1. Set record size selector knob (17) to the "10.12" position; be sure the knob is turned all the way to its stop (the dot between "10.12" should line up with dot on pickup arm).
2. Set needle selector knob to either position being certain that the knob is turned to its stop so the needle projects straight down.
3. Set the head assembly to the position for playing 7-inch or 10-inch records.
4. Press down on the On-Off Reject knob (1) momentarily. Rotate the turntable by hand through the change cycle until the pickup arm moves down toward the turntable.
5. Check the distance between the needle point and the near side of the centerpost. For proper set-down on 10-inch records, the distance between needle and centerpost should be between 4\(\frac{9}{16}\)" and 4-11/16".
6. Adjust set-down screw (21) and repeat steps 4 and 5 until the proper distance is obtained. If this adjustment is made carefully, the set-down point for 7-inch records and 12-inch records will be automatically correct.
7. Check 12-inch set-down as follows: Set the head assembly to the position for 12-inch records, press On-Off Reject knob momentarily, rotate turntable by hand through the change cycle and check the 12-inch set-down point. The proper distance between the needle point and the near side of the centerpost is between 5\(\frac{7}{16}\)" and 5-11/16".
8. Check 7-inch set-down as follows: Set the head assembly to the position for 7-inch and 10-inch records, set the record size selector knob (17) so the dot under the "7" lines up with the locating dot on the pickup arm. (NOTE: In some early production sets, it may be necessary to set the...
ADJUSTING THE PICKUP ARM HEIGHT
(See Figure 6)

This record changer is designed so that when the needle point rests 1/4" above the changer pan, the pickup arm will automatically lift high enough, during change cycle, to clear the top record of a stack of ten 7-inch, twelve 10-inch, or ten 12-inch records on the turntable. With proper pickup arm height setting, the pickup arm will not lift high enough to strike the bottom record of the stack to be played.

Figure 6. Arm Detail Showing Adjustments

With the record changer out of change cycle and the pickup arm clear of the turntable, adjust the lift adjusting screw (27) so that the needle rests approximately 1/4" above the top of the changer pan. Turning screw (27) in raises the pickup arm; turning it out lowers the arm.

After this adjustment has been made, the record changer should be run through its change cycle a few times to make certain that the pickup arm does not touch the bottom record of the stack to be played. If, for some reason, the arm lifts too high, a compromise adjustment should be made. That is, turn the screw out and lower the pickup arm slightly.

REJECT AND TRIP ADJUSTMENTS

Before making either reject or trip adjustments it is very important to make certain that the reject spring (2) is holding the push-off shaft (10) up, as far as it will go. If this precaution is not observed, erratic reject and trip action may result.

Possible causes of the spring not holding the push-off shaft up are:

a. The On-Off Reject knob (1) may be loose.

b. The reject spring (2) may be broken, missing, slipped down between washer (3) and push-off shaft (10), or has lost its tension.

c. Push-off shaft (10) binding.

REJECT ADJUSTMENT

1. Be sure to read the paragraph under "Reject and Trip Adjustments".

2. Adjust the reject link adjusting screw (98) until there is approximately 1/32 of an inch space between the end of the reject arm (97) and the rivet on the push-off arm and link assembly (76).

NOTE: If there is no space between these two parts, it will be possible for the changer to begin its change cycle when the on-off reject knob is turned to the "OFF" position. If there is too much space, the changer may reject erratically.

3. Operate the Record Changer, press the On-Off Reject knob momentarily and check reject action.

TRIP ADJUSTMENT

Since this Record Changer uses the oscillating trip principle to begin its change cycle, it is very important that the trip adjusting screw (95) is properly adjusted. See Figures 5 and 7.

Figure 7. Positioning Trip Serrations

The trip adjusting screw (95) is properly adjusted when the record changer trips into change cycle after the eccentric groove in the record has caused the pickup arm to move away from the centerpost once or twice, that is, one or two backswings of the pickup arm, before the changer trips into change cycle. Since some eccentric grooves cause greater movement of the pickup arm than others, the changer might trip into change cycle with only one backswing on some records and with two backswings on others.

The ideal adjustment of screw (95) for best operation is when the point of the pawl (103A) is horizontally, even or level with the smooth side of the trip serrations (94). NOTE: The point of the pawl will be approximately 3/32 of an inch from the bottom edge of the lip on the trip serrations. See Figure 7.

Adjust the trip adjusting screw (95) as follows:

1. Be sure to read the paragraph under "Reject and Trip Adjustments".

2. Connect record changer motor to power source and turn the On-Off Reject knob on and off as needed to check this adjustment.

3. Adjust trip adjusting screw (95) until the point of the pawl (103A) is horizontally even or level with the smooth side of the trip serrations (94), or until the point of the pawl is 3/32 of an inch from the bottom edge of the lip on the trip serrations. See Figure 7.

4. If the top of the trip stop wire (91A) is not level with the top of the main cam stop stud (72A) as shown in Figure 8, check to see if the trip stop wire is bent slightly. If it is, bend the wire until it is even (level) with the top of the stud.

5. Place a record on the turntable and check to make certain that the changer trips into change cycle with one or two backswings of the arm.

IMPORTANT

The eccentric groove of a record should be used when checking the trip adjustment. Do not lift the pickup arm and move it in and out by hand.

If the trip adjusting screw (95) is turned out too
far, it will take more than two backswings of the pickup arm to trip the changer into change cycle. If the screw (95) is almost all the way out, the changer will not trip. If the screw is turned too far in, there will be excessive drag and wear on the trip serrations, pawl point and on record eccentric grooves. Consequently, the trip adjustment should be made very carefully.

**CAUTIONS**

1. See that the rubber tires on both the drive wheel and the idler wheel are kept clean and free from oil, grease, dirt or any foreign material. Carbona or carbon tetrachloride may be used for cleaning these parts.

2. The drive wheel assembly (69) appears to be almost identical with that used on the model RC170 and RC170A record changers. These parts are not interchangeable.

3. When replacing the rubber tire (68) do not bend the tab on the drive wheel over too far as this may result in the tire catching or rubbing on the drive wheel pressure spring (71).

4. If the On-Off Reject knob (1) cannot be pulled off with the fingers, pry very carefully. The head cover (7) is plastic and if the On-Off Reject knob is pried off, excessive force should not be used.

5. When removing or replacing the pawl spring (102) care should be taken not to stretch it.

6. When removing or replacing the pickup arm (18), always loosen the Allen set screw (30) and lift off the complete assembly. The pivot spring, hub and pin assembly (29) can be removed from the pivot plate assembly (24) and replaced much more readily with the complete pickup arm assembly off of the changer.

7. When replacing the switch mounting bracket (79) or the trip bracket (89) be sure to locate the half punches in the holes in the pan before tightening their mounting screws (80).

8. When replacing the on-off switch assembly (81) care should be used in bending the tab fasteners so that the switch is mounted firmly to the bracket.

9. When replacing or reinstalling the record size selector knob (17), turn the set-down eccentric (23) to the position for 10" and 12" set-down. Then install the knob (17) so that the dot between "10.12" lines up with the locating dot on the pickup arm.

**CARTRIDGE AND NEEDLES**

The cartridge (34) used in these record changers is especially designed and there are a few things which should be observed when replacing the cartridge (34), needles (36 and 37), or pickup arm cable (40).

When replacing either needle make certain that the correct needle is inserted in the proper "side" of the cartridge. The needle (36) for 33 RPM records is an osmium tipped needle especially designed for playing 33 RPM records. The radius of the point of the 33 RPM needle is only 1/3 of the radius of the point of a standard (78 RPM) needle. If this sharp needle is used on standard 78 RPM records, it has a tendency to "wobble" in the record groove and would possibly damage the standard record groove. A needle for 78 RPM records may possibly damage 33 RPM "microgroove" records because of its tendency to "skate" across a microgroove record. Consequently, care should be taken when replacing needles.

The needle (36) for 33 RPM records is painted red to identify it. The needle guard on the 33 RPM "side" of the cartridge has red color dots to distinguish it from the 78 RPM "side" of the cartridge. The red (33 RPM) needle (36) should be inserted in the side of the cartridge which has the red color dots.

When replacing the cartridge (34) care must be taken when placing the pickup arm cable pinjacks on the cartridge. There must be sufficient slack in the cable to allow the cartridge to rotate. It is also important that the short length of plastic tubing be kept over one terminal.

**TWO SPEED MOTOR (67)**

The turntable speed of these Record Changers is changed mechanically. When the speed change knob (58) is moved to the "33" position, the speed change arm (56) moves. This causes the 33 RPM drive shaft to pivot and ride against the idler wheel (60). When the speed change knob is moved to the 78 RPM position, the speed change arm causes the 33 RPM drive shaft to pivot away from the idler wheel (60). When the speed change knob (58) is moved, make certain that it "clicks" or "snaps" into position.

Note that the 33 RPM drive shaft is driven by the 78 RPM drive shaft by means of a rubber belt (63). This belt should be clean and free from oil. If the belt is greasy or stretched, it might possibly slip which would cause the turntable speed to vary, resulting in unsatisfactory operation.

When replacing the speed change knob (58), make certain that the shaft in the knob does not touch the sides or ends of the tum-out in the pan. The speed change arm (56) must be installed properly (its half-punches keep the proper angle). If it is not installed correctly, the speed change knob shaft may rub against the edge of the opening in the pan causing rumble and noise pickup. Also, the clearance between the bottom of the speed change knob and the top of the pan should not be less than 1/64 of an inch or more than 3/64 of an inch.

**REMOVING THE PLASTIC BASE HOUSING (14)**

Should it be necessary to remove the plastic base housing, proceed as follows:

1. Remove retaining rings (86 and 88).
2. Release one end of the index spring (105).

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MODELS RC210, RC211, RC212

3. Lift the entire head assembly up from the top of the changer.
4. Loosen Allen set screw (30) and lift complete pickup arm assembly off.
5. Remove retaining ring (31) and washer (32).
6. Remove three screws (16) holding base.
7. Lift off the plastic base housing (14).
8. When reassembly has been completed, the pickup arm height should be carefully checked and adjusted, if necessary, by means of the lift adjusting screw (27). The set-down should also be checked and adjusted, if necessary, as outlined under "Adjustment Of Set-Down Point".

REMOVING TURNTABLE (8) AND BEARING ASSEMBLY (49)

To remove the turntable it is only necessary to grasp the turntable by its edges and lift up. Before replacing the turntable, make sure that the recessed part of the drive wheel (69) is towards the centerpost. If necessary, turn drive wheel counterclockwise about a turn so it locks in this position. The pickup arm should be positioned away from the turntable. In replacing the turntable, force is not needed to seat it. Make certain, however, that the idler wheel of the motor has been pushed in towards the centerpost and that the idler wheel is making contact with the inner side of the turntable flange.

The dimensions of the two speed motor are such that three cork washers (47) are used under the turntable hub to keep the turntable from rubbing against the idler wheel drive shafts.

In some cases it may be found that the three cork washers, after considerable use, are compressed so the turntable will rub. To build the stack up, an additional thin cork washer should be used. This fourth cork washer may be placed at the top or bottom of the stack.

The washers (47 and 48) and thrust bearing assembly (49) are removed by sliding them off of the centerpost. In replacing, have them in the order shown in Figure 9.

REMOVING BOTTOM COVER (107)

For Model RC210 only. To remove the bottom cover (107) from the record changer, remove the two rear screws (50) through the bottom. Then press on the front edge of the bottom cover; this frees the changer from the slotted mounting brackets at the front of the bottom cover. To replace bottom cover, reverse above operations.

The changer must float on the springs (51) to prevent microphonic feedback, thus these springs must be re-installed properly. The wider end fits around and hugs the extrusion in the mounting brackets in the bottom cover. The narrow end of the spring fits over the threaded bushing on the changer pan (54). To assure "free floating" of the changer, spacer washers (52) are used under the narrow portion of springs (51).

For Model RC211 only. To remove the bottom cover on this model (RC211), remove the three mounting screws (50), from the top of the changer pan. Then merely lift the changer pan off of the bottom cover (107) being careful to see that lead-in cables and motor leads are disconnected.

When reinstalling the changer pan on the bottom cover be certain the float springs (51) are properly installed. Insert the mounting screws (50). IMPORT-

ANT: These screws must be installed so they travel freely through the extruded holes in the changer pan. If the screws touch the edges of the holes in the pan, a scraping sound will occur when records drop to the turntable and microphones might also result.

LUBRICATION

Under normal operating conditions, the motor should never require oiling. The rest of the changer, however, should be lubricated with grease whenever it comes into the shop for repairs or adjustment. All pivot and friction points should be greased adequately but not excessively. A good automobile chassis grease may be used for this purpose.

The push-off shaft (10), powdered iron roller (85), oilite bearings, (used in the turntable hub and base housing), may be lubricated with SAE No. 20 motor oil.

Care should be taken to prevent any of the lubricant from coming into contact with the drive or idler wheel tires. Also be careful, when using oil, that an excess does not seep into the felt of the turntable.

RECORD CHANGER TROUBLE SHOOTING

1. Records Do Not Drop To Turntable Or More Than One Record Drops.
   (a) Check the distance between the inside edge of the centerpost (9) and the edge of the record support (12). This distance should be 4.61/64" = 1/32", in the 10-inch position.
   With the centerpost for 7-inch records in place and the head assembly in the 10-inch position, the distance between the inside edge of the centerpost and the edge of the record support should be 3½" = 1/32". These dimensions are critical and if distance does not meet specifications bend the centerpost slightly toward or away from the head assembly as needed.

2. Changer Repeatedly Trips Into Change Cycle.
   (a) Check for broken trip cocking spring (90), or
   (b) Check for broken reject spring (2), or
   (c) Check for On-Off Reject knob (1) loose, or
   (d) Check for misadjustment of reject adjusting screw (98), or trip adjusting screw (95).

3. Changer Will Not Trip.
   (a) Check for broken or loose cycle spring (92),
   (b) Check On-Off switch cover (81). If cover is not assembled to switch properly it may bind push-off link and arm (76) preventing cycle spring (92) from pulling the main cam (72) around,
   (c) Check for misadjustment of the trip adjusting screw (95), or
   (d) Check for bent trip stop wire (91A), or
   (e) Check for broken pawl spring (102).

   (a) Check adjustment of reject screw (98).

   (a) Check set-down spring (106), or
   (b) Check for broken or loose set-down adjusting spring (22), or
   (c) Check for loose pickup arm counter weight screws (20) resulting in erratic set-down. (These screws hold pivot and mounting plate (24) in position).

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Figure 9. RC210 Record Changer, Exploded.

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OPERATING INSTRUCTIONS

This Admiral Record Changer is designed to automatically play a series of twelve 10-inch or ten 12-inch 78 RPM or 33 RPM records. It will also automatically play ten 7-inch 33 RPM records or twelve of the new 7-inch 45 RPM records, by using an accessory 7-inch centerpost and an accessory 45 RPM Spindle Unit. The records must be of one size and type for each loading.

SELECTING CENTERPOST
To play 78 RPM or 33 RPM records (7-inch, 10-inch or 12-inch), insert the proper centerpost into the socket in the center of the turntable. To remove a centerpost, merely place one hand on the turntable and lift up the centerpost with the other hand. To play 45 RPM 7-inch records, insert the 45 RPM spindle into the socket in the center of the turntable. Turn the spindle counter-clockwise until the “Lock-In Lugs” fall into and lock in the three holes in the turntable. To remove the spindle, hold the turntable stationary, turn the spindle clockwise, then lift it out of the socket.

IMPORTANT: If the 45 RPM spindle is being used for the first time or if the changer does not operate properly on 45 RPM, be sure to read the information given under the heading “45 RPM Spindle Adjustment.”

SETTING SPEED CHANGE KNOB
For playing 78 RPM records, move the speed change knob (54) the “78” position; for playing 33 RPM records, move it to the “33” position; for 45 RPM records, move it to the “45” position. When moving the speed change knob, make certain that it clicks or snaps into position.

SETTING NEEDLE SELECTOR KNOB
To play 78 RPM records, rotate the needle selector knob so the side marked “78” faces up; to play 33 RPM records or 45 RPM records, the side marked “LP” must face up. The small arrows next to the “78” and “LP” indicate the direction in which the knob must be turned. When turning this knob to either position, make certain that it is turned until it reaches its stop.

SETTING HEAD ASSEMBLY
To play any 7-inch or 10-inch records, rotate the head assembly so that its embossed design is toward the centerpost. For 12-inch records, rotate the head assembly so that the embossed design is away from the centerpost.

SETTING RECORD SIZE SELECTOR KNOB
To play any 7-inch records, turn the Record Size Selector knob (16) all the way to the left until it reaches its stop.
To play 10-inch or 12-inch records, turn this knob to the right until it reaches its stop.

LOADING AND STARTING THE RECORD CHANGER
To load 78 RPM or 33 RPM records, place a stack of records so that they rest on the record support (11) and the offset in the centerpost. Do not mix records—play a stack of the same size and type.
To load 45 RPM records, place as many as twelve records over the 45 RPM Spindle, so that they rest on the record supports (67). Be sure that the records are held up by BOTH record supports as shown in figure 9. If the bottom record slips down over one of the record supports, the record may not drop when the changer goes through its change cycle.

REJECTING A RECORD
If you wish to stop playing any record and start playing the next one, merely press down on the On-Off Reject knob momentarily.

STOPPING AND UNLOADING
This Record Changer cannot be turned off, by means of the On-Off Reject knob, during its change cycle. Therefore, after the last record, allow the mechanism to go through its change cycle and start playing over again.

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THE CHANGE CYCLE

DESCRIPTION OF CHANGE CYCLE FOR 78 RPM AND 33 RPM OPERATION
(See Figures 3, 4 and 5)

If at all possible, we recommend that you carefully observe the operation of a changer that is in normal operating condition. It is a good idea to rotate the turntable by hand and repeat the change cycle until you understand the function of each part.

It is important to note that this changer employs two different types of trip arrangements. For 78 RPM and 33 RPM operation, the oscillating type trip is used, which depends upon the in and out movement of the pickup arm caused by the eccentric groove in the record. For 45 RPM operation, a position type trip is used which trips the changer into change cycle when the pickup arm reaches a given distance from the 45 RPM spindle.

The changer operates as follows: The turntable is driven by the rubber-tired drive wheel (86) on the three speed motor. The turntable speed (78 RPM, 33 RPM or 45 RPM) is determined by the diameter of the drive shaft that drives the idler wheel. See figure 3. The 78 RPM drive shaft is a part of the motor armature. The 33 RPM and 45 RPM drive shafts are moved in and out of position mechanically when the speed change knob is moved.

The changer mechanism is driven during its change cycle by the rubber-tired drive wheel (86), which in turn is driven by the knurled hub of the turntable. During normal playing, the drive wheel is held in a neutral position as illustrated in Fig. 4A, so that the indentation prevents the tire from contacting the knurled hub. The drive wheel (86) is held in this position by the trip stop wire (111A) and the cam stop stud (91A) on the control cam (91).

During the record play and as the needle enters the record eccentric groove, the pickup arm is moving in toward the centerpost. The pawl (127B) is moving across the trip serrations (114). When the eccentric groove in the record causes the pickup arm to move away from the centerpost, the pawl (127B) tends to reverse its direction, but its sharp point catches in one of the trip serrations (114) and moves the trip lever (111). As the eccentric groove moves the pickup arm back in toward the centerpost, and then away from the centerpost again, the pawl (127B), again locks in one of the trip serrations, moves the trip lever (111) far enough so that the trip stop wire (111A) is no longer engaged with the cam stop stud (91A). This oscillating trip action is dependent upon the adjustment of the oscillating trip adjusting screw (115). If it is adjusted properly, the pickup arm will move away from the centerpost, then toward the centerpost, and as it comes away the second time the changer will trip and start its change cycle. (See paragraph under heading "Oscillating Trip Adjustment"). The position of drive wheel (86) at this moment is shown in Figure 4B.

This allows the cycle spring (112) to pull the control cam clockwise (bottom view). Since the control cam (91) and the drive wheel (86) are on the same shaft, the drive wheel is turned so its rubber tire is against the knurled hub of the turntable (see Figure 4B). The turntable now rotates the drive wheel (86) which simultaneously rotates the control cam (91). As soon as the changer has been tripped, the trip cocking spring (110) causes the trip lever (111) to return the trip stop wire (111A) to the normal playing position.

Roller (105) riding on the control cam (91) moves the pivot link (104) which in turn rotates the control plate (123). The rotation of the control plate (123) causes its inclined tab (123A) to ride against the lift rod (30) which lifts the pickup arm from the record. The arm control lever roller and stud (127C) then engages the safety arm (124). Further rotation of the control cam (91) moves the pivot link (104) causing further rotation of the control plate (123); this moves the pickup arm to the right, clearing the record. This much has taken place in approximately one-third of the total rotation of the control cam.

As the control cam rotates further, its push-off stud (91B) engages with the end of the slot in the push-off link assembly (95), moving it. This movement is transmitted through the push-off arm (95A) and as a result, the push-off shaft (9) is rotated. This rotates the push-off cam (9A) which in turn slides the push-off plate (10) forward and drops the next record to be played. Note that the record stack rests on the record support shelf (11). The small slide at the top end of the centerpost holds back all records other than the bottom one when the push-off plate (10) moves forward.

As the control cam continues its rotation, the pivot link (104) moves back following the cam, since the roller (105) is kept in contact with the cam by the control plate spring (106). This moves the control plate (123) back; the arm control lever (127) moves the pickup arm to the set-down point for the record to be played. The pickup arm is held above the record because the lift rod (30) is still resting at the top of the inclined tab (123A) on the control plate (123). The

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set-down point is governed by the set-down adjusting screw (20). (See figure 10.) The shoulder on the set-down arm (129A) holds the pickup arm at the set-down point until it is pushed back by the edge of the control plate engaging the set-down arm stud (129B). The pickup arm is then free and moves down toward the record starting groove.

When the record changer is set to play 7-inch or 10-inch records, the set-down arm (129A), through the tension of the set-down spring (151), moves the arm in toward the centerpost until the return roller and stud (127D) reaches the shoulder of the set-down arm (129A). The pickup arm is held in this position until the control plate (123) engages the set-down arm stud (129B), pushing the set-down arm back, releasing or freeing the pickup arm.

When the changer is set for 12-inch records the size change eccentric (122) moves the set-down and size change assembly (129) so that the arm return roller and stud (127D) does not travel at great a distance along the set-down arm (129A) before it reaches the shoulder. Therefore the pickup arm cannot move in toward the centerpost as far as for 7-inch or 10-inch records, during change cycle.

When the On-Off Reject knob (1) is pressed down, the push-off cam and shaft (9) moves the reject arm (119) down. This movement causes the trip lever (111) to move which prevents the trip stop wire (111A) from engaging the cam stop stud (91A). The change cycle then proceeds in the manner described above.

The change cycle is exactly the same for either speed (33 RPM or 78 RPM) except for the fact that the change cycle time is proportional to the turntable speed (33 RPM or 78 RPM).

Playing 7-inch (33 RPM) records automatically is accomplished by removing the centerpost from 10-inch or 12-inch records and inserting the centerpost for 7-inch (33 RPM) records. Rotating the record size selector knob (16) to the position for 7-inch records, rotates the set-down eccentric (25). The set-down eccentric rotates or moves the set-down plate, part of pivot and mounting plate (22), and the pivot spring and hub (31). This in turn moves the end of the pickup arm closer to the centerpost and automatically provides for proper set-down on 7-inch records.

**DESCRIPTION OF CHANGE CYCLE FOR 45 RPM OPERATION**

For 45 RPM operation, the record changer functions in exactly the same manner as described under the heading "Description of Change Cycle for 78 RPM and 33 RPM." However, a few parts not yet described operate when the speed change knob (34) is in the "45" position and the 45 RPM spindle (62) is in place.

Since 45 RPM records do not have an eccentric groove, a position type trip is required to trip the changer into its change cycle. When the speed change knob is moved to the "45" position, the tension on the position trip cord (102) is released. This allows the position trip cocking spring (126) to pull the trip engagement arm (114A) so that the position trip

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ADJUSTMENTS

REJECT AND TRIP ADJUSTMENTS

This record changer employs two different types of trip mechanisms to trip it into change cycle. For 78 RPM and 33 RPM operation, an "oscillating" type trip is used. See figure 6. This type of trip depends upon the in and out movement of the pickup arm caused by the eccentric groove in the record.

For 45 RPM operation, a "position" type trip is used. See figure 8. (45 RPM records do not have an eccentric groove.) This type of trip arrangement, trips the changer into change cycle when the pickup arm reaches a given distance from the 45 RPM spindle.

Screw adjustments are provided for both types of trips. However, before making either of the trip adjustments or the reject adjustment, it is very important to make certain that the reject spring (2) is holding the push-off shaft (9) up, as far as it will go. It is also important that there is 3/4 of an inch clearance between the end of the reject arm (119) and the rivet on the push-off arm and link assembly (95). If these precautions are not observed, erratic reject and trip action may result, or if there is no clearance at the end of the reject arm, the changer may repeatedly trip into change cycle.

Possible causes of the spring not holding the push-off shaft up are:

a. The On-Off Reject knob (1) may be loose.
b. The reject spring (2) may be broken, missing, slipped down between washer (3) and push-off shaft (9), or has lost its tension.
c. Push-off shaft (9) binding.

REJECT ADJUSTMENT

1. Make certain that the push-off shaft (9) is not binding and is being held up, as far as it will go, by the reject spring (2) and the On-Off Reject knob (1).

2. Adjust the reject adjusting screw (118) until there is approximately 3/4 of an inch space between the end of the reject arm (119) and the rivet on the push-off arm and link assembly (95). NOTE: If there is no space between these two parts, it will be possible for the changer to begin its change cycle when the on-off reject knob is turned to the "OFF" position. If there is too much space, the changer may not reject or will reject erratically.

3. Operate the Record Changer, press the On-Off Reject knob momentarily and check reject action.

OSCILLATING TRIP ADJUSTMENT

For 33 RPM and 78 RPM Operation

IMPORTANT: This adjustment must be made properly before making the Position Trip Adjustment.

This record changer uses the oscillating type trip for 78 RPM and 33 RPM operation. See figure 6. In order for the changer to trip properly, the oscillating trip adjusting screw (115) must be properly adjusted. Also, this adjustment affects the position trip adjustment and consequently should be made carefully before attempting the position trip adjustment.

The oscillating trip adjusting screw (115) is properly adjusted when the record changer trips into change cycle after the eccentric groove in the record has caused the pickup arm to move away from the centerpost once or twice, that is, one or two backswings of the pickup arm, before the changer trips into change cycle. Since some eccentric grooves cause greater movement of the pickup arm than others, the changer might trip into change cycle with only one backswing on some records and with two backswings on others.
The ideal adjustment of screw (115) for best operation is when the point of the pawl (127B) is horizontally even or level with the smooth side of the trip serration plate (114). NOTE: The point of the pawl should be approximately 1/8 of an inch from the bottom edge of the lip on the trip serration plate. See figure 8.

Adjust the oscillating trip adjusting screw (115) as follows:

1. Make certain that the push-off shaft (9) is not binding and is being held up, as far as it will go, by the reject spring (2) and the On-Off Reject knob (1). Also check for 1/2 of an inch clearance at the end of the reject arm. See the third paragraph under heading “Reject and Trip Adjustments.”

Check to be sure that the position trip cord (102) is not broken or loose and that the cord tension adjusting cam (101) is not misadjusted.

2. Check to see that the top of the trip stop wire (111A) is even (level) with the top of the control cam stop stud (91A) as shown in figure 7. If the stop wire is not even with the top of the stud, bend the wire until it is even. The trip bracket assembly should be removed before bending the trip stop wire.

3. Set speed change knob in the “78” or “33” position.

4. Connect record changer motor to power source and turn the On-Off Reject knob on and off as needed to check this adjustment.

5. Adjust trip adjusting screw (115) until the point of the pawl (127B) is horizontally even or level with the smooth side of the trip serrations (114). See figure 6. The point of the pawl should be 1/4 of an inch from the bottom edge of the lip on the trip serrations.

6. Place a record on the turntable and check to make certain that the changer trips into change cycle with one or two backswings of the arm. Three or four backswings may be required on 7-inch 33 RPM records.

Important

The eccentric groove of a record should be used when checking the oscillating trip adjustment. Do not lift the pickup arm and move it in and out by hand.

If the oscillating trip adjusting screw (115) is turned out too far, it will take more than two backswings of the pickup arm to trip the changer into change cycle. If the screw (115) is almost all the way out, the changer will not trip. If the screw is turned too far in, there will be excessive drag and wear on the trip serrations, pawl point and on record eccentric grooves.

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improper set-down on 7-inch records. Turning the set-down adjusting screw (20) in, moves the set-down point of the pickup arm closer to the centerpost and turning the screw out moves it away from the centerpost.

CAUTION: Normal practice has been to check the set-down points, using records as a gauge. However, due to the large variety of record sizes, it is recommended that the distances specified below are checked to insure proper set-down on all sizes and types of records.

Make the set-down point adjustment as follows:
1. Set record size selector knob (16) to the "10.12" position; be sure the knob is turned all the way to its stop.
2. Set needle selector knob to either position being certain that the knob is turned to its stop so the needle projects straight down.
3. Set the head assembly to the position for playing 7-inch or 10-inch records.
4. Press down on the On-Off Reject knob (1) momentarily. Rotate the turntable by hand through the change cycle until the pickup arm moves down toward the turntable.
5. Check the distance between the needle point and the near side of the centerpost. For proper set-down on 10-inch records, the distance between needle and centerpost should be between 4 5/8" and 4 1/4".
6. Adjust set-down screw (20) and repeat steps 4 and 5 until the proper distance is obtained. If this adjustment is made carefully, the set-down point for 7-inch records and 12-inch records will be automatically correct.
7. Check 12-inch set-down as follows: Set the head assembly to the position for 12-inch records, press On-Off Reject knob momentarily, rotate turntable by hand through the change cycle and check the 12-inch set-down point. The proper distance between the needle point and the near side of the centerpost is between 5 3/8" and 5 1/4".
8. Check 7-inch set-down as follows: Set the head assembly to the position for 7-inch and 10-inch records, set the record size selector knob (16) all the way to the right until it reaches its stop. Press the On-Off Reject knob momentarily, rotate the turntable by hand through the change cycle and check the 7-inch set-down point. The proper distance between needle point and the near side of either of the two small centerposts is between 3 3/8" and 3 1/4". The proper distance from the needle point to the near side of the 45 RPM Spindle is between 2 3/8" and 2 5/8".
9. If step 7 or step 8 indicates improper set-down on 7-inch records or 12-inch records, make a compromise adjustment for 10-inch record set-down as outlined in steps 3, 4, 5 and 6.

ADJUSTING THE PICKUP ARM HEIGHT

(See Figures 9 and 10)

This record changer is designed so that when either needle point rests 3/16" above the changer pan, the pickup arm (17) will automatically lift high enough during the change cycle to clear the top record of a stack of twelve 10-inch, ten 12-inch, ten 7-inch 33 RPM or twelve 7-inch 45 RPM records on the turntable. With proper pickup arm height setting, the pickup arm will not lift high enough to strike the bottom record of the stack to be played.

With the record changer out of change cycle and the pickup arm clear of the turntable, adjust the lift adjusting screw (29) so that the needle rests approximately 1/8" above the top of the changer pan. Turning screw (29) in raises the pickup arm; turning it out lowers the arm. See Figure 10.

After this adjustment has been made, the record changer should be run through its change cycle a few times to make certain that the pickup arm does not lift high enough to touch the bottom record of the stack to be played. This adjustment should be checked with the 45 RPM Spindle in place and a 45 RPM record resting on the record supports (67). See figure 9. If, for some reason, the arm touches the bottom record, a compromise adjustment should be made. Turn the screw out and lower the pickup arm slightly.

---

ADJUSTING CORD TENSION

(See Figures 9 and 10)

An adjustment is provided which compensates for variations in the length of the position trip cord (102).
If the position trip cord is being replaced or if the adjusting cam lock screw (15) has come loose, allowing the cord tension adjusting cam (101) to rotate away from its normal position, proceed as follows:

1. Set speed change knob (54) to “45” position.
2. Move the cord tension adjusting cam (101) to just the point where all slack has been removed from position trip cord (102), and there is just a very slight tension on the cord tension spring (103). Do not adjust it so tight as to stretch the position trip cocking spring (126).
3. Tighten the adjusting cam lock screw (15).

**ADJUSTING DISTANCE BETWEEN RECORD SUPPORT (11) AND CENTERPOSTS (60 and 61)**

(See Figures 12 and 13)

To check the distance between the record support (11) and centerposts (60 and 61), proceed as follows:

1. Set the head assembly to the position for 7-inch and 10-inch records. Insert the centerpost (61) for 10-inch and 12-inch records.
2. Hold the centerpost away from the head assembly to take up any play.
3. Measure the distance from the edge of the record support to the inside edge of the offset shelf on the centerpost. If this distance is not between 4-59/64” and 4-63/64”, it will be necessary to bend centerpost until proper distance is obtained.

**NOTE:** To bend the centerpost, remove it from the changer, and place the bottom end in a vise. Grasp the centerpost BELOW the offset (with a wrench) and bend it the amount needed in the direction necessary.

4. With the head assembly in the position for 7-inch and 10-inch records, insert the centerpost (60) for 7-inch 33 RPM records. Then proceed with steps 2 and 3 above and check for a distance of between 33/8” and 33/16”.

5. If this distance is not within the dimensions specified in step 4, bend the centerpost as described in step 3.

---

**45 RPM SPINDLE ADJUSTMENT**

The push-off adjusting shaft (75) is the only adjustment on the 45 RPM Spindle (62). This adjustment is fairly critical and must be made for the individual record changer. The push-off adjusting shaft is preset at the factory so that the distance between the end of the shaft and the top of the lock nut (74) is 1 3/32”. This adjustment should be satisfactory for most record changers. However, the adjustment should be checked and adjusted, if necessary, before the 45 RPM Spindle is used. To check for proper adjustment, proceed as follows:

1. Place the 45 RPM Spindle in the hole in the center of the turntable and turn it so that “lock-in lugs” fall into slots in the turntable (do not lock the lugs into the turntable).
2. Press down on the spindle and CAREFULLY note whether or not the slicers (65 and 66) just start to move out of the spindle.
3a If the slicers do not move when the spindle is pressed down, proceed with step 4.
3b If the slicers start to move out of the spindle as it is pressed down, lift the spindle out, loosen the lock nut (74), turn the push-off adjusting shaft (75) in approximately one turn and then tighten the lock nut. Insert the spindle, press it down and check to see if the slicers still move out. If the slicers move out, repeat this procedure, turning the adjusting shaft in, approximately one turn at a time, until the slicers do not move out when the spindle is pressed down.
4. Insert the spindle and lock it in place. Put a stack of records over the spindle, turn the record changer on and momentarily press the on-off reject knob (1) to the reject position.
5. If the bottom record drops to the turntable, keep rejecting records until the whole stack has been dropped to the turntable. Each record should slide smoothly down the spindle. If all records drop properly, the adjustment is satisfactory.
6. If records do not drop, remove the spindle, loosen the lock nut (74) and turn out the push-off adjusting shaft (75) approximately one turn and repeat steps 1 and 2. Check step 3b and then proceed with steps 4 and 5. Repeat this procedure until the records drop properly.

---

*John F. Rider*
SERVICE AND REPAIR

DISASSEMBLING THE 45 RPM SPINDLE

(See Figure 14)

To disassemble the spindle for parts replacement etc., proceed as follows:

1. Remove two screws from the underside of the spindle and lift up the spindle cap. See figure 1a. CAUTION: When the spindle cap (63) is off, use extra care to keep from accidentally pushing up on the push-off adjusting shaft (75). If this shaft is pushed up, the slicer return springs (64) and slicer may fly off and be lost.

2. Using a "long nose" pliers or tweezers, remove the slicer spring (64) which holds the top slicer (65) in place. Then remove the top slicer, see figure 1b. (NOTE: This slicer has an offset. It must be removed first when disassembling and installed last when reassembling).

3. Remove the other slicer return spring and the bottom slicer (66).

4. Now, push up on the push-off adjusting shaft (75) until the record supports (67) come up over the top of the spindle.

5. Grasp both record supports with the thumb and two forefingers and lift them off of the slicer cam (69A). Release record supports carefully so record support return spring (68) is not lost.

6. To remove the slicer cam and push-off assembly (69), remove the retaining ring (72) and the push-off return spring (71) from the underside of the spindle and lift the assembly off from the top of the spindle.

CARTRIDGE AND NEEDLES

The cartridge (36) used in these record changers is especially designed and there are a few things which should be observed when replacing the cartridge (36), needles (40 and 41), or pickup arm cable (38).

When replacing either needle make certain that the correct needle is inserted in the proper "side" of the cartridge. The needle (41) for "LP" records is an osmium tipped needle especially designed for playing "LP" records. The radius of the point of the "LP" needle is only 1/4 of the radius of the point of a standard (78 RPM) needle. If this sharp needle is used on standard 78 RPM records, it has a tendency to "wobble" in the record groove and would possibly damage the standard record groove. A needle for 78 RPM records may possibly damage "LP" records because of its tendency to "skip" across the fine record grooves. Consequently, care should be taken when replacing needles.

The needle (41) for "LP" records is painted red to identify it. The needle guard on the LP "side" of the cartridge has red color dots to distinguish it from the 78 RPM "side" of the cartridge. The red (LP) needle should be inserted in the side of the cartridge which has the red color dots.

When replacing the cartridge (36) care must be taken when placing the pickup arm cable pinjacks on the cartridge. There must be sufficient slack in the cable to allow the cartridge to rotate. It is also important that the short length of plastic tubing be kept over one terminal.

THREE SPEED MOTOR

The turntable speed of this record changer is changed mechanically by causing one of the three drive shafts (having different diameters) to ride against the idler wheel. See figure 3. The 78 RPM drive shaft is part of the motor armature. The other two drive shafts (33 RPM and 45 RPM) are driven by the 78 RPM drive shaft by two rubber belts (55). These rubber belts (55) and the idler wheel (58) must be kept clean and free from oil. If they become greasy or stretched, they might possibly slip, causing the turntable speed to vary, resulting in unsatisfactory operation.

When replacing the speed change knob (54), make certain that the shaft in the knob does not touch the sides or ends of the cut-out in the pan. If the speed change arm is bent, the speed change knob shaft may rub against the edge of the opening in the pan, causing rumble and noise pickup. Also, the clearance between the bottom of the speed change knob and the top of the pan should not be less than 1/64 or more than 3/64 of an inch.

REMOVING THE PLASTIC BASE HOUSING (13)

Should it be necessary to remove the plastic base housing, proceed as follows:

1. Remove retaining rings (84 and 108).
2. Release one end of the index spring (130).
3. Lift the entire head assembly up from the top of the changer.
4. Loosen Allen set screw (32) and lift complete pickup arm assembly off.
5. Remove retaining ring (33) and washer (54).

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6. Remove three screws (15) holding base.
7. Lift off the plastic base housing (13).
8. When reassembly has been completed, the pickup arm height should be carefully checked and adjusted, if necessary, by means of the lift adjusting screw (29). The set-down should also be checked and adjusted, if necessary, as outlined under "Adjustment of Set-Down Point."

REMOVING TURNTABLE (8) AND BEARING ASSEMBLY (48)

To remove the turntable it is only necessary to grasp the turntable by its edges and lift up. Before replacing the turntable, make sure that the recessed part of the drive wheel (86) is towards the centerpost. If necessary, turn drive wheel counterclockwise about a turn so it locks in this position. The pickup arm should be positioned away from the turntable. In replacing the turntable, force is not needed to seat it. Make certain, however, that the idler wheel of the motor has been pushed in towards the centerpost and that the idler wheel is making contact with the inner side of the turntable flange. The idler wheel should be pushed in with a screwdriver or similar flat tool. Do NOT push toward the rear of the changer.

The dimensions of the three speed motor are such that three cork washers (46) are used under the turntable hub to keep the turntable from rubbing against the idler wheel drive shafts.

In some cases it may be found that the three cork washers, after considerable use, are compressed so the turntable will rub. To build the stack up, an additional thin cork washer should be used. This fourth cork washer may be placed at the top or bottom of the stack. CAUTION: If an addition cork washer is used, it may be necessary to make a compensating adjustment on the 45 RPM spindle. See "45 RPM Spindle Adjustment."

The washers (46 and 47) and thrust bearing assembly (48) are removed by sliding them off of the centerpost. Replace in the order shown in Figure 15.

REMOVING CHANGER FROM BOTTOM COVER

Model RC221 only. To remove the changer from the bottom cover of the RC221, remove the three mounting screws (79), from the top of the changer pan. Then merely lift the changer pan off of the bottom cover (136) being careful to see that lead-in cables and motor leads are disconnected.

When reinstalling the changer pan on the bottom cover, be certain that float springs (78) are properly installed. (The wide end of the spring fits against the extrusion on the changer pan.) Insert the mounting screws (79). IMPORTANT: These screws must be installed so they travel freely through the extruded holes in the changer pan. If the screws touch the edges of the holes in the pan, a scraping sound and microphonic may occur when records drop to the turntable.

REPLACING POSITION TRIP CORD (102)

The position trip cord (102) is ordinary braid or nylon dial cord approximately 3/32" thick. To replace this cord, cut a piece of dial cord about 10" or 12" long and tie one end to the tab on the motor. See figure 11. This is most easily done by either making a slip knot so the knot will tighten when the cord is placed over the tab on the motor and pulled, or removing one end of the idler wheel spring (57) and pivoting the idler wheel and bracket out of the way. Tie the other end of the cord to the cord tension spring (103) so that the distance between the two knots is approximately 8 1/2". Late production record changers have a metal clip (137) to fasten the cord at the tension spring end. After threading the cord under the control cam (91), hook the cord tension spring as shown in the illustration. Then adjust the cam (101) as outlined under "Position Trip Cord Tension Adjustment."

RISER PLATE (90)

The inclined portion of the riser plate (90) was copper plated in later production, to eliminate the possibility of stalling the changer during change cycle (45 RPM operation only).

If the record changer stalls during change cycle, try replacing the riser plate with part number G400A366.

LUBRICATION

Under normal operating conditions, the motor should never require oiling. Also, do NOT use oil on the 45 RPM spindle. The rest of the changer, however, should be lubricated with grease whenever it comes into the shop for repairs or adjustment. All pivot and friction points should be greased adequately but not excessively. A good automobile chassis grease may be used for this purpose.

The push-off shaft (9), powdered iron roller ((105), oilite bearings, (used in the turntable hub and base housing), may be lubricated with SAE No. 20 oil.

Care should be taken to prevent any of the lubricant from coming into contact with the drive or idler wheel tires, or the rubber drive belts. Also be careful, when using oil, that an excess does not seep into the felt of the turntable.

45 RPM RECORD SLIPPAGE

The 7-inch 45 RPM records may have a tendency to slip on each other when they are new. This would result in unsatisfactory reproduction which might be confused with results of a varying turntable speed.

In most cases, record slippage can be eliminated by making a series of shallow scratches, with a pen knife or other sharp instrument, on each record label. Another method of correcting this condition would be to place two small pieces of scotch tape, directly across from one another, on each record label.

RECORD CHANGER TROUBLE SHOOTING

Changer Will Not Trip.
1. Check for broken or loose cycle spring (112).
2. Check On-Off switch cover (100). If cover is not assembled to switch properly, it may bind push-off link and arm (95), preventing cycle spring
3. Check for misadjustment of the oscillating trip adjusting screw (115).
4. Check for bent trip stop wire (111A).
5. Check for broken pawl spring (128).

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Changer Repeatedly Trips Into Change Cycle.
1. Check for misadjustment of reject adjusting screw (118), or trip adjusting screw (115). See "Reject and Trip Adjustments".
2. Check for broken trip cocking spring (110).
3. Check for broken reject spring (2).
4. Check for loose On-Off Reject knob (1).
5. Check for bent trip stop wire (111A).

Changer Will Not Reject.
1. Check adjustment of reject adjusting screw (118).
2. Check for bent trip stop wire (111A).
3. Check for control cam (91) binding.

Pickup Arm Does Not Set Down Properly
1. Check set down adjustment. See paragraph under heading "Set Down Adjustments".
2. Check for broken or loose set down spring (151).
3. Check for broken or loose set down adjusting lock spring (21).
4. Check for missing or loose pickup arm counterweight screws (19) resulting in erratic set-down. (These screws hold pivot and mounting plate (22) in position.)
5. Check for taut pickup arm cable (35). The cable must be loose between the pickup arm and the terminal strip (14).

Pickup Arm "Skips" Across Records
1. Check to see that cabinet is level.
2. Check for worn needle.

Turntable Rubs Against Motor Drive Shafts
1. Check for missing or compressed cork washer (46 or 47). See discussion under heading "Removing Turntable (8) and Bearing Assembly (18)" in the Service and Repair section.

Changer Trips Into Change Cycle When On-Off Reject Knob Is Turned to Off.
1. Check paragraph under "Reject Adjustment".

Changer Causes Rumble Or Noise
1. Check for broken or missing "float" springs (78).
2. Check for "float" screws (79) rubbing against the edges of the holes in the changer pan.
3. Check for the speed change knob shaft (54) rubbing against the cut-out in the changer pan.

Records Do Not Drop to Turntable or More Than One Record Drops. (33 RPM and 78 RPM operation only.)
1. Check distance between record support and centerpost as described under "Adjusting Distance Between Record Support (11) and Centerposts (60 and 61)".

Changer Trips Into Change Cycle Before Finishing Record (78 RPM and 33 RPM only).
1. Check for broken position trip cord (102 or cord tension spring (103).
2. Check to see that cord tension adjusting cam (101) has not loosened or is misadjusted.

Changer Will Not Trip (45 RPM operation only).
1. Check for broken or missing position trip cocking spring (126).
2. Misadjustment of the position trip adjusting screw (117). See paragraph under heading "Position Trip Adjustment".
3. Broken or bent position trip inclined spring (127A).
4. Check to see that position trip cord (102) is not too short or is twisted or binding.
5. Check for misadjustment of the cord tension adjusting cam (101).

Changer Trips Into Change Cycle Before Finishing Record (45 RPM only).
1. Misadjustment of position trip adjusting screw (117). See "Position Trip Adjustment".

Records Do Not Drop to Turntable (7-inch 45 RPM only).
1. Adjust push-off adjusting shaft (75). See paragraph under heading "45 RPM Spindle Adjustment".
2. Check for broken or missing riser plate return spring (89).

Turntable Jumps (Rises) During Change Cycle (45 RPM only).
1. Adjust push-off adjusting shaft (75). See paragraph under heading "45 RPM Spindle Adjustment".

Changer Stalls in Change Cycle (45 RPM only)
1. See "Riser Plate (90)" discussion in the Service and Repair section.

CAUTIONS
1. See that the rubber tires on both the drive wheel and the idler wheel and both drive belts are kept clean and free from oil, grease, dirt or any foreign material. Carbona or carbon tetrachloride may be used for cleaning these parts.
2. When handling the idler wheel (58) or drive wheel (86), keep fingers and hands away from the rubber tires. This is also true when handling the rubber drive belts (55). Natural body oils on these parts may possibly cause slippage.
3. When replacing the rubber tire (85) do not bend the tab on the drive wheel over too far as this may result in the tire catching or rubbing on the drive wheel pressure spring (88).
4. If the On-Off Reject knob (1) cannot be pulled off with the fingers, pry very carefully. The head cover (7) is plastic and if the On-Off Reject knob is pried off, excessive force should not be used.
5. When removing or replacing the pawl spring (128) care should be taken not to stretch it.
6. When removing or replacing the pickup arm (17), always loosen the Allen set screw (32) and lift off the complete assembly. The pivot spring, hub and pin assembly (31) can be removed from the pivot plate assembly (22) and replaced much more readily with the complete pickup arm assembly off of the changer. When reinstalling pickup arm assembly or the arm control lever (127) be sure to replace all washers that were used originally.
7. When replacing the switch mounting bracket (98) or the trip bracket (109) be sure to locate the half punches in the holes in the pan before tightening their mounting screws (99).
8. When replacing the on-off switch assembly (100) care should be used in bending the tab fasteners so that the switch is mounted firmly to the bracket.
9. When replacing or reinstalling the record selector knob (16), turn the set-down eccentric shaft (25) to the position for 10" and 12" set-down (all the way to the left). Then install the knob (16) so that the dot between "10.12" lines up with the locating dot on the pickup arm.
10. When disassembling the 45 RPM spindle, do not push up on the push-off adjusting shaft just after removing the spindle cap.
In later production, turntable (8) is held in place by a retaining ring (part number 401A286). Remove before lifting turntable.

Figure 15. RC221 Exploded View
## PARTS LIST

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Part No.</th>
<th>Description</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
<td>403A27</td>
<td>On-Off Reject Knob</td>
<td>Screw (2 req.) #6-32 x 1 RMHS</td>
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<td>2</td>
<td>405A97</td>
<td>Reject Spring</td>
<td>Lock Nut</td>
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<td>3</td>
<td>481-166-47</td>
<td>Washer (Flat) .390x5/8x1/16</td>
<td>Push-off Adjusting Shaft</td>
</tr>
<tr>
<td>4</td>
<td>406A18</td>
<td>Rubber Bumper for Record Clip</td>
<td>Change Pan Assembly, Copper (RC221)</td>
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<td>5</td>
<td>403A32</td>
<td>Record Clip (Plastic)</td>
<td>Change Pan Assembly, Black (RC221)</td>
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<td>405A94</td>
<td>Record Clip Spring</td>
<td>Change Pan Assembly (RC222)</td>
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<td>7</td>
<td>403A31</td>
<td>Head Cover (Plastic)</td>
<td>Conical Mtg. Spring for RC221, RC222</td>
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<td>G400A332</td>
<td>Turntable</td>
<td>Floor (Mounting) Screw for RC221 only (3 req.)</td>
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<td>9</td>
<td>G400A248</td>
<td>Push-Off Cam and Shaft Assembly</td>
<td>Mtg. Screw &amp; Washer Assembly for RC222</td>
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<td>401A166</td>
<td>Push-Off Plate</td>
<td>3 Speed Motor</td>
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<td>G400A249</td>
<td>Support Tube and Shelf Assembly</td>
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<td>Fibre Washer (3 req.)</td>
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<td>403C28</td>
<td>Base Housing</td>
<td>Retaining Ring</td>
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<td>108-16</td>
<td>Terminal Strip</td>
<td>Drive Wheel Tire Only</td>
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<td>Screw, #6 P.K. Spec. 3/8&quot; OFHM</td>
<td>Drive Wheel (includes Tire)</td>
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<td>403A37</td>
<td>Record Size Selector Knob</td>
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<td>Pickup Arm</td>
<td>Drive Wheel Pressure Spring</td>
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<td>404A23</td>
<td>Pick-Arm Counterweight</td>
<td>Riser Plate Return Spring</td>
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<td>Screw, #4 FH S.T. (2 req.)</td>
<td>Riser Plate and Hub</td>
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<td>45-500-C2-47</td>
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<td>405A118</td>
<td>Set-Down Adjusting Lock Spring</td>
<td>Cam Stop Stud (Part of 91)</td>
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<td>G400A297</td>
<td>Pivot and Mounting Plate</td>
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<td>Pivot Shaft</td>
<td>Riser Control Stud (Part of 91)</td>
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<td>Set-Down Eccentric</td>
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<td>Control Cam Screw 3-32 x 1/4&quot; BS MS</td>
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<td>402A166</td>
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<td>G400A238</td>
<td>Lift Plate and Rod Assembly</td>
<td>Switch Bracket</td>
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<td>G400A294</td>
<td>Pivot Spring &amp; Hub (includes 8-32 Set Screw)</td>
<td>Screw, Switch and Trip Bracket Mt.</td>
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<td>1A45-14</td>
<td>Allen Set Screw 8-32</td>
<td>Off-On Switch and Cover</td>
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<td>33</td>
<td>401A235</td>
<td>Retaining Ring</td>
<td>Cord Tension Adjusting Cam</td>
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<td>34</td>
<td>412A32</td>
<td>Washer</td>
<td>Position Trip Cord</td>
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<tr>
<td>35</td>
<td>G400A207</td>
<td>Pivot Arm Cable and lugs</td>
<td>Use 10&quot; of braided silk or nylon radio dial cord (1/32&quot; diameter).</td>
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<td>36</td>
<td>409A11</td>
<td>Cartridge, includes Needles</td>
<td>Cord Tension Spring</td>
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<td>401A264</td>
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<td>39</td>
<td>98A5-2</td>
<td>Needle Nut (Knurled)</td>
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<td>78 RPM Needle</td>
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<td>405A111</td>
<td>Card Indexing Spring</td>
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<td>Shielded Lead-in Cable &amp; Plug (1 5/8&quot;)</td>
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<td>44</td>
<td>48B-A2</td>
<td>Plug (for lead-in cable)</td>
<td>Reject Arm Support and Trip Lever</td>
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<td>Motor Plug (Male)</td>
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<td>Cork Washer 3/4&quot; thick (1 req.)</td>
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<td>Thrust Bearing</td>
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<td>Oil Retaining Felt Washer (2 req.)</td>
<td>Trip Adjusting Screw</td>
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<td>98A15-10</td>
<td>33 RPM Drive Shaft</td>
<td>Position Trip Adjusting Lock Spring</td>
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<td>98A15-11</td>
<td>45 RPM Drive Shaft</td>
<td>Position Trip Adjusting Screw</td>
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<td>2A1-11-47</td>
<td>Hex Nut #8-32</td>
<td>Screw, Reject Adjusting 6-32 x 1/4&quot;</td>
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<td>3A4-5</td>
<td>Lock Washer</td>
<td>Reject Arm</td>
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OPERATING INSTRUCTIONS

This Admiral Record Changer is designed to automatically play a series of ten 7-inch 33 RPM "Long Play" records or ten 7-inch 45 RPM "Long Play" records. A wide-diameter, plastic centerpost is used for playing 45 RPM records and a conventional, metal centerpost is used for playing 33 RPM records.

SELECTING CENTERPOST

To play 45 RPM records, insert the large diameter (plastic) centerpost (2) into the hole in the center of the turntable (38). While holding the turntable with one hand, turn the centerpost counter-clockwise until the lock-in-lugs fall into and lock in the three slots in the turntable. To remove this centerpost, hold the turntable with one hand and turn the centerpost clockwise; then lift it up.

45 RPM OPERATION
(See Figures 2, 3 and 4)

If at all possible, we recommend that you carefully observe the operation of a changer that is in normal operating condition. It is a good idea to rotate the turntable by hand and repeat the change cycle until you understand the function of each part.

The changer operates as follows: The turntable (38) is driven by the smaller of the two rubber tires on the compound idler wheel (47), riding against the outer rim of the turntable.

The speed of the turntable is determined by the setting of the speed change knob (19). When the knob is in the "45" position, the larger rubber tire on the compound idler wheel (47) rides against the 45 RPM section (larger diameter) of the motor drive shaft. When the knob is moved to "33", the compound idler wheel moves so that the larger tire rides against the 33 RPM section (smaller diameter) of the motor drive shaft. See Figure 2.

To play 33 RPM records, insert the small diameter (metal) centerpost (1) into the center of the turntable and press it down until it "locks" in place. To remove this centerpost, merely lift it straight up and out.

SETTING SPEED CHANGE KNOB

To play 45 RPM records, set the Speed Change Knob (19) so that its indicating arrow points to "45". To play 33 RPM records, set this knob so its indicating arrow points to "33". When moving this knob to either position, make sure that the knob "clicks" into position.

This control also has a center ("neutral") position for disengaging the rubber-tired idler wheel (47). The changer pan is not marked "neutral" but the position can be felt when the Speed Change Knob is halfway between "33" and "45". In this position, the compound idler wheel is not in contact with the drive shaft or the turntable. When the record changer is not going to be used for some time, set the speed change knob in the center position.

LOADING AND STARTING THE RECORD CHANGER

To load 45 RPM records, place as many as ten over the 45 RPM centerpost so that the bottom record rests on the record supports (8). To load 33 RPM records, place as many as ten over the 33 RPM centerpost so that the bottom record rests on the ledge on the centerpost (1) and the 33 RPM record support (17). Start the changer by turning the Radio-Phono switch on the radio to the "Phono-On" position.

STOPPING AND UNLOADING

Turn changer off by turning Radio-Phono switch on the radio to "Phono-Off" position. Do not turn changer off during change cycle. To unload, merely lift records straight up.

THE CHANGE CYCLE

The changer mechanism is driven through change cycle by the knurled hub of the turntable rotating the rubber-tired drive wheel (36). During normal playing, the drive wheel does not touch the knurled hub of the turntable. See Figure 3A. As the needle enters the record spiral groove and moves towards the centerpost, the pickup arm lever and stud (72) moves simultaneously and rotates the trip bracket (61) counter-clockwise. Since the trip bracket and drive wheel are
on the same shaft, the drive wheel is pivoted approximately 10 degrees counter-clockwise. The rubber tire contacts the knurled hub of the turntable, and is rotated in a counter-clockwise direction. See Figure 3B.

The drive wheel shaft is fitted through the drive bracket (78) and is mounted OFF CENTER on the drive wheel (36). Due to the cam action of the "off-center" drive wheel (36), rotation of the drive wheel, by the knurled hub of the turntable, forces the drive shaft out. Since the drive shaft is fitted through the drive bracket (78), the drive bracket is pivoted around the drive bracket hub. The cycle spring (76) maintains pressure on the drive bracket so that the drive wheel tire is kept in contact with the knurled hub. After the changer has been tripped and the drive bracket begins to be pivoted by the movement of the drive wheel, the arm lift incline (78A) on the drive bracket moves across the lift rod moving it upward. This lifts the pickup arm off of the record. Stud (78C) on the drive bracket now contacts the pickup arm lever and begins to move it so the pickup arm moves out from the center of the record.

At about this time, the push-off adjusting shaft (15) on the 45 RPM centerpost (2) starts moving up the push-off incline (78B) on the drive bracket (78). See figure 12. This causes the push-off shaft to move up into the centerpost. As the push-off shaft moves into the centerpost, the arm lift incline (78A) on the drive bracket moves across the lift rod moving it upward. This lifts the pickup arm off of the record. Stud (78C) on the drive bracket now contacts the pickup arm lever and begins to move it so the pickup arm moves out from the center of the record.

As the drive bracket continues to pivot, the pickup arm continues to move away from the record, the slicers (5 and 6) continue to come out, and the record supports continue to pull in. When the pickup arm has moved to the right almost as far as it will go, the record supports (8) have pulled into the centerpost enough to drop the bottom record to the turntable and the slicers are out far enough to hold up the remainder of the stack of records.

The pickup arm lever control stud (72A) riding against the indexing edge of the index bracket (65) controls the movement of the pickup arm. The index bracket (65) and set down spring (64) prevent the pickup arm from moving out too far. (Later in the change cycle the index bracket (65) and set-down spring (64) control the set-down point.)

At this point, the drive wheel (36) has gone through one-half of its rotation and as the drive wheel continues to rotate, the drive bracket (78) will begin to return to its normal (out of change cycle) position.

The set-down spring (64) keeps the pickup arm lever (72) in contact with the arm control stud (78C) on the drive bracket. Therefore as the drive bracket moves back toward its normal position, the pickup arm is moved in toward the set-down point. When the pickup arm lever stud (72A) has reached the indexing point (notch) in the index bracket, the pickup arm has reached the set-down point and stops moving in toward the centerpost. At this time, the drive bracket has pivoted to a point where the lift rod (32) starts moving down the arm lift incline (78A) in the drive bracket and the pickup arm starts moving down toward the record. When the arm has moved down about halfway, the second stud on the drive bracket (78D) moves the index bracket (65) away from the stud on the pickup arm lever so that the pickup arm is free to travel in on the lead in grooves on the record.

Almost simultaneously, the push-off adjusting shaft (15) is riding down the push-off incline (78B) on the drive bracket. This allows the push-off return spring (11) on the centerpost to pull the cam and shaft assembly (9) down.

The record supports are forced out of the centerpost by their return spring (7) and the slicers are moved into the centerpost by the slicer return springs (4). When the slicers are all the way in, the stack drops to the record supports (8).

The drive wheel is no longer in contact with the knurled hub but it is rotated approximately 20 degrees further by the drive wheel bracket, which is held against the knurled hub of the turntable by the drive wheel spring (35).

When the drive wheel bracket has rotated past the knurled hub, the drive wheel must be rotated another 10 degrees by the trip bracket (61), or reject lever (43), before it will contact the knurled hub and begin the change cycle. When the reject knob (42) is moved to the "Rej" position, the reject lever roller rotates the drive wheel the necessary 10 degrees and the change cycle begins.

**33 RPM OPERATION**

The change cycle for 33 RPM operation is exactly the same as for 45 RPM operation, except for change cycle time and the fact that 33 RPM records are supported by the offset on the 33 RPM centerpost and the...
33 RPM record support (17), and are pushed off by the push-off plate (16).

When the drive bracket (78) has pivoted to the point where the pickup arm is clear of the record, the stud (80A) on the push-off bracket (80) is moved by the slot (78E) in the drive bracket. This movement causes the push-off plate (16) to pivot and push-off the bottom record. The remainder of the records are held back by the small sliding piece at the top of the centerpost. When the drive bracket pivots back to its normal playing position, the push-off bracket stud (80A) follows the slot in the drive bracket and causes the push-off plate to pivot back to its normal position. Then the record stack drops to the record support (17) from the push-off plate (16).

**ADJUSTMENTS**

**TRIP ADJUSTMENT**

This record changer employs the position type trip; that is, it trips into change cycle when the needle in the pickup arm reaches a given distance from the center of the record. If the trip is properly adjusted, the record changer will trip into change cycle when the needle is between 2" to 2-3/16" from the center of the hole in the turntable or approximately half way in on the spiral groove in the center of the record.

If the record changer does not trip at the proper position, it will be necessary to adjust the trip adjusting screw (75). See figure 4. Turning this screw in (clockwise) moves the trip point away from the centerpost. Turning it out, moves the trip point nearer to the centerpost.

If the screw is turned all the way out, the changer may not trip. If it is turned in too far, the changer may trip before the record finishes playing.

**33 RPM PUSH-OFF ADJUSTMENT**

(See Figures 1 and 4)

If 33 RPM records do not drop to the turntable during change cycle, it may be necessary to correct the push-off adjustment.

The push-off is properly adjusted when the leading edge of the push-off plate (16) extends to a maximum of 1/32" beyond the edge of the record support (17) during change cycle.

To make this adjustment, proceed as follows:

1. With the record changer in change cycle, rotate the turntable by hand until the pickup arm STOPS moving away from the centerpost.
2. Loosen the set screw (81) on the push-off bracket (80) and move the push-off plate (16) so that its leading edge extends 1/32" beyond the edge of the record support (17). Then tighten the set screw (81).
3. Load the record changer with 33 RPM records.

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place the changer in operation and keep rejecting records until the stack has been dropped to the turntable.

4. If records still do not drop properly, repeat steps 1 through 3.

**ADJUSTMENT OF SET-DOWN POINT**
(See Figures 4 and 5)

This record changer does not have a conventional set-down screw adjustment. The pickup arm should set-down properly unless the Allen set screw (34) on the pivot collar (33) is loosened, or excessive pressure has been applied to the pickup arm.

When properly adjusted for correct set-down, the needle point will set-down between 2-9/16" and 2-10/16" from the near side of the 45 RPM centerpost. (Between 3-5/16" and 3-6/16" from center of the hole in the turntable.) Making this adjustment for 45 RPM records, automatically provides correct set-down for 33 RPM records.

If the pickup arm does not set-down properly, the set-down point adjustment should be made as follows:

1. Insert the 45 RPM centerpost (2); set the speed change knob (19) to the "45" position; move the reject knob (42) to the "Rej" position and then rotate the turntable (clockwise) by hand JUST to the point where the pickup arm stops moving in toward the centerpost and starts moving downward. DO NOT ROTATE THE TURNTABLE BEYOND THIS POINT.

2. Insert a #6 Allen wrench into the Allen set screw (34) on the pivot collar (33) as shown in Figure 5. Do NOT loosen the Allen set screw.

3. From the underside of the changer, hold the pickup arm lever and trip bracket assembly (72) STATIONARY so that it can not move down or to either side.

4. Slightly loosen the Allen set screw (34).

5. Place a ruler against the near side of the 45 RPM centerpost and then move the pickup arm until the distance between the needle and centerpost is from 2-9/16" to 2-10/16".

6. Tighten the Allen set screw (34) VERY CAREFULLY to avoid moving the pickup arm. Before firmly tightening the Allen set screw, make sure that there is a little space (ten thousandths of an inch) between the pivot collar (33) and the stand-off.

7. Run the record changer through change cycle a few times to make certain that the set-down point adjustment has been properly made.

**ADJUSTING THE PICKUP ARM HEIGHT**

This record changer is designed so that when the needle rests 1/16" above the changer pan, the pickup arm will automatically lift high enough during change cycle to clear the top record of a stack of ten 33 RPM records on the turntable and will not lift high enough to strike the bottom record of a stack of 33 RPM records to be played.

With the record changer out of change cycle and the pickup arm clear of the turntable, adjust the pickup arm lift adjusting nut (69) (see figure 6), so that the needle rests 1-16" above the top of the changer pan. Turning the nut (69) clockwise raises the pickup arm; turning it counter-clockwise lowers the pickup arm.

To check this adjustment, load the record changer with ten 33 RPM records. Turn the changer on and reject records until the stack has been dropped to the turntable. The pickup arm should not lift high enough
to strike the bottom record (of the stack about to be played) but should lift high enough to play the tenth record on the turntable.

If, for some reason, the arm strikes the bottom record or will not lift high enough to play the tenth record, a compromise adjustment should be made. That is, raise the arm slightly to make the arm lift higher or lower the arm slightly to prevent it from striking the bottom record.

45 RPM CENTERPOST ADJUSTMENT

NOTE

This 45 RPM centerpost (G400B410) is very similar to, but is not interchangeable with, the 45 RPM centerpost (G400B329) used in models RC221, RC222. The centerposts can be readily identified by noting that the length of the un-threaded portion of the push-off adjusting shaft (15) is approximately 5/16" in G400B410, and 3/4" in G400B239.

If 45 RPM records do not drop to the turntable as they should, or if the turntable stalls during change cycle, it will be necessary to adjust the 45 RPM centerpost (2).

The push-off adjusting shaft (15) is the only adjustment on this centerpost. When properly adjusted, the dimension from the bottom of the adjusting nut (14) to the end of the push-off adjusting shaft (15) is approximately ½ inch. To make an adjustment, proceed as follows:

1. Turn the set off. Push the Reject knob (42) to the "Rej" position. Then rotate the turntable clockwise (to the right) by hand until the pickup arm moves as far away from the turntable as it will go. Do not continue to rotate the turntable beyond this point.

2. Insert the 45 RPM centerpost and lock it in place.

3. In this position the record supports (8) should be pulled into the centerpost until the top edge of the

record supports are just inside the centerpost. You should only be able to see approximately 1/32 of an inch of the centerpost wall. See Figure 8.

4. If the record supports do not pull into the centerpost as far as the position shown in Figure 8, remove centerpost, loosen the locknut (14) and turn the push-off adjusting shaft out (counter-clockwise) approximately one half turn.

5. Insert the centerpost and check to see if the record supports "pull in" to the proper position. If they do not, repeat step 4. If they pull in far enough, proceed with step 6.

6. Place a stack of 45 RPM records on the centerpost and turn the record changer on. Push the Reject knob to the "Rej" position and then keep rejecting records until the whole stack has been dropped to the turntable. If each record slides smoothly down the centerpost, the adjustment is satisfactory.

IMPORTANT: If the turntable stalls during change cycle, the push-off adjusting shaft may have been turned out too far. Remove the 45 RPM centerpost and run the changer through change cycle. If the changer does not stall with the centerpost removed, turn the push-off adjusting shaft in about four or five full turns and repeat steps 1 through 6 above.

SERVICE AND REPAIR

DISASSEMBLING THE 45 RPM CENTERPOST

(See Figure 9)

To disassemble the centerpost for parts replacement etc., proceed as follows:

1. Remove screws (12) from underside of centerpost and lift up the centerpost cap (3). See Figure 9. CAUTION: When the centerpost cap (3) is off, use extra care to keep from accidentally pushing up on the push-off adjusting shaft (15). If this shaft is pushed up, the slicer return springs (4) and slicers may ffly off and be lost.

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**Important**

Do NOT loosen the Allen set screw (34) in the pivot collar (33). If the screw is loosened, it will be necessary to make the set-down point adjustment.

1. Loosen the pivot locking screw (24) at the front of the pickup arm counterweight (21).
2. Turn the pivot screw (22) almost all the way out.
3. Move the pickup arm to the right to free the permanent pivot (part of the counterweight) from the pivot hole in the pivot collar (33). In early production changers, it may be necessary to use a slight twisting or "wiggling" motion to free the permanent pivot. When the permanent pivot has been freed, merely lift the pickup arm assembly up and off.

To reinstall the pickup arm assembly proceed as follows:

1. Slide the counterweight down on the pivot collar (33) until the permanent pivot point falls into the pivot hole in the pivot collar. In early production changers, it may be necessary to set the permanent pivot point in the pivot hole and then twist or "wiggle" the arm until the counterweight falls into the proper position.
2. Tighten the pivot screw (22) until it is tight and then back it off just enough so the pickup arm can move up and down freely.
3. Tighten the pivot locking screw (24).

**REMOVING THE PICKUP ARM (See Figure 5)**

If the pickup arm must be removed for any reason, proceed as follows:

1. Using a "long nose" pliers or tweezers, remove the slicer spring (4) which holds the top slicer (5) in place. Then remove the top slicer. (NOTE: This slicer has an offset. It must be removed first when disassembling and installed last when reassembling).
2. Remove the other slicer return spring and the bottom slicer (6).
3. Now, push up on the push-off adjusting shaft (15) until the record supports (8) come up over the top of the centerpost.
4. Grasp both record supports with the thumb and two forefingers and lift them off of the slicer cam (9A). Release record supports carefully so record support return spring (7) is not lost.
5. To remove the slicer cam and push-off assembly (9), remove the retaining ring (13) and the push-off return spring (11) from the underside of the centerpost and lift the assembly off from the top of the centerpost.

When assembling the centerpost, merely reverse the above procedure. When installing the record supports (8) and their return spring (7), place the spring between the record supports and compress the spring enough so the record supports can be slid down over the slicer cam (9A). When installing the slicers (5 and 6) be sure to install the flat slicer (5) first, and then the slicer with the offset (it also has a smaller cut-out).

**REMOVING THE PICKUP ARM ASSEMBLY (38)**

To remove the turntable first place the speed change knob (19) in the "neutral" position. Be sure that the changer is not in change cycle, move the pickup arm away from the turntable. Then remove the retaining clip (37) on top of the turntable and lift the turntable straight up.

Before replacing the turntable, see that the drive wheel (36) is not against the centerpost socket and move the pickup arm as far as possible from the centerpost. Be sure the speed change knob (19) is in the "neutral" position.

No force is needed to seat the turntable.

Replace the turntable retaining clip (37) on the centerpost socket so that its "turned-up" ends are facing upward and away from the pickup arm.

The cork washers (39) and thrust bearing assembly (40) are removed by sliding them over the centerpost socket. Replace them in the order shown in figure 12.

**LUBRICATION**

Under normal operating conditions, the motor should never require oiling. Also, do NOT use oil on the 45 RPM centerpost and do NOT oil the roller on the reject lever (43). Any oil on this roller will be transferred to the drive wheel tire when the reject knob is moved to the "Rej" position, which might cause the drive wheel (36) to slip during change cycle. The
drive shaft is fitted through an oilite bearing on the drive bracket (78); it also should not require oil.

The rest of the changer, however, should be lubricated with grease whenever it comes into the shop for repairs or adjustment. All pivot and friction points should be greased adequately but not excessively. A good automobile chassis grease may be used for this purpose.

The push-off shaft (16) and the bearing in the turntable hub may be lubricated with SAE No. 20 oil.

Care should be taken to prevent any of the lubricant from coming into contact with the drive or idler wheel tires. Also, be careful when using oil, not to let an excess seep into the felt of the turntable.

**CARTRIDGE AND NEEDLE REPLACEMENT**

Alternate cartridges, interchangeable when complete with needle, are used in this changer.

In models having cartridge (27), part number 409A300, replace the needle (28), part number 98A15-6, by loosening the knurled nut (29) and withdrawing the old needle. Insert the new needle and tighten the knurled nut. See figure 10.

In models having cartridge (27), part number 409A301, replace the needle (28), part number 98A15-14, by prying downward on the back edge of the needle. Insert the new needle by pressing it into the cartridge. See figure 11.

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<td>45 RPM Centerpost Base</td>
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<td>Speed Nut</td>
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<td>Cartridge with needle (See Figure 10)</td>
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<td>Drive Wheel Assembly (less spring)</td>
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<td>4040C 438</td>
<td>Changer Pan and Stud Assembly</td>
<td>83</td>
<td>402A 328</td>
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†This 45 RPM centerpost (G400B410) is very similar to, but is not interchangeable with, the 45 RPM centerpost (G400B329) used in models RC221, RC222. The centerposts can be readily identified by noting that the length of the un-threaded portion of the push-off adjusting shaft (15) is approximately 5 1/16" in G400B410, and 3 1/4" in G400B329.

*At the time of publication, 50 cycle conversion parts were not available.

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Figure 12. RC400 Exploded View.

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RECORD CHANGER TROUBLE SHOOTING

**Changer Will Not Trip Into Change Cycle.**
1. Check adjustment of trip adjusting screw (75).
2. Check for broken, loose or weak trip tension spring (73).
3. Check for broken, missing or loose trip adjusting lock spring (74).
4. Check for oil or foreign material on the drive wheel tire (36).
5. Check to see that the drive bracket (78) is free (not binding) to pivot around drive bracket hub.
6. Check for broken cycle spring (76).

**Changer Trips Into Change Cycle Before Finishing Record.**
1. Check adjustment of trip adjusting screw. (75). See paragraph under heading “Trip Adjustment.”

**Changer Will Not Reject.**
1. Check for oil or foreign material on the drive wheel tire (36).
2. Check to see that the drive bracket (78) is free to pivot around the drive bracket hub.

**Pickup Arm Does Not Set Down Properly.**
1. Check set-down adjustment. See paragraph under “Adjustment of Set-down Point”.

**Records Do Not Drop to Turntable.**
1. If 45 RPM records do not drop, adjust push-off adjusting shaft (15). See paragraph under heading “45 RPM Centerpost Adjustment”.
2. If 33 RPM records do not drop, check the push-off adjustment. See paragraph under heading “Push-off Adjustment”.

**Changer Stalls in Change Cycle.**
1. Check for parts binding.
2. If changer stalls with 45 RPM centerpost in place, adjust push-off adjusting shaft (15). See paragraph under heading “45 RPM Centerpost Adjustment”.

**Turntable Will Not Revolve When Changer Is Turned On.**
1. Check position of speed change knob (19). If it is in “neutral” position, the turntable will not revolve.
2. Check for oil or foreign material on the tires of the compound idler wheel (47).
3. Check for broken idler wheel spring (50).

**Changer Causes Rumble or Noise.**
1. Check for broken or missing “float” springs (58).
2. Check for speed change knob shaft (19) rubbing against the edge of the cut-out in the changer pan.

**Pickup Arm “Skips” Across Records.**
1. Check to be sure that cabinet is level.
2. Check for worn needle.

**CAUTIONS AND SERVICE HINTS**
1. See that the rubber tires on both the drive wheel (36) and the compound idler wheel (47) are kept clean and free from oil, grease, dirt or any foreign material. Carbona or carbon tetrachloride may be used for cleaning these parts.
2. When handling the idler wheel or drive wheel, keep fingers and hands away from the rubber tires. Natural body oils on these parts may possibly cause slippage.
3. When the turntable is off, do NOT push the drive wheel (26) against the centerpost socket.
4. If the record changer is not going to be used for some time, place the speed-change knob (19) in the “neutral” position. This will eliminate the possibility of denting the idler wheel tires (47).
5. When disassembling the 45 RPM centerpost, do not push up on push-off adjusting shaft (15), just after removing the centerpost cap (3).
6. When removing the pickup arm, do NOT loosen the Allen set screw (34) in the pivot collar (33).
7. Do not oil the roller on the reject bracket (43). Oil will be transferred to the drive wheel tire (26) possibly causing slippage during change cycle.
8. When replacing the turntable retaining clip (37) be sure to slip it on with the “turned-up” ends facing upward.
9. When removing or reinstalling turntable, make sure that the record changer is not in change cycle and that the speed change knob (19) is in the “neutral” position.
Due to the fact that a complete understanding of the proper operation of a record changer is necessary before any attempt be made to repair or effect Service adjustments; we are giving a description of the change cycle of the P-43 Series Capehart Record Changers.

The record shelves are set for the size record to be played (either 10" or 12") by turning either shelf to the position indicated on the decal, then the correct number of records should be placed on the record shelves. (Twelve 10" or ten 12"). The tone arm should be on its rest.

Before loading the records on the shelves they should be examined for rough edges (burrs, flash or chips) and if any burrs are found they should be removed with fine sandpaper.

Move the control switch which starts the phonograph and move the reject button sidewise. The changer will go into cycle lifting the tone arm off the rest and swinging it under the stack. The tone arm should swing clear of the record stack, a record should drop to the hooks, pause, then gently settle to the turntable. The tone arm should swing back and be lowered to the starting groove on the record. When the record is played the above cycle is repeated until the records have been played.

Now let's follow the above cycle through the mechanism.

When the reject button is moved, the Reject Lever (56-877) pushes the Start Lever and Release Trip Assembly (64215) far enough to disengage it from the Starting Lever Assembly (13-38). Due to its construction the Starting Lever (which is part of the Main Cam Assembly) (13-296) tilts down and engages with the Starting Pin (34309) to make the Main Cam Gear mesh with the Spindle Gear (part of 13-297).

The Turntable is screwed onto the Spindle Gear and both are driven through the Idler Pulley (3672) by the Motor. When the cycle is completed the Main Cam Gear disengages from the Spindle Gear because several teeth are left off the Main Cam Gear, this is called the playing position, see Fig. A,

When the Starting Lever engages with the Starting Pin (see above) the Main Cam Assembly is moved forward at the right speed and the correct distance to cause the gears to mesh properly. Then the Main Cam goes through a complete revolution.

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First the Tone Arm is lifted off the record through the Tone Arm Lift Lever (13-303). As soon as it is elevated both the Record Plungers move toward the Spindle to center the record for the drop to the Turntable; if no record is on the shelves the Automatic Switch is turned off, however the cycling switch makes the changer complete the cycle with the Tone Arm in playing position and needle resting on the record. As this happens the Tone Arm Return Lever (09-119) moves the Tone Arm from under the record stack. The Rear Record Plunger moves forward at the same rate of speed as the eccentric portion of the Spindle and the Front Plunger does. This pushes the record off the Rear Shelf where the Rear Record Hook catches it. Both Front and Rear Plunger move backwards at the same rate as the Spindle does, pushing the record off the Front Shelf and dropping it to the Front Hooks, the record pauses here until the Hooks move to center the record in respect to the Spindle. Then both Hooks snap back out of the way, allowing the record to settle gently to the turntable. Next the Tone Arm swings into the proper position and is lowered to the record. A wire feed-in spring acts against the Tone Arm Crank to feed the Tone Arm into the music grooves in! case there is no feed-in groove on the record.

To accomplish the record feed there are three sections of the Main Cam, together with the Centering Lever and Rocker Arm Assembly involved. The first section of the Main Cam is a "Boss" illustrated at the end of the Tone Arm Lift Lever in Fig. A. The Second section is the Trip Roller Assembly on top of the Main Cam. The third section is the "slot" in the Tone Arm Lift portion of the cam adjacent to the Trip Roller Assembly.

The action is as follows; As the Main Cam rotates, the "Boss" strikes the Centering Lever and Rocker as shown in Fig. B, this moves the Record Plungers toward the Spindle. Because this pressure is applied through a spring, variations in record diameter are of little consequence. After the Boss passes the Centering Lever, the Trip Roller strikes the Rear Rocker the first time moving the Rear Record Plunger forward and the Front Record Plunger is also moved forward, Fig. C. As the Main Cam moves on, the Record Plungers go to a central position then both move backward, Fig. D, then resume the central position, this is while the record rests on the Hooks. Then the Centering Lever drops into the "Slot" in the Main Cam, Fig. E, the Front and Rear Hooks are suddenly withdrawn from the record and it drops to the Turntable.

As the Tone Arm moves over the record, its motion is transmitted through the Friction Trip to the Friction Trip Lever. When the needle enters the change groove the Starting Lever Release Trip is released by the Friction Trip Lever, this allows the Starting Lever to drop and engage the Starting Pin.

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FIGURE 1

09-122 Automatic Stop Switch & Bracket Assembly
09-123 Tone Arm Return Lever & Spring Assembly
13-299 Turntable
13-303 Tone Arm Lift Lever & Bracket Assembly
13-305 Center Lever & Rocker Assembly
31-51 Decalcomania
31-142 Stop Switch Escutcheon
36-695 #6-32x3/8 Phil. Oven H.M.S. St
56-384 Tone Arm Rest Pin
56-845 10" Record Plunger, Fig. 5A
56-846 12" Record Plunger, Fig. 5A
56-868 Switch Lifting Lever
57-1 Tone Arm Support Housing, Fig. 4
57-108 Record Support Housing, Fig. 5A
57-109 Record Support Shelf & Tube Ass’’y Fig. 5A
57-110 Record Shelf Cover, Rear, Fig. 5A
57-111 Record Shelf Cover, Front, Fig. 5A
71-198 Tone Arm Assembly, Fig. 4
6069 Reject Button
46293 Trip Finger Stop, Fig. 2
99-12-1 8-32 Hex Nut
99-33-3 #8 S.P. Washer

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07-26 Front Locking Lever Assembly

Mounting Parts
- 36-117 10-32x1" H.H. Screw
- 36-136 #10 Flat Washer
- 368-7 10-32 Hex Nut
- 56-112 Spacer
- 99-33-4 #10 S.P. Washer

07-27 Rear Locking Lever Assembly

Mounting Parts
- 36-114 10-32x1/2" H.H. Screw
- 36-136 #10 Flat Washer
- 368-7 10-32 Hex Nut
- 56-112 Spacer
- 99-33-4 #10 S.P. Washer

07-28 Connecting Link Assembly

Mounting Parts
- 56-104 Connecting Link
- 56-106 Connecting Link Rivet
- 56-124 Gear Sector, Front
- 56-191 Gear Sector, Rear
- 56-263 Gear Spacer
- 99-36-28 Brass Washer
- 99-37-2 Wave Washer

Mounting Parts -- Continued
- 36-231 10-32x1/2" H.H. Screw
- 368-7 10-32 Hex Nut
- 99-33-4 #10 S.P. Washer

Tone Arm Return Lever and Spring Assembly
- 11-180 Feed-In Spring Assembly
- 36-141 6-32x1/4" R.H.M.S.
- 36-465 6-32x5/8" R.H.M.S.
- 3612-4 #6 S.P. Washer
- 3624-2 #6 Flat Washer
- 56-166 Ratchet Pawl
- 56-167 Shoulder Rivet
- 3996 Pawl Spring
- 99-11-6 6-32 Hex Nut
- 99-40-6 #0x3/16" Drive Screw

Mounting Parts
- 36-112 #10 Flat Washer 1" O.D.
- 36-115 10-32x1/2" H.H.M.S.
- 368-7 10-32 Hex Nut
- 56-155 Spacer
- 99-33-4 #10 S.P. Washer

Main Cam Assembly
- 13-38 Starting Lever Assembly

Trip Roller Assembly

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Mounting Parts
36-119 8-32x3/4" B.H.M.S.
368-4 8-32 Hex Nut
99-33-3 #8 S.P. Washer
99-36-20 #8 Flat Washer
56-100 Starting Lever End
56-105 Rivet
57-112 Main Cam
3996 Spring
99-36-1 Washer

Mounting Parts
34312 Pivot Pin
99-34-12 H.P. Cotter

Mounting Parts, Main Cam
36-129 1/4"-28 Hex Nut
56-154 Main Cam Stud
99-33-5 1/4" S.P. Washer
99-34-11 H.P. Cotter
99-36-45 Washer

Mounting Parts
36-143 Taper Pin
36-593 #2xl/4" Drive Screw
56-168 Shaft
56-169 Ratchet Locking Plunger
56-171 Switch Cam Spacer
56-173 Switch Bracket
64-18 Ratchet Plunger Spring
64-19 Switch Cam Spring
90-12 Switch
99-18-1 6-32x3/16" R.H.M.S.
99-36-7 Plain Washer
3612-4 #8 S.P. Washer

Mounting Parts
36-236 6-32xl/4" Philips O.H.

Tone Arm Lift Lever & Bracket Assembly
13-10

Front Gear & Cam Assembly, See Fig. 7
99-28-31 6-32x3/16" Bristol Set Screw

Rear Gear & Cam Assembly
99-28-31 6-32x3/16" Bristol Set Screw

Phono Motor 60 Cycles
3671 Motor Pulley 60 cycles

Phono Motor 50 Cycles
3681 Motor Pulley 50 cycles

Mounting Parts
45176 Tension Spring Holder
99-19-3 8-32x3/8" R.H.M.S.
99-33-3 #8 S.P. Washer
99-36-36 #8 Flat Washer

Mounting Parts
36-303 8/32x7/16 R.H.M.S.
56-102 Spacer
50206 Rubber Grommet
99-36-21 #8 Flat Washer

Centering Lever & Rocker Assembly
36-690 #10 Flat Washer 1/2"
0.D.x 0.042" St.
36-8-1 #10-32 Hex Nut 3/8"
A.F.x1/8" Ht. St.
56-841 Centering Lever
56-844 Plunger Rocker
56-848 Rocker Lever Spacer
56-852 Rocker Connecting Link
56-853 Centering Lever Return Arm
56-857 Centering Lever Rivet and Guide Pin
56-860 Rocker Connecting Link
56-878 Centering Lever Guide Pin
64-13 Centering Lever Return Arm Spring
64-290 Centering Lever Equalizing Spring
99-20-31 #10-32x7/8" R.H.M.S. - St.
99-33-4 #10 S.P. Int. Lockwasher

Play Control Assembly
13-302 Switch, Cam, Ratchet and Hub
13-153 Switch Cover

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**FIGURE 3**

36-303  8-32x7/16" R.H.M.S.
36-4    8-32x1/4" Hex Nut
57-108  Record Support Post, See Fig. 5A
3671   Motor Pulley 60 Cycle
3672   Idler Pulley
39245  Idler Spring
42165  Spacer
45176  Spring Holder
50206  Rubber Grommet
50209  Thrust Washer
64216  Idler Bracket and Stud Assembly
99-12-1 8-32x11/32" Hex Nut
99-19-3 8-32x3/8" R.H.M.S.
99-28-41 6-32x1/8" Bristol Set Screw
99-34-14 H.P. Cotter
99-36-21 #8 Flat Washer
99-36-38 Flat Brass Washer

**FIGURE 4**
### Complete Tone Arm Assembly

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<td>Plug</td>
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<td>#4x1/4&quot; Philips B.H.S.T.S.</td>
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<td>4-36x3/16&quot; Philips B.H.M.S.</td>
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<td>Slotted Needle Set Screw</td>
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<td>#4 S.P. Washer</td>
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### Mounting Parts

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* Replaced by 57-122

### FIGURE 5

- **Friction Trip Assembly**
  - 05-41  Trip Finger
  - 39227  Spring Washer
  - 39228  Coil Spring
  - 43185  Upper Collar
  - 99-28-30 6-32x1/4" Bristol Set Screw
  - 45165  Friction Trip Lever
  - 46301  Friction Trip Stop Disc

- **Friction Trip Assembly---Continued**
  - 50203  Cork Washer
  - 66355  Lower Collar, Pin and Screw
  - 99-28-30 6-32x1/4" Bristol Set Screw
  - 66366  Tone Arm Crank Assembly
  - 99-26-16 Tone Arm Crank Set Screw

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FIGURE 5A

56-845 10" Plunger
56-846 12" Plunger
* 57-108 Record Support Post
57-109 Record Support Shelf and Tube Assembly
57-110 Record Shelf Cover Rear
57-111 Record Shelf Cover Front

Mounting Parts
36-119 8-32x3/8" Phillips B.H.M.S. Post to Base
36-687 4-36x9/16" Phillips F.H.M.S.
36-688 6-32x9/16" Phillips B.H.M.S.

* Replaced by 57-121

FIGURE 6

©John F. Rider
09-122 Automatic Stop Switch Assembly
09-123 Tone Arm Return Lever & Spring Assembly
13-297 Spindle, Gear and Bracket Assembly
13-301 Spindle and Gear Assembly
34309 Starting Pin (needed to complete 13-301)
15-12 Spindle Support Bracket
31-142 Stop Switch Escutcheon
36-695 #6-32x3/8" Phil. Oven H.M.S. St.
364-4 6-32x1/4" H.H.M.S.
56-158 Spindle Thrust Plate
56-384 Tone Arm Rest Pin
57-6 Spindle Support Bracket
6048 Paper Gasket
4945 Felt Washer
99-42-10 3/16" Thrust Ball
99-42-11 Turntable Stop Washer

Tone Arm Lift Lever and Brake Assembly

07-215 Lever and Brake Spring Assembly
56-874 Lever only
64-285 Brake Spring
362-1 Rivet
368-1 6-32 Hex Nut
3630-2 6-32x7/8" R.H.M.S.
56-875 Switch Trip Finger
34312 Pin
34316 Pin
39229 Spring

Mounting Parts

50206 Rubber Grommet
99-36-21 Flat Washers
13-226 Main Cam Assembly
13-38 Starting Lever Assembly
15-78 Trip Roller Assembly
56-100 Starting Lever End
56-105 Starting Lever End Rivet
56-686
71-198 Tone Arm & Pick Up Assembly
3996 Starting Lever End Spring
34312 Starting Lever Pin
99-34-12 H.P. Cotter for 34312
99-36-1 Starting Lever End Rivet Washer

Mounting Parts

36-129 1/4"-28x7/16" Hex Nut
56-154 Main Cam Stud
99-33-5 1/4" S.P. Washer
99-34-11 H.P. Cotter for 56-154
99-36-45 Main Cam Stud Washer

FIGURE 7

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In the following five illustrations we are showing the cycle of operation of a P-43 Series Capehart 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 Rockers 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.
SERVICE SUGGESTIONS

1. TO REMOVE TURNTABLE 13-299

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 3672.

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 and 41/64 inches apart, plus or minus .005", and should be equidistant from the spindle. 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.

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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 46293 (Fig. 2)

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 (Fig. 5) so the needle lands
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 (Fig. 5) 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 (Fig. 5). 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 71-195 (Fig. 4)

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 (Fig. 5)

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 (Fig. 5) trips the Starting Lever Release Trip 64215 (Fig. 6).

To adjust tension loosen Bristol Set Screw 99-28-30 in Upper Collar 43185 (Fig. 5). 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 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.
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- Rivet, Starting Lever
- Connecting Link Rivet
- Record Support Post
- Record Support Shelf and Tube
- Spacer, Front Locking Lever
- Spacer
- Gear Sector, Front
- Starting Lever Spring
- Main Cam Stud
- Spacer (Tone Arm Swing Lever)
- Spindle Thrust Plate
- Gear Sector, Rear
- Wire Clamp
- Gear Sector Spacer
- Tone Arm Rest Pin
- Tone Arm Brace
- Spring Clip
- Centering Lever
- Plunger Rocker
- 10" Record Plunger
- 12" Record Plunger
- Rocker Lever Spacer
- Centering Lever Washer
- Centering Lever Guide Stud
- Rocker Connecting Link Rivet
- Centering Lever Return Arm
- Centering Lever Rivet and Guide Pin
- Rocker Connecting Link
- Spacer Sleeve
- Switch Shifting Lever
- Switch Mfg. Bkt
- 1/4"-28 Hex Nut, Only
- Switch Trip Finger
- Reject Lever (for use with Die Case Spindle Bracket)
- Centering Lever Guide Pin
- Spacer
- Reject Lever
- See 37122
- See 37121
- Record Support Shelf, Tube Assembly
- Record Shelf Cover, Rear
- Record Shelf Cover, Front
- Main Cam Only
- Record Support Post
- Tone Arm Support Housing
- Reject Knob
- Tone Arm
- Paper Gasket
- Cycle Switch Cover
- Bushing for Crystal Lead
- Crystal Shim
- Spring, Rear Locking Lever
- Spring, Shelf Lock Lever, Front
- Spring, Tripl Roller
- Spring, Centering Lever Equalizing
- Switch Trip Lever Spring
- Counter-balance Spring
- Tone Arm (and Pick Up Assembly)
- Crystal Cart
- White Sapphire Needle
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The Capehart P-77 Record Changer is a dual speed changer designed to operate at either 33 1/3 r.p.m. or 78 r.p.m. This changer is capable of playing 12-inch, 10-inch, or 7-inch records automatically at either speed. Furthermore, 12- and 10-inch records can be played intermixed.

The information herein presented is published in an effort to assist the serviceman in properly preparing the instrument for operation and in effecting any replacement or adjustment which he may be called upon to perform on the long play section of the subject model record changer. Information or adjustments that are not covered herein are the same as those required for the standard version of this changer (Model P-71), and are already covered in the maintenance manual for the Model P-71 record changer, previously published.

**SPECIFICATIONS**

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<tr>
<th>Voltage Rating</th>
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<td>Speed</td>
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<td>Type Pickup</td>
<td>Variable Reluctance</td>
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<tr>
<td>Type Needle</td>
<td>Osmium Point</td>
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**MICROGROOVE**

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<td>33 1/3 r.p.m.</td>
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</tr>
<tr>
<td>12</td>
<td>12</td>
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<tr>
<td>10</td>
<td>12</td>
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<td>10</td>
<td>12</td>
</tr>
<tr>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>7-inch records</td>
<td>12</td>
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</table>

**MAXIMUM RECORD**

- Variable Reluctance:
  - 12-inch records
  - 10-inch records
  - 7-inch records

**STANDARD**

- 78 r.p.m.
- 10
- 12

**IMPORTANT**

WHEN PUTTING TONE ARMS INTO POSITION ON THEIR MOUNTING - DO NOT PRESS ON THE RELEASE BUTTONS. THESE BUTTONS SHOULD ONLY BE COMPRESSED WHEN REMOVING THE TONE ARMS!

IF YOU PRESS THE BUTTONS WHEN TONE ARM IS BEING Pressed INTO POSITION ON ITS MOUNTING, YOU ARE LIKELY TO BEND THE BRONZE LOCKING CATCH!

**CHECKING**

After carefully uncrating the instrument, the following checks should be made before attempting to operate the record changer:

1. Remove all packing material and pieces of tape from the changer compartment.
2. Remove the shipping bolts from the floating mounting panel.
3. See that the changer and mounting panel float freely upon the spring mountings.
4. Check the sliding drawer to see that there is no binding in the roller and that the leads to the changer do not interfere with the action of the drawer.
5. Check both the 78 r.p.m. and 33 1/3 r.p.m. tone arm to see that the needle and pickup has not been damaged.
6. Run changer by hand through cycle to make sure action is free from binding.
7. See that the changer is level. If the changer is not level, use the simple method, described herein, to correct the condition.
8. Check the turntable speed at both 78 r.p.m. and 33 1/3 r.p.m. with a stroboscope record.

**LEVELING**

1. Remove the four acorn nuts which hold the changer mounting board to the spring mounts.
2. Lift the changer up from the front. It may or may not be necessary to remove the changer; however, if it is, be sure to remove the electrical connections from the underside before removing the changer.
3. Place a small washer, which can be easily made of soft cardboard (such as a blotter), on the spring mounts on the side which is the lowest. One or more of these washers may be used, depending on the amount the changer was off-level.
4. Set the changer back on the spring mounts, and replace the four acorn nuts. In this operation, be sure that the wires do not become fouled by either the changer or the slide mechanism.

**PREPARING FOR OPERATION**

1. The Tone Arm being pressed down on the Tone Arm Support causes inter-connection of the contacts from the pickup and the phono-output jack, thus the pickup is connected electrically.
2. The Tone Arm, in addition, when pressed down contacts one of the two switching rods. In this case (switching from 78 r.p.m. to 33 1/3 r.p.m.), it will contact the rod closest to the control button. One of these two rods, depending on which speed the changer is operating at, will at all times be protruding through the top of the main frame, near the tone arm support bracket. The rod is pressed down, by the force exerted by the tone arm being pressed, thus actuating a mechanical switch on the underside of the changer. The action of the rods at one end transmits the rotary motion by means of a drive shaft to a switch arm which is connected to the other end of the drive shaft. This switch arm (or lever) in turn acts to raise or lower the idler pulley (in this case, raise) so that it contacts the proper section of the motor drive shaft for the desired turntable speed.

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For additional data: See Farnsworth Model P71, Pages RCD.CH. 19-1 through RCD.CH. 19-10
Parts Identification

Adjustments

Tone Arm Set Down

When it is necessary to adjust the Tone Arm Set Down so that after the changing cycle is completed, the tone arm will set down properly in the lead-in grooves of the record, the adjustment should be made first for the 7-inch position and at 33 1/3 r.p.m. speed. The procedure to be followed is outlined below:

1. Place the 33 1/3 r.p.m. tone arm in place on the tone arm support.
2. Set the 7-inch Set Down Lever in position against the Tone Arm Interceptor Lever.
3. Make sure that the changer is in the playing position.
4. Loosen the set screw on the Tone Arm Crank (located on the underside of the changer).

If the tone arm sets in too far on the record, rotate the tone arm outward slightly while holding the Tone Arm Crank. If the tone arm does not set in far enough, rotate the tone arm inward slightly.

5. Tighten the Tone Arm Crank set screw.
6. Check the set down for a 7-inch record. If the adjustment is not correct, repeat steps 4 and 5.
7. Set the 7-inch Set Down Lever to the 10- and 12-inch record position.
8. Check the tone arm set down for 10-inch and 12-inch records at 33 1/3 r.p.m.
9. If the set down is not correct, adjust by means of the Tone Arm Adjusting Stud (located on the changer base). This adjustment will have no effect on the 7-inch adjustment already made.
10. Set the 78 r.p.m. Tone Arm in place on the Tone Arm Support.
11. Check the set down on 10- and 12-inch records. If the adjustment is not correct, the 78 r.p.m. tone arm may have become slightly bent in handling, and it will be necessary to rebend the arm slightly to provide the proper set down.

The Push Rods

The Push Rods, as shown in Figure 5, should be adjusted between two limits. When the rod is in the “up” position, it should not extend any higher than one-half the thickness of the support bracket plate. This is to insure that the rod does not bind on the Tone Arm Housing. The other limit is that the rod be high enough that when the tone arm housing is pressed down, the switching action will be completed.
The rods are adjusted at the factory, and the lock nuts are tightened and secured with Glyptal. If it is necessary to readjust these rods, be sure to tighten the lock nuts and coat them with Glyptal or some similar securing agent.

**NEEDLE PRESSURE**

This adjustment is accurately made at the factory; therefore, it should not be necessary to readjust the needle pressure under normal operating conditions. If, for some reason the factory adjustment no longer holds true, the following procedure should be used in readjusting.

The procedure for adjusting the 78 r.p.m. tone arm is the same as for the 33 1/3 r.p.m. tone arm, with exception of the pressure specifications.

There are two adjustments to be made in setting the tone arm for correct needle pressure. These are: The Tone Arm Spring Adjustment (located on the outer side of the tone arm housing), which is adjustable with a small screwdriver, and the Tone Arm Sideplay Adjustment (located directly opposite the spring adjustment), which requires a No. 8 Allen Wrench for adjustment. Both adjustments utilize a No. 6 Allen Head Locking Screw to maintain adjustment. The locking screws are located on the underside of the tone arm housing. See Figure 7.

**Detailed Procedure:**

1. Loosen the locking screws on both adjustments.
2. Loosen slightly the Tone Arm Sideplay Adjustment.
3. With a Gram Scale (if adjustment is being made for the 33 1/3 r.p.m. tone arm), test the up and down pressure of the tone arm. See Figures 8 and 9. This should be within the limits of 5 to 7 grams. If it is not, adjust the Tone Arm Spring Adjustment screw to provide the correct pressure.

   **Note:** With the 78 r.p.m. Tone Arm, the up and down pressure should be 1 5/8 ounce ± 1/4 ounce.

4. Tighten the locking screw for the spring adjustment.
5. Adjust the Tone Arm Sideplay screw to provide approximately 1/32” horizontal play, measured at the pickup.

   **CAUTION:** Do not tighten this screw beyond this limit, as added friction will be exerted which will effect the needle pressure.

6. Tighten the locking screw for the sideplay adjustment.

Lift the micro-groove 33 1/3 r.p.m. tone arm, as shown in Figure 8, approximately 1/2 inch and make a note of the gram scale reading. Then lower the tone arm approximately 1/2 inch and again note the reading of the scale, as in Figure 9. The two readings noted are the limits of needle pressure. The actual needle pressure is taken as the average of these two readings. The difference between the two readings is referred to as the Vertical Friction. This should not be more than 2 grams.

**WOW AND RUMBLE**

The condition known as "wow" is in actuality the result of a variation in speed within each revolution of the turntable. The most common cause of wow in turntable drive motors is found to be in the idler drive wheel, either in the bearing or the rubber drive tire. Proper lubrication and elimination of "gumming" will eliminate the bearing as a source of trouble. Some faults of the drive tire which may cause wow are listed as follows:

- Oil or grease on the tire—clean with a cloth saturated in carbon tetrachloride.
- Dent formed or worn in the tire. This can be caused by pressure of the motor pulley if the changer has remained idle for a long period of time or by the motor pulley if the turntable should become stalled. The remedy in this case is replacement of the idler drive wheel.
- Another possible source of wow is in the bearing support washer and its relationship with the turntable hub. This washer is held in place by two screws, the same two screws that are used to fasten the Turntable Hold Down Levers. The washer must be concentric with the turntable hub, otherwise, friction may result. Concentricity of the washer and turntable hub is accurately set at the factory; however, it is possible that the washer will become misaligned when the turntable is removed for servicing purposes. Therefore, it is recommended (to eliminate this source of "wow") when removing or replacing the turntable to loosen only one of the hold down lever screws at a time. In this way the support
If the reading is more than 2 grams, it will usually be found that the .005-inch spacing (mentioned in step 4 of Tone Arm Set Down Adjustment) of the tone arm support bracket has not been maintained.

**REPLACEMENT OF PICKUP UNITS**

**The Standard 78 r.p.m. Tone Arm**

The entire pickup housing on the 78 r.p.m. tone arm is easily removable as the housing plugs into a fixture in the end of the tone arm tube. This facilitates removal and replacement since there are no screws to be removed and solder connections to be made. If it is desired to replace just the cartridge, this can be done by first removing the small spring clip which holds the cartridge in its housing. Next, unsolder the pickup leads from the plug pins in the end of pickup housing. When the new pickup cartridge is placed in the housing, its leads must be soldered to the same plug pins as were those of the old cartridge.

**The Micro-Groove 33 1/3 r.p.m. Tone Arm**

The pickup housing on this tone arm is not removable. Replacement of the pickup cartridge in the 33 1/3 r.p.m. tone arm is accomplished by removing the two small screws from the underside of the pickup. NO UNSOILING is necessary since slip-on connectors are used for connecting the leads to the terminals on the pickup cartridge.

**REPLACEMENT OF THE MICROGROOVE NEEDLE**

The needle in this 33 1/3 r.p.m. pickup is replaceable. In order to replace the needle, the unit is first removed as described above. An ejecting tool is needed. This can be a straightened paper clip or similar object. Holding the pickup unit in the left hand, with the needle facing down, insert the ejecting tool in the hole in the brass eyelet in the center of the unit, and gently push the needle out. To insert a new needle, place the base pin of the needle in the center hole of the pickup and press down at the base of the needle. Do not press down on the stylus itself or its shaft. The needle aligns itself properly when pressed down.

**CIRCUIT MODIFICATIONS**

**CAPEHART P-4 INSTRUMENTS**

A circuit change is to be incorporated in instruments using the P-4 chassis, when used with the P-77 Long Play Record Changer. The change increases the frequency range of these instruments, and provides increased gain in the Pre-Amplifier. The change follows:

- The .01 mfd. condenser (Ref. No. 41), which is connected in series with a 68K resistor from ground to the junction of the 220K and 100K resistors (Ref. Nos. 12 and 5 respectively), in the plate circuit of the 2nd pre-amp stage, has been changed to a .005 mfd, 600V condenser.

**CAPEHART P-7 INSTRUMENTS**

The Pre-Amplifier Circuit used with P-7 instruments when incorporating the P-77 Long Play Record Changer will be modified in production to provide increased frequency range and audio gain. The change follows:

- On the Pre-Amplifier Equalizer Can, the two .01 mfd. condensers (one connected in series with a 33K resistor from the grid of the 2nd pre-amp stage to ground, and the other connected in series with a 68K resistor from the phono output cable to ground), have been changed to .005 mfd., 200V condensers.

**PARTS LIST**

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<th>Part No.</th>
<th>Description</th>
<th>Part No.</th>
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<td>Idler Assembly</td>
<td>450066A</td>
<td>Speed Change Shaft &amp; Lever</td>
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<td>450074A</td>
<td>Idler Block Assy. (Inc. in 450023A)</td>
<td>450145A</td>
<td>Circle Completing Switch Housing &amp; Lead Assy.</td>
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The Capehart Model P-777 Automatic Record Changer is a three-speed changer, designed to play, automatically, all types of records currently being made. 12-inch, 10-inch or 7-inch records can be played at 78 r.p.m., 45 r.p.m. or 33-1/3 r.p.m. In addition, 12-inch and 10-inch records, designed for the same speed, can be played intermixed.

The information presented herein is intended to supplement the Maintenance Information already issued covering the Model P-77 two-speed record changer. The combination of the two then presents up-to-date preliminary service information on the P-777 record changer. The P-777 is similar to the P-77 in all respects except two; these are the motor assembly and tone arm swing lever assembly. Later production of the P-77 included the revisions to the swing lever assembly; therefore, these changers will differ from the P-777 only in the motor assembly.

A complete parts and price list for the P-777 Record Changer is included herewith.

**TONE ARM SET DOWN ADJUSTMENT**
(This information applies to P-777 and late production P-77 Changers.)

When it becomes necessary to adjust the Tone Arm Set Down so that, after the changing cycle has been completed, the tone arm will set down properly in the lead-in grooves of the record, the following procedure should be used.

**7-INCH RECORDS:**

1. Place the Microgroove Tone Arm in position on the tone arm support.
2. Set the 7-inch record Set-Down Lever in position against the Tone Arm Interceptor Lever.
3. Place a 7-inch record (either 33-1/3 r.p.m. or 45 r.p.m.) on the spindle shelf and press the reject button.
4. Observe whether or not the needle lands in the starting groove of the record.
5. If the needle does not land properly, make adjustment to the eccentric stop nut located on the tone arm swing lever spring bracket. This adjustment is accessible from the underside of the changer.
   a. Loosen the small lock nut which secures the eccentric stop.
   b. If the needle lands too far in on the record, rotate the eccentric stop so as to move the swing lever toward the axis of the eccentric stop.
   c. If the needle lands off the edge of the record, rotate the eccentric stop so as to move the swing lever away from the axis of the eccentric stop.
   d. Tighten the lock-nut and secure with Glyptol or a similar fixative.
6. Check the adjustment by observing the set down with a full stack of records.

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10-INCH AND 12-INCH RECORDS:
1. Check the needle landing for 10-inch records with both tone arms.
2. If needle landing is not correct, adjust by means of the Tone Arm Adjusting Stud (located on the changer base). This adjustment has no affect on the 7-inch record adjustment already made.
3. Check the needle landing for 12-inch records with both tone arms. This, normally, will not require re-adjustment, if the 10-inch adjustment has been properly made.
4. Check the adjustment by observing the set down with a full stack of intermixed 10 and 12-inch records.

**POSSIBLE SERVICE PROBLEMS**

**TONE ARM SET DOWN**

1. If the Microgroove Tone Arm cannot be adjusted for proper set down on a 7-inch record, there are two possible causes, as follows:
   a. The tone arm crank has slipped on the tone arm support bracket tube. To be certain of this possibility, place the standard tone arm on the support bracket and observe the needle landing. If the standard tone arm also cannot be adjusted for proper set down, then adjustment should be made by loosening the set screw on the Tone Arm Crank. There is a .006-inch spacing required between the tone arm crank and the main frame; therefore, a .006-inch shim should be used to maintain this spacing while adjustment is being made. After loosening the set screw, hold the crank firmly with one hand and with the other rotate the tone arm in the direction necessary for proper set down. Tighten the set screw on the tone arm crank. A finer adjustment can now be made by the procedure given in Step 5 under "7-inch Records."
   
   b. The second possible cause is that the Microgroove Tone Arm has become misshapened. This possibility can either be eliminated or proven as in Step 2 by observing the needle landing of the standard tone arm. If the standard tone arm does set down properly and the Microgroove does not, then it is proven that the tone arm crank is in its proper position. Therefore, the Microgroove Tone Arm is not shaped correctly. The remedy is to reshape the Microgroove tone arm by bending the tube slightly until it does set down properly.

2. If the Microgroove Tone Arm can be adjusted properly for 7-inch records, no difficulty will be experienced in adjusting this tone arm for 10-inch and 12-inch records. However, if the standard tone arm cannot be made to set down properly (while the Microgroove arm does set down properly) it can be assumed that the standard tone arm has become misshapened. The remedy in this case is to reshape the standard tone arm to provide proper set down.

**BENT TONE ARMS**

The possibility of P-777 tone arms (particularly the Microgroove arm) becoming bent in shipment (resulting in improper set down when the instruments are unpacked and checked) is quite unlikely, for the tone arms are carefully packed in a separate carton.

It is possible that there is some slight variation in the relative shapes of the tone arms. It is important that the persons who unpack and check the instruments do not intermix the tone arms from various instruments at the time of unpacking. To have the changer operate with the least amount of prior adjustment, the tone arms which are packed with each particular instrument should be used with that instrument only. The record changer in each instrument is adjusted (at the factory) using the tone arms that are shipped with it.
MODEL P-777

BROKEN TONE ARM LOCK SPRINGS

The main cause of breakage of this lock-on spring results from improper methods of placing and removing the tone arms. The small release button on the tone arm housing is to be used only when removing the tone arm. If this button is depressed when placing the tone arm on the support bracket, the shaft of the button will exert pressure on the top of the lock-on spring, thus bending it as the tone arm is pressed down. It is probable then that when the tone arm is placed on the support again, the spring will not line-up with the hole in the cover plate; therefore, the spring is bent down and broken. Damage to the spring can also result from removal of the tone arm without pressing the release button.

IMPORTANT! Do not press the release button when placing the tone arm on the changer. Do press the release button when removing the tone arm.

MISALIGNED MOTOR BEARINGS

It is possible that the floating bearings in the motor may become misaligned in shipment, resulting in motor noise. This is possible if the changer or instrument is subjected to excessively rough handling in shipment. The bearings can be easily re-aligned by tapping the motor (with the handle of a screwdriver or light tack hammer) while the motor is running.

P-777 PARTS

<table>
<thead>
<tr>
<th>Ref No.</th>
<th>Part No.</th>
<th>Description</th>
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<tbody>
<tr>
<td>1</td>
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<td>Record Lift Lever Assembly.</td>
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<tr>
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<td>11378</td>
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<td>4</td>
<td>11495</td>
<td>Inner Spindle Assembly.</td>
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<td>13825</td>
<td>Tone Switch &amp; Brkt. Assembly (Complete)</td>
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<td>80030</td>
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PRELIMINARY MAINTENANCE INFORMATION

This information is published for the purpose of aiding the serviceman in properly setting the instrument up for operation and in effecting replacements or adjustments which he may be called upon to perform on those sections of the changer which have to do with its dual speed feature. Information or adjustments which are not covered herein are the same as those required for the standard version of this changer, and are already covered in the maintenance manual for the Capehart Model 41-E Record Changer, previously published.

SPECIFICATIONS

Power Consumption at 117 volts
  Turntable Motor .................. 22 Watts
  Cycling Motor ..................... 91 Watts
Voltage Rating .......................... 105 to 125 volts at 60 cycles
  Turntable Speed ..................... 78 r.p.m. & 33 1/3 r.p.m.
Type Pickup ........................ Variable Reluctance
Type Needle ......................... Osmium Point

MAXIMUM RECORD CAPACITY

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<th>Standard 78 r.p.m.</th>
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<tr>
<td>16 ........................... 10 inch or 12 inch records ............. 16</td>
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<tr>
<td>(intermixed) .................. ................................. manual</td>
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<tr>
<td>manual ....................... 7 inch records .................... manual</td>
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SETTING UP FOR OPERATION

After carefully uncrating the instrument, the following checks should be made on the record changer prior to its operation:

1. Remove all packing material and pieces of tape from the changer compartment.
2. Remove the shipping bolts which hold the changer baseplate down during shipment.
3. See that the changer floats freely upon the spring mountings.
4. Check both the 78 r.p.m. and 33 1/3 r.p.m. tone arms to see that the needle and pickup have not been damaged.
5. Check the turntable speed at both 78 r.p.m. and 33 1/3 r.p.m. with a stroboscope record.
6. Refer to the section "41-E2 & 41E Check List".

ADJUSTMENTS

TONE ARM SET DOWN ADJUSTMENT

Check the tone arm height. The pickup needle should barely clear the turntable cover when there is no record on the turntable. The height of the tone arm can be adjusted by means of a small screw, located on the underside of the tone arm housing. The setting of this screw should be secured with Glyptal after the adjustment is made. The adjustment is the same for both the standard and microgroove tone arms and the check should be made with both arms.
10-INCH SET DOWN ADJUSTMENT

Allow the changer to deliver a 10" record to the turntable, and let the tone arm move over the record. Just as the changer completes its cycle and the tone arm sets down on the record, stop the changer by turning the "Off-On" switch on the changer to the "Off" position. Lift the pickup end of the tone arm up and move the tone arm away from the spindle; a definite "stop point" will be noticed in so doing. Beyond this "stop point", a spring tension will tend to return the tone arm to the set down position. Hold the tone arm against this "stop point", and turn the 10-inch indexing screw in the direction indicated depending on the direction of the set down adjustment needed. The changer should be allowed to complete at least one more cycle with a 10-inch record to check the adjustment. The adjustment should be checked with both standard and microgroove records using the correct tone arm for each.

12-INCH SET DOWN ADJUSTMENT

The adjustment procedure is the same as that described for the 10-inch adjustment with the exception that a 12-inch record is used, and the 12-inch indexing screw is rotated for adjustment. The adjustment should be checked as before with both standard and microgroove records and tone arms.

ADJUSTMENTS OF THE SPEED SELECTOR PINS

The selector pins or rods, should be adjusted so that there is always at least .015 inch clearance between the top of the pin, when it is in the up position, and the underside of the tone arm housing. This is to ensure that the pin does not bind on the Tone Arm Housing as it moves while playing a record. If both pins are too high when in the up position, the pins can be lowered by placing the paper spacer (Part No. 60674), between the speed switch mounting bracket and the bearing casting. If only one of the pins is too high, this means that the cam shaft has slipped in the cam. The shaft is held in place by two allen head set screws. To adjust, the screws should be loosened and the shaft rotated until the selector pin is at the right height. If the motor speed is set for 78 r.p.m., the selector pin on the right should be in the up position. Tighten the set screws, and switch to the other speed. Check the clearance between the tone arm housing and the other selector pin.

NEEDLE PRESSURE ADJUSTMENT

The needle pressure of both the standard and microgroove tone arms is accurately set at the factory prior to shipment of the instrument; however, if it should become necessary to readjust this setting on either of the two tone arms, the following procedure is offered.

Procedure for adjustment of the standard tone arm is the same as that for the microgroove tone arm, with exception of the pressure specifications.

The adjustment screw is located on the underside of the tone arm housing and is accessible from the rear of the tone arm housing when the tone arm is in place on the changer. A small screw driver is used for adjusting this screw which is arranged so that rotation in a clockwise direction will increase needle pressure and rotation in a counter-clockwise direction will decrease it.
NEEDLE PRESSURE ADJUSTMENT - (cont.)

1. Check the tone arm side play. The tone arm should have approx. 1/32” horizontal play, measured at the pickup. If the amount of play does not correspond with this figure, adjustment can be effected by means of the two Allen Head set screws, which form the pivot point for the tone arm tube. The screws are secured with locking nuts, which should be tightened after the side play adjustment is made. This adjustment should be checked for both tone arms.

2. Using a Gram Scale for the Microgroove tone arm, and an Ounce Scale for the standard tone arm, check the up and down pressure of the tone arm in the following manner:
   Lift the tone arm up with the scale approx. 1/2 inch and make a note of the reading. Then lower the tone arm approx. 1/2 inch, and again note the scale readings. The two readings noted are the limits of the needle pressure. The actual needle pressure is taken as the average of these two readings. In the case of the microgroove tone arm, the actual needle pressure should be within the limits of 5 to 7 grams. For the standard tone arm, the specifications are 1 1/8 oz. + 1/8 oz.

3. If the needle pressure does not come within the specified limits, adjustment should be made on the needle pressure adjusting screws and the pressure re-checked as described in Step 2.

ADJUSTMENT OF THE CONNECTING ROD

The connecting rod should be adjusted so that positive switching is achieved at the Idler Block Assembly. There should be a small amount of play in the rod action. The rod can be shortened or elongated in the following manner:

1. Remove the hair pin cotter which fastens the motor end of the connecting rod to the switching link at the idler block.
2. Loosen the locking nut on the motor end.
3. Rotate the motor end of the connecting rod in or out, depending on whether the rod needs to be shortened or lengthened.
4. Replace the hair pin cotter, and tighten the locking nut.

MODIFICATIONS INCORPORATED IN THE 41-E2 RECORD CHANGER

Certain changes have been made to various parts of this changer, along with the added features of two speed operation. These modifications, listed herein, were incorporated to provide more accurate adjustment to accommodate microgroove records.

TRIP SLIDE ASSEMBLY (PART NO. 09387)

The trip slide assembly has been revised (previous part no. 09176), to provide a more convenient method of trip friction adjustment and to provide a means of adjusting the height of the assembly with respect to the baseplate. A new trip lever bushing is incorporated with a bearing adjusting screw and locking nut. To raise or lower the trip slide assembly, the nut is first loosened and the screw is rotated to provide the correct height. The nut is then tightened to secure the bearing adjustment.
TRIP SLIDE ASSEMBLY (PART NO. 09387) Cont.

Adjustment of the trip friction is provided by rotating the small adjusting screw (Part No. 36278), located in the center of the flat metal trip friction spring (Part No. 51166). Rotating the adjusting screw in a clockwise direction will cause the spring to exert more pressure on the trip pivot pin (Part No. 55465), thus increasing the friction between the trip slide assembly and the automatic stop trip lever.

TURN TABLE HEIGHT ADJUSTMENT

The 41E-2 incorporates an adjustable turntable bearing which enables the height of the turntable to be varied with respect to the baseplate. The new parts added to the changer for this purpose are:

55462 - TURN TABLE ADJUSTING PLATE
37690 - ADJUSTING SCREW
37691 - ADJUSTING NUT

To raise the turntable, the adjusting screw is rotated clockwise, after first loosening the adjusting or locking nut. To lower the turntable, the screw is rotated in the reverse direction. The correct height for the turntable is the same height (4 1/64"), as the milled surface on which is mounted the tone arm supporthousing.

MAIN CAM SHAFT (PART NO. 650013A)

The main cam shaft has been made in two sections, and a coupling has been provided between the reduction gear box section and the main cam section. The main cam section of the shaft can thus be de-coupled from the motor and reduction gears. The main cam shaft section is fastened in the coupling by means of a small set screw. The set screw should always be tightened on the flat side of the main cam shaft only. This prevents the shaft from slipping within the coupling.

This shaft de-coupling arrangement enables the serviceman to run the changer through cycle by hand, thus facilitating the checking and adjusting of the cycling mechanism.

41E-2 & 41E CHECK LIST

It is important to use a step by step method when checking either the Capehart Model 41-E2 or Model 41E Record Changers. If this method is not followed, it is possible to make one adjustment against the other, which will result in improper operation. This could be the cause for erratic conditions. Therefore, the following list should always be followed in order, referring to the Maintenance Manual on the 41E Record Changer for adjustments, which are not included herein.

TURN TABLE

1. (a) Check height of turntable with respect to the base plate. This is accomplished by placing a straight edge ruler long enough to reach the distance, taking in the diameter of the turntable, to a point along side the tone arm collar assembly. Observation will reveal the tone arm collar is mounted on a milled surface.

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### 41E-2 & 41E CHECK LIST (Cont.)

#### TURNTABLE

1. (a) Cont.)
   
   This milled surface and the ones under the hook post and buckhorn are all milled at the same time and are the same height above the base plate. We call these points bosses and are the points at which we start our measurements. The top of the turntable should be level with this boss. A tolerance of 1/64" high or low would be allowable. For 41-E2, refer to "TURNTABLE HEIGHT ADJUSTMENT".
   
   (b) To remove turntable, remove set screw in turntable shaft housing.

#### RECORD TRAY

2. (a) Check centering or record lowering tray with respect to turntable. This can be accomplished by placing the record selector lever in the "one side" position, run the record changer through a cycle to a point where the record lowering tray pauses for the second time. Stop the changer by the "on-off" switch at this point. Note the distance between the lowering tray and turntable. This distance must be equal on either side of turntable. Also note the level of the tray at this time. The front points of the 10" felt in the record tray should be level with the turntable cover.

   (b) Check for binding between record tray gears. To do this, it will be necessary to disengage the lever connecting the shaft with the quadrant section of the record tray gear, from the record tray slide arm assembly by removing the eccentric shoulder screw. Move tray up and down by hand.

   (c) Check 10" rubber bumpers.

   (d) Check 10" rubber guard for smooth operation.

   (e) Clean and remove rough spots on polished edges and surfaces.

#### BUCKHORN

3. (a) Check distance from the center of magazine pivot pin mounted in the buckhorn section of the magazine support, to the milled section of the base plate, on which is mounted the record separator hook post. This distance should be 7 9/16", plus or minus 1/16".

   Also check the distance between buckhorn pivot arms, which should be 13 7/16".

#### MAGAZINE

4. (a) Check distance between magazine pivot arms. This should be 13 1/4".

   (b) Check position of the upper record support on changers incorporating the single knife. The lower points of this support should be even and centered. Changers incorporating the double knife; check the roller and position of assembly.

   (c) Check magazine position with respect to lowering tray. Channel grooves will be noted at the base end of the record lowering tray. These were cut for the purpose of allowing the two lowest points of the record magazine to pass when traveling through the change cycle to deliver a record; therefore, it is necessary that these two points are centered within these channels. It will also be noted there are two holes at the back end of these tray channels to allow the level points of the record support bracket to protrude through the record lowering tray. These points should be adjusted to an equal distance with respect to the outside edge of the holes.

   (d) Clean and remove rough spots on all polished surfaces and edges.

   (e) Check & oil rollers -- Rollers should roll quietly.

   (f) Check record reverse arm and guide assembly. Should be parrallel and centered with a 12" record in magazine when changer is stopped at that portion of the cycle where the reverse arm has come in contact with the magazine and rubber bumper.

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(g). Check reverse arm fork as it engages the crank pin assembly. Should be centered and engaged so that the jaws extend around the crank pin about 1/8". At this point, check the return position of the magazine with the stop screw located at center and back of the buckhorn support. This would be the adjustment that would determine the clearance of the crank pin. See the 41E manual for adjustments of the travel of the crank pin assembly.

(h). Check linkage—magazine should return against stop snugly.

(i). Check record selector knife.

(j). Check record selector knife as it engages the record separator hook.

(k). Check felts on back side of lower record support casting. If loose, can be the cause of late delivery of records which would cause chipping due to sharp contact with record lowering tray tongue.


TONE ARM

5. (a). Check Tone Arm Height. Refer to "Tone Arm Set Down Adjustment", or the 41E

(b). Check the distance of Travel of the tone arm in toward the turntable spindle on a 12" record.

(c). Check pickup for tracking in record grooves.

(d). Check 10" and 12" landing position.

(e). Check feed-in tension spring.

TRIP SLIDE ASSEMBLY

6. (a). Height above base plate should be high enough at the rubber roller end to contact the trip clip on under side of turntable. Refer to "Trip Slide Assembly", or to the 41E Manual.

(b). Slide action should work freely and oil should never be used.

(c). Setting of stop should be set so that it is impossible for the trip clip on turntable to lock with trip slide assembly.

(d). Check rubber roller.

PLAY CONTROL

7. (a). Check play control.

BELOW CHASSIS

GEAR REDUCTION BOX

8. (a). Check adjustment of second reduction gear train. Should be no slack or bobbing of this assembly. This can be determined by under noise of gears.

(b). Check to see that oil has been put in gear box. A maximum of 1 oz. of heavy oil should be put in gear box. The gear should dip into this oil level.

(c). Check for oil leaks.

(d). Check position of reverse segment with respect to stops and locking assembly.
41E-2 & 41E CHECK LIST (Cont.)

TONE ARM MECHANISM

9. (a). Check horizontal and vertical position of tone arm crank assembly also relation to tone arm swing lever.

(b). Check position of tone arm brake spring collar.

(c). Check action of tone arm stop bracket assembly.

(d). Check position of tone arm, lift and swing cam.

(d). Check tone arm trip pin.

MERCURY SWITCH OPERATION

10. (a). Check reset lever and timing with main cam.

(b). Check contact of reset lever & mercury dog.

(c). Check clearance between top of mercury dog and lever extending down through base plate from trip slide arm assembly.

MAIN CAM SHAFT (See "Main Cam Shaft"

11. (a). Check for underplay with record magazine tilted up.

(b). Check action of slide arms of main cam.

(c). Check record selector lever action.

(d). Check cam track switches.

(e). Check lubrication.

ADDITIONAL CHECK LIST FOR 41-E2 ONLY

1. Check Idler Wheel.

2. Check Idler Mounting Assembly Part No. 14108.

3. Check connection link Assembly Adjust link to divide travel of 33 1/3 r.p.m. to 78 r.p.m. Part No. 09382.

4. Check Support Bracket, cam & hub assembly Adjust for equal throw of shift pins under tone arm key.

5. Check vertical tone arm pressure Adjust screw in cover plate assembly Part No. 09385.

6. Check for clearance between tone arm hinge bracket No. 57271, and tone arm housing.

7. Check clearance on friction cork above tone arm crank - should be .005.

8. Check for dirt in tone arm bearing.

9. Check clearance of shift pins against tone arm hinge bracket on 33 1/3 and 78 r.p.m. arms.

10. Check needle - should protrude beyond guard 1/32".

11. Check needle height - Should be adjusted to clear turntable with no record.

12. Check trip slide assembly --not to exceed 7 grams.

13. Check motor fan blades--should run true.
PARTS LIST

Following is a list of new parts and parts that have been revised. Parts that are not listed here are the same as those used in the standard version of this changer, the 41E.

44067 .... Two Speed Turntable Motor
15246 .... New Turntable
14100 .... Tone Arm Assembly (33 1/3 r.p.m.)
14101 .... Tone Arm Assembly (78 r.p.m.)
11378 .... Pickup & Housing Assembly (78 r.p.m.)
05160 .... Pickup & Lead Assembly (33 1/3 r.p.m.)
450148A.... Gear Shaft and Hub Assy.
0003-161 003 #6/32 x 7/16" F.H.M.S.
2085-071 017 #6/32 x 5/8" 0.H.M.S.

14108 .... Idler Mtg. Assy.
55456 .... Selector Pin
37688 .... "E" Washer
64492 .... Selector Spring
60674 .... Paper Spacer
36266 .... Washer
62199 .... Rubber Tone Arm Rest
2005-109-003 #4/40 x 3/8 F.H.M.S.
04135 .... Tone Arm Support Housing
07781 .... Speed Switch Support Bracket Assy.
09382 .... Connecting Rod Assy.
05163 .... Connecting Rod Motor End Assy.
55459 .... Connecting Rod (Cam End)
55461 .... Connecting Rod Adjusting Sleeve
54329 .... Contact Washer
37689 .... Washer
80528 .... 3 pr. Plug.
15245 .... Speed Switch Cam & Hug Assy.
57274 .... Tone Arm End
37685 051 Pivot Screw #6/32 x 3/8"
2016-005 003 #8/32 Hex Nut
2006-053 051 3/4 x 3/16 F.H.M.S.
04134 .... Tone Arm Hinge Bracket Assy.
05159 .... Pickup Housing & Tone Arm Tube Assy.
71244 .... Microgroove (33 1/3 r.p.m.) Pickup
71295 .... Resistor (Ins. Car.) 3.3 K 1/2 W

55153 .... Pickup Contact Assy.
450150A .... Spacer
650015A .... Main Cam Shaft
55449 .... Tone Arm Locking Pin
54490 .... Locking Pin Spring
09597 .... Trip Slide Assembly
09581 .... Cover Plate Ass'y.
51152 .... Cover Plate
55450 .... Spring Adj. Screw
37684 .... Spring Adjust. Nut
37421 .... "E" Washer
64489 .... Adjustment Spring
04136 .... Tone Arm Hinge Bracket, finish Assy.

55462 .... Turntable Adjusting Plate
37690 .... End Thrust Screw (Turntable
37691 .... " " " Adjustment
55457 .... Speed Switch Cam Shaft
57273 .... Speed Switch Crank
14107 .... Contact "Lead & Plate Assy". (Tone Arm Support)
71298 .... Pickup (78 r.p.m.)
59472 .... Pickup Housing (78 r.p.m.)
58863 .... Retainer Spring
51166 .... Trip Friction Spring
55465 .... Trip Pivot Pin
55466 .... Trip Bearing Adjusting Screw
37692 .... Trip Bearing Adjusting Nut

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GENERAL

This record changer is designed for a power supply of 105-125 volts, 60 cycles. It operates at two speeds of 78 rpm and 33 1/3 rpm and is equipped with one pickup arm head for standard groove records (tan) and one pickup arm head for microgroove records (red). The changer provides manual or automatic playing and takes a one-inch stack of 10- or 12-inch records. When the last record is played, the pickup arm returns to its starting position. The motor has to be switched off manually by the Speed Control Knob.

MANUAL OPERATION

1. Turn the Record Selector Post (1, Figure 1) to the 12-inch position in the direction indicated by the arrow on the post, in order to give more clearance in loading and unloading records. Turn the Selector Switch (23, Figure 1) to Manual.
2. Place a record on the turntable. It may facilitate this operation if the record is slanted, as it is slipped over the spindle with the edge of the record held below the level of the record selector post shelf. Records may be removed in the same manner.
3. Check the pickup cartridge to make certain it is the correct type for use with the record being played. This is important as use of the wrong cartridge will cause excessive record surface wear or even immediate damage to the record.
4. Move the speed control (9, Figure 1) from the OFF position to the 33 1/3 or 78 position as required by the type of record. Hereby, the motor switch connects the motor to the power supply, and the disk starts to rotate at the proper speed.
5. Push down the R button (24, Figure 1) in the front right-hand corner of the record changer and gently place the stylus of the pickup arm on the outer groove of the record. Lift the arm just sufficiently to clear the record. If it is raised too high, it may catch, restricting its travel.

AUTOMATIC OPERATION

1. Turn the Record Selector Post (1, Figure 1) to ten or twelve, according to the size of the records used, and turn the Selector Switch (23, Figure 1) to Automatic.
2. With the Record Stabilizer Weight turned back, place a stack of records (one-inch maximum height) on the spindle so that the bottom record rests on the step of the spindle and on the shelf of the Record Selector Post. Turn the record stabilizer weight forward to rest on the edge of the top record.
3. Check the pickup head assembly to make certain it is the correct type for use with the records being played. Move the Speed Control (9, Figure 1) to the 33 1/3 or 78 position, as required by the type of records.
4. Depress the R button (24, Figure 1) to reject any record.
5. To stop the phonograph before all records have been played, simply turn the Speed Control (9, Figure 1) to the middle OFF position. The pickup arm may be moved without damaging the mechanism. However, after the last record has been played, the pickup arm is automatically locked in position and should not be touched until it has come to the rest post (25, Figure 1).
6. After playing, entire stack may be removed by the following procedure: Move the Record Stabilizer Weight (3, Figure 1) back out of position, place fingers of both hands under opposite edges of bottom record and lift straight up following the contours of the spindle.

OPERATING PRECAUTIONS

The microgroove records are easily scratched so that it is recommended to use utmost care in handling the pickup arm while setting it on the record. Be sure that the right cartridge is used with the various types of records (tan for standard records, red for microgroove records).

DO NOT use warped, home-recorded, or odd-size records for automatic operation, but use manual operation.
DO NOT use force to start or stop the motor or any part of the record changing mechanism. Store the records on the record post or the turntable, as may warp, especially at higher temperature. Allow any oil or grease on the drive wheel or any rubber part of the changer to dry or to direct-current or to different alternating current supply.

LUBRICATION

Apply light machine oil on:
1. Motor bearings, saturate top and bottom felts.
2. Pickup arm shaft (5, Figure 3). Apply one drop each to bottom bearing point, bracket hole, and hole through main base plate.
3. Ball bearing assembly (7, Figure 1).
4. Idler wheels’ felt (6 and 16, Figure 1).

Apply Lubriplate No. 110 with small brush to:
1. Idler wheel linkage (5 and 17, Figure 1).
2. Turntable shaft stud.
3. Pickup arm hinge pins.
4. Knife edge of raising lever.
5. Main cam bearing. For lubrication, the substrate assembly has to be removed.

Apply STA-PUT with a small brush:
1. Teeth of main actuating gear (45, Figure 4).
2. Tracks of main cam gear (46, Figure 4).
3. Teeth of large and small Idler gear (12, Figure 1).
4. Raising lever bracket bearing surfaces (38, Figure 4).

PICKUP

This record changer is equipped with two head assemblies containing two different cartridges—one for standard groove, and one for microgroove records. The pickup and head assembly identified by the red color has to be used for microgroove Long Playing records (33⅓ rpm). The other pickup and head assembly for use with standard groove records is identified by tan color. The pickup head required for the type of record to be played is fitted into its socket at the end of the pickup arm. The cartridge is designed according to the variable reluctance principle which will give superior results from the standpoint of high fidelity, low surface noise, and negligible record wear. The pickup is not interchangeable with a crystal pickup as the ratio of output voltage of the two types is in the order of 70 to 1, due to the very low output voltage of the variable reluctance cartridge.

The stylus supplied is of a semi-permanent type. Dust and foreign matter should be removed from the stylus assembly at regular intervals with a soft brush. Make sure the stylus arm is centered between the pole pieces.

CYCLE OF OPERATION

STARTING THE CHANGE CYCLE—The motor is started by movement of the Speed Control Knob (9, Figure 1). The rotating motor bushing (11, Figure 1) drives the Idler Wheel according to the speed selected by the Speed Knob. The bushing has sections of different diameter which are engaged with the flywheel (8 or 15, Figure 1) corresponding to the position of the Speed Control. This control operates a lever arrangement (5 and 17, Figure 7) which presses the corresponding flywheel against the motor bushing and the rim of the disk. The rotating motor drives the disk by means of the flywheel friction drive. By means of the Gear Wheel on this disk the large Idler Gear (12, Figure 1) is engaged transferring the movement to the smaller Idler Gear which drives the Main Cam Actuating Gear (45, Figure 1). The power of the motor (33, Figure 3) is transferred to the disk by means of friction which is produced by the pressure of the springs (10 and 21, Figure 7). This pressure is applied to the Idler Wheel by means of the Levers (17 and 5, Figure 1). The Gear wheel of the Main Cam Actuating Gear (45, Figure 1, or 45, Figure 4) is rotating all the time the motor is switched on and only when this is coupled to the Main Cam Gear (46, Figure 4) the change cycle starts causing the Pickup Arm and the Record Selector Lever to perform the respective movements. This coupling is accomplished by means of a Pawl (46A, Figure 4 and Figure 5) mounted on the Bottom Cam Gear (46, Figure 4, and Figure 5) which presses against the bottom teeth of the Main Cam Actuating Gear (45A, Figure 2). The weight of the lever causes the Pawl (46A, Figure 5) to engage the Main Cam Actuating Gear. Only when this weight is lifted the Pawl moves out of the tooth and disengages the lower Cam Gear (46, Figure 4). This movement of the Pawl is actuated by the left end of the Trip Lever (47, Figure 4). Automatic cycling may be started by pressing on the R button. The Automatic Trip Arm (34, Figure 2) trips the Velocity Trip and Roller Assembly (47, Figure 4). This releases the Actuating Pawl (46A, Figure 5), allowing it to engage the Main Cam Actuating Gear (45, Figure 4) and couples it to the Main Cam Gear (45, Figure 4), driving the mechanism through the change cycle.

CYCLING—A single revolution of the main cam results in a complete automatic cycling of the changer. This includes selection of a record from the stack, lifting the tone arm from its rest position and setting the needle in the first groove of the record.

RECORD FEED—The outer and lower surface of the Main Cam (46, Figure 4) controls the record selection. The wheel on the rocker arm lever follows the variation of the path on the Main Cam and causes by its swinging movement the Selector Arm (2, Figure 4) to push forward and drop a record.

PICKUP ARM MOVEMENT—The shaft at the end of the lever (38, Figure 3) moves along a specially designed path in the lower surface of the automatic trip cam and guides the disk hub and with it the pickup arm. The path is so designed that it swings and...
lifts the pickup as required. If at the last groove of the record the pickup arm traverses \( \frac{1}{4} \) inch-\( \frac{1}{2} \) inch in \( \frac{1}{2} \) revolution of the turntable, the Automatic Trip Arm (30, Figure 3) trips the Velocity Trip and Roller Assembly (47, Figure 4). This releases the Actuating Pawl on the Main Cam Assembly, causing it to change the cycle. The Automatic Trip Arm moves the movement of the pickup arm through the friction clutch (29, Figure 2). This clutch must be kept free of oil and grease.

### SERVICE ADJUSTMENTS

A. AUTOMATIC TRIP—When the movement of the Pickup Arm towards the spindle is greater than \( \frac{1}{4} \) inch in \( \frac{1}{2} \) revolution of the turntable, the Automatic Trip Arm (30, Figure 3) trips the Velocity Trip and Roller Assembly (47, Figure 4). This releases the Actuating Pawl on the Main Cam Assembly, causing it to change the cycle. The Automatic Trip Arm moves the movement of the pickup arm through the friction clutch (29, Figure 2). This clutch must be kept free of oil and grease.

B. AUTOMATIC LOCK LEVER—This lever (48, Figure 2) should move up and down freely with no record on spindle. Hook end of the automatic shut-off lock lever (48C, Figure 4) should catch the Pickup Arm Raising Disk (31, Figure 3) at the beginning of the cycle to prevent travel of the arm and to cause it to stop at the rest position. The weight of the records moves the spindle through the hole and presses the Spring of the Automatic Lock Lever (48C, Figure 4), thereby lifting this lever. With no records on the spindle, the hook (48C, Figure 4) should clear the Pickup Arm Disk by \( \frac{1}{8} \) inch with the mechanism at rest. This distance can be adjusted by bending the lip (D, Figure 6) underneath the lever.

C. VELOCITY TRIP—At the completion of the change cycle, the Actuating Pawl (40A, Figure 5) is engaged by the hook end of the Velocity Trip and Roller Assembly (47, Figure 4) which has been returned to its normal position by the reset points on the Main Cam Drive Gear (45B, Figure 4). This hook should be adjusted for about \( \frac{1}{4} \) inch and \( \frac{1}{2} \) inch clearance from the bottom of the Main Cam Actuating Gear (45, Figure 5). Greater clearance may permit the Pawl to bounce past the hook and re-engage, causing it to go into another cycle.

D. INDEXING—The eccentric screw, accessible through the top of the Pickup Arm should be tightened at any normal adjustment. Turn the screw clockwise to index the stylus in towards the spindle and counterclockwise to index the stylus out away from the spindle. Should further adjustment be necessary, proceed as follows: Operate the mechanism by revolving the turntable manually until the stylus drops to within \( \frac{1}{4} \) inch of a 10-inch record on the turntable. Check that the notch in the Pickup Arm Raising Disk engages the Pickup Arm Raising Lever (38A, Figure 4). With a No. 8 Bristol wrench in each of the setscrews (point C, Figure 6), alternately loosen one and tighten the other until the stylus rests above the record lead-in groove at the desired point. After completion of this adjustment, see that both setscrews are tightened.

E. PICKUP ARM LIFT—The stylus should approach the top record of a full stack on the turntable with approximately \( \frac{1}{8} \) inch clearance. Adjust by bending the pickup arm raising lever (38A, Figure 3) at point B (Figure 6). Do not attempt to move Pickup Arm Raising Disk up or down because it would influence the proper working of the Automatic Lock Lever (48, Figure 2).

F. RECORD DROP ADJUSTMENT—As the change cycle is started, the first motion of the inclined outer bottom surface of the Main Cam (46, Figure 4) causes the Record Selector Post (2, Figure 4) to move towards the Spindle about \( \frac{1}{2} \) inch. This position is maintained until the Pickup Arm has made its full outward lateral excursion, at which time the Record Selector Post again moves towards the spindle, causing the bottom record to drop into playing position. The distance between the Selector Post and the Spindle should be such that with a standard record (9\( \frac{1}{2} \) inches for 10-inch and 11\( \frac{1}{2} \) inches for 12-inch) the distance between the edge of the record and the front of the selector arm groove is approximately \( \frac{1}{4} \) inch. This distance is too great, records of minimum diameter will not be pushed off the Spindle Step and if there is too short records will be pushed against the Spindle with undue force, causing center hole damage. If the Record Selector Post (1, Figure 1) has been bent back away from the Record Spindle, a standard record might rest on the spindle step with its edge just over the edge of the Record Selector Post shelf. Then at the beginning of the change cycle, the record is pushed off the spindle by the initial movement of the Record Selector Post, so that the record drops on the Pickup Arm. The push-off distance can be easily adjusted by the Screw on the rocker arm (40, Figure 5) which is accessible above the top of the main plate (remove disk!). Turning the screw clockwise diminishes the distance.

G. TO REMOVE THE PICKUP ARM—While holding the Pickup Arm firmly, bend in one end of the blue steel pickup arm hinge brackets while lifting up on the arm. This will release the pickup arm hinge pin. Repeat on the other pickup arm bracket, so that the released arm may be turned over and laid on the turntable.

H. TO REMOVE THE SUB-PLATE ASSEMBLY—In case it is necessary to replace any of the major parts of the sub-plate assembly, this can be removed by the following procedure:

1. Remove the Spindle which is held in by a clip under the sub-plate.
2. Remove the Turntable and the Pickup Arm.
3. Unhook the Rocker Arm Return Spring (42, Figure 2), and remove the Rocker Arm Pivot Pin (41, Figure 2).
4. Remove the holding screws.

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**MODEL P8 REPLACEMENT PARTS LIST**

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Ref.</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>RMS-177</td>
<td>27</td>
<td>SPRING—Tension spring for two-speed shaft</td>
</tr>
<tr>
<td>RMS-179</td>
<td></td>
<td>SPRING—Spring for weight RWP-003</td>
</tr>
<tr>
<td>RMS-180</td>
<td></td>
<td>SPRING—Tension spring for stabilizer</td>
</tr>
<tr>
<td>RMS-181</td>
<td></td>
<td>SPRING—Shock mounting spring</td>
</tr>
<tr>
<td>RMT-008</td>
<td></td>
<td>SPINDLE—Spindle assembly</td>
</tr>
<tr>
<td>RMT-020</td>
<td></td>
<td>IDLER WHEEL—Idler wheel assembly</td>
</tr>
<tr>
<td>RM-055</td>
<td>23</td>
<td>DRIVE SLEEVE—Drive sleeve and set-screw</td>
</tr>
<tr>
<td>RM-056</td>
<td></td>
<td>IDLER WHEEL—Idler wheel assembly (33 1/3 rpm)</td>
</tr>
<tr>
<td>RMX-071</td>
<td></td>
<td>BEARING—Ball and retainer assembly</td>
</tr>
<tr>
<td>RMX-072</td>
<td></td>
<td>POST and nut assembly</td>
</tr>
<tr>
<td>RMX-075</td>
<td>31</td>
<td>DISC AND HUB ASSEMBLY—For pick-up arm casting</td>
</tr>
<tr>
<td>RMX-076</td>
<td>29</td>
<td>COLLAR—Collar assembly</td>
</tr>
<tr>
<td>RMX-077</td>
<td>40</td>
<td>CAM—Main cam assembly</td>
</tr>
<tr>
<td>RMX-080</td>
<td>47</td>
<td>SPRING—Collar clutch tension spring</td>
</tr>
<tr>
<td>RMX-081</td>
<td></td>
<td>IDLER GEAR ASSEMBLY</td>
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<tr>
<td>RMX-084</td>
<td>3</td>
<td>RECORD SHELF ASSEMBLY</td>
</tr>
<tr>
<td>RMX-098</td>
<td></td>
<td>NEEDLE PADDLE ASSEMBLY</td>
</tr>
<tr>
<td>RMX-129</td>
<td></td>
<td>PICKUP ARM LEVER AND BRACKET HINGE—Pickup arm mount hinge</td>
</tr>
<tr>
<td>RMX-135</td>
<td>20</td>
<td>TWO-SPEED SHAFT ASSEMBLY</td>
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<tr>
<td>RMX-137</td>
<td></td>
<td>COUNTERBALANCE—Pickup counterbalance assembly</td>
</tr>
<tr>
<td>RMX-139</td>
<td>47</td>
<td>VELOCITY TRIP AND ROLLER ASSEMBLY</td>
</tr>
<tr>
<td>RPA-009</td>
<td>4</td>
<td>ARM—Phono pickup arm</td>
</tr>
<tr>
<td>RPH-003</td>
<td></td>
<td>HOUSING—Housing for pickup assembly</td>
</tr>
<tr>
<td>RPH-004</td>
<td></td>
<td>HOUSING—Housing for pickup assembly, 13 1/2 rpm</td>
</tr>
<tr>
<td>RPI-001</td>
<td></td>
<td>STYLUS—Replaceable stylus, 3 mils (78 rpm)</td>
</tr>
<tr>
<td>RPI-005</td>
<td></td>
<td>STYLUS—Replaceable stylus, 1 mil (33 1/3 rpm)</td>
</tr>
<tr>
<td>RPX-040</td>
<td></td>
<td>CARTRIDGE—Magnetic pickup, 3 mils (78 rpm)</td>
</tr>
<tr>
<td>RPX-041</td>
<td></td>
<td>CARTRIDGE—Magnetic pickup, 1 mil (33 1/3 rpm)</td>
</tr>
<tr>
<td>RSS-004</td>
<td>32</td>
<td>SWITCH—A-C power switch</td>
</tr>
<tr>
<td>RSY-017</td>
<td></td>
<td>SPEED CHANGER—Switch assembly, less button</td>
</tr>
<tr>
<td>RWP-003</td>
<td></td>
<td>WEIGHT—Weight for RPH-003</td>
</tr>
</tbody>
</table>

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### TROUBLE SHOOTING CHART

#### SYMPTOMS

<table>
<thead>
<tr>
<th>TRIPPING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Changer Fails to Trip.</td>
</tr>
<tr>
<td>2. Changer Trips Continuously.</td>
</tr>
<tr>
<td>3. Changer continues to play last record and does not switch off.</td>
</tr>
</tbody>
</table>

**GLIDE IN ON 12" RECORDS**

**RECORD DROP.**

**MORE THAN ONE RECORD IS DROPPED.**

**INDEXING OF ARM.**

**SELECTOR POST ANGLE INCORRECT.**

**PICKUP ARM MOVEMENT.**

**NEEDLE SKIPS GROOVES.**

**PICKUP ARM DROPS OFF THE REST POST.**

**MOTOR**

| 2. Changer is Sluggish or Motor Overheats. |

#### REMEDIES OR CAUSES

1. **Check:**
   - (a) Adjustment A.
   - (b) Velocity Trip and Roller Assembly binding (47, Figure 3).
   - (c) Actuating Pawl (46A, Figure 5) stuck.
   - (d) Automatic Trip Lever (39, Figure 3) bent and not hitting the Velocity Trip and Roller Assembly (47, Figure 3).
   - (e) Velocity and Roller Assembly rubbing on the underside of the Main Cam Actuating Gear.
   - (f) Manual lever binding.
   - (g) No velocity lead-in groove in center of record.
   - (h) Worn record or needle.
   - (i) Foreign matter in record groove.

2. **Check:**
   - (a) Velocity and Roller Assembly (47, Figure 3) rubbing on Main Cam Actuating Gear (46, Figure 3).
   - (b) Manual Trip Lever binding.
   - (c) Hook end of Velocity Trip and Roller Assembly (47, Figure 3) bent and not engaging Pawl (46A, Figure 5). To be adjusted for about 1 inch clearance from the bottom of the Main Cam Drive Gear.
   - (d) Bakelite Disengage Roller broken on Velocity Trip and Roller Assembly (47A, Figure 4).

3. **Check:**
   - (a) Floating Spindle (free up and down movement).
   - (b) Automatic Shut-off Lock Lever (48, Figure 4). Hook end of this arm (48C, Figure 4) should catch the Pickup Arm Rising Disk (31, Figure 3) at the beginning of the cycle to prevent travel of the arm and cause it to drop on the Rest button.
   - This hook should clear the Pickup Arm Rising Disk (31, Figure 3) by $\frac{1}{2}$ inch with the mechanism at rest. Bend lip (D, Figure 6) if necessary to make this adjustment.

4. **Check:**
   - (a) Manual Trip Lever Hair Spring bent or broken.
   - (b) Velocity Trip and Roller Assembly binding (47, Figure 4).
   - (c) Actuating Pawl stuck (46A, Figure 5).

   Check tension of compression spring (44, Figure 4).
   - Check adjustment E.
   - Check adjustment F.
   - Check latch of record spindle.
   - Check adjustment D.
   - Check adjustment F.
   - Check adjustment E.

   **Check:**
   - (a) Record changer not level.
   - (b) Pickup Arm binding. Check vertical and lateral friction.
   - (c) Badly worn record or needle.

   Check adjustment E.

1. **Check:**
   - (a) Defective Switch mechanism.
   - (b) Defective Switch (do not attempt to repair).
   - (c) Incorrect line voltage.
   - (d) Defective motor winding.

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GENERAL

This single post and single tone arm record changer is designed for dual speed operation (33 1/3 or 78 revolutions per minute) from a power source of 110 volts at 60 cycles. It will play the Standard Groove or Microgroove type records for these speeds, a single record at a time or a series of twelve 10-inch or ten 12-inch records or ten records of the two sizes intermixed. Note: Never stack together the Standard and Microgroove records intermixed for automatic operation as playing of each type record requires special attention to the pick-up discussed below.

The tone arm is designed to use either of two pick-up heads which are interchanged by a plug arrangement at the end of the tone arm. The pick-up heads are finished in color for identification. The TAN head is used to play Standard Groove records while the RED colored head is for Microgroove reproduction. Always use the TAN head with Standard Groove records and the RED head with Microgroove records. Use of the wrong head is certain to result in damage to records and pick-up stylus.

MANUAL OPERATION

1. Turn the Selector switch (23) to the “M” position.
2. With the Record Stabilizer Weight (1) turned back and the spindle in position, place the record on the spindle. The record is then moved slightly to slip over the step in the spindle and lowered to the turntable.
3. Attach to the pick-up arm the correct pick-up head (19) required for the particular type record to be played.
4. Set the Turntable Speed Control (32) to correspond to the speed required by the type of record.
5. Depress the “ON” button (24).
6. Gently place the stylus of the pick-up on the outer groove of record.
7. Upon the end of record playing or to stop recording during manual play, lift the pick-up arm from record and return it to “rest” position. A slight pressure upon the pick-up arm at the rest position will depress the “OFF” button (25) to stop the mechanism.
8. When through operating the record changer, set the Speed control to the “OFF” position.

AUTOMATIC OPERATION

1. Turn the Selector switch (23) to “A” position.
2. Turn back the Record Stabilizer Weight (1). Place upon the record spindle not more than twelve of the 10-inch records, ten of the 12-inch, or ten records intermixed. The bottom record will rest on the step of the spindle and the record selector shelf (62). Set the Stabilizer Weight (1) forward so that it rests on the edge of the top record.
3. Attach to the pick-up arm the correct pick-up head (19) required for the type records to be played.
4. Set the Speed Control (32) to the setting as required by the type of records used.
5. Depress the “ON” button (24). The record changer will operate automatically without further attention and when the last record has been played, the pickup arm will automatically come to rest upon the “OFF” button (25) turning off the changer mechanism. The automatic shut-off feature applies to standard groove record operation only. The TAN pick-up head, balanced to give a greater needle pressure than required for the RED head as applied to microgroove records, has sufficient weight to trip the “OFF” button mechanism.
6. If it is desired to reject a record selection being played, push down the ON button. The record changer will then immediately shift to play the next record.
7. To stop operation of the record changer at any time during automatic play, lift the pick-up arm off the record and return it to the “rest” position on the OFF button, however, after the last record is being played, the pick-up arm mechanism is automatically locked in position and must either complete the cycle or the “ON” button must be depressed.
8. To remove a stack of records from the turntable, pull out the record spindle, lift off the entire stack of records, and replace spindle.
9. When through operating the record changer, set the Speed control to the “OFF” position.

OPERATING PRECAUTIONS

1. Do not, under any circumstances, connect the motor to a source of direct current or to alternating current other than that specified by the label.
2. Do not allow oil or grease to come in contact with the rubber tire friction drive wheels (14 and 16) or the Automatic Trip Arm (30) and Clutch (29) parts.
3. Never use force to start or stop the motor, or any part of the record changer mechanism.
4. Do not intermix Microgroove records with the Standard Groove type.
5. Make certain the correct pick-up head (19) is used to play the desired records. The TAN head is for Standard Groove recordings, while the RED head is used to reproduce Microgroove recordings.
6. Always make certain that the Speed Control (32) is set to the proper speed position as required for the type of record.
7. Use only records in good condition for automatic operation. For warped, odd size, or home recorded records, play as for manual operation.
8. Do not store the records upon the record post and spindle or on the turntable as they may warp, especially if the temperature is high.
9. When through operating the record changer, make certain the Speed Control (32) is returned to the “OFF” position. This pre-
VENTS A DAMAGING FLAT SURFACE UPON THE RUBBER TIRED DRIVE WHEELS OTHERWISE DEVELOPED AS THE MOTOR DRIVE SHAFT BEARS PRESSURE UPON THEM WHEN THE RECORD CHANGER REMAINS IDLE FOR LONG PERIODS ENGAGED IN EITHER OF THE SPEED POSITIONS.

LUBRICATION

USE A LIGHT MACHINE OIL ON THE FOLLOWING:

1. Motor bearings, saturate top and bottom felts at end belts.
2. Pick-up arm shaft (5), see Figure 3. Apply one drop each to bottom bearing point, bracket hole, and hole through main base plate.
3. Ball bearing assembly (8). See Figure 1.
4. Idler wheel felt (21). See Figure 1.

APPLY LUBRIPASTE NO. 110 WITH A SMALL BRUSH TO:

1. Idler wheel linkage (15). See Figure 1.
2. Turntable shaft stud (9). See Figure 1.
3. Pick-up arm hinge pins.
4. Pick-up arm raising lever (38). Apply to edge lifting disk hub (31). See Figure 3.
5. Main cam (46) bearing. See Figure 2. It is necessary to remove the sub-plate assembly to lubricate this bearing.

APPLY STA-PUT WITH A SMALL BRUSH TO:

1. Teeth of Main Cam Gear (45). See Figure 4.
2. Channeled undersurface of Main Cam Gear (46). See Figure 4.
3. Teeth of Idler Drive Gears (11 and 12). See Figure 1.
4. Pick-up Arm Raising Lever (38). Apply to bearing surfaces. See Figure 4.

PICK-UP CARTRIDGE

THE MODEL P10 RECORD CHANGER IS EQUIPPED WITH TWO PICK-UP ARM CARTRIDGE HEADS, EACH CONTAINING A GENERAL ELECTRIC VARIABLE RELUCTANCE CARTRIDGE INCORPORATING A REPLACEABLE STYLUS ASSEMBLY. THE "TAN" COLORED HEAD IS PLUGGED INTO THE END OF THE PICK-UP ARM TO PLAY WIDE GROOVE RECORDS KNOWN AS THE STANDARD TYPE. THE "RED" COLORED HEAD IS SIMILARLY INSERTED INTO THE ARM WHEN USING THE LONG PLAYING MICROGROOVE RECORDS.

SERVICE—The stylus assemblies may be removed readily from the cartridge for replacement. Instructions for replacement are supplied with each new replaceable stylus assembly catalogued in the replacement parts list on the last page of this publication.

To insure optimum performance from the cartridge, its stylus, record, magnetic pole pieces, and gaps should be cleaned periodically of foreign particles accumulated from the record surfaces. A soft bristle brush similar to Cat. No. RQB-001 should be used to clean these parts. The gap clearance between stylus and each of its pole assembly (46) controls the record feed. The attached record selector pieces has been adjusted to be not less than .011 inch. Care to shelf (62) and associated record selector arm fingers (61) should be taken not to disturb this adjustment during service move to push forward a record from the shelf, off the step of the record spindle, and onto the turntable.

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**PICK-UP ARM INDEXING**—The position of the Record Selector Fingers (61) and attached Index Control Arm (3) just before a record leaves the Record Shelf (62), determines the proper index of the pick-up arm to start on the first grooves of that particular record.

When a 10-inch diameter record rests upon the record shelf, the record selector fingers are tilted so that the attached index control arm is engaged with the Index Lever Assembly (43). The index lever, by virtue of its compressed spring, forces the Pick-up Arm Raising assembly (38) to follow the outer contour of the channeled undersurface of the Main Cam Assembly (46). Guided by this contour, the pick-up arm raising lever lowers the pick-up arm to the proper position upon the first grooves of the 10-inch record.

A 12-inch record upon the record shelf will depress the record selector fingers, unlatching the attached index control arm from the index lever assembly. This renders the index lever assembly inoperative and results in the pick-up arm raising lever following the inside contour of the channeled undersurface of the main cam assembly as guided by its associated tension springs. In following this contour, the pick-up arm raising lever lowers the pick-up arm to the proper position upon the first grooves of the 12-inch record.

**AUTOMATIC SHUT-OFF**—As the last record leaves the Record Selector Shelf (62) and Record Spindle Step to drop onto the turntable, the bottom of the spindle ceases to bear down upon the end of the Automatic Shut-off Lock Lever (48) directly beneath as a result of all record weight removed from the spindle. This changes the position of the automatic shut-off lock lever so that the hooked segment of its lowered end engages with a segment of the Disk Hub (31), obstructing its normal movement. As a result, the pick-up arm is lowered onto the OFF Button, depressing it to shut off the electrical power to the record changer mechanism.

**SERVICE ADJUSTMENTS**

**A. IDLER WHEEL DRIVE**—The turntable is driven by means of one or the other friction idler drive wheels (14 or 16). The driving power is transferred from the motor bushing (27) to the drive wheels and then to the rim of the turntable.

It is important, therefore, that the motor bushing, idler wheel, and rim of turntable be kept clean of grease, oil, dirt, or any foreign matter. Naphtha or an equivalent quick drying solvent is satisfactory for cleaning these parts.

**B. AUTOMATIC TRIP**—The Automatic Trip Arm (30) follows the movement of the pickup arm through a weight compression clutch (29). When the movement of the pick-up arm (4) toward the record spindle is greater in velocity than 1/4 inch per 1/4 revolution of the turntable, the automatic trip arm trips the Velocity Trip and Roller Assembly (47). This releases the actuating pawl on the Main Cam Assembly (46), allowing it to engage the Main Cam Gear (45) to drive the mechanism through the changer cycle.

Normally, the change in velocity of pick-up arm movement occurs at the end of record play, due to the eccentric record leading grooves toward the record spindle.

**C. AUTOMATIC LOCK LEVER**—The automatic Lock Lever (48) should move up and down freely with no record on the spindle. Normally, its hooked end adjacent to the Pick-up Arm Raising Disk Hub (31) will be raised clear of the disk hub as long as records are upon the spindle. However, after the last record has been played, the hooked end of the automatic lock lever is in a lowered position (due to record weight removed from spindle). In this position, the hook of the lever obstructs further lateral movement of the disk hub and pick-up arm and the pick-up arm is then lowered on to the OFF Button (25) shutting off the changer mechanism.

**D. VELOCITY TRIP**—At the completion of the first part of change cycle, the actuating pawl is engaged by the hook end of the Velocity Trip and Roller Assembly (47) which has been returned to its normal position by the reset points on the Main Cam Drive Gear (45). This hook should be adjusted between .005 to .015 inch clearance from the bottom of the main cam drive gear. Greater clearance may permit the pawl to bounce past the hook and re-engage with the main cam gear sawtooth, causing the changer mechanism to operate into another cycle.

**E. INDEXING**—The eccentric screw (10) accessible through the top of the Pick-up Arm (4) should take care of any normal adjustment. Turn the screw clockwise to index the pick-up stylus in, toward the spindle, or counterclockwise to index the stylus out, away from the spindle.

Should further adjustment be necessary, proceed as follows: Operate the mechanism by revolving the turntable manually until the stylus drops to within 1/2 inch of a 10-inch record on the turntable. With a No. 8 Bristol wrench in each of the set screws (points D and E, Fig. 5), alternately loosen one and tighten the other until the stylus rests above the records lead-in groove at the desired point.

Make certain both set screws are tightened after adjustment is completed.

The 12-inch position is indexed automatically by the pressure of a 12-inch record on the Record Selector Fingers (61).
PICK-UP ARM REMOVAL AND REPLACEMENT

The following step-by-step procedure may be used in removing the pick-up arm for service and replacement:
1. The spacing spring between the hinge pins of the pick-up arm bracket must be removed by pressing down on its center until it snaps off the pins. This spring was used to prevent the pick-up arm hinge from coming apart during shipment.
2. With a screwdriver or long-nose pliers, bend in one of the blue steel pick-up arm hinge brackets while lifting up on the arm. This will release the hinge bracket from its hinge pin.
3. Repeat step 2 to free opposite hinge bracket.
4. The pick-up arm may now be removed after freeing pick-up cord from clips.
5. In replacing pick-up arm, the above procedure may be followed in reverse. Make certain cord does not become wedged in bracket. The roller at the rear of pick-up arm hinge should pass beneath the lift bracket attached to the record changer deck. The spacing spring need not be replaced unless the unit is to be shipped.

SUB-PLATE ASSEMBLY (REMOVAL AND ASSEMBLY)

In the event that it becomes necessary to replace any of the major parts of the sub-plate assembly (Figure 4), the entire assembly should first be removed from the main plate. Proceed as follows:
1. Remove the record spindle and turntable.
2. Remove four screws holding Center Trim (2) from Main Plate and remove trim.
3. Remove the Record Selector Shelf (62) held to the Rocker Arm and Roller Assembly (40) by the two screws.
4. Detach Rocker Arm Return Spring (42) from main plate.
5. Remove the four No. 8-32 screws holding the sub-plate studs and the main cam gear stud to the main plate.
6. Main plate may be lifted from sub-plate, letting rocker arm drop through opening of main plate.
Reverse the above procedure to reassemble record changer, making certain pick-up arm shaft, sub-plate dowels and other parts are in their proper position.

RECORD SELECTOR SHELF AND ROCKER ARM ASSEMBLY (REMOVAL AND REASSEMBLY)

The Record Selector Shelf and Rocker Arm Lever Assembly (62 and 40) may be removed from the record changer by detaching its Return Spring (42), removing its Pivot Pin (41) and lifting the assembly out from the top of the record changer.
# MODEL P10

## TROUBLE SHOOTING CHART

<table>
<thead>
<tr>
<th>SYMPTOMS</th>
<th>REMEDIES OR CAUSES</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TRIPPING</strong></td>
<td></td>
</tr>
<tr>
<td>1. Automatic Trip Fails.</td>
<td>(a) Binding of velocity trip and roller assembly (47).</td>
</tr>
<tr>
<td></td>
<td>(b) Actuating pawl stuck; part of main cam assembly (46).</td>
</tr>
<tr>
<td></td>
<td>(c) Automatic trip arm (30) bent and not striking velocity trip and roller (47).</td>
</tr>
<tr>
<td></td>
<td>(d) Manual trip lever (34) binding.</td>
</tr>
<tr>
<td></td>
<td>(e) No velocity lead-in eccentric groove at center of record.</td>
</tr>
<tr>
<td></td>
<td>(f) Foreign matter in record groove or broken record.</td>
</tr>
<tr>
<td>2. Manual Trip Fails.</td>
<td>(a) Manual trip lever (34); wire spring bent or broken.</td>
</tr>
<tr>
<td></td>
<td>(b) Velocity trip and roller assembly (47) binding.</td>
</tr>
<tr>
<td></td>
<td>(c) Actuating pawl stuck.</td>
</tr>
<tr>
<td>3. Velocity Trip Fails.</td>
<td>(a) Check Service Adjustments paragraphs D.</td>
</tr>
<tr>
<td>4. Last Record Is Not Played.</td>
<td>(b) Velocity trip and roller assembly (47) rubbing on main cam gear (45).</td>
</tr>
</tbody>
</table>

## PICK-UP INDEXING

1. Pick-up does not start in proper record groove.

## PICK-UP ARM MOVEMENT

1. Pick-up arm lift too high or too low.

## RECORD DROP

1. Inconsistent record drop.

## MOTOR

1. Motor does not shut off automatically.

### CAT. NO. | REF. | DESCRIPTION
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>RMS-181</td>
<td>60</td>
<td>SPRING—Record changer mounting spring</td>
</tr>
<tr>
<td>RMT-008</td>
<td>14</td>
<td>TURNTABLE—Record turntable drive wheel (78 rpm)</td>
</tr>
<tr>
<td>RMW-053</td>
<td>27</td>
<td>DRIVE BUSSING—Motor shaft drive bushing and set screw</td>
</tr>
<tr>
<td>RMW-055</td>
<td>16</td>
<td>WHEEL—Turntable drive wheel (33 1/3 rpm)</td>
</tr>
<tr>
<td>RMX-071</td>
<td>8</td>
<td>BEARING—Ball bearing and retaining assembly</td>
</tr>
<tr>
<td>RMX-072</td>
<td>9</td>
<td>STUD—Turntable shaft assembly</td>
</tr>
<tr>
<td>RMX-073</td>
<td>45</td>
<td>CAM—Main cam assembly</td>
</tr>
<tr>
<td>RMX-077</td>
<td>47</td>
<td>LEVER—Velocity trip and roller assembly</td>
</tr>
<tr>
<td>RMX-081</td>
<td>11, 12</td>
<td>GEAR ASSEMBLY—Fiber idler drive gears, coupling, washer, and mounting bolt</td>
</tr>
<tr>
<td>RMX-097</td>
<td>38</td>
<td>RECORD SPINDLE</td>
</tr>
<tr>
<td>RMX-109</td>
<td>61</td>
<td>LEVER—Pick-up arm raising lever and bracket assembly</td>
</tr>
<tr>
<td>RMX-119</td>
<td>63</td>
<td>RECORD PUSH-OFF SHELF ASSEMBLY—Plastic shelf with record selector fingers and index arm attached</td>
</tr>
<tr>
<td>RMX-128</td>
<td>51</td>
<td>PICK UP ARM HINGE—Hinge assembly for pick-up arm</td>
</tr>
<tr>
<td>RMX-129</td>
<td>52</td>
<td>PIVOT POST—Pick-up arm pivot shaft and hinge bracket</td>
</tr>
<tr>
<td>RMX-135</td>
<td>35</td>
<td>SHAFT ASSEMBLY—Speed control shaft with retaining washer and toggle arm</td>
</tr>
<tr>
<td>RMX-137</td>
<td>52</td>
<td>SPRING AND BRACKET—Pick-up arm counterbalance assembly</td>
</tr>
<tr>
<td>RPA-010</td>
<td>4</td>
<td>PICK UP ARM—Plastic shell with female receptacle and pick-up cord</td>
</tr>
<tr>
<td>RPH-003</td>
<td>19</td>
<td>PICK UP HEAD—Tan colored plastic head with male connector tips and ballast weight (less pick-up cartridge)</td>
</tr>
<tr>
<td>RPH-004</td>
<td>19</td>
<td>PICK UP HEAD—Red colored plastic head with male connector tips (less pick-up cartridge)</td>
</tr>
<tr>
<td>RPJ-001</td>
<td>4</td>
<td>STYLUS ASSEMBLY—3 mil sapphire replaceable stylus (for use with standard groove records)</td>
</tr>
<tr>
<td>RPJ-005</td>
<td>1</td>
<td>STYLUS ASSEMBLY—1 mil sapphire replaceable stylus (for use with microgroove records)</td>
</tr>
<tr>
<td>RPX-040</td>
<td>1</td>
<td>PICK UP CARTRIDGE—Includes 3 mil sapphire replaceable stylus RPJ-005</td>
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<tr>
<td>RPX-041</td>
<td>1</td>
<td>PICK UP CARTRIDGE—Includes 1 mil sapphire replaceable stylus RPJ-005</td>
</tr>
<tr>
<td>RSS-004</td>
<td>33</td>
<td>SWITCH—A-C power switch</td>
</tr>
<tr>
<td>RSS-014</td>
<td>36</td>
<td>SPEED CONTROL MOUNTING KIT—Consists of bushing, dial, sapphire index arm, toggle bracket, and hex nut</td>
</tr>
<tr>
<td>RSX-016</td>
<td>19</td>
<td>WEIGHT—Used in tail pick-up head (19) to obtain correct stylus pressure for 3 mil cartridge</td>
</tr>
</tbody>
</table>

### PARTS LIST

- ARM—Automatic trip arm
- MOTOR—60-cycle motor
- BUTTON—"ON" button
- BUTTON—"OFF" button
- WASHER—Felt washer over turntable drive wheel
- KNOB—Manual control knob and spring washer
- KNOB—Speed control knob
- CLIP—Retaining clip for turntable drive wheel
- MOUNTING BUSHING—Rubber mounting bushing for record changer mounting springs
- GROMMET—Rubber shock mount for motor mounting
- RIVET—For mounting turntable drive wheel lever (15)
- SET SCREW—Allen head, cone point, 8-32 x 1/4 inch for pick-up arm raising disk hub (31)
- SCREW—Mounting screw for idler drive gears
- WASHER—Turntable bearing race washer
- WASHER—Fiber washer beneath turntable drive wheel
- RECORD STABILIZER WEIGHT
- GEAR—Main cam drive gear
- GEAR COUPLING—Drive coupling between idler drive gears
- LEVER—Automatic shut-off lock lever
- ARM—Rocker arm and roller assembly (less record selector shelf and fingers)
- LEVER—Index selector lever
- LEVER—Manual trip lever and wire assembly
- LINK LEVER—Supports one of each turntable drive wheel
- LEVER PLATE—Speed control lever plate with neutral positioning flat index spring
- LEVER—Turntable drive wheel link lever release
- COVER—A-C power switch cover
- DISK AND HUB—Pick-up arm raising disk with set screws
- RECORD PUSH-OFF SHELF—Plastic record shelf
- PIN—Rocker arm pivot pin
- PIN—Pivot pin for automatic shut-off lever
- SPRING—Pick-up arm raising lever tension spring
- SPRING—Index rod compression spring
- SPRING—Rocker arm return spring
- SPRING—Tension spring on 78 rpm turntable drive wheel
- SPRING—Tension spring on 33 1/3 rpm turntable drive wheel
- SPRING—Tension spring on speed control shaft toggle
- SPRING—Used in mounting pick-up cartridges (19)
GENERAL

This record changer is designed to operate from a power source of 105-125 volts at 60 cycles per second. It is a dual speed type of 33 1/3 rpm or 78 rpm for playing the standard records automatically or the "Long Play" records manually.

This changer is similar to the Model P6 except for the addition of the pickup arm with the 1 mil stylus for playing the narrow groove records and the dual-speed motor. A switch has been added to switch to either pickup arm. For detailed information, on automatic operation, trouble shooting, and replacement parts common to both the P6 and the P11, refer to ER-S-P6. Only parts special to the P11 changer are given below.

CONTROLS

1. The CONTROL KNOB turns the power to the motor "ON" in Manual or Auto position and will cancel a record being played when rotated to Rej.
2. If the SPEED CHANGE KNOB is rotated to Long Play, the turntable will rotate at 33 1/3 rpm. When rotated to St'd Play, the turntable will rotate at 78 rpm. When the record changer is not in use, this knob should be rotated to the center position to relieve pressure from the rubber tired idler wheel.
3. PICKUP ARM SWITCH should be switched to St'd Play when playing records of the wide or standard groove. This switch should be switched to Long Play when playing 33 1/3 rpm "Long Play" records which have the narrow or microgroove type of grooves.
4. 10-INCH RECORD SHELF should be raised to a vertical position when playing 12-inch records or lowered to a horizontal position when playing 10-inch records automatically.
5. HOLD-DOWN ARM should be lowered onto the top record of the stack when playing records automatically.

MANUAL OPERATION

1. Raise the hold-down arm and the 10-inch record support to a vertical position and lower the record onto the turntable over the spindle.
2. Select the proper turntable speed with the SPEED CONTROL KNOB.
3. Set the PICKUP ARM SWITCH to select the proper pickup arm.
4. Rotate the CONTROL KNOB to manual.
5. Place the stylus of the proper pickup arm in the lead-in groove of the record.
6. After the record has been played, lift the pickup arm and place it in its rest position. Rotate the CONTROL KNOB to the "OFF" position to stop the turntable.

AUTOMATIC OPERATION

1. Place up to ten 12-inch or twelve 10-inch records over the spindle resting on the spindle shell and the 12-inch shelf or the 10-inch shelf. Lower the HOLD DOWN ARM onto the records.
2. Set the PICKUP ARM SWITCH to St'd Play.
Note: Only records of the wide or standard groove width which require a 3 mil stylus may be played automatically on this changer.
3. Select the proper speed for the records with the SPEED CONTROL KNOB. Note: Do not intermix records requiring different turntable speeds.
4. Rotate the CONTROL KNOB to Rej, and release it. The record changer will automatically play the records. After the last has played, lift the pickup arm and place it on its rest position. Rotate the CONTROL KNOB to "OFF" to stop the changer.

OPERATING PRECAUTIONS

Do not use warped records for automatic operation. For warped, odd-size, or home-recorded records, play as for manual operation.

When playing microgroove records, do not allow the St'd Pickup to contact the records as this may damage the record surface.

Do not allow oil or grease to come in contact with the rubber of the idler wheel.

P11 REPLACEMENT PARTS LIST

<table>
<thead>
<tr>
<th>Cat. No.</th>
<th>Description</th>
<th>Ref. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>RAC-077</td>
<td>COVER—Terminal cover</td>
<td>113</td>
</tr>
<tr>
<td>RBH-011</td>
<td>MOTOR—Two-speed phono-motor (see Fig. 4)</td>
<td>109</td>
</tr>
<tr>
<td>RHD-023</td>
<td>GROMMET—For motor speed lever</td>
<td>102</td>
</tr>
<tr>
<td>RHX-017</td>
<td>ARM REST—Assembly</td>
<td>110</td>
</tr>
<tr>
<td>RMM-092</td>
<td>ARM REST BUMPER</td>
<td>109</td>
</tr>
<tr>
<td>RMM-108</td>
<td>LEVER—Motor speed lever</td>
<td>102</td>
</tr>
<tr>
<td>RMM-109</td>
<td>&quot;C&quot; WASHER</td>
<td>104</td>
</tr>
<tr>
<td>RMM-110</td>
<td>LEVER—Motor speed change lever</td>
<td>105</td>
</tr>
<tr>
<td>RMM-111</td>
<td>WASHER—Friction washer</td>
<td>106</td>
</tr>
<tr>
<td>RMM-112</td>
<td>SPACER—Thin motor spacer</td>
<td>107</td>
</tr>
<tr>
<td>RMM-113</td>
<td>SPACER—Thick motor spacer</td>
<td>108</td>
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<tr>
<td>RMS-178</td>
<td>SPRING—Balance spring inside RPA-008</td>
<td>112</td>
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<tr>
<td>RPA-008</td>
<td>TONE ARM ASSEMBLY—For LP records</td>
<td>111</td>
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<tr>
<td>RPA-040</td>
<td>STANDARD PLAY PICKUP</td>
<td>114</td>
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<tr>
<td>RPB-011</td>
<td>LONG PLAY PICKUP</td>
<td>111</td>
</tr>
<tr>
<td>RSW-067</td>
<td>SWITCH—Tone arm switch</td>
<td>101</td>
</tr>
</tbody>
</table>
Two-speed phono motor with belt driven 33⅓ RPM bushing

Two-speed phono motor with idler wheel switching cam

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TO OPERATE MANUALLY

Raise the record balance arm (42) and the 10" record support (38). Place a record on the turntable and turn the control button to the manual position. Place the pickup arm at the start of the record and return it to the pickup arm rest at the end of the record.

TO OPERATE AUTOMATICALLY

Place the pickup arm on the pickup arm rest and raise the record balance arm (42). (The 10" record support (38) must be lowered for 10" records and raised for 12" records.) Place 12-10" or 10-12" records on the spindle and record support. Lower the record balance arm (42) and turn the control button to reject and release it. It will automatically return to the automatic position.

To reject an unfinished record turn the control button to reject and release it.

To remove records from the turntable, turn the control button to the OFF position and raise the record balance arm (42) and the 10" record support (38) and lift the records off.

CYCLE OF OPERATION

The following drawings show a complete cycle of operation. Figures 1, 1A, 1B and 1C show the mechanism in the OFF or nonoperating position. The rest of the Figures show the mechanism in various phases of the change cycle.

To start the change cycle turn the control button (126) to the Reject position as shown in Fig. 2. This causes the notched washer (127) to take the position shown in Fig. 2B. And as soon as the control button (126) Fig. 2 is released, the selector lever spring forces the notched washer (127) Fig. 3B, also (126) Fig. 3, into the automatic position. This action of the notched washer causes point A of the selector lever (132) Fig. 2B to move against the OFF-CYCLE switch (125) Fig. 2B applying voltage to the motor.

Point B of the selector lever (132) Fig. 2B moves away from the lead roller shoulder nut (95) Fig. 2B. Point C of the selector lever (132) pushes against the lead roller dropping lever (78) Fig. 2B causing it to move away from the lead roller shoulder nut (95) Fig. 2B. Thereby, allowing the lead roller (94) Fig. 2A to enter the spiral cam underneath the turntable Fig. 2A.

Fig. 2C shows the lead roller (94) engaged with the spiral cam. This starts the change cycle by the action of the spiral cam forcing the lead roller (94) Fig. 3C and the swing arm (71) Fig. 3B toward the center of the turntable. As the swing arm moves toward the center of the turntable, the cammed end of it (Point D), Fig. 3B forces the adjusting plunger pin (21) Fig. 3C upward raising the pickup arm (14) Fig. 3C from the pickup arm rest (2) Fig. 3C.

As the swing arm (71) Fig. 3B moves farther toward the center of the turntable, the ratchet arm friction springs (82 and 83) Fig. 3B engage the ratchet arm (7) Fig. 3B and swings the pickup arm (14) Fig. 3 away from the turntable (136) Fig. 3 until the ratchet arm (7) Fig. 3B is stopped by coming in contact with the ratchet arm stop bracket (142) Fig. 3B.
As the swing arm (71) Fig. 3B starts toward the center of the turntable, Point E, on the swing arm (71) Fig. 3B moves away from the ratchet arm lever (64) Fig. 3B allowing it to pivot up due to the tension of the ratchet arm lever spring (69) Fig. 3B so that it will be in a position for Point F of the ratchet arm lever to contact the ratchet arm (7) Fig. 3B at the proper point for the pickup arm (14) Fig. 3C to set down on the record. If it were not engaged at the proper point, the tension of the ratchet arm friction springs (82 and 83) Fig. 3B would carry the pickup arm past the start of the record.

Another operation that is taking place as the swing arm (71) Fig. 3B moves toward the center of the turntable is that the roller (73) Fig. 3B of the cammed dropping lever (74) Fig. 3B, makes contact with the lever trip bracket (109) Fig. 3B and gradually forces the cammed dropping lever away from the bearing pin shoulder nut (103) Fig. 3C so that as soon as a record is dropped, the lower or return roller (102) Fig. 3C also (102) Fig. 3A is allowed to enter the spiral cam Fig. 3A so that the swing arm (71) Fig. 3B can return to its original position. This will be covered later, as soon as this phase of the change cycle occurs.

Point G of the swing arm (71) Fig. 3B pushes against the roller (117) Fig. 3B of the ejector idler lever (118) Fig. 3B and the adjusting screw (119) Fig. 3B on the ejector idler lever (118) Fig. 3B pushes against the lower push pin (114) Fig. 3B, which in turn pushes against the ejector lever (31) Fig. 3B (a side view of the ejector lever (31) is shown in Fig. 6). The ejector lever (31) Fig. 6A then pushes against the 12" record slide bolt (33) Fig. 6A which pushes the 10" record slide bolt (40) Fig. 6A; causing the 10" record to drop on the turntable.

To play a 12" record, raise the 10" record support (38) Fig. 8, which causes point J on the 10" record support (38) Fig. 8 to engage the change lever ejector (28) Fig. 8A, which pivots and moves the change lever (67) Fig. 1B toward the rear of the changer base plate. This allows the ratchet arm lever (64) Fig. 1B to pivot more causing the ratchet arm (7) Fig. 1B to hit against point K on the ratchet arm lever (64) Fig. 1B causing the 12" record to land on the turntable, as was the case with Point F for the 10" record.

As mentioned in a previous paragraph, the roller (73) Fig. 3B of the cammed dropping lever (74) Fig. 3B has made contact with the lever trip bracket (109) Fig. 3B end has forced the cammed dropping lever (74) Fig. 3B away from the bearing pin shoulder nut (103) Fig. 3C allowing the lower or return roller (102) Fig. 3A (also 102) Fig. 3C to enter the spiral cam Fig. 3A and so to return the swing arm (71) Fig. 3B to its original position.

The lead roller (94) Fig. 3A (also 94 Fig. 3C) is then forced out of the spiral cam by a raised portion of the spiral cam Point H Fig. 3A. Through the action of the tension spring (79) Fig. 3B the lead roller dropping lever (78) Fig. 3B is moved into position over the lead roller shoulder nut (95) Fig. 3B thereby keeping the lead roller (94) Fig. 3C also Fig. 3A out of the spiral cam.

As the swing arm (71) starts back to its original position, the ejector mechanism returns to its original position. The pickup arm is being moved into position to land on the record through the action of the ratchet arm friction springs (82 and 83) Fig. 4B, on the ratchet arm (7) Fig. 4B.

As explained in a previous paragraph, the ratchet arm lever (64) Fig. 4B has been moved up so as to stop the ratchet arm (7) Fig. 4B at the proper position for the pickup arm to land on the record. As the swing arm (71) Fig. 4B nears the end of its' return swing Point I of the swing arm engages

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the friction brake spring spring (61) Fig. 4B. This insures smooth lowering of the pickup arm and also tends to hold the swing arm (71) Fig. 4B in the same position while a record is being played. As soon as the adjusting plunger pin (21) Fig. 4C starts down the cammed end Point D Fig. 4B of the swing arm (71) Fig. 4B the ratchet arm friction springs (82 and 83) Fig. 4B disengage from the ratchet arm (7) Fig. 4B. Point F of the ratchet arm lever (64) Fig. 4B is forced away from the ratchet arm (7) Fig. 4B by Point E on the swing arm (71) Fig. 4B.

The pickup arm (14) Fig. 4 also Fig. 4C is lowered on the record and then Point H of the spiral cam Fig. 4A forces the lower or return roller (102) Fig. 4A also Fig. 4C out of the spiral cam. Through the action of the tension spring (76) Fig. 4B the cammed dropping lever (74) Fig. 4B also Fig. 4C is moved into position over the bearing pin shoulder nut (103) Fig. 4C thereby keeping the lower or return roller (102) Fig. 4C out of the spiral cam. Thus the pickup arm can continue across the record.

Fig. 5 shows the pickup arm (14) at the end of the record, and Fig. 5A shows how the ratchet arm (7) has also moved to the end of the record and the adjusting screw (11) of the ratchet arm (7) is just at the point of pushing the lead roller dropping lever (76) away from the lead roller shoulder nut (95) so that the lead roller (94) Fig. 5B may enter the spiral cam for another cycle of operation.
FIG. 7
12" RECORD EJECTOR
(NORMAL POSITION)

FIG. 7A
12" RECORD EJECTOR
(EJECTING POSITION)

FIG. 8
CHANGE LEVER EJECTOR (28)
IN 10" POSITION

FIG. 8A
CHANGE LEVER EJECTOR (28)
IN 12" POSITION

FIG. 9
SECTIONAL VIEW OF
PICKUP ARM AND
ADJUSTING PLUNGER PIN

FIG. 10
SECTIONAL VIEW OF
LEAD ROLLER
ASSEMBLY 98
<table>
<thead>
<tr>
<th>SYMPTOMS</th>
<th>CAUSES</th>
<th>REMEDIES</th>
</tr>
</thead>
</table>
| 1-Mechanism continues to cycle      | 1-Broken or bent selector lever spring (135)                           | 1-Replace if broken  
la-If bent, remove the notched washer (127) and straighten the spring                                                                |
| 2-Mechanism jams on return half of cycle | 1-A broken or leave dropping lever tension spring (79)               | 1-Replace if broken  
la-Reset in proper place if loose                                                                                                         |
| 3-Mechanism jams on forward         | 1-A broken or loose cammed dropping lever spring (76)                 | 1-Replace if broken  
la-Reset in proper place if loose                                                                                                         |
| 4-Mechanism trips before end        | 1-Ratchet arm adjusting screen (11) turned too far clockwise          | 1-Turn adjusting screw (11) counterclockwise until proper point is reached                                                             |
| 5-Mechanism does not trip at end of record | 1-Ratchet arm adjusting screw (11) turned too far counterclockwise  | 1-Turn adjusting screw (11) counterclockwise until proper point is reached                                                             |
|                                      | 2-Lead roller compression spring (97) too weak to push lead roller (94) into spiral cam (137 & 138) | 2-Replace compression spring (97)                                                                                                         |
| 6-Pickup arm (14) jumps groove      | 1-The lead roller dropping lever (78) may be bent and is jammed       | 1-Straighten it out and check to see that it moves freely                                                                              |
| 7- Pickup arm (14) lands too fast on record | 1-Friction broke spring (61) weak or broken                          | 1-Replace spring                                                                                                                               |
| 8-Pickup arm (14) does not land at start of record | 1-Ratchet arm lever spring (69) may be too weak to hold ratchet arm lever (64) in place  | 1-Replace spring  
2-Disconnect line cord and place control button (126) on automatic. Trip the mechanism and rotate manually noting where pickup arm lands. Loosen clamp screw (8) and holding ratchet arm in place move pickup to start of record and tighten clamp screw (8) |
In order to observe the action of the changer mechanism as it progresses through a complete cycle of operation, disconnect motor plug from power supply so that Turntable can be rotated by hand. Move the front Control Button to the right so that only the word "AUTO" is visible. Then slide the "START-REJECT" Control Button to the left as far as it will go and release it. The operation of all parts of the changer can now be examined as the Turntable is rotated clockwise.

<table>
<thead>
<tr>
<th>FUNCTION</th>
<th>EXPLANATION</th>
</tr>
</thead>
</table>
| SETTING FOR DESIRED RECORD SIZE | 1. The position of the "10-12" Control Button determines the size of records that may be played on the changer.  
2. When this Control Button is in the 12 inch position, the Index Pin (19) is stopped by the front notch on the Index Stop Lever (43). The horizontal motion of the Pick-up Arm (1) is thus stopped. After the Pick-up Arm Lift Pin (17) and Pick-up Arm (1) are lowered, the Pick-up Arm will land in the correct position to start playing a 12 inch record.  
3. When the Control Button is in the 10 inch position, the Index Pin (19) is stopped by the rear notch on the Index Stop Lever (43). Since this notch is deeper than the front notch, the Pick-up Arm (1) will be stopped at a point closer to the Center Post. After the Pick-up Arm Lift Pin (17) and Pick-up Arm (1) are lowered, the Pick-up Arm will land in the correct position to start playing a 10 inch record. |

| SETTING FOR DESIRED NEEDLE | 1. Operating the Needle Selector (62) rotates Crystal Cartridge (2) to engage the proper Needle. |

| SETTING FOR DESIRED SPEED | 1. When the Speed Selector Knob (61) is moved to the left as far as it will go toward the number "78" the motor hub rotates the Idler Wheel (52) which, in turn, engages the inside rim of the Turntable.  
2. When the Speed Selector Knob (61) is moved to the right as far as it will go toward the number "33" an auxiliary shaft (connected to the motor hub through Rubber Drive Belt (16)) rotates the Idler Wheel (52). The Idler Wheel engages the inside rim of the Turntable. |

| STARTING Operating the "ON-OFF" Switch (46) | 1. Operating this Switch supplies power to Motor (48).  
2. Motor (48) operates Idler Wheel (52) to rotate Turntable and Turntable Gear (59).  
3. All other parts of mechanism remain at rest until Starting Pawl (24) is released by trip action at end of playing cycle or by operation of the "START-REJECT" Control Button. |

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### Description of Cycle (Continued)

#### Function

**Tripping**
To trip mechanism and start change cycle, slide “START-REJECT” Control Button down and to the left as far as it will go and then release it.

**Function of the Main Cam (20)**
1. The grooves on the upper surface of the Main Cam direct and co-ordinate the motions of the Pick-up Arm Lift Pin (17), which elevates the Pick-up Arm (1) during the change cycle and the Pick-up Arm Follower (18), which moves the Arm horizontally during the change cycle.

**Displacement of a Record**
1. While the Main Cam (20) is turning, the Eccentric (26) turns the Record Support Arms (32) through the action of the Eccentric Arm (27) and Tie Bar (29).
2. During the first half of the change cycle the Record Support Arm Shafts (30 and 31) and Record Support Arms (32) rotate in a clockwise direction. The two lower changer blades eject the bottom record loaded on the changer and the two upper changer blades slide under the remainder of the stack.
3. During the remainder of the cycle, the Record Support Arm Shafts (30 and 31) and Record Support Arms (32) rotate in a counter-clockwise direction. The upper changer blades now slide out from under the stack of records and drop the stack onto the lower changer blades.

**Movement of Pick-up Arm**
1. As the Main Cam (20) starts to rotate, the Pick-up Arm Lift Pin (17) raises the Pick-up Arm (1) by riding up the outer ridge of the Main Cam (20).
2. After approximately a quarter turn of the Main Cam (20), the Pick-up Arm Follower (18) enters the groove in the Cam. The groove is cut so as to push the Pick-up Arm Follower (18) and thus the Pick-up Arm (1) to the right.
3. After approximately a three-quarter turn of the Main Cam (20), the groove in the Cam causes the Pick-up Arm Follower (18) and Pick-up Arm (1) to move to the left.
4. Near the end of the cycle, the outer ridge of the Main Cam (20) slopes downward and the Pick-up Arm Lift Pin (17) and Pick-up Arm (1) are lowered.

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DESCRIPTION OF CYCLE (Continued)

<table>
<thead>
<tr>
<th>FUNCTION</th>
<th>EXPLANATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.</td>
<td>The position at which the Pick-up Arm sets down on a record may be adjusted by means of the Index Screw (41) located on the upper right hand side of the changer base. The Screw acts as an eccentric in changing the position of the Index Stop Lever (43). A complete description of this method of positioning the Arm and another method which will give greater range of adjustment if required may be found in the “Trouble Shooting Chart” under the section entitled “Pick-up Arm (1) sets down at wrong starting point on record”.</td>
</tr>
<tr>
<td>6.</td>
<td>Elevation of the Pick-up Arm is adjusted by turning the Lift Adjusting Screw (5) located on the under side of the Pick-up Arm (1). For complete adjustment details, see section of “Trouble Shooting Chart” entitled “Pick-up Arm elevation is too high or too low during change cycle”.</td>
</tr>
</tbody>
</table>

COMPLETION OF MAIN CAM CYCLE

1. After one complete revolution of the Main Cam (20), the notch in the teeth of this Cam will disengage the Main Cam from the Turntable Gear (59). The Cam Stop Roller (55) enters a groove on the side of the Main Cam (20) which serves to locate its rest position.

2. The Starting Pawl (24) contacts and again becomes held by the Trip Release Assembly (23).

ACTION OF TRIP MECHANISM AT END OF RECORD

1. During the playing portion of the cycle the Trip Latch (25) contacts the serrated edge of the Trip Release Assembly (23). While the Pick-up Arm (1) is advancing toward the Center Post (50) the Trip Latch (25) will not move this assembly. When the Needle (3) enters the spiral groove at the end of the record, the motion of the Pick-up Arm away from the Center Post will cause the Trip Latch (25) to operate the Trip Release Assembly (23). The Starting Pawl (24) will be released and will engage the Turntable Gear (59) to start the change cycle.

“MANUAL” CONTROL OF CHANGER

1. When “AUTO-MANUAL” Control Button is moved down and to the left so that the word “MANUAL” is visible, the Starting Pawl (24) is held in such a position as to be unable to engage the Turntable Gear (59) and it is impossible for the changer to cycle automatically. Forward or reverse recordings may now be played by manually placing the Pick-up Arm on the record at the desired starting point.

STOPPING

1. To stop the changer (NOT DURING CHANGE CYCLE), slide the “ON-OFF” Switch (46) to its off position. Power to the Motor (48) will be turned off.
LUBRICATION

The record changer leaves the factory completely lubricated and under normal conditions this lubrication should be sufficient for approximately one year or 1,000 hours of operation. When operated under extreme conditions of dust or heat, lubrication should be performed as frequently as required.

NOTE: AVOID EXCESSIVE LUBRICATION. Do not permit any oil to get on the rubber tire of the Idler Wheel, on the motor hub, on the Trip Release and Starting Pawl mechanism, or on the drive rim of the Turntable. Any oil on these places should be removed with Carbon Tetrachloride.

A drop of good machine oil once a year on the Center Post Assembly bearings, motor bearings, small cotton oil wick on Main Cam, and frictional surfaces will provide the necessary lubrication.

PARTS LIST

<table>
<thead>
<tr>
<th>NO.</th>
<th>DESCRIPTION</th>
<th>PART NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Pick-up Arm, includes Hinge and Shaft (less Crystal Cartridge, Needles, Needle Selector Assembly and springs)</td>
<td>507452</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Crystal Cartridge (includes Needles)</td>
<td>507453</td>
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</tr>
<tr>
<td>3.</td>
<td>&quot;Long Playing&quot; Needles</td>
<td>507454</td>
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<tr>
<td>4.</td>
<td>Spring, Lift Adjusting</td>
<td>508949</td>
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<td>5.</td>
<td>Screw, Lift Adjusting</td>
<td>508950</td>
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<td>6.</td>
<td>Set Nut for Needle</td>
<td>508951</td>
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<td>7.</td>
<td>Spring, Needle Pressure</td>
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<td>Adjusting Washer</td>
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<td>Tube, Hinge</td>
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<td>10.</td>
<td>Pin, Hinge</td>
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</tr>
<tr>
<td>11.</td>
<td>Indexing Assembly</td>
<td>508956</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Crank Assembly</td>
<td>508957</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>Spring, Extension</td>
<td>508958</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td>Spring, Index Latch</td>
<td>508959</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Pin, Index Latch</td>
<td>508960</td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>Rubber Drive Belt for Motor</td>
<td>508961</td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>Pick-up Arm Lift Pin (part of Item 11)</td>
<td>508962</td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>Pick-up Arm Follower (part of Item 12)</td>
<td>508963</td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>Index Pin (part of Item 11)</td>
<td>508964</td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>Main Cam Assembly (includes attached levers and springs)</td>
<td>508965</td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>Spring, Starting Pawl</td>
<td>508966</td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td>Spring, Trip Latch</td>
<td>508967</td>
<td></td>
</tr>
<tr>
<td>23.</td>
<td>Trip Release Assembly</td>
<td>508968</td>
<td></td>
</tr>
<tr>
<td>24.</td>
<td>Starting Pawl (part of Item 20)</td>
<td>508969</td>
<td></td>
</tr>
<tr>
<td>25.</td>
<td>Trip Latch (part of Item 12)</td>
<td>508970</td>
<td></td>
</tr>
<tr>
<td>26.</td>
<td>Eccentric (part of Item 20)</td>
<td>508971</td>
<td></td>
</tr>
<tr>
<td>27.</td>
<td>Eccentric Arm Assembly</td>
<td>508972</td>
<td></td>
</tr>
<tr>
<td>28.</td>
<td>Drive Crank Nut</td>
<td>508973</td>
<td></td>
</tr>
<tr>
<td>29.</td>
<td>Tie Bar Assembly</td>
<td>508974</td>
<td></td>
</tr>
<tr>
<td>30.</td>
<td>Shelt, Front Record Support Arm</td>
<td>508975</td>
<td></td>
</tr>
<tr>
<td>31.</td>
<td>Shelt, Rear Record Support Arm</td>
<td>508976</td>
<td></td>
</tr>
<tr>
<td>32.</td>
<td>Record Support Arm Assembly</td>
<td>508977</td>
<td></td>
</tr>
<tr>
<td>33.</td>
<td>Plastic Cap, Record Support Arm</td>
<td>508978</td>
<td></td>
</tr>
<tr>
<td>34.</td>
<td>Cap Screw, Record Support Arm</td>
<td>508979</td>
<td></td>
</tr>
<tr>
<td>35.</td>
<td>Base Assembly (includes Escutcheon and other riveted parts)</td>
<td>508980</td>
<td></td>
</tr>
<tr>
<td>36.</td>
<td>Escutcheon</td>
<td>508981</td>
<td></td>
</tr>
</tbody>
</table>

* Not supplied as replacement part

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# TROUBLE SHOOTING CHART

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turntable fails to start after actuating &quot;ON-OFF&quot; Switch (46).</td>
<td>1. No Power.&lt;br&gt;2. Idler Wheel (52) not engaging turntable.&lt;br&gt;3. Defective &quot;ON-OFF&quot; Switch (46).&lt;br&gt;4. Defective motor.&lt;br&gt;5. Broken Rubber Drive Belt (16).&lt;br&gt;6. Binding in changer mechanism.</td>
<td>Check to determine if there is power at the wall outlet by disconnecting radio power cord and connecting a lamp to same outlet. Check to see that pivot lever under Idler Wheel (52) is free. Also be sure that spring which pulls Idler Wheel (52) toward Turntable is hooked to motor frame and has sufficient tension. Check continuity across switch contacts. Replace switch if necessary. Check and replace if necessary. &lt;br&gt;For analysis of fault see symptom entitled &quot;Changer stops while changing a record&quot;.</td>
</tr>
<tr>
<td>Changer refuses to cycle when &quot;START-REJECT&quot; Control Button is operated.</td>
<td>1. Broken or weak Starting Pawl Spring (21).&lt;br&gt;2. Bent Reject Link (39).</td>
<td>If the Starting Pawl Spring (21) is defective, the Starting Pawl (24) will not engage the Turntable Gear (59) when the Trip Release Assembly (23) is operated. Replace this Spring. Rear end of Reject Link (39) must contact side of Trip Release Assembly (23). Straighten Link.</td>
</tr>
<tr>
<td>Changer stops while changing a record.</td>
<td>1. Grease on Idler Wheel (52) or Turntable rim.&lt;br&gt;2. Idler Wheel (52) not engaging Turntable properly.&lt;br&gt;3. Binding in changer mechanism.&lt;br&gt;4. Low line voltage.&lt;br&gt;5. Weak Motor (48).</td>
<td>Clean with Carbon Tetrachloride. Check to see that pivot lever under Idler Wheel (52) moves freely. Also be sure that spring which pulls Idler Wheel (52) toward Turntable is properly engaged and has sufficient tension. Check for binding at points where Turntable Gear (59) engages Main Cam (20); also at base of Center Post Assembly (53). If Tie Bar (29) is bent and is rubbing against changer base, straighten or replace Tie Bar Assembly (29). Make sure Tie Bar (29) does not rub or jam against frame of Center Post Assembly (53). If this condition occurs, proceed as follows:&lt;br&gt;a. Loosen the bolt and Drive Crank Nut (28) at the end of the Eccentric Arm Assembly (27).&lt;br&gt;b. Rotate the Turntable clockwise by hand until the changer cycle is completed.&lt;br&gt;c. Move Tie Bar Assembly (29) [Record Support Arm Shafts (30 and 31) and Record Support Arms (52) will also move] until Tie Bar (29) is approximately 1/32&quot; from the frame of the Center Post Assembly (53).&lt;br&gt;<strong>NOTE:</strong> There are two positions of the Tie Bar (29) at which it may be placed approximately 1/32&quot; from the frame of the Center Post Assembly (53). Set the Record Support Arms (32) for automatic operation. Then make sure that at the proper separation of the Tie Bar and the frame of the Center Post Assembly, the lower blades of the Record Support Arm Assemblies (32) are nearer the Center Post (53) than the upper blades.&lt;br&gt;d. Retighten the bolt and Drive Crank Nut (28), making sure that the flange of the Nut faces toward the Record Support Arm Shaft (31).&lt;br&gt;e. Operate &quot;START-REJECT&quot; Control Button and rotate the Turntable clockwise by hand through the changer cycle. If the adjustment has been properly made, the Tie Bar (29) will no longer come in contact with the frame of the Center Post Assembly (53).&lt;br&gt;Lubricate changer mechanism if necessary; see section entitled &quot;Lubrication&quot;.&lt;br&gt;Line voltage should not be less than 105 volts. If after checking the above items, the changer continues to stall, it may be assumed that the Motor has low torque and should be replaced.</td>
</tr>
</tbody>
</table>
### TROUBLE SHOOTING CHART (Continued)

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changer cycles continuously.</td>
<td>1. Bent arm on Trip Release Assembly (23).</td>
<td>If the Trip Release Assembly (23) becomes bent, the Starting Pawl (24) may not become held by this Assembly at the completion of the Main Cam cycle. Straighten or replace Trip Release Assembly (23).</td>
</tr>
<tr>
<td></td>
<td>2. Bent Starting Pawl (24).</td>
<td>If the portion of the Starting Pawl (24) which contacts the Trip Release Assembly (23) becomes bent, the Starting Pawl may not become held by this Assembly at the completion of the Main Cam cycle. Straighten Starting Pawl (24).</td>
</tr>
<tr>
<td></td>
<td>3. Broken or weak Reject Spring (37).</td>
<td>A defective Reject Spring (37) will not return the &quot;START-REJECT&quot; Control Button to its original position and may keep the Trip Release Assembly (23) from engaging the Starting Pawl (24). Replace this Spring.</td>
</tr>
<tr>
<td>Changer fails to cycle after playing a record.</td>
<td>1. Bent or broken Trip Latch (25).</td>
<td>The Trip Latch (25) must contact and exert pressure against the serrated edge of the Trip Release Assembly (23) at the end of a record. Straighten Trip Latch or replace Crank Assembly (12).</td>
</tr>
<tr>
<td></td>
<td>2. Broken or weak Trip Latch Spring (22).</td>
<td>A defective Trip Latch Spring (22) will prevent the Trip Latch (25) from contacting the Trip Release Assembly (23). Replace Spring.</td>
</tr>
<tr>
<td></td>
<td>3. Worn serrated edge of Trip Release Assembly (23).</td>
<td>If the serrated edge of the Trip Release Assembly (23) becomes worn, the Trip Latch (25) will not cause the Trip Release to release the Starting Pawl at the end of a record. Replace Trip Release Assembly (23).</td>
</tr>
<tr>
<td></td>
<td>4. Broken or weak Starting Pawl Spring (21).</td>
<td>If the Starting Pawl Spring (21) is defective, the Starting Pawl (24) will not engage the Turntable, Gear (59) when the Trip Release (23) is operated. Replace this Spring.</td>
</tr>
<tr>
<td></td>
<td>5. No eccentric or Spiral groove at center of record.</td>
<td>The Needle (3) must enter the spiral groove at the center of a record before the Trip Latch (25) will operate the Trip Release Assembly (23). Old records which do not have this groove will prevent automatic operation of the changer.</td>
</tr>
</tbody>
</table>
| Record drops on one side only during change cycle OR Both sides of record do not drop simultaneously during cycle. | 1. Record Support Arms (32) incorrectly adjusted. | Proceed as follows:  
   a. Make sure that the Record Support Arms (32) are set for automatic operation and the changer has completed its change cycle.  
   b. Loosen the three bolts and Drive Crank Nuts (28) that hold the Tie Bar Assembly (29) and Eccentric Arm Assembly (27) to the Record Support Arm Shafts (30 and 31).  
   c. Move the Tie Bar Assembly (29) until it is approximately 1/32" from the frame of the Center Post Assembly (55).  
   d. Then, holding the Tie Bar Assembly (29) in place, rotate Record Support Arms (32) and Record Support Arm Shafts (30 and 31) until lower changer blades are pointing in the general direction of the Center Post (55).  
   e. Place a 10" record on the lower changer blades of the Record Support Arms (32) (as done when stacking records for automatic operation) and adjust Record Support Arms (32) so that the record covers the same amount of space on the two lower blades. Also, make sure that the nearest portion of the upper changer blades is approximately 5/6" from the edge of the record.  
   f. Retighten the three bolts and Drive Crank Nuts (28). The flange of the Nuts should face toward the Record Support Arm Shafts (30 and 31).  
   g. Operate "START-REJECT" Control Button and rotate the Turntable clockwise by hand through the changer cycle.  
   If trouble is not completely corrected, repeat this adjustment but make slight changes in the positioning of the lower changer blades with respect to the 10" record. |
<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Record fails to drop off Record Support Arms (32) at correct time during change cycle.</td>
<td>1. Record Support Arms (32) incorrectly adjusted. 2. Record size not standard.</td>
<td>For proper adjustment, see previous section of &quot;Trouble-Shooting Chart&quot; entitled &quot;Record drops on one side only during change cycle or Both sides of record do not drop simultaneously during cycle&quot;. A standard 10&quot; record has a diameter of 9 1/2&quot; = 1/32 and a standard 12&quot; record has a diameter of 11 1/2&quot; = 1/32.</td>
</tr>
<tr>
<td>Erratic motion of Pick-up Arm (1) in horizontal direction during change cycle.</td>
<td>1. Broken Pick-up Arm-Follower (18). 2. Loose bolt and nut on Crank Assembly (12).</td>
<td>The groove in the Main Cam (20) directs the motion of the Pick-up Arm Follower (18) and the Pick-up Arm (1) in the horizontal direction. A broken Pick-up Arm Follower (18) eliminates or adversely affects this motion. Replace Crank Assembly (12). The nut and bolt on the Crank Assembly (12) clamp the Crank Assembly to the shaft of the Pick-up Arm Assembly (1). If the nut and bolt are loose, horizontal motion between these two assemblies will be transmitted by friction only. Relighten according to section of &quot;Trouble-Shooting Chart&quot; entitled &quot;Pick-up Arm (1) sets down at wrong starting point on record&quot;.</td>
</tr>
<tr>
<td>Erratic motion of Pick-up Arm (1) in vertical direction during change cycle.</td>
<td>1. Weak or broken Spring for Index Latch (14). 2. Weak or broken conical spring on Indexing Assembly (11).</td>
<td>This spring is a safety device enabling the Pick-up Arm (1) to be moved horizontally beyond its normal operating range without causing injury to the changer mechanism. However, if the Extension Spring (18) is defective, horizontal motion between the Crank Assembly (12) and the Pick-up Arm Assembly (1) will be transmitted by friction only. Replace spring.</td>
</tr>
<tr>
<td>Pick-up Arm Elevation is too high or too low during change cycle.</td>
<td>1. Lift Adjusting Screw (5) improperly adjusted.</td>
<td>When Pick-up Arm elevation is incorrect, proceed as follows: a. Put twelve 10&quot; records on the Turntable. b. Slide &quot;START-REJECT&quot; Control Button to the left as far as it will go and then release it. c. Rotate Turntable clockwise by hand until Pick-up Arm (1) and Needle (3) approach the stack of records. d. Adjust the Lift Adjusting Screw (5) so that clearance between Needle and top record is approximately 3/32&quot;.</td>
</tr>
<tr>
<td>Pick-up Arm (1) sets down at wrong starting point on record.</td>
<td>1. Incorrect adjustment of set-down point.</td>
<td>The position at which the Pick-up Arm (1) sets down on a record may be adjusted by means of the Index Bushing Assembly (41). Proceed as follows: a. Set changer for 12&quot; operation and place a 12&quot; record on the Turntable. b. Slide &quot;START-REJECT&quot; Control Button to the left as far as it will go and then release it. c. Rotate Turntable clockwise by hand until Pick-up Arm (1) and Needle (3) start to drop down to record. d. Loosen nut on Index Bushing Assembly (41) and adjust screw of this assembly to drop Pick-up Arm and Needle at desired position on record. This position should place the Needle 5-11/16&quot; from the Center Post (53). e. Retighten nut on Index Bushing Assembly (41). f. Make final adjustment of set-down point using Index Bushing Assembly (41) as explained above.</td>
</tr>
</tbody>
</table>

*John F. Rider*
## TROUBLE SHOOTING CHART (Continued)

<table>
<thead>
<tr>
<th>SYMPTOM</th>
<th>CAUSE</th>
<th>REMEDY</th>
</tr>
</thead>
<tbody>
<tr>
<td>2. Weak or broken spring which operates Index Pin (19).</td>
<td>A defective spring which operates the Index Pin (19) will not engage this Pin with the notches on the Index Stop Lever (43). Replace Indexing Assembly (11). The lever located on the inside surface of the Main Cam aids in obtaining the proper set-down point for the Pick-up Arm (1). It guides the Pick-up Arm Follower (18) during the final part of the change cycle. If the spring which operates this lever is defective, the Main Cam Assembly (20) must be replaced. See section of &quot;Trouble Shooting Chart&quot; entitled &quot;Erratic motion of Pick-up Arm (1) in horizontal direction during change cycle&quot;.</td>
<td></td>
</tr>
<tr>
<td>3. Defective spring which operates lever on inside surface of Main Cam (20).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Broken Pick-up Arm Follower (18), loose bolt and nut on Crank Assembly (12), or weak or broken Extension Spring (13).</td>
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</tr>
<tr>
<td>Tripping is possible with Control Button in &quot;Manual&quot; position.</td>
<td>1. Bent Starting Pawl (24). If the portion of the Starting Pawl (24) which contacts the Manual Link (38) is bent, the Starting Pawl will not be kept from engaging the Turntable Gear (59). Straighten Starting Pawl or replace Main Cam Assembly (20). Rear end of Manual Link (38) must contact flange on Starting Pawl (24) when changer is set for manual operation. Straighten Link.</td>
<td></td>
</tr>
<tr>
<td>Improper &quot;tracking&quot; of Needle with record — Needle slips out of grooves and slips portions of record.</td>
<td>1. Incorrect setting of Needle Selector (62). Make sure that Needle Selector (62) is in the correct position for playing the type of records on the changer. Clean record with record brush or soft camel's hair brush.</td>
<td></td>
</tr>
<tr>
<td>2. Foreign matter in record grooves.</td>
<td></td>
<td></td>
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<tr>
<td>4. Badly worn Needle (3).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Incorrect adjustment of Needle Pressure Spring (7).</td>
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<tr>
<td>To eliminate the possibility of installing the Needles in the wrong sides of the Crystal Cartridge, the shaft of the &quot;Long Playing&quot; Needle is painted red. The pressure that the Pick-up Arm (1) exerts on a record is controlled by the Needle Pressure Spring (7). Using a Needle Pressure Gauge, the needle pressure should be between 8 and 12 grams. To change needle pressure, proceed as follows: a. To decrease needle pressure, place a screwdriver in a notch of Adjusting Washer (8) and turn Washer by moving screwdriver upward. b. To increase needle pressure, place a screwdriver in a notch of Adjusting Washer (8) and turn Washer by moving screwdriver downward. In making this adjustment it will be necessary to disengage Adjusting Washer (8) from lip on Pick-up Arm Hinge (1).</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SYMPTOM</td>
<td>CAUSE</td>
<td>REMEDY</td>
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</tr>
<tr>
<td>Slow Turntable speed</td>
<td>1. Speed Selector (61) in wrong position.</td>
<td>Make sure that Speed Selector (61) is in the correct position for</td>
</tr>
<tr>
<td></td>
<td>2. Grease on Idler Wheel (52) or Turntable rim causing slipping.</td>
<td>playing the type of records on the changer.</td>
</tr>
<tr>
<td></td>
<td>3. Idler Wheel (52) not properly engaging Turntable.</td>
<td>Clean surfaces with Carbon Tetrachloride.</td>
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<tr>
<td></td>
<td>4. Binding of drive parts.</td>
<td>Check to see that pivot lever under Idler Wheel (52) is free. Also</td>
</tr>
<tr>
<td></td>
<td>5. Line voltage too low.</td>
<td>be sure that spring which pulls Idler Wheel (52) toward Turntable</td>
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<td></td>
<td>6. Operating temperature too low.</td>
<td>is properly engaged and has sufficient tension.</td>
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<tr>
<td></td>
<td>7. Faulty Motor (48).</td>
<td>Carefully check Center Post Assembly (53) for binding.</td>
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<td></td>
<td></td>
<td>Line voltage should not be less than 106 volts.</td>
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<td>If the changer has been stored in a cold room, the Turntable speed</td>
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<td>may be slower than normal.</td>
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<td>If, after checking the above six items Turntable speed is still too</td>
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<td>slow, then it may be assumed that the Motor is at fault and should</td>
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<tr>
<td></td>
<td></td>
<td>be replaced.</td>
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<tr>
<td>Rumble or “wow”</td>
<td>1. Changer not floating freely on its mounting springs.</td>
<td>Be sure the four Base Mounting Screws used for mounting the changer</td>
</tr>
<tr>
<td></td>
<td>2. Improper motor mounting.</td>
<td>have been screwed down as far as they will go.</td>
</tr>
<tr>
<td></td>
<td>3. Worn tire on Idler Wheel (52).</td>
<td>Be sure that Motor (48) is mounted on Rubber Grommets (51).</td>
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<td></td>
<td>4. Worn Pad for Needle Selector.</td>
<td>Examine Idler Wheel (52) for flat spots on tire and replace Wheel</td>
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<td>if defective.</td>
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<td>A worn Pad will cause the Needle Selector (52) to rest against the</td>
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<tr>
<td></td>
<td></td>
<td>Pick-up Arm (1). This will cause “needle talk-back”. Replace Needle</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Selector Pad.</td>
</tr>
</tbody>
</table>

**PROCEDURE FOR REMOVAL AND REPLACEMENT OF MAJOR PARTS**

<table>
<thead>
<tr>
<th>NAME OF ITEM</th>
<th>METHOD OF REMOVING OR REPLACING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Needle (3).</td>
<td>To remove or replace a Needle (3), proceed as follows:</td>
</tr>
<tr>
<td></td>
<td>a. If Standard Needle is to be removed, adjust Needle Selector (62) so that the words “78</td>
</tr>
<tr>
<td></td>
<td>ONLY” appear at the top. If “Long Playing” Needle is to be removed, adjust Needle Selector</td>
</tr>
<tr>
<td></td>
<td>(62) so that the words “33 ONLY” appear at the top.</td>
</tr>
<tr>
<td></td>
<td>b. Loosen Set Nut for Needle (6) located directly below Needle.</td>
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<tr>
<td></td>
<td>c. Insert Needle so that point extends away from Crystal Cartridge (2) and flat surface of</td>
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<td>shaft is against Set Nut (6). When tightening Nut make sure that Needle remains parallel to</td>
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<td></td>
<td>sides of Cartridge and point protrudes approximately 1/16” from lower frame of Needle</td>
</tr>
<tr>
<td></td>
<td>Selector.</td>
</tr>
<tr>
<td>Crystal Cartridge (2).</td>
<td>Remove the two Needles (3). Remove the two screws (and associated nuts and sleeves) which</td>
</tr>
<tr>
<td></td>
<td>pass through the Needle Selector Assembly (62) and the Cartridge (2). Crystal Cartridge may</td>
</tr>
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<td></td>
<td>now be removed by slipping the “quick disconnect” electrical connectors off the prongs at the</td>
</tr>
<tr>
<td></td>
<td>rear of the Cartridge (2).</td>
</tr>
<tr>
<td>Center Post Assembly</td>
<td>Removal of the Center Post Assembly (53), as well as the remainder of the drive mechanism,</td>
</tr>
<tr>
<td>(53)</td>
<td>may be more easily accomplished if the changer has completed its change cycle. Remove the</td>
</tr>
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<td></td>
<td>Turntable by lifting it up from changer base. Then remove the three Screws and Lockwashers</td>
</tr>
<tr>
<td></td>
<td>(57).</td>
</tr>
<tr>
<td></td>
<td>To disassemble the Center Post Assembly (53), remove the two screws on this Assembly.</td>
</tr>
<tr>
<td></td>
<td>When reassembling the Center Post Assembly (53), make sure that the Large Ball Bearing (58)</td>
</tr>
<tr>
<td></td>
<td>is properly seated in the base of the Assembly. To accomplish this, invert the upper portion</td>
</tr>
<tr>
<td></td>
<td>of this Assembly and place the Ball Bearing (58) in the hollow at the base of the Center Post.</td>
</tr>
<tr>
<td></td>
<td>Invert the lower portion of this Assembly and slide it over the Ball Bearing (58) as far as</td>
</tr>
<tr>
<td></td>
<td>it will go. Insert and tighten the two screws. Then remount the Center Post Assembly (53) on</td>
</tr>
<tr>
<td></td>
<td>the changer base using the three Screws and Lockwashers (57).</td>
</tr>
<tr>
<td></td>
<td>If binding occurs after assembly,</td>
</tr>
<tr>
<td></td>
<td>a. Disassemble and place one drop of good machine oil in base of Center Post Assembly (53).</td>
</tr>
<tr>
<td></td>
<td>b. If mechanism still binds, remove Assembly. Remove the two screws on this Assembly, rotate</td>
</tr>
<tr>
<td></td>
<td>the flange on the upper section of the Assembly 180°, and replace the screws.</td>
</tr>
</tbody>
</table>

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**PROCEDURE FOR REMOVAL AND REPLACEMENT OF MAJOR PARTS (Continued)**

<table>
<thead>
<tr>
<th>NAME OF ITEM</th>
<th>METHOD OF REMOVING OR REPLACING</th>
</tr>
</thead>
</table>
| Eccentric Arm Assembly (27) and Tie Bar Assembly (29). | After the Center Post Assembly (53) has been removed, loosen the Drive Crank Nut (28) at one end of the Eccentric Arm Assembly (27) and remove the small screw and washer at the other end. The Eccentric Arm Assembly may then be easily removed.  
After the Eccentric Arm Assembly (27) has been removed, loosen the two Drive Crank Nuts (28) and slide the Tie Bar Assembly (29) off the two Record Support Arm Shafts (30 and 31).  
When reassembling, make sure that the flanges on the Drive Crank Nuts (28) face toward the Record Support Arm Shafts (30 and 31). |
| Main Cam Assembly (20). | After the Eccentric Arm Assembly (27) has been removed, the Main Cam Assembly will easily slide off its shaft. |
| Record Support Arm Assemblies (32) and Record Support Arm Shaft Assemblies (30 and 31). | After the Eccentric Arm Assembly (27) and Tie Bar Assembly (29) have been removed, remove the Record Support Arm Caps (33). The Record Support Arms (32) and Record Support Arm Shafts (30 and 31) are now disengaged from the Base Assembly (35) and may be easily slipped off. |
| Pick-up Arm Assembly (1). | The Pick-up Arm Assembly (1) should not be removed from the changer unless it is to be replaced. There are 18 Small Ball Bearings around the top of the Pick-up Arm Shaft and 17 Small Ball Bearings in a circular slot near the bottom of the Pick-up Arm Shaft. These Bearings will fall out of their respective positions unless the changer is in a horizontal position when the Pick-up Arm Shaft is removed and unless removal is accomplished with extreme care.  
To remove the Pick-up Arm Assembly:  
a. Make sure changer is in a horizontal position.  
b. Pull Phono Pick-up Cable to obtain "slack" in cable between Pick-up Arm (1) and changer base.  
c. Loosen the bolt and nut on the Crank Assembly (12) and remove the Pick-up Arm Assembly by carefully lifting at its base.  
When reassembling, the Pick-up Arm Shaft (1) must pass through each part of the Crank Assembly (12), and the hinge at the end of the Pick-up Arm (1) must be as close to the pick-up arm post of the Base Assembly (35) as possible. |
| Indexing Assembly (11) and Crank Assembly (12). | These two assemblies may be removed by loosening the bolt and nut on the Crank Assembly (12) and sliding these assemblies off the Pick-up Arm Shaft (1).  
**CAUTION:** Separation of these two assemblies is not recommended unless one of the assemblies is to be replaced.  
The Indexing Assembly (11) and Crank Assembly (12) may be separated by removing the small "C" washer on the Index Pin (19) and the Spring and Pin for Index Latch (14 and 15).  
When reassembling, make sure parts of Crank Assembly are in correct order and position. Hold hinge at the end of Pick-up Arm (1) tightly against pick-up arm post of Base Assembly (35) to prevent the 35 Small Ball Bearings around the Pick-up Arm Shaft from falling out. |
DESCRIPTION OF OPERATIONAL CYCLES

Power for the motor is obtained through the on-off switch mounted on the bridge assembly. This switch is operated manually by the control button with positions OFF-MAN-AUT-REJ. This button is located to the left of the record-shelf assembly, on the top of the Record Changer.

The Record Changer has three speeds, controlled by the Speed Selector located to the right of the record-shelf assembly. The positions of the Speed Selector are STD PLAY - 45 - LONG PLAY. These speed changes are brought about by the shift lever, which changes the positions of the idler wheel and pulley with respect to the motor shaft.

The changer mechanism of the Record Changer is brought into action when a small retracted gear segment, mounted on the cam gear, is released, and engages the hub gear of the turntable shaft, causing the cam gear to be driven. While a record is playing, the retracted gear segment is held in the retracted position by the trip-plate retaining wall, which engages the roller of the gear segment. The segment is released either manually, by pushing the OFF-MAN-AUT-REJ control to REJ, or automatically, when the changer tone arm reverses direction as the needle follows the eccentric finish groove of a record. For 45 r.p.m. automatic operation, an additional trip mechanism is brought into play. This trip mechanism is actuated by a trip stop, mounted on the trip receiver. When the needle of the tone arm enters the finish groove of a 45 r.p.m. record, the trip stop engages the trip lever, which releases the hammer; this hammer strikes the trip plate, and pushes it aside. The gear segment is then released, as explained above, for either the standard or long-play operations.

The tone arm of the Record Changer is operated by two link assemblies attached to actuator levers, which are in contact with the cam surfaces of the cam gear. When the cam gear starts rotating, the lower actuator lever is pushed outward first, and the link assembly with the long cord attached to it raises the tone arm off the record. As the cam gear continues to turn, the upper actuator lever is pushed outward, and its link assembly pulls the tone arm out against the rest post. At this instant, a roller on the cam gear makes contact with the push-off actuator (which is connected to the record-shelf assembly through a series of push-off bars), and operates the record-dropping mechanism.

After the record has dropped to the turntable, the cam releases the upper actuator, permitting the tone arm to move inward. As the tone arm moves toward the center of the turntable, the index finger engages one of the selectors, which stops the tone-arm travel at a point just above the start groove of the record. Following this action, the lower actuator, which is engaged with the lower cam surface of the cam gear, starts riding inward, relaxing the long cord and link assembly, allowing the tone arm to set down onto the record.

INDEXING OR SET-DOWN

7" Record

Set a 7" record on the turntable, push the OFF-MAN-AUT-REJ control to REJ, and rotate the turntable by hand approximately 4½ turns. The tone-arm needle should be approximately ½" above the record at this point. Loosen the clamp screw on the trip arm slightly (figure 9); then hold the tone arm steady, ½" in from the edge of the record, and set the trip arm so that the magnetic index stop, Part No. 76-5497, is in contact with the selector hinge (inside selector). Part No. 56-7494, as shown in figure 1. The index stop should engage the selector hinge by a minimum of ½". Tighten the clamp screw, leaving 1½" vertical play, or clearance, between the trip arm and the base plate.

10" Record

Make the index adjustment for 7" records first. Check 10" indexing by the same method as that outlined above. With the needle point ½" above the record, and ¼" in from the outside edge, the index stop should be in contact with the middle selector, Part No. 56-7478, as shown in figure 2.

Ordinarily, the 10" index is satisfactory after the 7" index adjustment is made; if not, bend the selector slightly to the right or left, as required, for proper set-down of the needle.

12" Record

Adjust as given above for 10" records, except that the index stop should contact the outside selector, Part No. 56-7478. If the indexing is incorrect, bend the selector hinge slightly to the right or left, as required, for proper set-down.

TRIP ACTION

10" or 12" Standard or Long-Play Records

With a 10" or 12" record on the turntable, the Speed Selector set to either STD PLAY or LONG PLAY, and the OFF-MAN-AUT-REJ control in AUTO position, place the tone arm in the finish, or eccentric, groove of the record. The trip finger, Part No. 56-7486, now rides over the ratchet of the trip plate, Part No. 76-5252, as shown in figure 3. The trip finger should ride at an angle of 25° to 30° with respect to the ratchet. To obtain the correct angle, adjust the screw on the trip receiver, Part No. 56-7491, as indicated in figure 3. Make certain that the vertical center line of the trip finger coincides with the center line of the ratchet. To obtain this alignment, loosen screw "A" slightly, and screw "B" completely, on the trip receiver, and swing the trip receiver to the right or left, rotating about point "A" until the trip finger is centered over the ratchet; then tighten the screws.

When this adjustment is made, care should be taken to prevent the trip receiver from being pulled in toward the trip arm too far, as this will prevent the trip-arm stop from engaging the selector hinge by a minimum of ½". A compromise between these two adjustments should be reached.

The index adjustment will be affected when making the above adjustments. Remember that these three adjustments are interrelated, and that, when any one of them is made, the other two should be rechecked.

7" — 45 R.P.M. Records

Place a 7", 45 r.p.m. record, with adaptor insert, on the turntable. Set the Speed Selector to 45, and the OFF-MAN-AUT-REJ control to AUTO position. Set the tone arm on the portion of the record which contains the leadin grooves. The mechanism should trip when the needle reaches a point approximately ½" from the last groove (which is concentric). If it trips before reaching this point, bend the trip finger, Part No. 56-7486, away from the trip-arm stop. If it fails to trip when this point is reached, bend in the opposite direction.

The trip-arm stop should engage the trip by a minimum of ½" in both the horizontal and vertical planes, as shown in figure 3. This may be adjusted by loosening the trip locking screw, and sliding or raising the trip to the desired position.

The horizontal force required to trip the changer and initiate the change cycle should not exceed 2 grams at any turntable speed.
FIGURE 1. 7" INDEX ADJUSTMENT

FIGURE 2. 10" INDEX ADJUSTMENT

FIGURE 3. TRIP ADJUSTMENTS
NEEDLE POINT 3/32" (MIN.) ABOVE BASEPLATE

BEND EAR TO OBTAIN CORRECT BASEPLATE CLEARANCE

FIGURE 4. BASE-PLATE-CLEARANCE ADJUSTMENT

ADJUST EAR OF SHAFT AND SWIVEL ASSY.

FIGURE 5. TONE-ARM HEIGHT AND LIFT ADJUSTMENT

FIGURE 6. HORIZONTAL AND VERTICAL TIMING ADJUSTMENTS

FIGURE 7. SPECIAL RECORD-SHELF GAUGE, SHOWN IN CORRECT POSITION

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TONE-ARM HEIGHT AND LIFT

With the changer out of cycle, and the tone arm free, set the arm over the base plate. The needle point should be approximately \( \frac{3}{16} \)" above the base plate, as shown in figure 4. To adjust the clearance, bend the protruding ear of the swivel post (bending the ear upward increases the clearance, downward decreases the clearance), as shown in figure 5. Now raise the tone arm to its maximum height, and place it against the rest post. There should be a minimum of \( \frac{1}{8} \)" clearance between the lower edge of the tone arm and the top of the rest-post hook. Adjust the ear on the swivel post until a mean is reached between the correct rest-post clearance and base-plate clearance.

TONE-ARM HORIZONTAL AND VERTICAL TIMING

Before making the vertical and horizontal adjustments, make the tone-arm height and lift adjustments described above.

For the vertical timing, start with the changer out of cycle and the tone arm on the rest post, push the OFF-MAN-AUT-REJ control to REJ, and rotate the turntable approximately \( 1\frac{1}{2} \) revolutions by hand. At this point, the lower eccentric portion of the cam-and-gear assembly, Part No. 76-3095-2, fully engages the lower (vertical) actuator (the actuator with the cord), Part No. 76-5322. Adjust the wire loop of the lower link, Part No. 56-7023, figure 6, by squeezing or opening the loop so that the safety spring is expanded approximately \( \frac{1}{3} \)". With this adjustment, the ear of the tone-arm swivel post makes firm contact with the lower end of the cutout on the tone-arm pivot assembly.

For the horizontal timing, start as given in the above paragraph. At the same point, \( 1\frac{1}{2} \) revolutions from the start of the cycle, the upper eccentric portion of the cam gear fully engages the upper (horizontal) actuator, Part No. 76-5323. Adjust the wire loop of the upper link, Part No. 76-7023, with the short cord, figure 6, by squeezing or opening the loop so that the safety spring is expanded approximately \( \frac{5}{32} \)". With this adjustment, the tone arm should be snug against the rest post, but not so tight as to cause undue slapping as the arm returns to the rest post during cycling.

RECORD SHELF

Set the record shelf to the 10" position, with the changer out of cycle. Loosen the two hex-head drive screws that hold the record-shelf assembly to the changer base plate just sufficiently to allow movement of the record-shelf stanchion. Place the Philco record-shelf gauge, Part No. 45-1672, over the spindle and onto the record-shelf actuator, as shown in figure 7. Move the record-shelf assembly away from the spindle until the large, curved part of the gauge drops even with the record-shelf lips. Now push the record shelf and gauge lightly against the spindle, taking out all play toward the spindle; keep the lips of the record shelf in even contact with the edge of the gauge. Tighten the two hex-head screws.

PUSH-OFF

With the changer out of cycle, push the OFF-MAN-AUT-REJ control to REJ, and rotate the turntable 2 revolutions by hand. At this point, the push-off actuator, Part No. 56-4588, is in its most forward position, in contact with the roller on the cam gear. Loosen the push-off-bar locking screw (indicated in figure 3) slightly (just sufficiently to allow adjustment), and squeeze the push-off ears toward each other until the slide plate on the record shelf extends between \( \frac{3}{16} \)" and \( \frac{1}{8} \)" beyond the lips of the shelf. Tighten the hex-head push-off-bar screw.

NEEDLE PRESSURE

Use the Philco gram scale, Part No. 45-9531. Calibrate the scale to zero by holding it upright for vertical measurement, and setting the pointer to the center line of the scale. The center is the "0" point, and each small division on either side of "0" is equal to one gram.

After the scale has been calibrated to zero, hold the scale perpendicularly to the tone-arm head, and support the tone arm by placing the standard-play needle in the hole at the end of the gram-scale arm, as shown in figure 8. By lifting the gram scale carefully, raise the tone arm approximately \( \frac{1}{2} \)", and note the reading. Then lower the tone-arm, and note the reading. The average of these two readings is the needle pressure, which should be between 7 and 9 grams. The pressure is adjustable by bending the ear at the rear of the tone arm to which the tone-arm spring is anchored, as shown in figure 9. Bending the ear so as to stretch the spring decreases the needle pressure; bending so as to relax the spring increases the needle pressure. If the needle pressure is out of tolerance, make the above adjustments gradually, and recheck after each change, as a small movement gives a rather large variation in needle pressure.

When making this adjustment, be careful not to bend or distort the bracket. If this bracket is deformed, the needle pressure on the last record of a stack will differ from the needle pressure on the first record. When the proper needle pressure is attained, the upper edge of the ear should be parallel to the rear, lower edge of the tone-arm shell. If the bracket was bent while adjusting the ear, gently pry down or push up the bracket (applying even pressure on both sides) until the ear and tone-arm shell are in proper relationship.

VERTICAL FRICTION

To measure the vertical friction, take two gram-scale readings as explained above under NEEDLE PRESSURE. One-half of the difference between the two readings is the vertical friction, which should not exceed 1.5 grams.

HORIZONTAL FRICTION

Calibrate the gram scale by laying it flat, face-up. Set the pointer to zero (center mark).

Place a counterweight on top of the rear end of the tone arm, with the changer out of cycle; move the counterweight until the tone arm is balanced horizontally, and the needle point clears the turntable. Hold the gram scale face-up, place its pointer against the side of the pickup, and slowly move the gram scale so as to push the tone-arm horizontally with the pointer, as shown in figure 10. Note the reading of the gram scale while moving the tone arm throughout its entire travel (outside the trip range). At no time should the horizontal friction (the force required to move the tone arm) exceed \( \frac{1}{2} \) grams, nor be less than \( \frac{3}{4} \) of a gram.

Note: Whenever any repairs or replacements are performed, all adjustments should be checked, and any necessary adjustments made. When making adjustments, check the lubrication at all points indicated in the LUBRICATION section, and lubricate where necessary, after cleaning off old and excess grease with a soft brush and carbon tetrachloride.
FIGURE 8. MEASURING VERTICAL FRICTION

FIGURE 9. NEEDLE-PRESSURE ADJUSTMENT

FIGURE 10. MEASURING HORIZONTAL FRICTION
FIGURE 11. TOP VIEW, SHOWING LUBRICATION POINTS

FIGURE 12. BOTTOM VIEW, SHOWING LUBRICATION POINTS
LUBRICATION

When the Record Changer is brought in for service, it should be well cleaned with a fine brush and carbon tetrachloride. Remove the needle guard and clean out accumulated dust with a fine brush. Remove all dirt and old grease and oil. When applying new grease and oil, use it sparingly. Lubrication points are shown in figures 11 and 12. It may be necessary to remove some parts and assemblies in order to properly lubricate them. For example, the cam gear and actuator levers should be removed to lubricate the cam-gear spindle and the actuator stud. The lubrication points that cannot be reached without some degree of disassembly are indicated in the following list with an asterisk, and are also indicated in the breakdown views of their respective assemblies.

LUBRICANTS
Oil—S.A.E. 20
Grease—Texaco Motor Cup Grease (unless otherwise specified)

PARTS NOT TO BE LUBRICATED
The following parts should not be lubricated at any time:
- Trip receivers
- Trip fingers
- Selector assembly (except specific points indicated)
- Ratchet portion of trip plate
- Trip-latch assembly
- Idler tire
- Drive belt
- Drive-pulley shaft

PARTS TO BE OILED

**Record-Shelf Assembly**
- Top of push-off saddle
- Each of four cast lugs on 10" shelf where pin is inserted and where hold-down pivots*
- Loops of hold-down springs where hooked to 10" hold-down and 7" record shelf*
- Points of contact of record shelves where push-off blades ride*
- Control button fulcrum points*

**Bridge Assembly**
- Three dimples and two upturned ears
- End and detent notches of control slider

**Cam Gear**
- Between roller and gear surface
- Gear teeth and two lateral cam surfaces
- Upper cam surface where selector hinge rides*

**Main Assembly**
- Push-off bar where it connects to its actuator
- Push-off actuator where its dimples slide on base plate
- Speed Selector ears where they slide on base plate
- Speed Selector cam slot, detent surfaces, and pivot point
- Selector hinge where ears slide on base plate
- Turntable shaft at upper outside bearing only*
- Detent assembly; to roller stud, ear, and sliding guide surfaces
- Trip actuator, to three guide surfaces and ear operating reset lever
- Actuator spindle*
- Horizontal actuator bushing, outside*
- Vertical actuator bushing where trip reset arm rides

**Tone Arm**
- Point of shaft and where it rotates in tone-arm stanchion

**Motor Assembly**
- Cam surface of idler-wheel lifter
- Detent surfaces
- Guide slots of shifter plate
- Extension of idler shaft in contact with lower shifter plate

**PARTS TO BE OILED**

- Tone-arm pivot pin*
- Trip-plate bushing (inside)*
- Spindle; where spindle slides in hole in the bridge, and where it engages the upper bearing of turntable
- Cam-gear spindle*
- Roller on gear segment

**CAUTION:** When lubricating the motor, remove the rubber belt and idler wheel. When lubrication is completed, be sure the motor shaft and pulley are free from oil and grease. Failure to observe this precaution may result in slippage.

**GRAPHITE**
Powdered graphite should be applied to the ear of the selector plate in the brass shifter bushing.

**PETROLEUM JELLY (or DOW CORNING “DC-4”)**
Apply to the contacts of the cartridge contact plate, and to the dimple of the cartridge retaining spring.

**SERVICE NOTE:** After long usage, the push-off bar may develop squeaks while cycling. If this is encountered, the following points should be greased sparingly.
- Both ends of return spring
- Fulcrum of push-off rod
- Point of contact between push-off bar and hanger
- Where hanger pivots in fulcrum plate
- Where push-off rod rides in push-off bar

**UNEVEN TURNTABLE SPEED (WOWS)**

Uneven turntable speed may be caused by the following conditions.
1. Dirt under and around the idler-wheel assembly.
2. Idler-wheel spring loose or missing.
3. Flat spot on idler-wheel tire or on turntable.
4. Loose or worn pulley belt.
5. Oil or grease on idler-wheel tire, pulley, or drive shaft.
REPLACEMENT OF PARTS AND ASSEMBLIES

The following procedures are recommended for the correct removal of parts and assemblies. The parts should be replaced by reversing the order of removal. Adjustments should be made according to the directions given in the ADJUSTMENTS section of the manual.

1. Crystal
   Grasp crystal with fingernails. With the other hand, hold tone arm and apply slight pressure on switch lever. Pull down and to the outside. Replace by holding crystal contacts toward spindle, and pushing upward until firmly seated.

2. Needle
   a. Remove crystal (see paragraph 1). Gently lift out with prying motion, using fingernail or knife point. When replacing needle, align key of needle shaft with keyway in chuck of cartridge, then push needle into cartridge.

3. Spindle
   a. Remove cutter pin from lower end, and pull spindle out. The turntable may now be lifted off.
   NOTE: When replacing the turntable, position the speed-control button midway between LONG-PLAY and 45. Hold the idler wheel back toward the center while positioning the speed control until the idler stays retracted. Then replace turntable. This method will prevent damage to the idler-wheel tire.

4. Tone-Arm Assembly
   a. Place changer in MAN position.
   b. Unsolder the four tone-arm leads from terminal panel.
   c. Remove vertical actuator safety spring from long overt.
   d. Loosen trip-arm clamp screw.
   e. Lift out tone arm. Figure 13 shows tone-arm assembly.
   NOTE: When the tone arm is replaced, be sure to maintain \( \frac{3}{2} \) vertical play between the trip arm and the fiber washer.
   To insure proper tone-arm damping, be sure that the tone-arm damper is firmly seated in its proper position. Also, the lead washer under the adjusting screw of the trip receiver should never be replaced with a substitute; if it is necessary to replace it, use lead washer, Part No. 84-12959.

5. Trip-Arm Assembly
   a. Loosen clamp screw.
   b. Raise tone arm sufficiently to clear trip arm.
   c. Remove trip arm, and disengage link spring. Figure 14 shows trip-arm and trip-receiver assemblies.
   NOTE: When reassembling, maintain \( \frac{3}{2} \) vertical play.

6. Motor Assembly
   a. Remove spindle and turntable (see paragraph 3).
   b. Unsolder motor lead from switch on bridge assembly.
   c. Remove ground wire from terminal panel.
   d. Remove the three hex-head screws, washers, and spacers from motor frame.
   e. Slide jaws of speed-shift lever free of brass spacer and ear of speed-change actuator plate.
   f. Lift motor out. Figures 15 and 16 show motor assemblies.

7. Speed-Change Assembly
   a. Remove "E" washer and washer from actuator shaft.
   b. Remove "E" washer and detent spring from selector-lever shaft.
   c. Lift off trip actuator.
   d. Remove lower "E" washer from selector shaft.
   e. Rotate selector lever until ears clear cutouts of base plate, and brass spacer comes free from motor shaft lever.
   f. Lift selector lever upward and off.
   g. Disengage link from control button. Figure 17 shows speed-change assembly.

8. Tone-Arm-Actuator Levers
   a. Remove "E" washer from actuator shaft; lift trip actuator off, and push to one side.
   b. Remove long spring from reset lever, and lift off.
   c. Remove small "E" washer from actuator shaft (above main plate), and remove inner actuator shaft.
   d. Disengage link from vertical actuator.
   e. Remove spacer, and swing horizontal actuator away from cam gear; slip off from actuator stud, and disengage link. Figure 17 shows actuator assembly.

9. Push-Off Actuator
   a. Remove tone-arm actuators (see paragraph 8).
   b. Remove return spring from push-off bar.
   c. Disengage push-off bar from its actuator.
   d. Rotate actuator until its ears clear cutouts in base plate. Lift off. See figure 17.

10. Bridge Assembly
    a. Remove mounting plate and hammer-actuator springs.
    b. Remove "E" washer, curved washer, and spacer from cam gear shaft.
    c. Lift hammer, hammer bushing, spacer, mounting plate and trip-latch assembly, and mounting plate bushing from shaft.
    d. Remove hex-head screw holding spindle spring and bridge to turntable-bearing bracket.
    e. Lift bridge off, and disengage control link from slider control bar. See figure 18.

11. Cam-Gear Assembly
    a. Remove bridge (see paragraph 10).
    b. Remove "E" washer, and lift off trip plate.
    c. Remove "E" washer and spacer.
    d. Slide cam gear from spindle. Figure 18 shows cam-gear assembly.

12. Selector Assembly
    a. Remove cam-gear assembly (see paragraph 11).
    b. Remove hex-head screws holding selector bracket.
    c. Remove index lever, index-lever spring, and selector-hinge spring.
    d. Lift out entire assembly. Figure 19 shows selector assembly.

13. Push-Off and Shelf Assembly
    a. Remove push-off return spring, push-off bar, and hanger.
    b. Remove selector-link bar from selector lever, then disengage from control button.
    c. Remove the two hex-head screws holding stanchion.
    d. While lifting assembly free of base plate, rotate, and disengage control link.
    e. Remove the three speed nuts holding fulcrum plate.
    f. Slide control-button shaft from fulcrum plate, and remove plate and control buttons.
    g. Remove spring ring, spring-retaining washer, and heavy spring.

CAUTION: Use due care—the heavy spring may fly out.

h. Remove shelf and push-off assembly from stanchion. Figure 20 shows record shelf and push-off assemblies.

14. Push-Off Blades
    a. Remove the two Phillips-head screws from bottom of 10"-12" record shelf, and the one Phillips-head screw from the top. Lift off cover.
    b. The 10"-12" push-off blade, the push-off rod, and the 10"-12" hold down and springs may now be removed.
    c. Remove the two small Phillips-head screws from top of 7" cover. Remove cover.
    d. The hold-down spring, 7" hold-down, ball bearing and push-off spring, push-off blade, and push-off return spring may now be removed.
FIGURE 13. TONE-ARM ASSEMBLY

FIGURE 14. TRIP-ARM AND TRIP-RECEIVER ASSEMBLIES

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FIGURE 17. ACTUATOR AND SPEED-CHANGE ASSEMBLIES

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FIGURE 18. CAM-GEAR AND BRIDGE ASSEMBLIES (BRIDGE ASSEMBLY PARTS ARE IDENTIFIED BY *)

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FIGURE 19. SELECTOR ASSEMBLY
FIGURE 20. RECORD-SHELF AND PUSH-OFF ASSEMBLIES
### REPLACEMENT PARTS LIST

**DESCRIPTION** | **SERVICE PART NO.**
---|---
Actuator Assembly  
Actuator, horizontal  | 76-5323  
Actuator, trip, 45 r.p.m.  | 76-5262  
Actuator, vertical  | 76-5322  
"E" washer  | 1W60980FE7  
"F" washer  | 1W60971FE7  
Link, horizontal and vertical timing (2)  | 56-7023  
Reset lever, 45 r.p.m. trip  | 56-7504  
Spacer  | 56-7594  
Spindle, actuator mounting  | 56-7503  
Spring, actuator (2)  | 56-7625  

**DESCRIPTION** | **SERVICE PART NO.**
---|---
Bridge Assembly  
Bearing assembly, turntable  | 76-3998-1  
Bridge  | 76-2991  
Control link  | 56-5761-1  
Control slider  | 56-7506  
Cover, motor switch  | 56-7579-1  
Spring, control  | 76-4010  
Switch, motor power  | 56-5760  
42-1867  
Cam-Gear Assembly  
Bushing, index lever  | 76-3995-2  
"E" washer  | 56-7493  
Hammer  | 1W60977FE7  
Index lever, cam locking  | 76-5324  
Latch assembly, 45 r.p.m trip  | 56-7492  
Mounting plate assembly  | 76-5247  
Spacer (2)  | 76-5245  
Spring, hammer actuator  | 56-7497  
Spring, index lever  | 56-7033  
Spring, 45 r.p.m. trip-latch return  | 56-4603  
Trip finger, of trip latch  | 56-7033-2  
Trip plate  | 76-5478  
Washer (2)  | 76-5625  
Washer, curved  | 56-7479  

**DESCRIPTION** | **SERVICE PART NO.**
---|---
Index-Selector Assembly  
Bracket, selector  | 76-7477  
Feeler (2)  | 76-5249  
Pin  | 1W36521FA3  
Selector (2)  | 56-7478  
Selector hinge  | 56-7494  
Spacer  | 56-7305  
Spring, feeler (2)  | 56-7479  
Spring, selector hinge  | 56-7495  
Tubular slip  | 1W5711FE7  

**DESCRIPTION** | **SERVICE PART NO.**
---|---
Motor Assembly, 60 cycles  
(see figure 15)  | 35-1430  
Cable-and-plug assembly, motor power  | 41-3869  
Drive belt  | 76-7594  
Idler wheel  | 54-4926  
Pulley assembly  | 56-7598  
Shock mount (3)  | 45-4501  
Spacer, mounting  | 56-7548  
Spring, compression  | 56-7598  

**DESCRIPTION** | **SERVICE PART NO.**
---|---
Motor Assembly, 60 cycles  
(see figure 16)  | 35-1433  
Idler wheel  | 45-6558  
Pulley  | 45-6559  
Shock mount (3)  | 54-4501  
Spacer, mounting  | 56-4926  
Motor Assembly, 25 cycles  | 35-1446  
Motor Assembly, 50/60 cycles  | 35-1442  
Conversion kit for 50-cycle operation  | 40-7848  

**DESCRIPTION** | **SERVICE PART NO.**
---|---
Push-Off-Bar Assembly  
Actuator, push-off  | 56-4588  
Bar, push-off, front  | 56-7515  
Bar, push-off, rear  | 56-4774  
Hanger, push-off  | 56-7507  
Safety slider  | 56-4599-1  
Spring, return  | 56-4600  

**DESCRIPTION** | **SERVICE PART NO.**
---|---
Push-Off and Shelf Assembly  
Ball  | 76-5259  
Bumper, 10"-12" hold-down  | 54-4592  
Bumper, 7" hold-down  | 54-7941  
Control button (2)  | 76-3993-1  
Fulcrum plate  | 56-7510  
Hold-down wire, 7"  | 56-7309  
Pin  | 56-7701  
Push-off blade (7")  | 56-7513  
Push-off rod  | 56-7307  
Shaft, control-button mtg.  | 56-7509  
Slide plate, 10" and 12" push-off  | 56-7306  
Spring, 7" hold-down  | 56-7514  
Spring, 10" and 12" hold-down (2)  | 56-7322  
Spring, 7" push-off blade  | 56-7575  
Spring, 7" push-off blade return  | 56-7412  
Spring, ring  | 56-4628  
Spring, shelf assy.  | 56-4630  
Washer, spring retainer  | 56-4627  

**DESCRIPTION** | **SERVICE PART NO.**
---|---
Speed Change  
Detent assembly  | 76-5261  
Lock, detent plate  | 56-7499  
Roller, detent  | 56-7501  
Selector lever  | 56-7500  
Selector link bar  | 56-7505  
Spring, detent  | 56-7502  

**DESCRIPTION** | **SERVICE PART NO.**
---|---
Tone Arm (complete)  | 35-2692-3  
Bracket, mounting for shaft and swivel  | 56-7402  
Cartridge  | 76-4649  
Contact plate  | 76-4647  
Damper, pyralin  | 56-7946-1  
Guard, needle  | 56-7612  
Needle  | 56-2693  
Pin, shaft and swivel  | 56-7011  
Pull-cord assembly, vertical timing  | 76-2982-3  
Retainer plate, front  | 56-6795  

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REPLACEMENT PARTS LIST (Continued)

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>SERVICE PART NO.</th>
<th>DESCRIPTION</th>
<th>SERVICE PART NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retainer plate, rear</td>
<td>56-6794</td>
<td>Base-plate and tone-arm-stanchion assembly</td>
<td>76-5256</td>
</tr>
<tr>
<td>Screw, shoulder, swivel mounting (3)</td>
<td>56-7408-1</td>
<td>Bumper, rubber, tone-arm rest</td>
<td>54-4647</td>
</tr>
<tr>
<td>Shaft-and-swivel assembly</td>
<td>76-5207-1</td>
<td>Cable clamp</td>
<td>56-2832</td>
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<tr>
<td>Shock-mount, swivel mounting (3)</td>
<td>54-4729</td>
<td>Driver, 45 r.p.m. record</td>
<td>56-7747</td>
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<tr>
<td>Spacer, wire, shaft and swivel pin</td>
<td>56-7406</td>
<td>Insert (adapter), 45 r.p.m. record</td>
<td>54-4744</td>
</tr>
<tr>
<td>Spring, cartridge retaining</td>
<td>56-6796</td>
<td>Spindle</td>
<td>76-3926-1</td>
</tr>
<tr>
<td>Spring, needle pressure</td>
<td>56-7403</td>
<td>Cotter pin, spindle retaining</td>
<td>ZW35740</td>
</tr>
<tr>
<td>Spring, safety, pull-cord</td>
<td>56-4608</td>
<td>Spring, spindle</td>
<td>56-7508</td>
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<tr>
<td>Stanchion, tone arm</td>
<td>56-5746-1</td>
<td>Switch, tone-arm-output selector</td>
<td>42-1873</td>
</tr>
<tr>
<td>Tone-arm shell</td>
<td>35-2684-1</td>
<td>Tone-arm rest</td>
<td>56-6376</td>
</tr>
<tr>
<td>Trip Arm</td>
<td></td>
<td>Turntable</td>
<td></td>
</tr>
<tr>
<td>Index stop, magnetic</td>
<td>76-4204</td>
<td>Felt ring, turntable bearing</td>
<td>54-7385</td>
</tr>
<tr>
<td>Nut, clamp screw</td>
<td>76-5497</td>
<td>△This motor is not stocked. Order Part No. 35-1430.</td>
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<tr>
<td>Pull-cord assembly, horizontal timing</td>
<td>76-2982-2</td>
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<tr>
<td>Spring, safety, pull-cord</td>
<td>56-4608</td>
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<td></td>
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<tr>
<td>Spring, stop (2)</td>
<td>56-4613</td>
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<tr>
<td>Trip-arm stop</td>
<td>56-4614</td>
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<tr>
<td>Trip finger</td>
<td>54-7613-1</td>
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<tr>
<td>Trip receiver</td>
<td>56-7491</td>
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<tr>
<td>Washer (2)</td>
<td>IWS1919FA3</td>
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<td></td>
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<tr>
<td>Washer, lead</td>
<td>8WS1958</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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FIGURE 21. WIRING DIAGRAM OF MODEL M-20
Trav-ler Record Changer Model A

OPERATION OF RECORD CHANGER

For 10" records the long side of the record shelf (11) must be turned counterclockwise (Fig. 6) so that it points toward the spindle (47).

For 12" records, the short side of the record shelf (11) must be turned counterclockwise so that it points toward the spindle (47).

In either case, always turn the record shelf counterclockwise until a click is heard. This will be the 10"-12" index lever (9) engaging one of two slots on the 10"-12" index cam (12). This insures correct positioning of the mechanism during cycling or playing.

Lift the record holldown plate (20) Fig. 6 to the rear of the record shelf (11) (if it is not already there) and place two or three records on the spindle (47) and record shelf (11). Return the record holldown plate (20) so that it rests on the records holding them in place.

Turn the control knob (29) to the Reject position and hold momentarily. Release the control knob (29) and it will return to the ON position for automatic operation.

If the mechanism is working properly more records may be added.

This changer was designed to play automatically 12 - 10" or 10 - 12" standard records not mixed, and to operate on 115-117 volts 60 cycles.

CYCLE OF OPERATION

Drawings A through 5 show Trav-ler Model A Record Changer progressing through a complete cycle of operation.

Fig. A shows the bottom view of the Record Changer with the drive wheel and belt in place. Fig. B shows the bottom view of the Record Changer with the drive wheel and belt removed and the main cam (40) in place. All parts visible from the bottom of the Record Changer are labeled in these 2 drawings.

If Figs. 1 through 5, the drive wheel (41) and main cam (40) have been omitted for sake of clarity and to show operation of otherwise hidden parts. The main cam, however, has been shown in these drawings as a dotted line to illustrate its position.

Only those parts are labeled in Figs. 1 - 5B which are operative or referred to in that particular phase of cycle. Figs. 1, 1A, and 1B illustrate the parts of the Record Changer in the OFF or normal position.

To start the change cycle, turn the control knob (29) to the Reject position as shown in Fig. 2A. Release the control knob and it will automatically return to the ON position as shown in Fig. 3A.

This causes the reject arm actuating lever (26 Fig. 2) to move to the left, causing the reject arm (35 Fig. 2) to pivot and push the ON -
OFF switch (22 Fig. 2) to the ON position. And at the same time point A of the reject arm (25 Fig. 2) pushes against the release arm (35 Fig. 2) releases its hold on the cam pawl (39 Fig. 2C) allowing it to drop down and engage the raised portions of the drive wheel (41 Fig. 2C). The drive wheel is driven by the drive belt (42) and drive pulley (46 Fig. A).

This section starts turning the main cam (40 Fig. B). The pickup arm lift (56 Fig. 3B) which normally rests in the depression (point C) in the top of the main cam (40 Fig. 3C) is forced out of the depression and rides around the flat surface of the cam for the duration of the change cycle. At the same time, the pickup arm lift (56) forces the pickup arm (62 Fig. 3B) upward. And the cam follower (14, point D, Fig. 3) in following the inside contour (E Fig. 3C) of the main cam moves the pickup (62 Fig. 3A) away from the turntable (54 Fig. 3A) so that a record will be free to drop. (Assuming start of new cycle.)

As soon as point F of the main cam (40 Fig. 3C) moves against the ejector roller (15 Fig. 3) the roller is forced away from the main cam and the roller shaft (15) see exploded view) in turn forces the ejector plate (16) Fig. 3A and 6 forward and pushes a record off the record shelf (11 Fig. 4A).

As the main cam (40 Fig. 3) continues to turn, the tension of the ejector spring (31 Fig. 3) forces the ejector roller (15) to follow the outside contour of the main cam (40 Fig. 4). This allows the ejector plate (16 Fig. 4A) to return to its normal position.

Near the end of the change cycle as the cam follower (14, point D, Fig. 4) reaches point G of the inside contour of the main cam (40 Fig. 4C), the pickup arm starts moving toward the turntable (54 Fig. 4A), and when it is directly over the starting point of the record, the main cam (40 Fig. 4C) moves until the depression, C, in the main cam, is directly under the pickup arm lift (56 Fig. 4B), which causes the pickup arm (62 Fig. 4B) to lower onto the record.

As the main cam (40 Fig. 4) ends its' revolution, the cam pawl (39 Fig. 4D) comes in contact with point B on the release arm (35 Fig. 4) and is lifted up from contact with the drive wheel (41 Fig. A also Fig. 4D) and thereby stopping the main cam in its original position.

The pickup arm is now free to move across the record.

Fig. 5 shows how the pickup trip arm (13) has followed the pickup arm (62 Fig. 5A) as it moved across the record. The pickup arm is at the end of the record and the serrated end of the pickup trip arm has moved against the release arm tension bracket (33 Fig. 5). (Also see 33 on exploded view). The backward and forward movement caused by the grooves at the end of the record forces the release arm tension bracket (33 Fig. 5) to pivot, and the pivot point applies pressure to the release arm (35 Fig. 5) forcing it away from the cam pawl (39 Fig. 2G) allowing the cam pawl to drop and engage the main drive wheel (41 Fig. 2C), thereby starting another change cycle.

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MODEL A

(1) SPINDLE

(2) TURNTABLE

(3) PICKUP ARM

(4) 3 POSITION CONTROL SWITCH

(5) PICKUP REST POST

(6) RECORD SUPPORT SHELF IN 10" POSITION

(7) RECORD HOLD DOWN PLATE

FIG. A
DRIVE WHEEL AND BELT IN PLACE

FIG. B
CAM IN PLACE

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ALWAYS TURN LEFT FOR 10" OR 12" RECORDS

Fig. 6
RECORD SHELF SHOWN IN 12" POSITION

Fig. 7
BALL DETENT & SLOT

Fig. 5
END OF RECORD POSITION

Fig. 5A
TOP VIEW

Fig. 5B
SIDE VIEW

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<table>
<thead>
<tr>
<th>SYMPTOMS</th>
<th>CAUSES</th>
<th>REMEDIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Changer continues to cycle</td>
<td>1. Release arm spring (37) weak or lost</td>
<td>1. Replace Spring</td>
</tr>
<tr>
<td></td>
<td>2. Revert Arm (25) binding</td>
<td>2. Oil lightly at pivot pin</td>
</tr>
<tr>
<td></td>
<td>3. Release arm (35) bent</td>
<td>3. Straighten until parallel with changer base plate</td>
</tr>
<tr>
<td></td>
<td>4. Actuating lever shaft (27) binding</td>
<td>4. Remove control knob and oil shaft lightly</td>
</tr>
<tr>
<td>2. Mechanism does not trip at end of record</td>
<td>1. Pickup trip arm (13) is bend downwards</td>
<td>1. Straighten trip arm until parallel with changer base plate</td>
</tr>
<tr>
<td>3. Pickup arm moves a short way in on record</td>
<td>1. Pickup trip arm (13) is bent upwards</td>
<td>1. Straighten trip arm until parallel with base plate</td>
</tr>
<tr>
<td>than jumps a groove</td>
<td>1. Worn spots in idler wheel (c)</td>
<td>1. Replace idler wheel or if spots are too deep try sanding the wheel smooth</td>
</tr>
<tr>
<td></td>
<td>2. Oil on idler wheel (c) and turntable rim</td>
<td>2. Clean idler wheel and turntable rim</td>
</tr>
<tr>
<td></td>
<td>3. Warped record</td>
<td></td>
</tr>
<tr>
<td>4. Wow or motor rumble</td>
<td>1. Moving parts binding</td>
<td>1. Locate part and oil lightly</td>
</tr>
<tr>
<td></td>
<td>2. Line voltage incorrect</td>
<td>2. 115-117 Volts 60 cycles</td>
</tr>
<tr>
<td></td>
<td>3. Defective motor winding</td>
<td>3. Replace motor</td>
</tr>
<tr>
<td></td>
<td>4. Drive belt slipping</td>
<td>4. Clean belt, pulley and drive wheel if oily. Replace belt if not oily</td>
</tr>
<tr>
<td>5. Change cycle is too slow or motor over-</td>
<td>1. Ball detent is not in detent slot Fig. 7</td>
<td>1. Hold the pickup arm part (55) stationary and move the pickup arm un-</td>
</tr>
<tr>
<td>heats</td>
<td></td>
<td>til the ball detent Fig 7 engages the ball detent slot</td>
</tr>
<tr>
<td>6. Pickup arm lands too far in on record or</td>
<td>1. The pickup arm lift (56) is bent upwards</td>
<td>1. Bend the pickup arm lift (56) down slightly and try the changer each</td>
</tr>
<tr>
<td>Fig. 7</td>
<td></td>
<td>time until the proper angle is obtained</td>
</tr>
<tr>
<td>7. Pickup arm does not lower enough to reach</td>
<td></td>
<td></td>
</tr>
<tr>
<td>the record</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Turntable will not start</td>
<td>1. A break in the line cord</td>
<td>1. Replace</td>
</tr>
<tr>
<td></td>
<td>2. Defective power plug</td>
<td>2. Replace</td>
</tr>
<tr>
<td></td>
<td>3. Defective switch</td>
<td>3. Replace</td>
</tr>
<tr>
<td></td>
<td>4. No voltage at power outlet</td>
<td>4. Check fuse box</td>
</tr>
<tr>
<td></td>
<td>5. Burned out motor</td>
<td>5. Replace</td>
</tr>
<tr>
<td>9. Distorted sound</td>
<td>1. Audio Amplifier defective</td>
<td>1. Check with radio reception or check</td>
</tr>
<tr>
<td></td>
<td>2. Word needle</td>
<td>audio amplifier</td>
</tr>
<tr>
<td></td>
<td>3. Defective crystal cartridge</td>
<td>2. Replace needle</td>
</tr>
<tr>
<td></td>
<td>4. Horn record</td>
<td>3. Try new cartridge</td>
</tr>
<tr>
<td>10. No Sound</td>
<td>1. Defective crystal cartridge</td>
<td>4. Check with new record</td>
</tr>
<tr>
<td></td>
<td>2. Loose connection between crystal and audio amplifier</td>
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<tr>
<td></td>
<td>3. Defective Audio Amplifier</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>1. Replace</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Make continuity and short check</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Make conventional voltage, resistance and tube check</td>
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</table>
## TRAV-LER RECORD CHANGER MODEL A

<table>
<thead>
<tr>
<th>PART NO.</th>
<th>DESCRIPTION</th>
<th>PART NO.</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>1</td>
<td>Base Plate</td>
<td>33</td>
<td>Release Arm Tension Bracket</td>
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<tr>
<td>2</td>
<td>Motor</td>
<td>34</td>
<td>Tension Bracket Spring</td>
</tr>
<tr>
<td>3</td>
<td>Motor Mount Spacer</td>
<td>35</td>
<td>Release Arm</td>
</tr>
<tr>
<td>4</td>
<td>#6 Flat Washer</td>
<td>36</td>
<td>Hairpin Clip</td>
</tr>
<tr>
<td>5</td>
<td>6 - 32x7/8&quot; Motor Mount Screw</td>
<td>37</td>
<td>Release Arm Spring</td>
</tr>
<tr>
<td>6</td>
<td>Idler Wheel</td>
<td>38</td>
<td>Main Cam and Drive Wheel Shaft</td>
</tr>
<tr>
<td>7</td>
<td>Fibre Washer</td>
<td>39</td>
<td>Cam Pawl</td>
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<tr>
<td>8</td>
<td>Hairpin Clip</td>
<td>40</td>
<td>Main Cam</td>
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<tr>
<td>9</td>
<td>10&quot; - 12&quot; Index Lever</td>
<td>41</td>
<td>Drive Wheel</td>
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<tr>
<td>10</td>
<td>Index Lever Tension Spring</td>
<td>42</td>
<td>Drive Belt</td>
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<tr>
<td>10A</td>
<td>Tension Spring Anchor Nut #6-32</td>
<td>43</td>
<td>Bearing Support Bar</td>
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<tr>
<td>11</td>
<td>Record Shelf</td>
<td>44</td>
<td>Speed Nut</td>
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<tr>
<td>12</td>
<td>10&quot; - 12&quot; Index Cam</td>
<td>45</td>
<td>Turntable Bearing</td>
</tr>
<tr>
<td>13</td>
<td>Pickup Arm Trip Arm and Shaft</td>
<td>46</td>
<td>Drive Pulley and Set Screw</td>
</tr>
<tr>
<td>14</td>
<td>Cam Follower and Arm</td>
<td>47</td>
<td>Spindle</td>
</tr>
<tr>
<td>15</td>
<td>Ejector Roller and Shaft</td>
<td>48</td>
<td>Bearing Washer</td>
</tr>
<tr>
<td>16</td>
<td>Ejector Plate</td>
<td>49</td>
<td>Turntable Thrust Bearing</td>
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<tr>
<td>17</td>
<td>Ejector Cam</td>
<td>50</td>
<td>Bearing Washer</td>
</tr>
<tr>
<td>18</td>
<td>Ejector Washer</td>
<td>51</td>
<td>#10 Lock Washer</td>
</tr>
<tr>
<td>19</td>
<td>Ejector Assembly Top</td>
<td>52</td>
<td>#10-28 Nut</td>
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<tr>
<td>20</td>
<td>Record Hold Down Plate</td>
<td>53</td>
<td>Speed Nut</td>
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<tr>
<td>21</td>
<td>Hold Down Plate Spring</td>
<td>54</td>
<td>Turntable</td>
</tr>
<tr>
<td>22</td>
<td>A.C. On-Off Switch</td>
<td>55</td>
<td>Pickup Arm Post and Set Screws</td>
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<td>23</td>
<td>A.C. Connector Plug</td>
<td>56</td>
<td>Pickup Arm Lift</td>
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<tr>
<td>24</td>
<td>Release Arm Stop</td>
<td>57</td>
<td>Crystal Pickup Cartridge</td>
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<tr>
<td>25</td>
<td>Reject Arm</td>
<td>57A</td>
<td>Pickup Mounting Screws</td>
</tr>
<tr>
<td>26</td>
<td>Reject Arm Actuating Lever</td>
<td>57B</td>
<td>Needle</td>
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<tr>
<td>27</td>
<td>Actuating Lever Shaft</td>
<td>57C</td>
<td>Needle Set Screw</td>
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<tr>
<td>28</td>
<td>&quot;C&quot; Washer</td>
<td>58</td>
<td>Pickup Leads Spring Clip</td>
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<tr>
<td>29</td>
<td>Control Knob</td>
<td>59</td>
<td>#4-32 Nut</td>
</tr>
<tr>
<td>30</td>
<td>Bearing Support Bar Standoff</td>
<td>60</td>
<td>Spaghetti Sleeve</td>
</tr>
<tr>
<td>31</td>
<td>Ejector Roller Spring</td>
<td>61</td>
<td>#4-32x1/2&quot; Machine Screw</td>
</tr>
<tr>
<td>32</td>
<td>Release Arm Support</td>
<td>62</td>
<td>Pickup Arm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>63</td>
<td>Pickup Arm Rest</td>
</tr>
</tbody>
</table>
DESCRIPTION

The Webster-Chicago Model 146 is a single post, spring-cushioned spindle, automatic record changer. Simple in design and operation, it provides manual or automatic playing of a 1” stack of 10” or 12” records with a minimum of waiting time between records during automatic operation. When set for automatic operation, Model 146 returns the pickup arm to the rest position after the last record, although the motor continues to revolve until attended.

Model 146 features the exclusive Webster-Chicago Velocity Trip mechanism. The pickup arm is not actuated by "lead-in" springs and there is a minimum of lateral pressure. The arm travels freely in either direction. This lack of lateral pressure or inertia add immeasurably to the life of records and is considered to be as important as extra light vertical pressure, which in some instances would result in poor tracking at extremely low or high frequencies. This free floating arm permits "home recordings" or "inside out" records up to 12” size to be played manually. Model 146 will change warped or rough-edged records, at the same time assuring maximum protection to the finest discs.

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OPERATION

MOTOR
Connect the motor cord to a source of 105-115 volt 60 cycle current only. If it is desired to operate the changer on 50 cycle current, a special motor pulley (Part No. 17X412-11) must be used in place of the one supplied with the changer in order to drive the turntable at the required speed of 78 R.P.M.
Do not under any circumstances connect the motor to a source of direct current or alternating current of any other frequencies.

PICKUP
The high impedance crystal cartridge supplied may be of the fixed permanent point or removable needle type. If it is the latter, use a needle which is not more than 1 1/4 inches long for most satisfactory results.

Some desirable qualities of a good needle are faithful reproduction, low surface scratch or hiss, long wearing qualities, minimum record wear and rugged construction.

The Webster-Chicago Nylon Needles are particularly adaptable for use with your Webster-Chicago "146". Do not use single play or cactus needles for automatic operation. Such needles require frequent replacement or sharpening and are not designed to play a full stack of records.

OPERATION - AUTOMATIC
1. Turn the Record Shelf forward or back for ten or twelve inch records.
2. With the record ballast weight lifted and turned forward out of position, place up to a 1" stack of 10" or 12" records on the spindle so that the bottom record rests on the step of the spindle and on the Record Shelf.
3. Turn the record ballast weight and lower it until it rests on the top record.
4. Move the control knob from the STOP position (nearest the pickup arm rest) to the START-REJECT position (farthest from the pickup arm rest) and release. The control will then drop back into the automatic playing position and the mechanism will continue to operate automatically until the last record is completed. The pickup arm will then return to the "rest" position and the motor will continue to revolve until the control knob is returned to the STOP position.
5. To reject any record while playing in the automatic position, move the control knob momentarily to the START-REJECT position and release.

NOTE: The mechanism may be turned off at any time or during any portion of the change cycle by moving the control knob to the STOP position.
The pickup arm may be moved horizontally at any time without damage to the mechanism. However, the pickup arm cannot be returned to the pickup arm rest until the change cycle has been completed.

After the last record has been played, the entire stack may be removed from the turntable at one time. The simplest procedure is as follows:

a. Place the pickup arm on the pickup arm rest.
b. Lift and turn the record ballast weight out of position.
c. Place the fingers of both hands under opposite edges of the bottom record.
d. Do not apply pressure to the top record. (Keep your thumbs free.)
e. Lift the stack of records straight up following the contours of the spindle. This permits the stack of records to follow the curve of the spindle without binding and greatly facilitates the removal of the stack.

OPERATION - MANUAL

1. Turn the Record Shelf to the TWELVE inch position (this is not essential but permits more clearance in loading and unloading records.)
2. Place a record on the turntable.
3. Move the control knob from the STOP position to the AUTOMATIC position, then toward the spindle to the MANUAL position, as indicated by the arrow on the control knob.

No harm will result if the knob is accidentally moved to the START-REJECT position. If a twelve inch record is on the turntable, the arm will automatically index to the edge of the record. If a ten inch record is on the turntable, the needle will be set down gently on the rubber pad and the arm may be moved to the edge of the record.

4. Place the needle gently on the edge of the record. Particular care should be exercised if your pickup has a sapphire point needle. Although the sapphire is very hard and long wearing, it is extremely brittle and may be fractured or chipped if dropped on the record.
5. To stop the mechanism at any time, move the control knob to the STOP position.
All units are accurately adjusted, lubricated and tested at the factory. However, service repairs and adjustments sometimes become necessary. This bulletin should be studied carefully before making any adjustments or replacing parts.

The functions and most probable misadjustments of the main assemblies are as follows (reference numbers refer to the exploded views)

**THE AUTOMATIC TRIP FAILS TO FUNCTION**

The Main Cam Assembly (32) and Actuating Gear (31) are the heart of the record changer. The Main Cam Assembly drives the mechanism associated with the action of the Pickup Arm (7) and the Record Selector assemblies. It, in turn, is driven by the gear train (28, 29, 30) and the Turntable which is rim driven by the phonograph motor.

The Main Cam Assembly and Actuating Gear is put in motion or "tripped" by means of the "automatic" trip or by the manually operated "reject" trip. When the movement of the Pickup Arm toward the spindle is greater than \( \frac{1}{8} \) in \( \frac{1}{2} \) revolution of the turntable, the Automatic Trip Arm (35) trips the Velocity Trip and Roller Assembly (33). This releases the Actuating Pawl on the Main Cam Assembly (32), allowing it to engage the Main Cam Actuating Gear (31) and driving it through the change cycle. The pressure from the Automatic Trip Arm required to actuate the trip mechanism is negligible.

The Automatic Trip Arm follows the movement of the Pickup Arm through a weighted friction clutch (34). This clutch must be kept free of oil and grease. If the clutch does not cause the Automatic Trip Arm to trip the mechanism, clean the clutch parts with carbon tetrachloride. This clutch should operate the trip mechanism without placing undue drag on the movement of the pickup arm.

*Also check for:*

1. Velocity Trip and Roller Assembly (32) binding.
2. Slight burr on end of the Actuating Pawl or on the underside of the hook end of the Velocity Trip and Roller Assembly.
3. Actuating Pawl stuck (part of Main Cam Assembly (32) engaged by the hook end of the Velocity Trip and Roller Assembly (33).
4. Automatic Trip Arm (35) bent and not hitting the Velocity Trip and Roller Assembly (33).
5. Automatic Trip Arm (35) fails to touch the Velocity Trip and Roller Assembly.
6. Velocity Trip and Roller Assembly (33) rubbing on the underside of the Main Cam Actuating Gear (31).
7. No velocity lead-in groove or eccentric groove in the center of record.
8. Foreign matter in record groove.
10. Badly bent or worn needle.

IF THE "REJECT" TRIP FAILS TO FUNCTION

When the control knob is moved to the extreme START-REJECT position, the hair spring of the Reject Trip Lever Arm (54) actuates the Velocity Trip and Arm Assembly, putting the change mechanism in cycle. See Fig. 1.

Check for:
1. "Reject" trip hair spring of Lever 54 bent or broken.
2. Velocity Trip and Roller Assembly (33) binding.
3. Actuating Pawl stuck (part of Main Cam Assembly 32).

IF THE MECHANISM CONTINUES TO CYCLE

At the completion of the change cycle, the Actuating Pawl is disengaged from the Main Cam Assembly Actuating Gear by the hook end of the Velocity Trip and Roller Assembly, which has been returned to its normal position by the reset points on the Main Cam Drive Gear, Fig. 2.

If the clearance between the lip on the Velocity Trip Lever and the edge of the Main Cam is too small, it will prevent the hooked end of the Velocity Trip Lever from engaging the trigger. Adjust the clearance between the lip ("D" of Fig. 2) on the Velocity Trip Lever and the Main Cam to be within 1/32" and 1/16" when the roller is contacting the point of one of the reset points on the Actuating Gear.

Also check for:
1. Velocity Trip and Roller Assembly (33) rubbing on Main Cam Actuating Gear (31).
3. "Disengage Roller" broken on Velocity Trip and Roller Assembly (33).

PICKUP ARM LIFT TOO HIGH OR TOO LOW

The vertical movement of the pickup arm is controlled by the angle of the pickup arm raising lever (37 and Fig. 4). The needle should approach the top record of a full stack of 10" records on the turntable with approximately 1/16" clearance.

To adjust:
1. Put a full stack of 10" records ON THE TURNTABLE.
2. Trip the "Start-Reject" control and rotate the turntable clockwise until the needle clears the top record of the stack by about 1/16"
3. Be sure the notch in the pickup arm raising disc engages the pickup arm raising lever.
4. If the needle does not clear the top record or if it raises too high, adjust by bending the pickup arm raising lever (37) at points X and Y as indicated in Fig. 4.

CAUTION: All adjusting bends should be made slowly, using slight but firm, easy pressure.

Be sure the set screws in the Pickup Arm Raising Disc (36) are not loose and are properly positioned in the alignment holes as explained in the paragraph on Needle Setdown Indexing.

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NEEDLE SET DOWN INDEXING INCORRECT

The horizontal movement of the pickup arm (7) is controlled by the eccentric excursion of the Pickup Arm Raising Lever (37) moving the Pickup Arm Raising Disc (36) when actuated by the Main Cam Assembly (32). The eccentric screw (part of 8), accessible through the top of the pickup arm (7), should take care of any normal position adjustment. Turn this screw clockwise to index the needle in toward the spindle and counter-clockwise to index the needle out away from the spindle.

Should further adjustment be necessary, proceed as follows:

1. Set the eccentric screw, just mentioned, to a middle position.
2. Set the Record Shelf (4) to the 10" position.
3. Operate the mechanism by revolving the turntable manually until the needle drops to within 1/8" of a one inch record on the turntable.
4. Be sure the notch in the Pickup Arm Raising Disc (36) engages the Pickup Arm Raising Lever (37).
5. The No. 8 Bristol set screws "A" of the Pickup Arm Raising Disc (36, Fig. 3) have pointed ends which fit into off center holes in the Pickup Arm Pivot (9). Alternately loosen one screw and tighten the other until the needle rests above the record lead-in groove at the desired point. Be sure that both set screws are tight when this adjustment is completed.
6. Complete the change cycle of the mechanism and place the pickup arm on the Pickup Arm Rest (10). The tongue of the Pickup Arm Raising Disc (36) should now rest against the post which supports the sub plate assembly. If the pickup arm does not rest in the proper position on the pickup arm rest, bend the tongue closer to or away from this post until the pick-up arm is correctly positioned.

REMEMBER: Always slight but firm, easy bends!

7. Turn the Record Shelf to 12" and check the needle drop on a twelve inch record. Make any additional adjustments with the eccentric screw mentioned previously.

PICKUP ARM DROPS OFF REST

The upturned end of the Pickup Arm Pivot Shaft Bracket (Fig. 3) prevents the Pickup Arm from falling off the Pickup Arm Rest. There should be 1/64" clearance between the tongue of the Pickup Arm Raising Disc (36) and the bottom of the groove formed by the Bracket and the Base Plate Post. Bend the Bracket end up or down to secure proper positioning of the Disc tongue and the Pivot bracket. Be careful to bend the end only or the Bracket will bind on the Pickup Arm Pivot Shaft. The Bracket should not be too high or the Disc tongue will rub on it when the needle approaches the edge of a 12" record, causing "glide in" on the first few grooves of the record.

ERRATIC INDEXING

Indexing in either the 10" or the 12" position is controlled through the presence or absence of pressure from the Compression Spring (45), on the Pickup Arm Raising Lever bracket, forcing the stud to travel the inside edge or the outside edge of the groove in the bottom of the Main Cam. The compression on this spring is changed as the Record Shelf is changed from the 10" to the 12" position. Improper adjustment of the spring tension will result in erratic indexing.

In the 12" position, the spring should be just free. In the 10" position the compression of the spring holds the stud of the Pickup Arm Raising Lever against the outside edge of the groove. If the compression tension needs adjustment:

1. Turn the Record Shelf (4) to the 12" position.
2. Trip the Reject control and rotate the Turntable clockwise until the push-off Blade reaches its farthest forward position. At this point the cam follower will be at the highest point on the Main Cam ("A" of Fig. 5).
3. Loosen the lock bolts of (41) and (42).
4. Be sure that the Record Shelf is held in the extreme 12" position while adjusting the Record Shelf and Push-off Blade fingers.
5. At the same time, push the Push-off Blade forward as far as possible and push the Push-off Blade and Record Shelf Assembly downward tight against the Housing (6).
6. Position the Record Shelf finger and the Toggle Assembly (41) so the 12" finger of the Push-off

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Blade finger (42) looks like Fig. 6. A visual spacing of approximately $\frac{1}{8}$" between the rounded edge of the toggle assembly and the Push-off Blade finger when viewed directly from the bottom of the record changer is required. See Fig. 6. Since these two parts lie on different planes, this adjustment must be made by observation only.

7. While holding the Push-off Blade and Record Shelf Assembly tight against the Housing (6), push the Index Toggle Assembly (41) against the spacer (40) and tighten the lock bolt.

8. Tighten the Push-off Blade bracket lock bolt, leaving approximately $\frac{1}{8}$" clearance between the shoulder of the Record Shelf shaft and the Push-off Blade finger bracket (42).

**RECORD FAILS TO DROP**

The record must leave the spindle step just prior to or at least by the time it leaves the record shelf. If the spindle is too far from the record shelf, the record will hang up on the spindle step and fail to drop.

*To adjust:*

Press down on the edge of the turntable nearest the Record Shelf to secure proper spacing. DO NOT bend the spindle itself. Also be sure a standard record is used when aking this adjustment. A standard 10" record has a diameter of $9\frac{7}{8}$" $\pm \frac{1}{8}$". A standard 12" record measures $11\frac{7}{8}$" $\pm \frac{1}{8}$" in diameter.

If the changer still fails to drop records, put the mechanism in cycle and watch the movement of the Push-off Blade. If it fails to protrude beyond the edge of the Record Shelf when at its greatest forward position, adjust the Push-off Blade finger position:

1. Turn the record Shelf (4) to the 12" position.
2. Trip the Reject control and rotate the Turntable until the Push-off Cam Follower reaches the highest point on the Main Cam ("A" of Fig. 5).
3. Loosen the Push-off Blade finger (42) clamp bolt.
4. Push the Push-off Blade forward as far as possible and hold the Push-off Blade and Record Shelf assembly downward tight against the housing (6).
5. Tighten the Push-off Blade finger clamp bolt (42), leaving $\frac{1}{8}$" vertical clearance between the shoulder of the Record Shelf shaft and the Push-off Blade finger (42).

**CHANGE CYCLE STARTS BEFORE END OF RECORD**

If the Trip Assembly chatters while the changer is running or if the changer cycles before the entire record is played, there is probably insufficient clearance between the hook end of the Velocity Trip and Roller Assembly and the actuating gear. This clearance should be adjusted to be within $\frac{1}{8}$" to $\frac{1}{4}$" by bending the lever at point "C" as shown in Fig. 7.

**LAST RECORD REPEATS**

The weight of the records on the Spindle keeps the Automatic Shut Off Lock Lever (59) from dropping and engaging the Pickup Arm Raising Disc. The dropping of the last record releases the Automatic Shut Off Lock Lever, permitting it to drop and prevent the Pickup Arm Raising Disc from moving the Arm onto the record when the change cycle starts.
REPLACEMENT OF PARTS

TO REPLACE PICKUP CARTRIDGE

A Pickup cartridge can be most easily replaced by first removing the Pickup Arm.

1. Hold the Pickup Arm firmly with left hand.
2. Remove the spring from between the pins of the hinge bracket.
3. Using a tool such as a screwdriver, press in on one of the blue steel Pickup Arm hinge brackets while lifting up on the arm. This will release the Pickup Arm Hinge pin.
4. Repeat on the other pickup arm bracket.
5. The Pickup Arm, when released from the hinge brackets, may then be turned over and laid on the turntable for easy access to the cartridge.

TO REPLACE THE PICKUP ARM

The Pickup Arm may be replaced in its bracket as follows:

1. Hook the roller on the rear of the hinge assembly under the Pickup Arm lift stop, inside the Housing (6).
2. Using a pair of long nose pliers, place the pickup arm hinge brackets, one at a time, over the pins in the Pickup Arm Pivot Shaft (9) bracket.

The retaining spring need not be replaced unless the unit is to be re-shipped.

In performing this operation, be sure that the pickup cord lies outside of the hinge and does not become wedged in the bracket.

LUBRICATION

Model 146 Record Changers leave the factory completely oiled and lubricated. Under normal conditions this should be sufficient for approximately one year or 1,000 hours of operation. When operated under extreme conditions of dust or heat, this operation should be performed more frequently as required.

Do not permit any oil or grease to get on the rubber Idler Drive Wheel or the Motor Sleeve, on Turntable Drive Rim or on the Automatic Trip Arm clutch. Any oil or grease on these points should be removed using Carbon Tetrachloride.

The recommended lubricants and points of lubrication are as follows:

A — No. 10 OIL (Apply With Small Oil Can or Medicine Dropper)

2. Pickup Arm Shaft. Drop one drop each to bottom bearing point, bracket hole through Main Base Plate.
3. Ball Bearing Assembly.
4. Idler Wheel Felt.

B — A NON FLUID LUBRICANT (Apply With Small Brush)

1. Idler Wheel Link.
2. Turntable Shaft Stud.
3. Pickup Arm Hinge Pins.
5. Main Cam Bearing. (It is necessary to remove the sub-plate assembly to lubricate this bearing.)
6. Teeth of Main Cam Actuating Gear.
7. Track of Main Cam Gear.
8. Teeth of Large and Small idler gears.

AVOID EXCESSIVE LUBRICATION

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MODELS 133-6, 146, 160, 161, 164

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**Cut Away View**

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MODELS 133-6, 146, 160, 161, 164

Exploded View
Below Main Plate

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## REPLACEMENT PARTS LIST

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**DESCRIPTION**

The Webster-Chicago Model 246 is a dual speed, single post, spring cushioned spindle automatic record changer. Simple in design and operation, it provides automatic or manual playing of up to a 1" stack of 10" or 12" standard 78 R.P.M. or microgroove 33 1/3 R.P.M. records.

Model 246 returns the pickup arm to the rest position after playing the last record, although the motor continues to revolve until the "33 1/3 — OFF — 78" Speed Control Lever is moved to the OFF position. This is especially important when playing microgroove records for it eliminates the necessity of manually lifting the pickup arm or setting it down on the easily scratched microgrooves. The idler wheels are also pulled away from the motor shaft when the Speed Control Lever is in the OFF position, eliminating the possibility of a flat spot developing on the rubber wheels with consequent "wow".

Model 246 also features the exclusive Webster-Chicago velocity trip mechanism. The pickup arm is not actuated by "lead-in" springs and placeable tandem point needle. A unique cone on the arm is set at the top of the cartridge and the needle travels freely in either direction. This lack of weight counterbalance automatically lowers the lateral pressure or inertia adds immeasurably to the life of records and is considered to be as important as extra-light vertical pressure, which in some instances would result in poor tracking at extremely low or high frequencies. The free floating arm permits "home recordings" or "inside out" records up to 12" size to be played manually.

Model 246 will change warped or rough edged records, at the same time assuring maximum protection to the finest discs.

**OPERATION**

**PICKUP**

The special pickup cartridge supplied has a rear arm which is not actuated by "lead-in" springs and is placeable. The needle point on the cartridge is placed in the OFF position when the counterbalance is adjusted for light or normal needle pressure. When the counterbalance weight is turned back, the needle pressure is the 7 grams required for proper playing of the microgroove records. When it is turned forward to the side of the pick up arm, the normal weight for standard 78 R.P.M. records is at the needle point.

The voltage output is normally lower when playing microgroove records. The volume control of the radio or amplifier must be turned up further when they are played.

Any 33 1/3 R.P.M. records other than microgroove should be played with the standard needle and standard needle weight.

**MOTOR**

Connect the motor cord to a source of 105-120 volt, 60 cycle current only. If it is desired to operate the changer on 50 cycle current, special motor shaft bushings must be used in order to drive the turntable at the required speed of 78 R.P.M. or 33 1/3 R.P.M.

Do not under any circumstances connect the motor to a source of direct current (DC) or alternating current of any other frequencies.
SPEED CONTROL ADJUSTMENTS

1. Move the Speed Control Lever to either “33⅓” or 78” as required for microgroove or standard records.

Moving the Speed Control Lever also turns the motor power on.

2. Move the needle pressure counterbalance weight back for 7 gram needle pressure and the .001” tip radius needle point required by microgroove records. Move the weight lever forward for normal pressure and the .003” tip radius needle point required by the usual 78 R.P.M. records.

The Red or White dots on the Pickup Arm and the Speed Control Knob should match. The proper needle point will then be in position for the record speed selected.

FOR AUTOMATIC RECORD CHANGE

1. Turn the Record Shelf forward or back for ten or twelve-inch records. Do not turn this shelf while a record is changing or the mechanism is in cycle.

2. With the record ballast weight lifted and turned forward out of position, place up to a 1” stack of 12” or 10” records on the spindle so that the bottom record rests on the step of the spindle and on the Record Shelf.

3. Turn the record ballast weight and lower it until it rests on the top record.

4. Move the “Manual-Reject” Control toward you, to the “Reject” position, and release it. The Control will then drop back into the automatic playing position and the records will be changed automatically until the last record is completed. The pickup arm will then return to the “Rest” position and the motor will continue to revolve until the Speed Control is turned to the OFF position.

5. To reject any record while playing in the automatic position, move the “Manual-Reject” Control to the REJECT position and release.

The pickup arm may be moved horizontally at any time without damage to the mechanism.

However, after the last record is completed or while the mechanism is in cycle the pickup arm cannot be returned to the pickup arm rest until the change cycle has been completed.

After the last record has been played, the entire stack may be removed from the turntable at one time. The simplest procedure is as follows:

a. Place the pickup arm on the pickup arm rest.

b. Lift and turn the record ballast weight out of position.

c. Place the fingers of both hands under opposite edges of the bottom record.

d. Do not apply pressure to the top record. (Keep your thumbs free.)

e. Lift the stack of records straight up following the contours of the spindle. This permits the stack of records to follow the curve of the spindle without binding and greatly facilitates the removal of the stack.

FOR “MANUAL” RECORD CHANGE

CAUTION: We recommend that microgroove records never be played with the control in the “Manual” position. The microgrooves are easily scratched and the automatic rest position of the pickup arm plus the use of the “Reject” position of the control knob make manual playing unnecessary. However, manual operation when playing standard 78 R.P.M. records is often desirable.

1. Place a record on the turntable.

2. Move the “Manual-Reject” Control toward the spindle to the “Manual” position, as indicated by the arrow on the Control Knob. No harm will result if the knob is accidentally moved to the “Reject” position. If a twelve-inch record is on the turntable, the arm will automatically index to the edge of the record. If a ten-inch record is on the turntable, the needle will be set down gently on the rubber pad and the arm may be moved to the edge of the record.

3. Place the needle gently on the edge of the record.

4. To stop the mechanism at any time move the Speed Control Lever to the OFF position.

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SERVICE INFORMATION

All units are accurately adjusted, lubricated and tested at the factory. However, service repairs and adjustments sometimes become necessary. This bulletin should be studied carefully before making any adjustments or replacing parts.

The functions and most probable misadjustments of the main assemblies are as follows (reference numbers refer to the exploded views).

THE AUTOMATIC TRIP FAILS TO FUNCTION

The Main Cam Assembly (32) and Actuating Gear (31) are the heart of the record changer. The Main Cam Assembly drives the mechanism associated with the action of the Pickup Arm (7) and the Record Selector assemblies. It, in turn, is driven by the gear train (28, 29, 30) and the Turntable which is rim driven by the phonograph motor.

The Main Cam Assembly and Actuating Gear is put in motion or "tripped" by means of the "automatic" trip or by the manually operated "reject" trip. When the movement of the Pickup Arm toward the spindle is greater than 1/8" in 1/2 revolution of the turntable, the Automatic Trip Arm (35) trips the Velocity Trip and Roller Assembly (33). This releases the Actuating Pawl on the Main Cam Assembly (32), allowing it to engage the Main Cam Actuating Gear (31) and driving it through the change cycle. The pressure from the Automatic Trip Arm required to actuate the trip mechanism is negligible.

The Automatic Trip Arm follows the movement of the Pickup Arm through a weighted friction clutch (34). This clutch must be kept free of oil and grease. If the clutch does not cause the Automatic Trip Arm to trip the mechanism, clean the clutch parts with carbon tetrachloride. This clutch should operate the trip mechanism without placing undue drag on the movement of the pickup arm.

Also check for:

1. Velocity Trip and Roller Assembly (32) binding.
2. Slight burr on end of the Actuating Pawl or on the underside of the hook end of the Velocity Trip and Roller Assembly.
3. Actuating Pawl stuck (part of Main Cam Assembly (32) engaged by the hook end of the Velocity Trip and Roller Assembly (33).
4. Automatic Trip Arm (35) bent and not hitting the Velocity Trip and Roller Assembly (33).
5. Automatic Trip Arm (35) fails to touch the Velocity Trip and Roller Assembly.
6. Velocity Trip and Roller Assembly (33) rubbing on the underside of the Main Cam Actuating Gear (31).
7. No velocity lead-in groove or eccentric groove in the center of record.

ADJUST IF NECESSARY BY BENDING AT POINT "D".

Fig. 1

Fig. 2

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8. Foreign matter in record groove.
10. Badly bent or worn needle.

IF THE "REJECT" TRIP FAILS TO FUNCTION

When the control knob is moved to the extreme START-REJECT position, the hair spring of the Reject Trip Lever Arm (54) actuates the Velocity Trip and Arm Assembly, putting the change mechanism in cycle. See Fig. 3.

Check for:
1. "Reject" trip hair spring of Lever 54 bent or broken.
2. Velocity Trip and Roller Assembly (33) binding.
3. Actuating Pawl (32) stuck (part of Main Cam Assembly).

IF THE MECHANISM CONTINUES TO CYCLE

At the completion of the change cycle, the Actuating Pawl is disengaged from the Main Cam Assembly Actuating Gear by the hook end of the Velocity Trip and Roller Assembly, which has been returned to its normal position by the reset points on the Main Cam Drive Gear, Fig. 2.

If the clearance between the lip on the Velocity Trip Lever and the edge of the Main Cam is too small, it will prevent the hooked end of the Velocity Trip Lever from engaging the trigger. Adjust the clearance between the lip ("D" of Fig. 2) on the Velocity Trip Lever and the Main Cam to be within $\frac{1}{64}$" and $\frac{1}{64}$" when the roller is contacting the point of one of the reset points on the Actuating Gear.

Also check for:
1. Velocity Trip and Roller Assembly (33) rubbing on Main Cam Actuating Gear (31).
3. "Disengage Roller" broken on Velocity Trip and Roller Assembly (33).

PICKUP ARM LIFT TOO HIGH OR TOO LOW

The vertical movement of the pickup arm is controlled by the angle of the pickup arm raising lever (37 and Fig. 4). The needle should approach the top record of a full 1" stack of records on the turntable with approximately $\frac{1}{16}$" clearance.

To adjust:
1. Put a full 1" stack of records ON THE TURN-TABLE.
2. Trip the "Start-Reject" control and rotate the turntable clockwise until the needle clears the top record of the stack by about $\frac{1}{16}$".
3. Be sure the notch in the pickup arm raising disc engages the pickup arm raising lever.
4. If the needle does not clear the top record or if it raises too high, adjust by holding the pickup arm raising lever (37) at point X and bending at Y as indicated in Fig. 4.

CAUTION: All adjusting bends should be made slowly, using slight but firm, easy pressure.

Be sure the set screws in the Pickup Arm Raising Disc (36) are not loose and are properly positioned in the alignment holes as explained in the paragraph on Needle Setdown Indexing.
NEEDLE SET DOWN INDEXING INCORRECT

The horizontal movement of the pickup arm (7) is controlled by the eccentric excursion of the Pickup Arm Raising Lever (37) moving the Pickup Arm Raising Disc (36) when actuated by the Main Cam Assembly (32). The eccentric screw (part of 8) accessible through the top of the pickup arm (7), should take care of any normal position adjustment. Turn this screw clockwise to index the needle in toward the spindle and counter-clockwise to index the needle out away from the spindle.

Should further adjustment be necessary, proceed as follows:

1. Set the eccentric screw, just mentioned, to a middle position.
2. Set the Record Shelf (4) to the 10" position.
3. Operate the mechanism by revolving the turntable manually until the needle drops to within 1/8" of a ten inch record on the turntable.
4. Be sure the notch in the Pickup Arm Raising Disc (36) engages the Pickup Arm Raising Lever (37).
5. The No. 8 Bristol set screws "A" of the Pickup Arm Raising Disc (36, Fig. 1) have pointed ends which fit into off center holes in the Pickup Arm Pivot (9). Alternately loosen one screw and tighten the other until the needle rests above the record lead-in groove at the desired point. Be sure that both set screws are tight when this adjustment is completed.
6. Complete the change cycle of the mechanism and place the pickup arm on the Pickup Arm Rest (10). The tongue of the Pickup Arm Raising Disc (36) should now rest against the post which supports the sub plate assembly. If the pickup arm does not rest in the proper position on the pickup arm rest, bend the tongue closer to or away from this post until the pickup arm is correctly positioned.

REMEMBER: Always slight but firm, easy bends!

7. Turn the Record Shelf to 12" and check the needle drop on a twelve inch record. Make any additional adjustments with the eccentric screw mentioned previously.

PICKUP ARM DROPS OFF REST

The upturned end of the Pickup Arm Pivot Shaft Bracket (Fig. 3) prevents the Pickup Arm from falling off the Pickup Arm Rest. There should be 1/64" clearance between the tongue of the Pickup Arm Raising Disc (36) and the bottom of the groove formed by the Bracket and the Base Plate Post. Bend the Bracket end up or down to secure proper positioning of the Disc tongue and the Pivot bracket. Be careful to bend the end only or the Bracket will bind on the Pickup Arm Pivot Shaft. The Bracket should not be too high or the Disc tongue will rub on it when the needle approaches the edge of a 12" record, causing "glide in" on the first few grooves of the record.

ERRATIC INDEXING

Indexing in either the 10" or the 12" position is controlled through the presence or absence of pressure from the Compression Spring (45), on the Pickup Arm Raising Lever bracket, forcing the stud to travel the inside edge or the outside edge of the groove in the bottom of the Main Cam. The compression on this spring is changed as the Record Shelf is changed from the 10" to the 12" position. Improper adjustment of the spring tension will result in erratic indexing.

In the 12" position, the spring should be just free. In the 10" position the compression of the spring holds the stud of the Pickup Arm Raising Lever against the outside edge of the groove. If the compression tension needs adjustment:

1. Turn the Record Shelf (4) to the 12" position.
2. Trip the Reject control and rotate the Turntable clockwise until the push off Blade reaches its farthest forward position. At this point the cam follower will be at the highest point on the Main Cam ("A" of Fig. 5).
3. Loosen the lock bolts of (41) and (42).
4. Be sure that the Record Shelf is held in the extreme 12" position while adjusting the Record Shelf and Push-off Blade fingers.
5. At the same time, push the Push-off Blade forward as far as possible and push the Push-off Blade and Record Shelf Assembly downward tight against the Housing (6).
6. Position the Record Shelf finger and the Toggie Assembly (41) so the 12" finger of the Push-off
Fig. 6

Blade finger (42) looks like Fig. 6. A visual spacing of approximately $\frac{1}{64}$" between the rounded edge of the toggle assembly and the Push-off Blade finger when viewed directly from the bottom of the record changer is required. See Fig. 6. Since these two parts lie on different planes, this adjustment must be made by observation only.

7 While holding the Push-off Blade and Record Shelf Assembly tight against the Housing (6), push the Index Toggle Assembly (41) against the spacer (40) and tighten the lock bolt.

8. Tighten the Push-off Blade bracket lock bolt, leaving approximately $\frac{1}{64}$" clearance between the shoulder of the Record Shelf shaft and the Push-off Blade finger bracket (42).

RECORD FAILS TO DROP

The record must leave the spindle step just prior to or at least by the time it leaves the record shell. If the spindle is too far from the record shell, the record will hang up on the spindle step and fail to drop.

To adjust:

Press down on the edge of the turntable nearest the Record Shelf to secure proper spacing. DO NOT bend the spindle itself. Also be sure a standard record is used when making this adjustment. A standard 10" record has a diameter of $9\frac{7}{8}$" $\pm \frac{1}{32}$". A standard 12" record measures $11\frac{7}{8}$" $\pm \frac{1}{32}$" in diameter.

If the changer still fails to drop records, put the mechanism in cycle and watch the movement of the Push-off Blade. If it fails to protrude beyond the edge of the Record Shelf when at its greatest forward position, adjust the Push-off Blade finger position.

1. Turn the record shelf (4) to the 12" position.
2. Trip the Reject control and rotate the Turntable until the Push-off Cam Follower reaches the highest point on the Main Cam ("A" of Fig. 5).
3. Loosen the Push-off Blade finger (42) clamp bolt.
4. Push the Push-off Blade forward as far as possible and hold the Push-off Blade and Record Shelf assembly downward tight against the housing (6).
5. Tighten the Push-off Blade finger clamp bolt (42), leaving $\frac{1}{64}$" vertical clearance between the shoulder of the Record Shelf shaft and the Push-off Blade finger (42).

CHANGE CYCLE STARTS BEFORE END OF RECORD

If the Trip Assembly chatters while the changer is running or if the changer cycles before the entire record is played, there is probably insufficient clearance between the hook end of the Velocity Trip and Roller Assembly and the actuating gear. This clearance should be adjusted to be within $\frac{1}{32}$" to $\frac{1}{64}$" by bending the lever at point "C" as shown in Fig. 7.

Fig. 7

LAST RECORD REPEATS

The weight of the records on the Spindle keeps the Automatic Shut Off Lock Lever (59) from dropping and engaging the Pickup Arm Raising Disc. The dropping of the last record releases the Automatic Shut Off Lock Lever, permitting it to engage the Pickup Arm Raising Disc and prevent the Pickup Arm from moving onto the record. The Pickup Arm then comes to rest on the Rest Button.

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If the last record continues to play:
1. Check the Spindle to be sure that it moves up and down freely.
2. With no records on the Spindle, and with the mechanism at rest, the hook "D" of the Automatic Shut Off Lock Lever (59) should clear the top of the Pickup Arm Raising Disc by \( \frac{1}{32} \)". Adjust, if necessary, by bending the Automatic Shut Off Lock Lever slightly.

**Fig. 8**

Last Record Will Not Play

As explained above, the weight of records on the spindle prevents the Automatic Lock Lever (59) from dropping. As the Cam Lever and Bracket assembly (46) moves forward to engage the Push-off Blade Actuating Lever (42), Fig. 5, point A of the Cam Lever (46), Fig. 8, should also move forward under point B of the Automatic Shut Off Lock Lever (59) to make certain it does not drop until the last record has dropped to the turntable and the Pickup Arm is in position to play. If point A does not engage point B, the Lock Lever (59) will drop to engage the Pickup Arm Raising Disc (36) and the Pickup Arm will return to the rest position without playing the last record.

To adjust, bend B so they engage properly. It may be necessary to bend (46) at point C, then readjust point D so it engages the Pickup Arm Raising Disc (36) correctly.

78 R.P.M. At Both Speed Settings

The 78 R.P.M. bushing on the motor shaft should be low enough to clear the 33\(\frac{1}{3}\) R.P.M. idler wheel. If it is too high:
1. Loosen the bushing set screw, using a No. 8 Bristol wrench.
2. Lower the bushing until it just clears the idler wheel.
3. Tighten the set screw.

**SLOW SPEED**

1. Idler wheel (23) or (74) may be cocked at an angle. Bend the mounting bracket (25).
2. Too strong tension on Idler Link Tension Spring (26) or (85). Stretch spring slightly.
3. Lip of Idler Wheel Link (25) may be binding in mounting hole. Carefully bend out the lip so the Idler Wheel rides more firmly on the rim of the Turntable.

**MOTOR DOES NOT TURN ON**

The top switch leaf of the AC switch (60) may be bent, preventing contact when the Speed Control Lever is moved to 33\(\frac{1}{3}\) or 78. Bend the Switch leaf by means of a small screw driver inserted through the small opening in the plastic protecting cover or bend the switch mounting bracket.

**STALLS DURING CHANGE CYCLE**

Too weak tension on Idler Link Spring (26) or (85). Tighten spring as required.

**ERRATIC SPEED ("WOW")**

Remove any dirt or excess flocking from the inside rim of the turntable. Check the rubber drive wheel for a flat spot or "out of round".

The idler wheel links (25) should be loose on the shoulder rivets but not sloppy. If too loose, erratic speed will result.
1. Remove the motor.
2. Carefully stake the shoulder rivet move securely to insure smooth operation.
3. Idler wheel cocked at an angle. This may have been caused by forcing the Turntable onto the spindle and bearing (18) with the Speed Control Lever in either the "33\(\frac{1}{3}\)" or "78" position. Remove the Turntable and carefully bend the idler wheel (23 or 74) so the idler wheel link stud (part of 84) is perpendicular. Always have the Speed Control at OFF when putting on the Turntable.
NEEDLE JUMPS GROOVES ON 33 1/3 R.P.M.

Check the needle pressure, using a Clarkstan needle pressure gauge. Pressure should be between 7 grams and 9 grams. To increase the pressure, use a heavy wire or small steel rod to turn the spring shaft (63).

BOTH NEEDLE POINTS TOUCH AT ONCE

1. Needle point is bent. Replace needle.
2. Needle mounting bracket "fingers" improperly bent. See Fig. 9.

REPLACEMENT OF PARTS

TO REPLACE THE NEEDLE

1. Loosen the needle set screw, using a small screw driver.
2. Remove the needle.
3. Insert new needle with the flat side of the needle shank facing the needle set screw. Be sure the needle shank is all the way in to the bottom of the needle hole.
4. Tighten the set screw. The needle point should be parallel to the sides of the needle slot and evenly spaced between the walls of the slot.

TO REPLACE THE CARTRIDGE

1. Remove the two set screws, one on each side of the cartridge.
2. Lift the cartridge from the pickup arm mounting studs and remove the Tilt Spring from its mounting hole.
3. Insert the Tilt Spring in the new cartridge.
4. Seat the cartridge on the mounting studs, insert and tighten the two set screws.

The holes in the cartridge bracket are elongated. Position the cartridge so it fits solidly against the back finger of the mounting bracket when the needle weight counterbalance lever is in the "forward" or microgroove position and solidly against the front finger of the bracket when the counterbalance lever is in the "back" or 78 R.P.M. position.

TO REPLACE THE PICKUP ARM

CAUTION: Closely observe the original placement of the pickup cord and replace it in the same position. (See Fig. 10.) Do Not push hard on the needle end of the cartridge. Bending the mounting bracket will cause improper tracking or even cause both needle points to touch the record at once.

1. Remove mounting screws from mounting studs A and B, Fig. 10.
2. Gently remove hinge assembly from the mounting studs.
3. Remove tension spring anchor from mounting stud A. (See Fig. 11.)
4. Loosen No. 8 Bristol set screw and remove needle pressure counterbalance arm.
5. Remove the tilt control Lever. Do not disassemble the springs from this lever.
6. Remove the pickup cord and tilt spring brackets.
7. Remove the cartridge mounting screws and the cartridge.

Reassemble the parts to the new pickup arm in reverse order. Read the paragraph regarding replacement of the cartridge.
LUBRICATION

Model 246 Record Changers leave the factory completely oiled and lubricated. Under normal conditions this should be sufficient for approximately one year or 1,000 hours of operation. When operated under extreme conditions of dust or heat, this operation should be performed more frequently as required.

Do not permit any oil or grease to get on the rubber Idler Drive Wheel or the Motor Sleeve, on Turntable Drive Rim or on the Automatic Trip Arm clutch. Any oil or grease on these points should be removed using Carbon Tetrachloride.

The recommended lubricants and points of lubrication are as follows:

A — No. 10 OIL (Apply With Small Oil Can or Medicine Dropper)
2. Pickup Arm Shaft. Drop one drop each to bottom bearing point, bracket hole through Main Base Plate.
3. Ball Bearing Assembly.
4. Idler Wheel Felt.

B — A NON FLUID LUBRICANT (Apply With Small Brush)
1. Idler Wheel Link.
2. Turntable Shaft Stud.
3. Pickup Arm Hinge Pins.
5. Main Cam Bearing. (It is necessary to remove the sub-plate assembly to lubricate this bearing.)
6. Teeth of Main Cam Actuating Gear.
7. Track of Main Cam Gear.
8. Teeth of Large and Small idler gears.

AVOID EXCESSIVE LUBRICATION
Exploded View above Main Plate
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The Webster-Chicago Model 256 is a dual speed, single post, spring cushioned spindle, automatic record changer. Simple in design and operation, it provides automatic or manual playing of up to a 1" stack of 10" or 12" standard 78 R.P.M. or microgroove 33⅓ R.P.M. records.

Model 256 returns the pickup arm to the rest position after playing the last record, although the motor continues to revolve until the "33⅓ OFF --- 78" Speed Control Lever is moved to the OFF position. This is especially important when playing the microgroove records for it eliminates the necessity of manually lifting the pickup arm or setting it down on the easily scratched microgrooves. The idler wheels are also pulled away from the motor shaft when the Speed Control Lever is in the OFF position, eliminating the possibility of a flat spot developing on the rubber wheels with consequent wow.

Model 256 also features the exclusive Webster-Chicago velocity trip mechanism. The pickup arm is not actuated by "lead-in" springs and there is a minimum of lateral pressure. The arm travels freely in either direction. This lack of lateral pressure or inertia adds immeasurably to the life of records and is considered to be as important as extra-light vertical pressure, which in some instances would result in poor tracking at extremely low or high frequencies. The free floating arm permits "home recordings" or "inside out" records up to 12" size to be played manually.

Model 256 will change warped or rough edged records, at the same time assuring maximum protection to the finest discs.

**OPERATION**

**DESCRIPTION**

The special pickup cartridge supplied has a replaceable tandem point needle. A unique connection between the cartridge and the needle weight counterbalance automatically lowers the proper point into playing position when the counterbalance is adjusted for light or normal needle pressure. When the counterbalance weight is turned back, the needle pressure is the 7 grams required for proper playing of the microgroove records. When it is turned forward to the side of the pickup arm the normal weight for standard 78 R.P.M. records is at the needle point.

The voltage output is normally lower when playing microgroove records. The volume control of the radio or amplifier must be turned up further when they are played.

Any 33⅓ R.P.M. records other than microgroove should be played with the standard needle and standard needle weight.
MOTOR
Connect the motor cord to a source of 105-120 volt, 60 cycle current only. If it is desired to operate the changer on 50 cycle current, special motor shaft bushings must be used in order to drive the turntable at the required speed of 78 R.P.M. or 33 1/3 R.P.M.
Do not under any circumstances connect the motor to a source of direct current (DC) or alternating current of any other frequencies.

SPEED CONTROL ADJUSTMENTS
1. Move the Speed Control Lever to either “33 1/3” or “78” as required for microgroove or standard records. Moving the Speed Control Lever also turns the motor power on.
2. Move the needle pressure counterbalance weight back for 7 gram needle pressure and the .001” tip radius needle point required by microgroove records. Move the weight lever forward for normal pressure and the .003” tip radius needle point required by the usual 78 R.P.M. records.
The Red or White dots on the Pickup Arm and the Speed Control Knob should match. The proper needle point will then be in position for the record speed selected.

FOR AUTOMATIC RECORD CHANGE
1. Turn the Record Selector Post to “10” or “12” for ten or twelve inch records. The Record Selector Post is pivoted and turns in a counterclockwise direction to the 10” position and clockwise to the 12” position as indicated by the arrows. Do not use the Ballast Weight as a handle to turn the post. Turn by grasping the head of the Record Selector Post with the thumb and forefingers.
2. Turn the Selector Switch (sleeve of ON button) to AUTOMATIC.
3. With the Record Ballast Weight turned back, place up to a 1” stack of 12” or 10” records on the spindle so that the bottom record rests on the step of the spindle and the shelf of the Record Selector Post.
4. Turn the Record Ballast Weight forward to rest on the top record.
5. Press the ON button. To reject any record while playing in the AUTOMATIC position, press the ON button.
6. After the last record has been played, the entire stack may be removed from the turntable at one time. The simplest procedure is as follows:
   a. Turn the Record Ballast Weight back out of position.
   b. Place the fingers of both hands under opposite edges of the bottom record.
   c. Do not apply pressure to the top record. (Keep your thumbs free.)
   d. Lift the stack of records straight up following the contours of the spindle. This permits the stack of records to follow the curve of the spindle without binding and greatly facilitates the removal of the stack.

FOR “MANUAL” RECORD CHANGE
CAUTION: We recommend that microgroove records never be played with the control in the “Manual” position. The microgrooves are easily scratched and the automatic rest position of the pickup arm plus the use of the “Reject” position of the control knob make manual playing unnecessary. However, manual operation when playing standard 78 R.P.M. records is often desirable.
1. Place a record on the turntable.
2. Turn the Record Selector Post to the “12” position. (This is not essential but permits more clearance in loading and unloading records.)
3. Turn the Selector Switch (sleeve of ON button) to MANUAL.
4. Place a record on the turntable. It may facilitate this operation if the record is placed over the spindle at an angle, with one edge of the record held below the level of the Record Selector Post Shelf. Records may be removed in the same manner.
5. Press the ON button.
6. Place the needle gently on the edge of the record. Do not lift the pickup arm too high as this will cause it to catch in the Automatic Stop Lock position.
7. To stop the mechanism at any time, turn the Speed Control to the “OFF” position.
SERVICE INFORMATION AND ADJUSTMENTS

All units are accurately adjusted, lubricated and tested at the factory. However service repairs and adjustments sometimes become necessary. This bulletin should be studied carefully before making any adjustments or replacing parts.

The functions and most probable misadjustments of the main assemblies are as follows (reference numbers refer to the exploded view)

THE AUTOMATIC TRIP FAILS TO FUNCTION

The Main Cam Assembly (38) and Actuating Gear (36) are the heart of the record changer. The Main Cam Assembly drives the mechanisms associated with the action of the Pickup Arm (5) and the Record Selector assemblies. It, in turn, is driven by the gear train (29, 30, 31) and the Turntable which is rim driven by the phonograph motor.

The Main Cam Assembly and Actuating Gear is put in motion or “tripped” by means of the “automatic” trip or by the manually operated “reject” trip. When the movement of the Pickup Arm toward the spindle is greater than 1/8” in 1/8 revolution of the Turntable, the Automatic Trip Arm (33) trips the Velocity Trip and Roller Assembly (37). This releases the Actuating Pawl on the Main Cam Assembly (38), allowing it to engage the Main Cam Actuating Gear (36) and driving it through the change cycle. The pressure from the Automatic Trip Arm required to actuate the trip mechanism is negligible.

The Automatic Trip Arm (33) follows the movement of the Pickup Arm through a weighted friction clutch (32). This clutch must be kept free of oil and grease. Should it become necessary, clean the clutch parts with carbon tetrachloride. This clutch should operate the trip mechanism without placing undue drag on the movement of the pickup arm.

Also check for:
1. Velocity Trip and Roller Assembly binding.
2. Slight burr on end of the actuating pawl or on the underside of the Velocity Trip hook.
3. Actuating Pawl stuck (part of Main Cam Assembly (38) engaged by the hook end of the Velocity Trip and Roller Assembly (37).
4. Automatic Trip Arm (33) bent and not hitting the Velocity Trip and Roller Assembly (37).
5. Automatic Trip Arm (33) fails to touch the Velocity Trip and Roller Assembly.
6. Velocity Trip and Roller Assembly (37) rubbing on the underside of the Main Cam Actuating Gear (36).
7. No velocity lead-in groove or eccentric groove in the center of record.
8. Foreign matter in record groove.
10. Badly bent or worn needle.

IF THE “REJECT” TRIP FAILS TO FUNCTION

When the “On” button is pressed, the hair spring of the “reject” trip lever arm (65), actuates the Velocity Trip and Arm Assembly, putting the change mechanism in cycle.

Check for:
1. “Reject” trip hair spring of Lever (65) bent or broken.
2. Velocity Trip and Roller Assembly (37) binding.
3. Actuating Pawl (part of Main Cam Assembly 38) stuck.
IF THE MECHANISM CONTINUES TO CYCLE

At the completion of the change cycle, the Actuating Pawl is disengaged from the Main Cam Assembly Actuating Gear (36) by the hook end of the Velocity Trip and Roller Assembly (37) which has been returned to its normal position by the reset points on the Main Cam Drive Gear (Fig. 3). This hook should be adjusted for about 1/64" clearance from the bottom of the Main Cam Drive Gear (36), Fig. 1. Greater clearance may permit the pawl to bounce past the hook and reengage, causing the mechanism to continue to cycle.

If the clearance between the lip on the Velocity Trip Lever and the edge of the Main Cam is too small, it will prevent the hook end of the Velocity Trip Lever from engaging the trigger. Adjust the clearance between the lip (D, Figs. 3 and 5) on the Velocity Trip Lever of the Main Cam to be within 1/64" when the roller is contacting the point of one of the protrusions on the Actuating Gear.

Also check for:
1. Velocity Trip and Roller Assembly (37) rubbing on Main Cam Actuating Gear (36).
3. "Disengage Roller" broken on Velocity Trip and Roller Assembly (37).

ADJUST IF NECESSARY BY BENDING AT POINT "D".

Fig. 3

PICKUP ARM LIFT TOO HIGH OR TOO LOW

The vertical movement of the pickup arm is controlled by the angle of the Pickup Arm Raising Lever (40). The needle should approach the top record of a full stack of 10" records on the turntable with approximately 1/6" clearance.

To adjust:
1. Put a full stack of 10" records ON THE TURN- TABLE.
2. Press the "On" button and, rotate the Turntable clockwise until the needle clears the top record of the stack by about 1/8".
3. Be sure the notch in the Pickup Arm raising disc (34) engages the pickup arm raising lever (40).
4. If the needle does not clear the top record or it raises too high, adjust by bending the pickup arm raising lever at the point indicated in Fig. 4.

CAUTION: All adjusting bends should be made slowly, using slight but firm, easy pressure. Be sure the set screws (A of Fig. 1) of the pickup arm raising disc are not loose and are properly positioned in the alignment holes as explained in the paragraph on Needle Setdown Indexing.

Fig. 4

NEEDLE SET DOWN INDEXING INCORRECT

The horizontal movement of the pickup arm (5) is controlled by the eccentric excursion of the Pickup Arm Raising Lever (40) moving the Pickup Arm Raising Disc (34) when actuated by the Main Cam Assembly (38). The eccentric screw (part of 6), accessible through the top of the pickup arm (5), should take care of any normal position adjustment. Turn this screw clockwise to index the needle in toward the spindle and counter-clockwise to index the needle out away from the spindle.

Should further adjustment be necessary, proceed as follows:
1. Set the eccentric screw, just mentioned, to a middle position.
2. Set the Record Selector Post (42) to the 10" position.
3. Operate the mechanism by revolving the Turntable manually until the needle drops to within 1/4" of a 10" record on the turntable.
4. Be sure the notch in the Pickup Arm Raising Disc (34) engages the Pickup Arm Raising Lever (40).
5. With a No. 8 Bristol wrench in each of the set screws of the Pickup Arm Raising Disc (35) as indicated in A, Fig. 1, alternately loosen one screw and tighten the other until the needle rests above the record lead-in groove at the desired point.

6. Complete the change cycle of the mechanism and position the Pickup Arm on the rest button (10). If necessary, bend the tongue of the Pickup Arm Raising Disc closer to or away from the Base Plate Post until the Pickup Arm is correctly seated on the rest button when the tongue is touching the Base Plate Post.

NOTE: All adjusting bends should be slight but firm, easy bends.

CHANGE CYCLE STARTS BEFORE END OF RECORD

If the trip assembly chatters while the changer is running, or if the changer cycles before the entire record is played, there is probably insufficient clearance between the hook end of the Velocity Trip and Roller Assembly (37) and the Actuating Gear (36). This clearance should be adjusted to be within \( \frac{1}{32} \) to \( \frac{1}{64} \)" by bending the lever at point "C" shown in Fig. 5.

![Fig. 5](image)

MORE THAN ONE RECORD IS DROPPED DURING A CHANGE CYCLE

The floating latch at the top of the Record Spindle is so spaced that only one record at a time can slide between the heel of the latch and the step of the spindle. The hole in the latch is elongated so that the latch can slip into the spindle recess when records are being removed.

If more than one record is dropped at a time, it will be found to be due to:

1. Foreign matter in spindle recess causing the latch to stick.
2. Exceptionally thin records.

RECORD DROPS ON PICKUP ARM

As the change cycle is started, the first motion of the inclined outer bottom surface of the Main Cam (38) causes the Record Selector Post (42) to move toward the Spindle about \( \frac{3}{32} \) inch. This position is maintained until the Pickup Arm has made its full outward lateral excursion at which time the Record Selector Post again moves toward the spindle, causing the bottom record to drop into playing position.

If the Record Selector Post (42) has been bent back, away from the Record Spindle, it is possible for a standard record to rest on the spindle step, with its edge just over the edge of the Record Selector Post shelf. Then as the change cycle is started, the record is pushed off the spindle by the initial movement of the Record Selector Post, so that it drops on the Pickup Arm.

To correct this condition, the Rocker Arm Assembly must be adjusted so that the Record Selector Post is brought nearer to the spindle. This adjustment is made in the following manner:

1. With the mechanism at rest, remove the Turntable and replace the Record Spindle. Set the Record Selector Post to the position for playing 12-inch records and place a 12-inch record on the Record Spindle.

2. Insert a short screwdriver through the motorboard opening into the screw slot as shown at "A" in Fig. 6. Clockwise rotation of the screw will increase the distance between the Record Spindle and the Record Selector Post; counter-clockwise rotation will decrease it.

It is recommended that the distance between the edge of the record and the step of the Record Selector Post be held to just over \( \frac{3}{32} \) of an inch so that records with rough or sharply beveled edges will not catch on the outer edge of the Record Selector Post.

CAUTION: Be certain that a standard size record is used in making this adjustment. A standard 10" record measures 9\( \frac{3}{4} \) ± \( \frac{1}{32} \) diameter. A standard 12" record measures 11\( \frac{7}{8} \) ± \( \frac{1}{32} \) diameter.

![Fig. 6](image)
GLIDE IN ON 12" RECORDS

1. Check tension of compression spring (47A) as explained above. Spring should be free in 12" position.

2. Remove any cause of friction in Index Lever (47).

3. Tongue of Pickup Arm Raising Disc (34) should not touch beveled edge of pickup arm pivot shaft bracket (35) when the needle is on the edge of a 12" record. Bend the end of the bracket if necessary.

LAST RECORD DOES NOT PLAY

The weight of the records on the Spindle keeps the Automatic Shut Off Lock Lever (44) from dropping and engaging the Pickup Arm Raising Disc (38), thus permitting the mechanism to continue to cycle.

The Push Off Post (50) moves forward slightly at the beginning of each change cycle. The bracket "B" on this post is then underneath the elevated hook "A" on the Automatic Shut Off Lock Lever (44). This forward movement takes place before the last record drops so the change cycle should continue. However the dropping of the last record releases the Automatic Shut Off Lock Lever, permitting it to drop and shut off the mechanism when the change cycle starts after the last record.

If the last record does not play.

1. Bend the elevated hook "A", Fig. 8 forward so that it will overlap the Push Off Post bracket "H" about $\frac{1}{64}$" with a record on the spindle.

LAST RECORD CONTINUES TO PLAY

1. Check the record spindle to be sure that it moves up and down freely.

2. With no records on the spindle, check the Automatic Shut Off Lock Lever (44). The lower hook end of this arm ("C") should catch the Pickup Arm Raising Disc (34) at the beginning of the cycle to prevent travel of the Pickup Arm, causing it to drop on the OFF button. With no records on the Spindle and with the mechanism at rest, this hook should clear the top of the Pickup Arm Raising Disc by $\frac{1}{64}$". Adjust, if necessary, by inserting a screw driver in the hole in the bottom base plate and bending

ERRATIC INDEXING

Indexing in the 10" or the 12" position is controlled through the presence or absence of pressure from the Compression Spring (47A) on the Pickup Arm Raising Lever (40). The compression on this spring is changed as the Record Selector Post (42) is changed to the 10" or 12" position. Improper adjustment of the spring tension will result in erratic indexing. In the 12" position, the spring should be just free. In the 10" position, the compression of the spring holds the stud of the Pickup Arm Raising Lever (40) against the outside edge of the groove, forcing the stud to travel the inside edge or the outside edge of the groove in the bottom of the Main Cam (38).

To adjust:
Bend the slotted arm (part of 40) for proper tension and smooth clearance of the spring guide arm (47).

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lips "D". Never attempt to move the Pickup Arm Raising Disc up or down.
3. The elevated hook "A" on the Automatic Shut Off Lock Lever will sometimes lock with the bracket "B" on the Record Selector Post (50) if the drop of the record is delayed. More clearance can be obtained by bending the elevated hook "A" away from the bracket.

78 R.P.M. AT BOTH SPEED SETTINGS
The 78 R.P.M. bushing on the motor shaft should be low enough to clear the 33⅓ R.P.M. idler wheel. If it is too high:
1. Loosen the bushing set screw, using a No. 8 Bristol wrench.
2. Lower the bushing until it just clears the idler wheel.
3. Tighten the set screw.

SLOW SPEED
1. Idler wheel (24) or (91) may be cocked at an angle. Bend the mounting bracket (26).
2. Too strong tension on Idler Link Tension Spring (27) or (90). Stretch spring slightly.
3. Lip of Idler Wheel Link (26) may be binding in mounting hole. Carefully bend out the lip so the Idler Wheel rides more firmly on the rim of the Turntable.

MOTOR DOES NOT TURN ON
The top switch leaf of the AC switch (61) may be bent, preventing contact when the Speed Control Lever is moved to 33⅓ or 78. Bend the Switch Leaf by means of a small screw driver inserted through the small opening in the plastic protecting cover or bend the switch mounting bracket.

STALLS DURING CHANGE CYCLE
Too weak tension on Idler Link Spring (25 or 90). Tighten spring as required.

ERRATIC SPEED ("WOW")
Remove any dirt or excess flocking from the inside rim of the turntable. Check the rubber drive wheel for a flat spot or "out of round". The idler wheel links (26) should be loose on the shoulder rivets but not sloppy. If too loose, erratic speed will result.
1. Remove the motor.
2. Carefully stake the shoulder rivet more securely to insure smooth operation.
3. Idler wheel cocked at an angle.

BOTH NEEDLE POINTS TOUCH AT ONCE
1. Needle point is bent. Replace needle.
2. Needle mounting bracket "fingers" improperly bent. See Fig. 9.

REPLACEMENT OF PARTS

TO REPLACE THE NEEDLE
1. Loosen the needle set screw, using a small screw driver.
2. Remove the needle.
3. Insert the new needle with the flat side of the needle toward the set screw. Be sure the needle shank is all the way in to the bottom of the needle hole.
4. Tighten the set screw. The needle point should be parallel to the sides of the needle slot and evenly spaced between the walls of the slot.

TO REPLACE THE PICKUP ARM
CAUTION: Closely observe the original placement of the pickup cord and replace it in the same position. (See Fig. 10). Do not push hard on the needle end of the cartridge. Bending the mounting bracket will cause improper tracking
3. Remove tension spring anchor from mounting stud A. (See Fig. 11.)
4. Loosen No. 8 Bristol set screw and remove needle pressure counterbalance arm.
5. Remove the tilt control lever. Do not disassemble the springs from this lever.
6. Remove the pickup cord and tilt spring brackets.
7. Remove the cartridge mounting screws and the cartridge.

Reassemble the parts to the new pickup arm in reverse order. Read the paragraph regarding cartridge replacement.

**TO REPLACE THE CARTRIDGE**

1. Remove the two set screws, one on each side of the cartridge.
2. Lift the cartridge from the pickup arm mounting studs and remove the Tilt Spring from its mounting hole.
3. Insert the Tilt Spring in the new cartridge.

4. Seat the cartridge on the mounting studs, insert and tighten the two set screws.

The holes in the cartridge bracket are elongated. Position the cartridge so it fits solidly against the back finger of the mounting bracket when the needle weight counterbalance lever is in the “forward” or 78 R.P.M. position and solidly against the front finger of the bracket when the counterbalance lever is in the “back” or micro-groove position.

**REPLACE PICKUP ARM BRACKET AND SHAFT ASSEMBLY**

1. Loosen Bristol screws in Pickup Arm Raising Disc.
2. Remove Disc and Clutch parts by sliding them off the bottom of the Pickup Arm Shaft and pull shaft out of changer from above.

To replace, reverse the procedure and adjust the Pickup Arm Raising Disc for proper operation.

**REPLACE RECORD POST AND ROCKER ARM ASSEMBLY**

1. Remove the Pickup Post Assembly.
2. Remove the four nuts under the main plate which hold the Crescent Assembly.
3. Unhook the Rocker Arm Return Spring.
4. Remove the Rocker Arm Pivot Pin.
5. Lift out the Record Selector Post, Rocker Arm and Crescent Assembly as a unit.
6. In replacing the Rocker Arm Assembly, note paragraph “Replacing the Sub-Plate Assembly.”

**LUBRICATION**

Model 256 Record Changers leave the factory completely oiled and lubricated. Under normal conditions this should be sufficient for approximately one year or 1,000 hours of operation. When operated under extreme conditions of dust or heat, this operation should be performed more frequently as required.

Do not permit any oil or grease to get on the rubber Idler Drive Wheel or the Motor Sleeve, on Turntable Drive Rim or on the Automatic Trip Arm clutch. Any oil or grease on these points should be removed using Carbon Tetrachloride.

The recommended lubricants and points of lubrication are as follows:

**A — No. 10 OIL (Apply With Small Oil Can or Medicine Dropper)**

2. Pickup Arm Shaft. Drop one drop each to bottom bearing point, bracket hole through Main Base Plate.
3. Ball Bearing Assembly.
4. Idler Wheel Felt.

**B — A Non Fluid Lubricant (Apply With Small Brush)**

1. Idler Wheel Link.
2. Turntable Shaft Stud.
3. Pickup Arm Hinge Pins.
5. Main Cam Bearing. (It is necessary to remove the sub-plate assembly to lubricate this bearing.)
6. Teeth of Main Cam Actuating Gear.
7. Track of Main Cam Gear.
8. Teeth of Large and Small idler gears.

**AVOID EXCESSIVE LUBRICATION**
This view shows a Model 246 mechanism. It is used because it shows the dual speed mechanism and main actuating gear assembly.
Exploded View above Main Plate

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## PARTS LIST

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