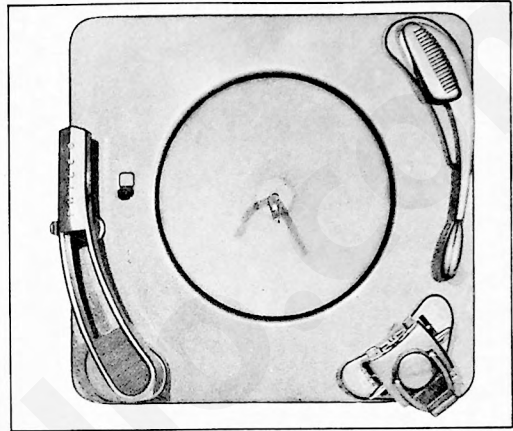


RECORD CHANGERS

MODEL M-12C

INTRODUCTION

The Philco DeLuxe Automatic Record Changer and Record Player Combination, Model M-12C, (figure 1), incorporates the use of two tone arms. The changer tone arm is used with the record-changer mechanism to play ten 12" records or twelve 10" records, automatically, at the standard speed of 78 r.p.m. The long-play tone arm is used with the manual record player, which plays the new Columbia Long-Playing Records ($33\frac{1}{3}$ r.p.m.). This tone arm employs the new Philco Balanced-Fidelity Reproducer, which applies the extremely low needle pressure of $\frac{1}{2}$ ounce. The motor is shut off automatically at the end of the record.



TP-7339

Figure 1. Philco Automatic Record Changer and Record Player Combination, Model M-12C

DESCRIPTION OF OPERATING CYCLES

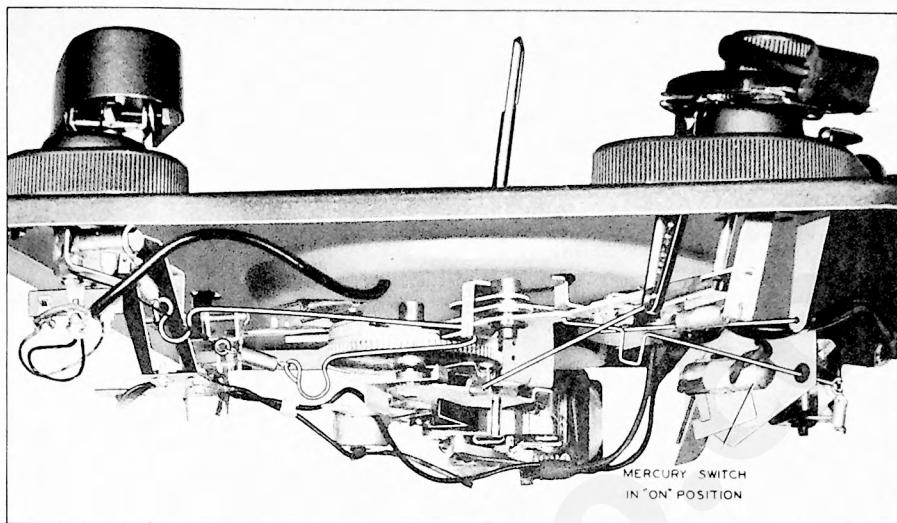
Power for the motor is obtained through two switches connected in series electrically. One is an on-off switch mounted on the bridge assembly, Part No. 76-3998 (figure 8), and is operated manually by the control button with positions OFF, MAN, AUT, and REJ. This button is located to the left of the record-shelf assembly on the top of the record changer.

The other switch is a mercury-type switch, mounted on a switch bracket, and is operated by the long-play tone arm. When the tone arm is on the rest post, a leg on the reset trip arm, connected to the tone-arm shaft, is in contact with an ear on the bracket-and-clip assembly to which the mercury switch is attached, and the switch is set in the "on" position (figure 2); when the switch is in this position, the motor circuit is controlled by the OFF-MAN-AUT-REJ control.

When the long-play tone arm is placed on a record, the mercury switch is held in the "on" position by a ratchet latch plate mounted on the switch-bracket assembly (figure 21); this ratchet plate has a cutout, in which rests a protruding ear of the bracket-and-clip assembly which contains the mercury switch. As the tone arm enters the finish groove of a record, a trip finger (attached to the reset trip arm) rides over the ratchet latch plate and trips it; this releases the bracket-and-clip assembly, causing the mercury switch to tip into the "off" position (see figure 3), thus opening the motor circuit and stopping the turntable.

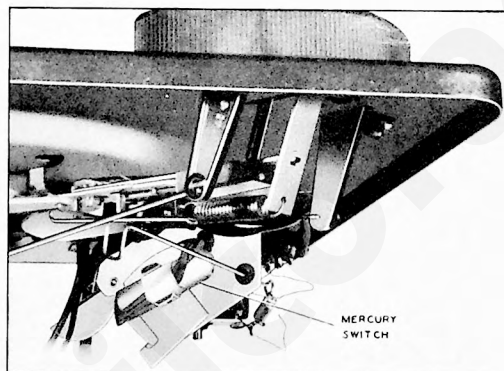
The record changer has two speeds, controlled by the play control button, with positions ST'D PLAY and LONG PLAY. This button is located to the right of the record-shelf assembly on the top of the record changer. When the play control is set to ST'D PLAY, the idler wheel on the motor engages the motor shaft directly, driving the turntable at a speed of 78 r.p.m. When the play control is set to LONG PLAY, a selector link, one end of which is attached to the base of the control under the changer, actuates a selector lever mounted on the changer base plate. This selector lever engages a shift lever mounted on the motor (figure 4). A large pulley on the shift lever is connected to the motor shaft by means of a small rubber belt. The idler wheel engages this large pulley, driving the turntable at a speed of $33\frac{1}{3}$ r.p.m. The play control also actuates a single-pole, double-throw switch, which is mounted on the base plate under the turntable (figure 4). The output leads of the two tone arms are connected to this switch. When the play control is set to the LONG PLAY position, the switch cuts off the output of the changer tone arm, and closes the circuit for the long-play tone arm. The reverse of this action takes place when the play control is set to the ST'D PLAY position.

The changer mechanism of the record changer is brought into action when a small retractable gear segment, mounted on the cam gear, is released, and engages the hub gear of the turntable shaft, causing



TP-7348

Figure 2. Mercury Switch, Shown in ON Position

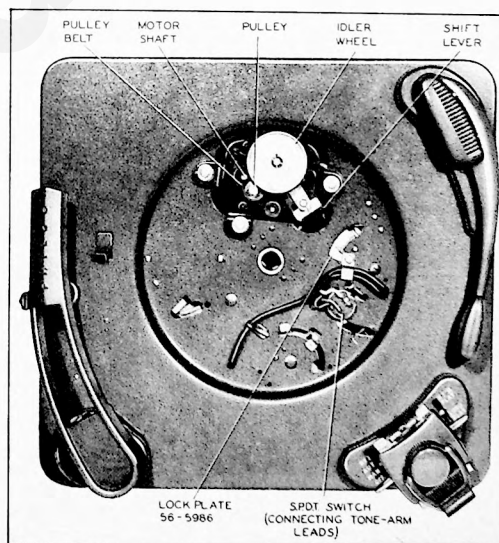


TP-7341

Figure 3. Mercury Switch, Shown in OFF Position

the cam gear to be driven. While a record is playing, the retractable gear segment is held in the retracted position by the trip-plate ear; the segment is released either manually, by pushing the OFF-MAN-AUT-REJ control to REJ, or automatically, when the changer tone arm follows the finish groove of a record; automatic tripping is initiated by the trip arm, which is attached to the tone-arm shaft, and which rides over the trip-plate ratchet screw, causing the cam-gear segment to be released.

The tone arm of the record changer is operated by two link assemblies (figure 13) attached to actuator



TP-7359A

Figure 4. Top View, Turntable Removed, Showing Motor Assembly and SPDT Switch

levers, which are in contact with the cam surface of the cam gear. When the cam gear starts, the lower actuator lever is pushed outward first, and the short link assembly attached to it raises the tone arm off

RECORD CHANGERS (MODEL M-12C)

the record. (The same action also raises the long-play tone arm, at the end of a record, by means of the long link assembly, which is also attached to the lower actuator lever.) 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.

TESTING AND TROUBLE-SHOOTING PROCEDURE

The following series of operating tests is given to aid in localizing troubles. Each test should be performed with several good records before making any adjustments.

With both tone arms on their rest posts, set the record shelf to the 10" position, and place a 10" record over the spindle and onto the record shelf. Set the play control to ST'D PLAY, and push the OFF-MAN-AUT-REJ control knob to REJ. Observe the record-dropping action; the record should fall smoothly onto the turntable. The tone arm should rise from the rest post, and the needle should come down on the record at about $\frac{1}{8}$ " from the outer edge. Play the record through, and observe the tripping action; the trip mechanism should operate within the first two or three revolutions after the needle has entered the eccentric finish groove of the record.

Remove the record from the turntable, turn the record shelf to the 12" position, place a 12" record on the spindle and record shelf, and repeat the above testing procedure.

During a change cycle, the lower edge of the tone arm should clear the top of the rest-post hook by a minimum of $\frac{1}{8}$ ".

Remove the record from the turntable, place the changer tone arm over the changer base plate, and observe the clearance between the needle point and the base plate; the clearance should be not less than $\frac{1}{16}$ "; however, the needle should be no higher than the top of the turntable.

Place the tone arm on the rest post, set the OFF-MAN-AUT-REJ control to MAN, and the play control to LONG PLAY. Place a 12" Columbia Long-Playing (micro-groove) record on the turntable, and set the long-play tone arm on the record. Play the record for a few minutes and listen to its tone, then place the tone arm in the finish groove of the record, and observe the shut-off action. The turntable should stop within three revolutions after the tone arm has entered the finish groove.

Remove the record from the turntable, place the tone arm over the base plate, and observe the clearance between the needle point and the base plate; the clearance should be not less than $\frac{1}{16}$ ". Now raise the tone arm over the rest post; it should clear the post by a maximum of $\frac{1}{32}$ ".

TURNTABLE AND MOTOR TEST

Place a stroboscope disc, such as the Philco Part No. 45-9531, on the turntable, and illuminate the disc with a lamp operating on 60-cycle a.c. Set the OFF-MAN-AUT-REJ control to MAN, and play control to LONG PLAY, and observe the dots in the row calibrated for $33\frac{1}{3}$ r.p.m. on the stroboscope disc. The dots should appear to remain stationary, or have very little drift, either to the right or to the left.

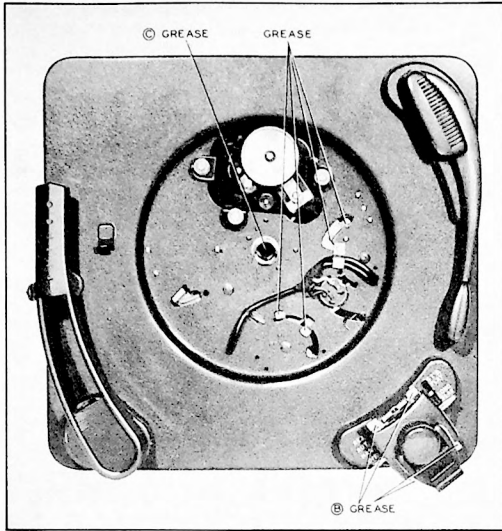
Remove the stroboscope disc from the turntable, place a stack of ten 12" records onto the turntable, and place the stroboscope disc on the top record. Set the play control to ST'D PLAY, set the OFF-MAN-AUT-REJ control to MAN, and illuminate the stroboscope with a lamp operating on 60-cycle a.c. Observe the dots in the row calibrated for 78 r.p.m.; they, too, should appear to remain stationary, or have very little drift to the right or left.

CLEANING AND LUBRICATION

When the record changer is brought in for service, it should be well cleaned, by using carbon tetrachloride. Remove all dirt and all grease and oil. When applying new grease and oil, use it sparingly. All lubrication points are shown in figures 5 and 6.

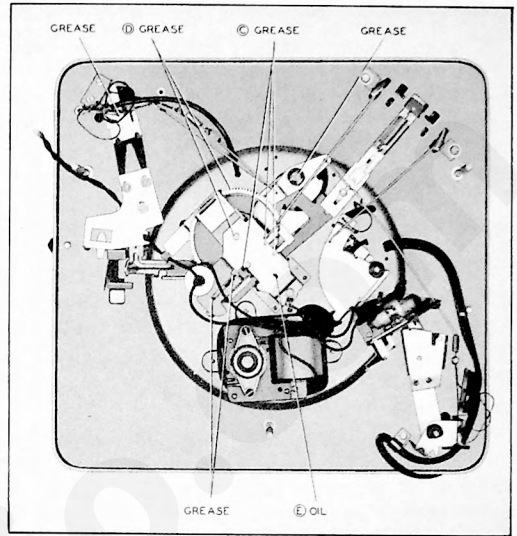
It may be necessary to remove some parts and assemblies in order to lubricate them properly. For example, the cam gear and actuator levers should be removed to lubricate the cam-gear spindle and the actuator stud.

RECORD CHANGERS (MODEL M-12C)



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Figure 5. Top View, Showing Lubrication Points



TP-7340

Figure 6. Bottom View, Showing Lubrication Points

PARTS NOT TO BE LUBRICATED

The following parts should not be lubricated at any time:

- Both trip receivers and trip fingers.
- Ratchet screw on trip plate.
- Selector assembly.
- All parts of long-play tone arm and its sub-assemblies.
- All parts of trip-switch assembly.

PARTS TO BE GREASED

Record-Shelf Assembly

Each of four dimples, and both sides of slide plate (point B of figure 5).

Bridge Assembly

Three dimples (points C of figure 6).

Cam Gear

Cam-gear teeth and all outer surfaces of gear (points D of figure 6).

Main Assembly

- Cam-gear spindle.
- Actuator stud.
- Turntable-shaft upper bearing (point C of figure 5).
- Changer tone-arm-shaft base (fill dimple with grease).
- All assemblies that have ears, and dimples that slide on the main base plate.

PARTS TO BE OILED

Use S.A.E. 20 oil on the following parts:

Trip-Plate Bushing

Apply one or two drops to inside of bushing.

Spindle

Apply one or two drops to base of spindle where it slides vertically in the bridge plate (point E of figure 6).

SERVICING THE RECORD CHANGER

Some of the record-changer troubles that may be encountered, also the methods of servicing, are given below. The serviceman should become thoroughly familiar with the operation of all parts in the mechanisms before attempting to service the record changer.

Some troubles may be caused by a lack of lubrication or an accumulation of dirt. Before making the final tests and adjustments, make sure that the changer is well cleaned and lubricated.

RECORD CHANGERS (MODEL M-12C)

CORRECTION OF TROUBLES

1. **Changer tone arm fails to rise off the rest post when the OFF-MAN-AUT-REJ control is set to REJ. Changer tone arm does not clear the top record when a full stack of records (ten 12", or twelve 10") is on the turntable.**

Check the tone-arm height and lift adjustments, as directed on page 538, and the tone-arm vertical and horizontal timing adjustments, as directed on page 538.

2. **Changer tone-arm needle does not set down on the record properly. Changer tone arm sets on the record, then falls off.**

Check the 10" and 12" index and set-down adjustments, as given below.

Check to determine whether the changer is level.

3. **Sound is distorted, weak, or intermittent, on the changer tone arm.**

Replace the needle (page 542). Make sure that the knurled thumb nut on the chuck is tightened securely.

Replace the crystal (page 544).

Check for bad wiring connections.

Check the tone arm for binding. Absence of vertical end play in the tone-arm shaft will cause excessive horizontal drag, resulting in distortion or groove jumping.

Check for uneven turntable speed (page 542).

4. **Changer fails to cycle at the end of a record.**

Check the trip-finger adjustment (page 542). Observe whether the records being used contain an eccentric finish groove in the center.

5. **Changer fails to drop the record automatically. Record holes becoming enlarged.**

Check the record-shelf and push-off adjustments, as given on page 540.

6. **Long-play tone arm does not raise and lower on the rest post when the changer is put into cycle, or does not clear the rest post when lifted off the record.**

Check the tone-arm height clearance and the raise adjustment, as given on pages 541 and 542.

7. **Sound is distorted, weak, or intermittent, on the long-play tone arm.**

Try a new needle and cartridge (pages 542 and 544).

Check all wiring.

Make sure that only long-playing records are being used at the slow speed.

Check the speed with a stroboscope disc, as directed on page 534.

Check the selector-lever throw adjustment, as given on page 542.

Check the pulley belt on the motor, as directed on page 542.

Check the needle pressure, the horizontal friction, and the pickup holder adjustments (pages 540 and 541).

8. **Record changer fails to shut off when the long-play tone arm rides the eccentric finish groove of a long-play record.**

Check the trip-finger and the trip-switch adjustments (page 542).

Check the mercury switch; when it is properly set in the clip assembly, the red dot on the switch should be on top.

ADJUSTMENTS FOR THE RECORD CHANGER

10" INDEX OR SET-DOWN

Set a 10" record on the turntable, push the OFF-MAN-AUT-REJ control to REJ, and rotate the turntable by hand approximately $4\frac{1}{2}$ turns. The tone-arm needle should be $\frac{1}{2}$ " above the record at this point. Loosen the clamp screw on the trip arm slightly (figure 13); then hold the tone arm steady, $\frac{1}{8}$ " in from the edge of the record, and set the trip arm so that the trip-arm stop, 56-4614, is in contact with the inside selector hinge, 56-4617FA3, as shown in figure 7.

Tighten the clamp screw, leaving $\frac{1}{32}$ " vertical play, or clearance, between the trip arm and the base plate.

12" INDEX OR SET-DOWN

Make the 10" index adjustment first, then remove the 10" record from the turntable and place a 12"

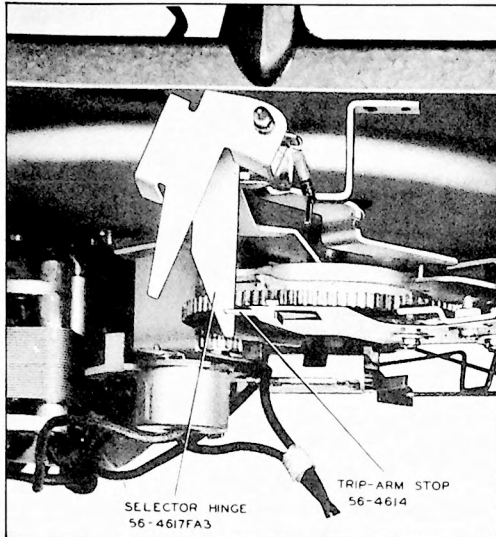
record in its place. Reject the changer, and rotate the turntable until the needle point is $\frac{1}{2}$ " above the record. The trip-arm stop should be against the outside selector, 56-4618FE15, as shown in figure 8.

Ordinarily, the 12" index is satisfactory after the 10" index adjustment is made; if not, bend the selector slightly to the right or left, as required, for the proper set-down of the needle on the record ($\frac{1}{8}$ " in from the edge of the record).

TRIP FINGER

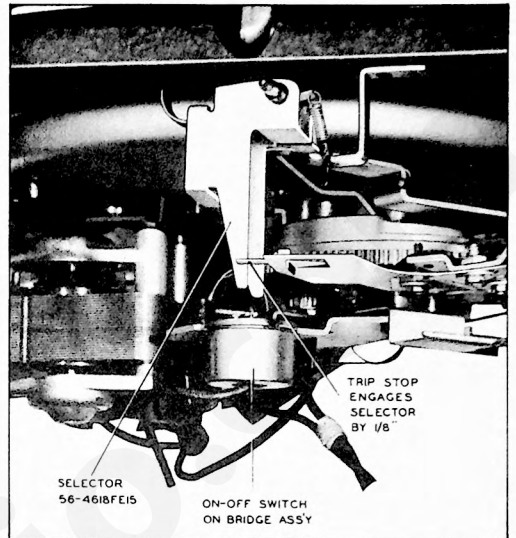
With a record on the turntable, place the tone arm in the finish groove of the record. The trip finger, 54-7613, is now riding over the ratchet screw of the trip plate, 76-2990, as shown in figure 9. The trip finger should assume an angle of 25° to 30° with respect to the ratchet screw. To obtain the correct angle, adjust the screw on the trip receiver, 56-5981,

RECORD CHANGERS (MODEL M-12C)



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Figure 7. 10-Inch Index Set-Down Adjustment



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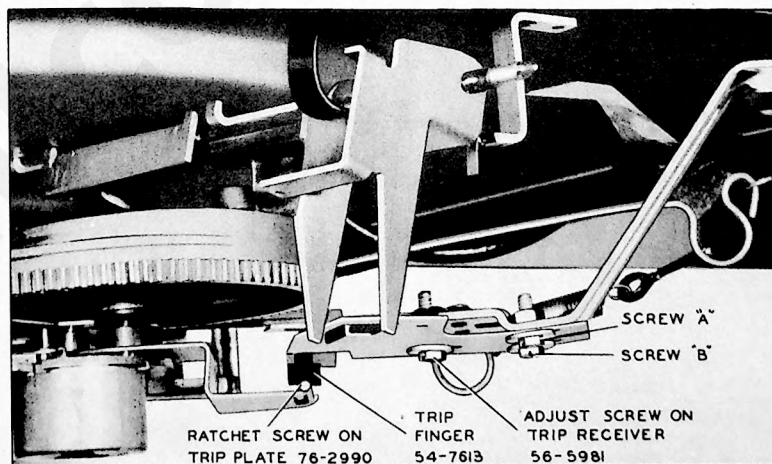
Figure 8. 12-Inch Index Set-Down Adjustment

as indicated in figure 9. Make certain that the vertical center line of the trip finger coincides with the center line of the ratchet screw. To obtain this alignment, loosen screw "A" slightly, and screw "B" completely, on the trip receiver, 56-5981, and swing the trip receiver to the right or left until the trip finger is centered over the ratchet screw; 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, 56-4614, from engaging the selector hinge by a minimum of $\frac{1}{8}$ ", as shown in figure 8. A happy medium between the above adjustments should be reached.

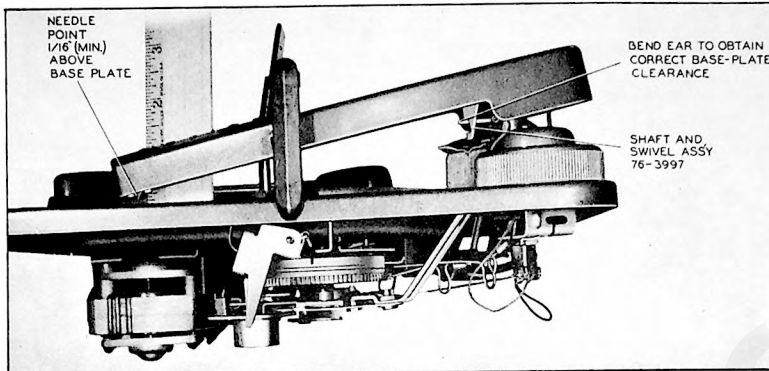
Also, the index, or set-down, adjustment may be slightly affected when making the above adjustments,



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Figure 9. Trip-Finger and Trip-Receiver Adjustments

RECORD CHANGERS (MODEL M-12C)



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Figure 10. Base Plate Clearance Adjustment, Changer Tone Arm

so it is well to remember that these three adjustments are interrelated, and that, when any one of them is made, the other two should be rechecked.

TONE-ARM HEIGHT AND LIFT

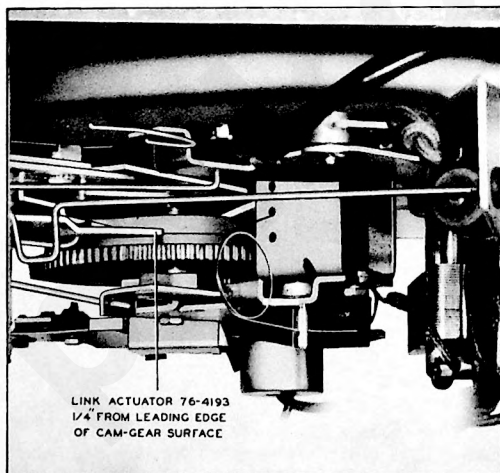
With the changer out of cycle, and the tone arm free, set the arm over the base plate. The needle point should be approximately $\frac{1}{4}$ " above the base plate. To adjust, bend the protruding ear of the swivel post (bending the ear upward increases the clearance), shown in figure 10. Now raise the 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

compromise is reached between the correct rest-post clearance and base-plate clearance.

TONE-ARM VERTICAL AND HORIZONTAL TIMING

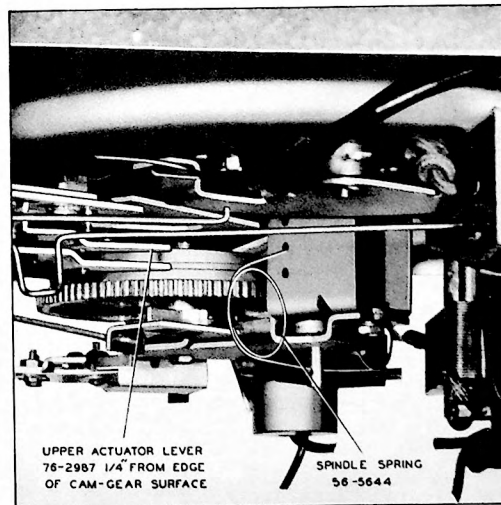
Before making these adjustments, make the tone-arm height and lift adjustments described above.

For the vertical adjustment, start with the changer out of cycle, push the OFF-MAN-AUT-REJ control to REJ, and rotate the turntable $\frac{3}{4}$ of a revolution by hand. At this point, the leading edge of the cam is approximately $\frac{1}{4}$ " from the end of the link actuator,



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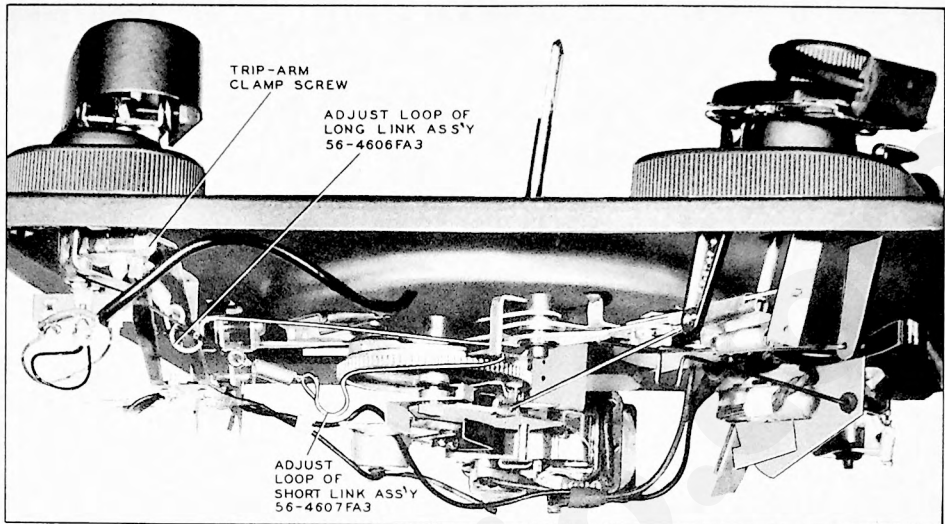
Figure 11. Vertical Timing Adjustment, Changer Tone Arm



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Figure 12. Horizontal Timing Adjustment, Changer Tone Arm

RECORD CHANGERS (MODEL M-12C)

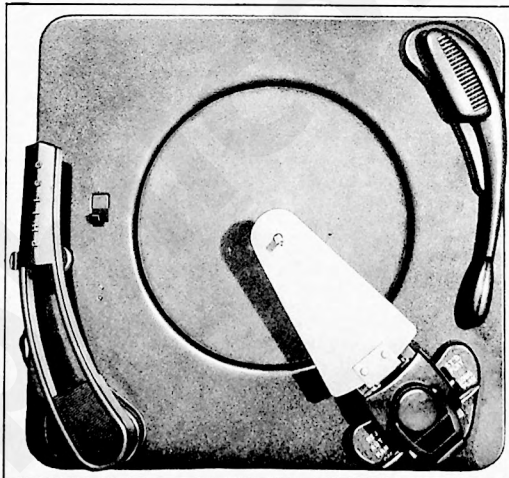


TP-7348A

Figure 13. Loop Adjustment for Tone-Arm Vertical and Horizontal Timing

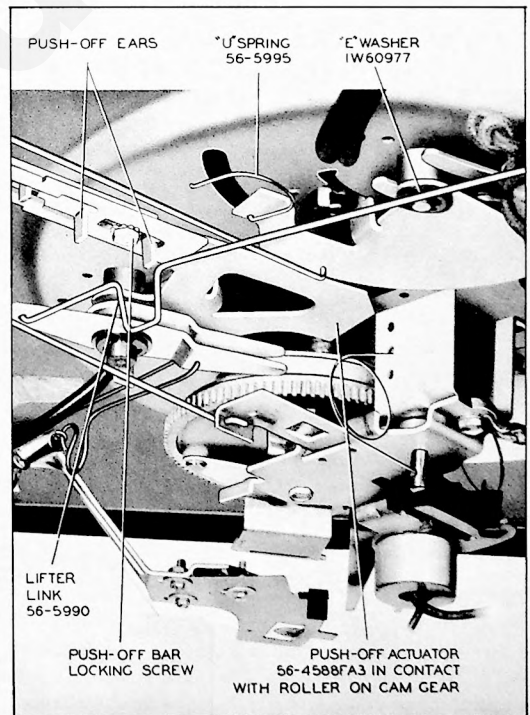
76-4193 (this is the lower actuator lever shown in figure 11). Adjust the wire loop of the *short* link (56-4607FA3 in figure 13) until the ear of the tone-arm swivel post makes contact with the lower end of the cutout on the tone-arm pivot assembly.

For the horizontal adjustment, start with the changer out of cycle, and rotate the turntable $1\frac{1}{2}$ revolutions by hand. At this point, the upper leading edge of the cam gear is approximately $\frac{1}{4}$ " from the upper actuator



TP-7338

Figure 14. Special Philco Record-Shelf Gauge, Shown in Correct Position



TP-7350

Figure 15. Push-Off Adjustment

RECORD CHANGERS (MODEL M-12C)

lever, 76-2987 (shown in figure 12). Adjust the wire loop of the *long* link (56-4606FA3 in figure 13) by squeezing or spreading it until the tone arm is up against the rubber bumper on the rest post.

RECORD SHELF

Set the record shelf to the 10" position, with the changer out of cycle. Place the Philco record-shelf gauge, 45-1470, over the spindle and onto the record shelf, as shown in figure 14. Loosen the two hex-head screws that hold the record-shelf assembly to the changer base plate. 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 $2\frac{1}{2}$ revolutions by hand; at this point, the push-off actuator, 56-4588FA3, is in its most forward position, in contact with the roller on the cam gear, as shown in figure 15. Loosen the push-off-bar locking screw and squeeze the push-off ears toward each other until the slide plate on the record shelf extends $\frac{1}{32}$ " beyond the lips of the shelf. Tighten the hex-head push-off-bar screw.

LONG-PLAY TONE ARM ADJUSTMENTS

VERTICAL FRICTION

Use the Philco gram scale, 45-1614. Calibrate the scale to zero by holding it on its side 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, place the scale on the changer base, with the guard on the scale in an open position, at right angles to the scale, as shown in figure 16. Set the needle of the long-play tone arm into the hole at the end of the pointer. Press down on the head of the pickup, and let it spring back; then note the reading on the scale. Raise the pickup, let it return slowly, and note the reading on the scale. The average of the two readings taken is the needle pressure; the difference between the two readings is the vertical friction. The correct needle pressure is between 6 and $7\frac{1}{2}$ grams. The vertical friction should not exceed 2 grams.

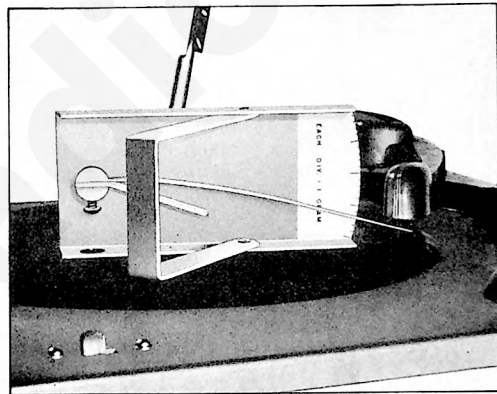
NEEDLE PRESSURE

To adjust the needle pressure, move the tone arm toward the center of the turntable; unhook the spring from the notch on the pivot assembly (below the rear end of the tone arm), and place the spring into a different notch. Each notch represents a change of one gram in needle pressure. After changing the spring into a different notch, measure the needle pressure again with the gram scale. Figure 17 shows the notches on the pivot assembly.

HORIZONTAL FRICTION

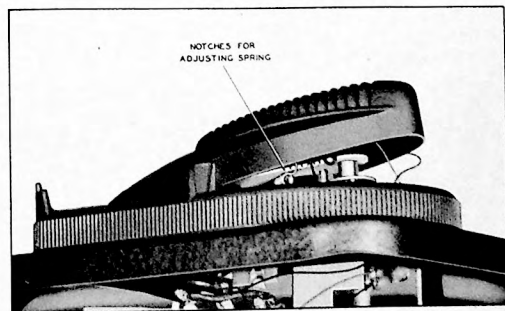
Calibrate the gram scale by laying it flat, face-up. Set the pointer to zero with the scale in this position.

Place a counterweight on top of the rear end of the tone arm; 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 push the



TP-7349

Figure 16. Philco Gram Scale, Shown in Position for Measuring Needle Pressure and Vertical Friction



TP-7342

Figure 17. Needle-Pressure Adjustment



Figure 18. Measuring Horizontal Friction

TP-7353

tone arm horizontally, as shown in figure 18. Note the reading on the gram scale while moving the tone arm throughout its entire travel (outside of the trip range). At no time should it require more than 2 grams of pressure to move the tone arm.

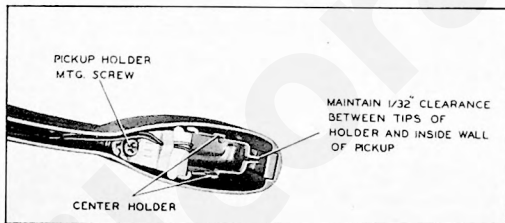


Figure 19. Pickup-Holder Adjustment

TP-6596-1

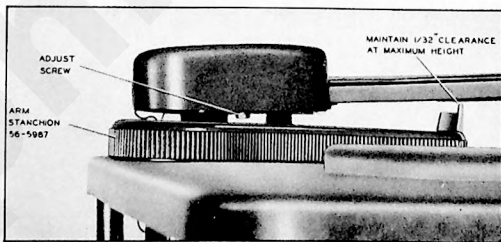


Figure 20. Height Adjustment, Long-Play Tone Arm

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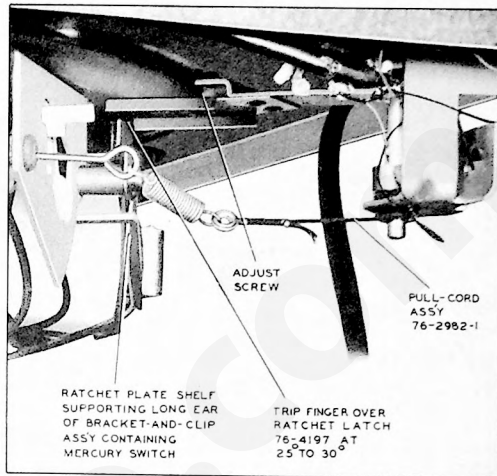


Figure 21. Trip-Finger Adjustment

TP-7344

PICKUP HOLDER

The pickup cartridge holder should be centrally spaced between the walls of the tone arm, so that there is no binding or rubbing against the inside of the tone arm when the cartridge is moved vertically.

To obtain the proper spacing, first remove the tone arm, as directed on page 544; loosen the screw which holds the pickup-bracket mounting. Move the mounting until it is centrally spaced between the walls of the tone arm; maintain a $\frac{1}{32}$ " clearance between the tip of the ears on the holder and the inside surface at the front end of the tone arm, as shown in figure 19.

TONE-ARM BASE-PLATE CLEARANCE

With the tone arm off the rest post and over the base plate, the needle should be at least $\frac{1}{16}$ ", and not more than $\frac{3}{16}$ ", above the base plate. To adjust, grasp the tone arm and raise or lower it (whichever is required) with a little pressure, to obtain the correct clearance. To lower the tone arm, it may be necessary to remove the turntable and bring the pickup toward the center; this position affords sufficient leverage to permit bending the tone arm downward. (See page 544 for removal of the spindle; remove the turntable by pulling it straight up.)

TONE-ARM HEIGHT CLEARANCE

The tone arm should clear the rest-post hook at its highest point by a maximum of $\frac{1}{32}$ ". This clearance can be obtained by adjusting the hex-head screw on the pivot assembly, shown in figure 20.

RECORD CHANGERS (MODEL M-12C)

tone-arm raise

Should the record changer be put through a change cycle with the long-play tone arm set on a record, the tone arm should lift from the record automatically, and set down on the rest post; during any further changer cycling, this tone arm should merely raise and lower on its rest post. To obtain the correct action, adjust the square loop of the lifter link,

56-5990, shown in figure 15, so that the tone arm is lifted firmly against the height-adjustment screw when the pickup is at its maximum height over the rest post.

When the changer is out of cycle, the pull-cord assembly, 76-2982-1 (figure 21), should be slack, allowing the tone arm to be freely moved, manually, anywhere on the record.

TRIP ADJUSTMENTS

TRIP FINGER

When the pickup needle is in the eccentric groove of a long-playing record, the trip finger should be riding over the ratchet latch, 76-4197, at an angle of 25° to 30°. To obtain the correct angle, adjust the screw shown in figure 21.

TRIP SWITCH

When the pickup is set on the rest post, the mercury switch should be latched in the "on" position. To adjust the switch, loosen the clamp screw on the reset trip arm, 76-4198, hold the pickup on the rest post, and move the reset trip arm outward until its protruding leg contacts the short ear on the bracket-and-clip assembly, 76-4195; there should be a maximum of $\frac{1}{32}$ " clearance between the long ear on the bracket-and-clip assembly and the cutout shelf on the ratchet latch, 76-4197. See figure 22.

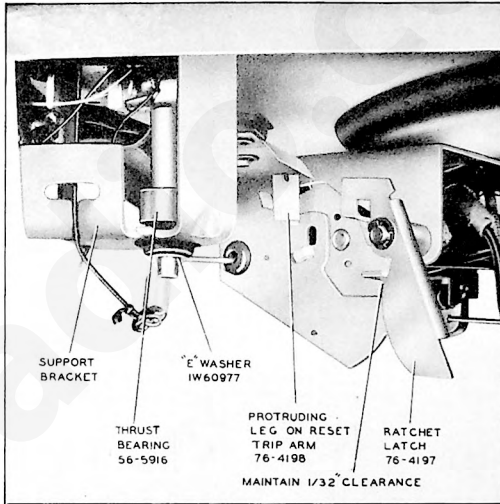
When tightening the clamp screw, maintain $\frac{1}{32}$ " vertical end play in the tone-arm shaft.

SELECTOR-LEVER THROW

The lock plate, 56-5986 (figure 4), is adjusted by loosening the hex-head screw under the base plate and moving the lock plate so that, when the play control is set to either position, the selector-lever throw does not cause the shift-speed lever on the motor to bind against the mechanical stop on the motor.

UNEVEN TURNTABLE SPEED (WOWS)

Uneven turntable speed can be caused by the following conditions:



TP-7358

Figure 22. Trip-Switch Adjustment

- Dirt under and around the idler-wheel assembly.
- Idler-wheel spring loose or missing.
- Flat spot on idler-wheel tire.

(For the $33\frac{1}{3}$ r.p.m. speed, a loose or worn pulley belt can result in a slow speed. To replace the pulley belt, push the idler-wheel assembly aside.)

REPLACEMENT OF PARTS AND ASSEMBLIES

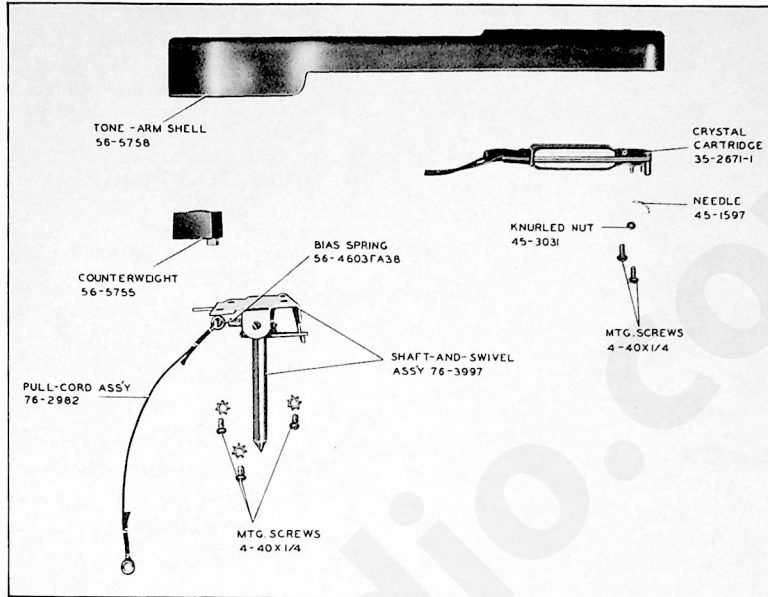
The following procedures are recommended for the correct removal of parts and assemblies. The parts should be replaced by reversing the order of removal. Adjustments should be made according to the directions given in the adjustment section.

1. NEEDLES

To remove the needle from the standard crystal on the changer tone arm, loosen the knurled nut under the crystal and pull the needle out.

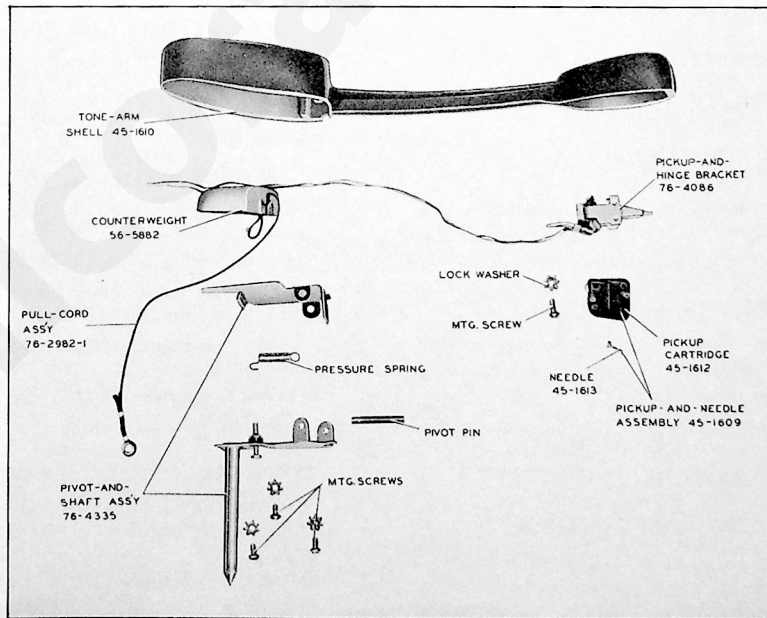
To remove the needle from the special cartridge of the long-play tone arm, grasp the sides of the cartridge

RECORD CHANGERS (MODEL M-12C)



TP-7354

Figure 23. Changer Tone-Arm Assembly (35-2675)



TP-7361

Figure 24. Long-Play Tone-Arm Assembly (35-2686)

RECORD CHANGERS (MODEL M-12C)

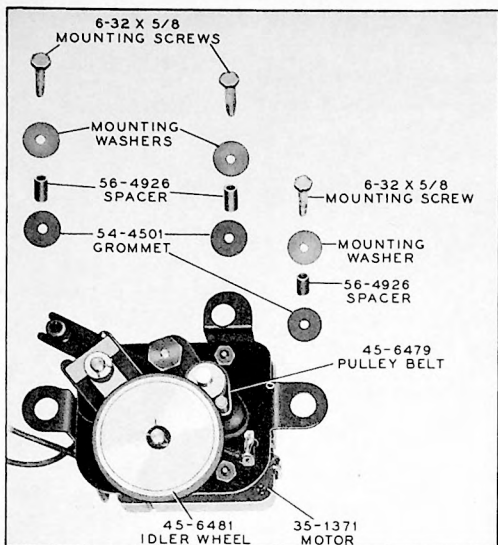


Figure 25. Motor Assembly (35-1371)

with the fingernails and pull it out; then pry out the needle with the fingernail or knife point. When replacing this needle, align the keyway on the needle shaft with the slot in the chuck on the cartridge, then push the needle into the cartridge. Replace the cartridge by pushing it until it is firmly seated.

2. CRYSTAL CARTRIDGE, 35-2671-1

- Bring changer tone arm toward center of turntable.
- Remove the two screws and lock washers that hold cartridge to tone arm.
- Drop cartridge below tone arm sufficiently to allow the removal of the two clips from cartridge. Figure 23 shows the cartridge assembly.

3. SPINDLE, 76-3926

- Unhook both ends of spindle spring, 56-5644, from the "U"-shaped bracket mounted under changer base. See figure 12.
- Uncoil spring through spindle and remove spring.
- Pull out spindle.

4. CHANGER-TONE-ARM ASSEMBLY, 35-2675

- Unsolder tone-arm wires from terminal panel on under side of changer base plate.
- Remove pull cord from link spring.
- Loosen clamp screw that holds trip arm to tone-arm shaft (figure 13).

- Lift out tone arm. Figure 23 shows the tone-arm assembly.

NOTE

When the tone arm is replaced on the changer, be sure to maintain $\frac{1}{32}$ " vertical end play between the trip arm and the changer base plate.

5. LONG-PLAY-TONE-ARM ASSEMBLY, 35-2686

- Unsolder tone-arm leads from terminal panel on underside of changer base plate.
- Remove pull cord from lifter-link spring.
- Loosen the clamp screw that holds the reset trip arm to the tone-arm pivot shaft.
- Lift out tone arm. Figure 24 shows the tone-arm assembly.

6. MOTOR ASSEMBLY, 35-1371

- Remove spindle as directed in paragraph 3.
- Unsolder motor lead from mercury switch.
- Unsolder motor lead from switch mounted on bridge assembly.
- Remove ground lead from one side of bridge assembly.
- Remove the three screws, washers, and spacers from motor frame. Figure 25 shows the correct assembly.
- Lift motor out.

7. BRIDGE ASSEMBLY, 76-3998

- Remove the two hex-head screws from bridge plate.
- Disengage the link control rod, 56-4589FA3, from the slider control bar.

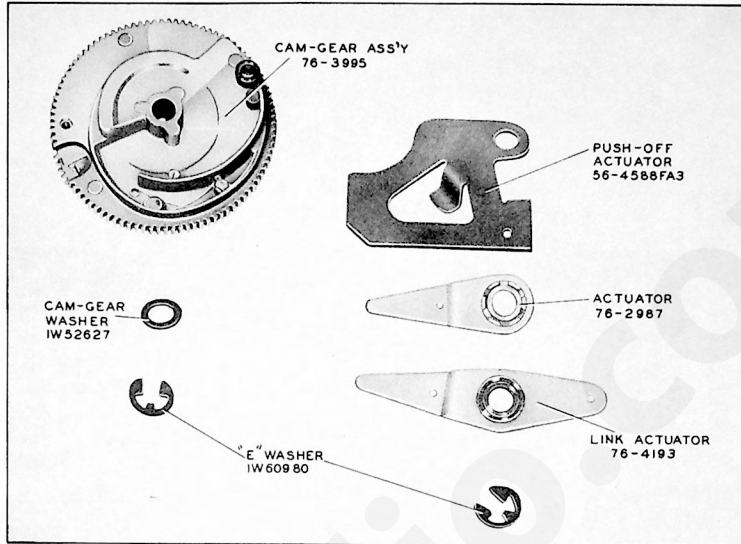
8. CAM-GEAR ASSEMBLY, 76-3995

- Remove bridge assembly as directed in paragraph 7.
- Slide trip plate off cam-gear spindle.
- Remove turntable lower bearing, 76-2991, from "U"-shaped mounting bracket by pulling it off.
- Remove large "E" washer, 1W60980, from cam-gear spindle.
- Slide cam washer, 1W52627, off cam spindle.
- Slide cam gear off spindle.

9. TONE-ARM ACTUATOR LEVERS

- Remove short link, 56-4607FA3, from link spring.
- Remove "E" washer, 1W60980, from actuator stud.
- Slide link actuator, 76-4193, from stud.
- Disengage lifter link, 56-5990, from link actuator.
- Remove long link, 56-4606FA3, from link spring.
- Slide actuator lever, 76-2987, from stud. Figure 26 shows the actuator levers.

RECORD CHANGERS (MODEL M-12C)



TP-7015A

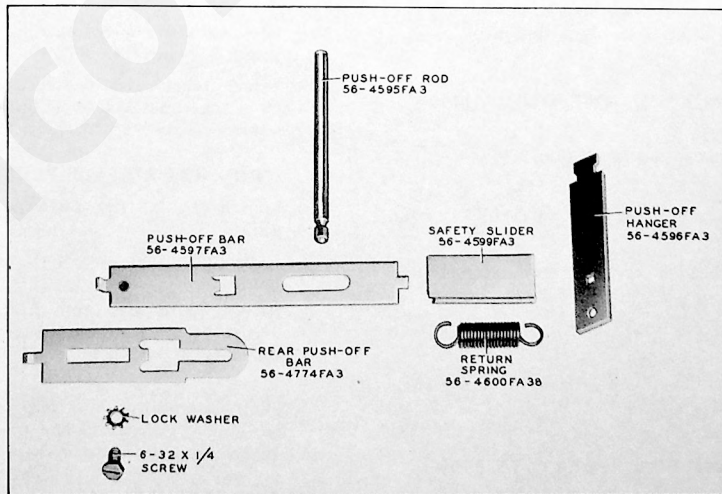
Figure 26. Cam-Gear and Actuator Assemblies

10. PUSH-OFF ACTUATOR, 56-4588FA3

- a. Remove actuator levers as directed in paragraph 9.
- b. Remove selector lever, 56-5985, as directed in paragraph 19.
- c. Press push-off rod, 56-4595FA3, and push-off

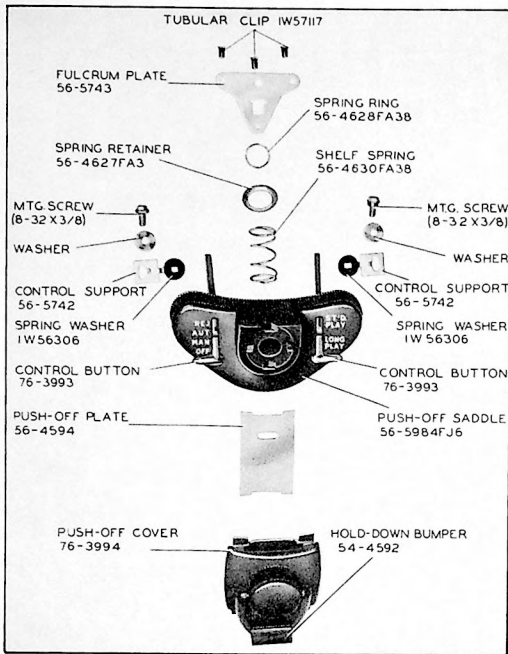
hanger bar, 56-4596FA3, together and pull downward to release the entire assembly.

- d. Slide push-off actuator over to align upturned ears with cutout in base plate.
- e. Slide actuator off stud.



TP-4183-1

Figure 27. Push-Off Assembly



TP-7360

Figure 28. Record-Shelf Assembly

NOTE

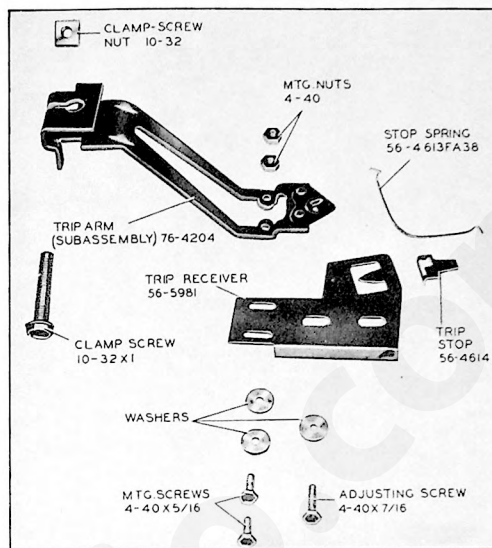
When removing the push-off assembly, the slide plate, 56-4594, on the record shelf may slide out of the assembly. When reassembling, this blade should be inserted in the record-shelf assembly with the elongated hole toward the 12-inch position of the record shelf. The push-off assembly is shown in figure 27.

11. CONTROL BUTTON (OFF-MAN-AUT-REJ), 76-3993

- a. Remove bridge assembly, 76-3998, as directed in paragraph 7.
- b. Disengage control link rod, 56-4589FA3, from control button.
- c. Remove hex-head screw that holds record shelf to changer base plate.
- d. Remove control-button support, 56-5742, from control button.
- e. Lift control button out through record-shelf saddle.

12. CONTROL BUTTON (PLAY), 76-3993

- a. Remove selector lever, 56-5985, as directed in paragraph 19.
- b. Disengage selector link, 56-5991, from control button.



TP-4227-1A

Figure 29. Trip-Arm and Trip-Receiver Assemblies

- c. Remove the hex-head screw that holds the record-shelf assembly to the changer base plate.
- d. Remove control-button support, 56-5742, from control button.
- e. Lift control button out through record-shelf saddle.

13. RECORD-SHELF ASSEMBLY

- a. Remove both control buttons as directed in paragraphs 11 and 12.
- b. Lift out entire record-shelf assembly through top of changer base plate. Figure 28 shows the assembly of the record shelf.

14. TRIP-ARM ASSEMBLY, 76-4204

- a. Loosen clamp screw on trip arm, 76-4204. See figure 13.
- b. Raise tone arm and shaft sufficiently to clear trip arm.
- c. Remove trip arm and disengage link spring. Figure 29 shows the trip-arm and trip-receiver assembly.

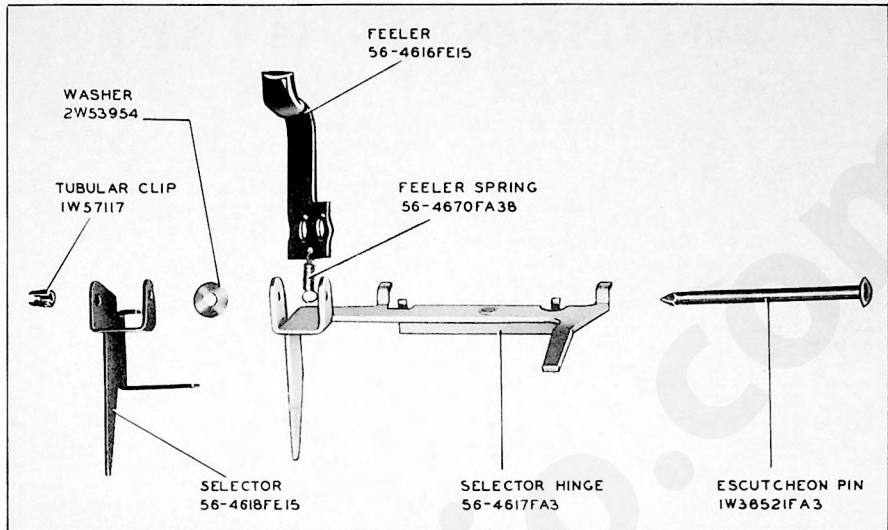
NOTE

When assembling the trip arm assembly, maintain $\frac{1}{32}$ " vertical end play between the trip arm and the changer base plate.

15. SELECTOR ASSEMBLY

- a. Remove cam gear as directed in paragraph 8.
- b. Remove feeler spring, 56-4670FA38, from bracket on changer base plate.

RECORD CHANGERS (MODEL M-12C)



TP-4123-2

Figure 30. Selector Assembly

- c. Tilt selector assembly and remove it from changer base plate. Figure 30 shows the assembly.

16. LONG-PLAY-TONE-ARM THRUST BEARING, 56-5916

- a. Remove long-play-tone-arm assembly, 35-2686, as directed in paragraph 5.
- b. Remove "E" washer, 1W60977, from thrust-bearing shaft.
- c. Lift thrust bearing out of the rubber grommet mounted on the long-play-tone-arm-shaft-support bracket. See figure 22.

17. LONG-PLAY-TONE-ARM STANCHION, 56-5987

- a. Remove long-play-tone-arm assembly, 35-2686, as directed in paragraph 5.
- b. Remove the hex-head screws that hold stanchion to changer base plate.
- c. Lift stanchion off base plate. See figure 20.

18. LONG-PLAY-TONE-ARM UPPER BEARING, 56-5903

- a. Remove long-play-tone-arm stanchion, 56-5987, as directed in paragraph 17.
- b. Remove "E" washer, 1W60981, from upper-bearing shaft mounted on long-play-tone-arm stanchion (figure 20).
- c. Remove upper bearing from rubber grommet mounted on long-play-tone-arm stanchion.

19. SELECTOR LEVER, 56-5985

- a. Remove "E" washer, 1W60977, from stud which mounts selector lever on changer base plate. See figure 15.
- b. Remove spring washer, 1W56306, from stud.
- c. Remove "U"-shaped detent spring, 56-5995, between selector lever and changer base plate.
- d. Loosen lock-plate screw.
- e. Align ears of selector lever with cutout slots on changer base plate.
- f. Remove selector lever from stud.
- g. Disengage selector link, 56-5991, from selector lever.

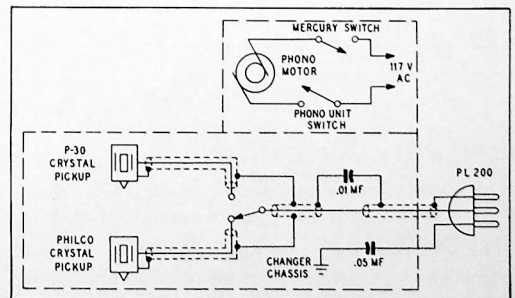


Figure 31. Wiring Diagram

TP-6428

RECORD CHANGERS (MODEL M-12C)

REPLACEMENT PARTS LIST

Description	Service Part No.	Description	Service Part No.
Motor	35-1371	Pivot pin (changer tone arm)	56-5754
Crystal pickup (changer)	35-2671-1	Counterweight (changer tone arm)	56-5755
Tone-arm assembly (changer)	35-2675	Tone-arm shell (changer)	56-5758
Tone-arm assembly (long play)	35-2686	Counterweight (long-play tone arm)	56-5882
Turntable	35-3066-1	Bearing (long-play tone arm)	56-5903
Cable and plug	41-3869-2	Trip (long-play tone arm)	56-5912
Switch	42-1873	Bearing, thrust	56-5916
Needle (changer)	45-1597	Trip receiver (trip arm)	56-5981
Pickup-and-needle assembly (long play)	45-1609	Saddle, push-off	56-5984FJ6
Tone-arm shell (long play)	45-1610	Lever, selector	56-5985
Pickup cartridge	45-1612	Plate, lock	56-5986
Needle (long play)	45-1613	Stanchion (long-play tone arm)	56-5987
Knurled thumb nut	45-3031	Link, lifter	56-5990
Pulley belt	45-6479	Link, selector	56-5991
Motor pulley	45-6480	Spring, detent ("U" shaped)	56-5995
Idler wheel	45-6481	Trip receiver (reset trip)	56-6404
Grommet, motor mtg.	54-4501	Switch, mercury	76-2140-2
Bumper (record-shell hold-down)	54-4592	Pull-cord assembly (changer tone arm)	76-2982
Trip finger	54-7613	Pull-cord assembly (long-play tone arm)	76-2982-1
Cable clamp	56-2832FA3	Actuator assembly (changer tone arm)	76-2987
Lever, index	56-4585FA3	Trip plate	76-2990
Actuator, push-off	56-4588FA3	Bearing assembly	76-2991
Link, control	56-4589FA3	Spindle	76-3926
Plate (push-off slide)	56-4594	Control button	76-3993
Rod, push-off	56-4595FA3	Push-off cover (record shell)	76-3994
Hanger, push-off	56-4596FA3	Cam gear	76-3995
Bar, push-off	56-4597FA3	Shaft and swivel (changer tone arm)	76-3997
Slider, safety	56-4599FA3	Bridge assembly	76-3998
Spring, return	56-4600FA38	Base-plate assembly	76-4008
Spring, index	56-4603FA38	Cover assembly (switch)	76-4010
Link, long	56-4606FA3	Bracket (pickup and hinge)	76-4086
Link, short	56-4607FA3	Link, actuator	76-4193
Spring	56-4608FA38	Trip switch	76-4194
Spring, stop	56-4613FA38	Bracket-and-clip assembly	76-4195
Trip-arm stop	56-4614	Switch bracket	76-4196
Feeler (selector assembly)	56-4616FE15	Latch assembly	76-4197
Hinge, selector	56-4617FA3	Reset and trip	76-4198
Selector	56-4618FE15	Base-plate assembly	76-4201
Retainer, spring	56-4627FA3	Trip arm (subassembly)	76-4204
Spring ring	56-4628FA38	Pivot assembly	76-4335
Spring (record shell)	56-4630FA38	Screw, 4-40 x 1/4, crystal mtg.	1W14460
Retainer, spring	56-4647	Pin (escutcheon)	1W36521FA3
Spring (feeler)	56-4670FA38	Cam-gear washer	1W52627
Bar, push-off (rear)	56-4774FA3	Spring washer	1W56306
Spacer, motor mtg.	56-4926	Tubular clip	1W57117
Spring, spindle	56-5644	"E" washer, small	1W60977
Support (control button)	56-5742	"E" washer, medium	1W60980
Plate, fulcrum	56-5743	"E" washer, large	1W60981
Tone-arm rest (changer)	56-5744	Washer, selector assembly	2W53954
Push-off saddle	56-5753		

SERVICE HINTS

INOPERATIVE MODEL M-12C

One cause of an inoperative Model M-12C is failure of the user to observe the proper operating procedure.

The long-play tone arm has an automatic shut-off feature which automatically shuts off the motor when the long-playing record is finished. This feature consists of a mercury switch and latch which is operated through the tone arm by the eccentric grooves at the

end of the record. After the mercury switch has been tripped "off," the long-play tone arm must be firmly pushed to the extreme right against the tone arm rest, to latch the mercury switch in the "on" position. Since the mercury switch is in series with the motor circuit at all times, the long-play tone arm must be on the rest to enable the changer to operate on standard records.

RECORD CHANGERS (MODEL M-12C)

PRODUCTION CHANGES				
RUN NO.	DESCRIPTION OF CHANGE	REMOVED PART NO.	ADDED PART NO.	REASON FOR CHANGE
1	Counterweight for standard-play tone arm removed. Standard-play crystal pickup with steel case replaced with crystal pickup with aluminum case.	56-5755 35-2671-1	35-2671-2	To improve audio response.
2	Standard-play crystal pickup with aluminum case replaced with crystal pickup with steel case. Counterweight for standard-play tone arm added.	35-2671-2	35-2671-1 56-5755	To reduce rumble.
3	Resistor across standard-play tone arm changed from 1 megohm to 820,000 ohms.	66-5108340	66-4828340	To improve bass response.