



INSTRUCTIONS FOR Recording Attachment

Type 72-D/72-DX
(MI-11901/MI-11900)

GENERAL DESCRIPTION

1. The RCA Type 72-D/72-DX Recording Attachment is designed for mounting on transcription and portable turntables for making lateral-cut sound recordings. The attachment is driven by the turntable spindle and is designed to cut records at 96, 112, and 136 lines per radial inch, either inside out or outside in. It is provided with two indicators, each having six scales calibrated in minutes of playing time. These 12 scales cover all combinations of two turntable speeds, three different lines-per-inch, and two directions of cutting. Only one of the indicators is in place at a time.

2. The Type 72-D (MI-11901) Recording Attachment consists of the following components: One Recording Attachment MI-11852; one Recorder Head MI-11853; and one Base Attachment Kit MI-11854.

3. The Type 72-DX (MI-11900) Recording Attachment consists of the following components: One Recording Attachment MI-11852; one High-Fidelity Recorder Head MI-11850-C; one Base Attachment Kit MI-11854; and one Heater Accessory Kit MI-11855.

Controls

4. The following is a summary of the various controls on Recording Attachment MI-11852 and the function of each control:

- a. Thumbnut (A) for adjusting the depth of cut.
- b. Thumbnut (B) for adjusting the angle of the cutter.
- c. Lever (C) for lowering the recording head.
- d. Lever (D) for disengaging the feed nut in the carriage and latching the carriage in the raised position. It can also be used for cutting a closed groove.
- e. Knob (E) for disengaging the feed screw.
- f. Shift lever (F) for changing the lines-per-inch and the direction of travel of the carriage.
- g. Hand crank (G) for spiraling.

Accessories

5. The following accessory equipment can be used with the recording equipment:

- a. Advance Ball Kit, MI-11851, to maintain constant depth of groove. (Available only for use

TECHNICAL DATA

Unit designation

Type 72-D/72-DX
(MI-11901/MI-11900)

Lines per inch

96, 112, and 136

Recording blank diameter

That of any standard recording blank

Recording head required

MI-11853 or
MI-11850-C/MI-11855

Direction of cutting

Inside out and outside in

Overall dimensions

Length, 15 $\frac{5}{8}$ inches
Width, 6 $\frac{1}{2}$ inches
Height, 5 $\frac{3}{4}$ inches

Weight

8 $\frac{1}{2}$ pounds

Chip removal

By accessory suction tube attached to carriage

on MI-11850-C recorder head.) Should be used when recording is done on wax, and may be used when it is done on lacquer.

b. Automatic Equalizer, MI-11101, to compensate for the gradual decrease in the high-frequency response as the stylus moves toward the center of the record.

c. Vacuum system MI-4922 pump and MI-4923 hose and coupling kit for chip removal.

d. MI-4910A conversion kit for 70A and 70B turntables.

e. MI-4878-C 90° stylus and MI-4842 70° stylus.

f. The MI-11854 Base Attachment Kit is required for mounting the MI-11852 recording attachment on all turntables of the 70 series (70-A, 70-B, 70-C, and 70-C1) as well as on the OR-1A turntable, MI-11211-B. If the MI-11852 Recording Attachment is to be used on 70-A and 70-B turntables, the platter and the turntable must be modified by the addition of an MI-4910-A kit. In-

structions for effecting this modification accompany the kit.

FUNCTIONAL DESCRIPTION

Construction

6. The MI-11852 recording attachment consists of five major components: an end bracket (N); two support tubes (K); a feed screw (inside the front support tube); a carriage (M); and a head-drive assembly and cover (P).

7. Inside the end bracket the feed screw is geared to the hand crank (G). When this crank is turned, the feed screw turns and moves the carriage faster than normal. This permits spiraling the cutting stylus quickly from one diameter to another. The end bracket is mounted so that the attachment can be swung both vertically and laterally.

8. The two support tubes serve, jointly, to hold the end bracket and the head-drive assembly to-

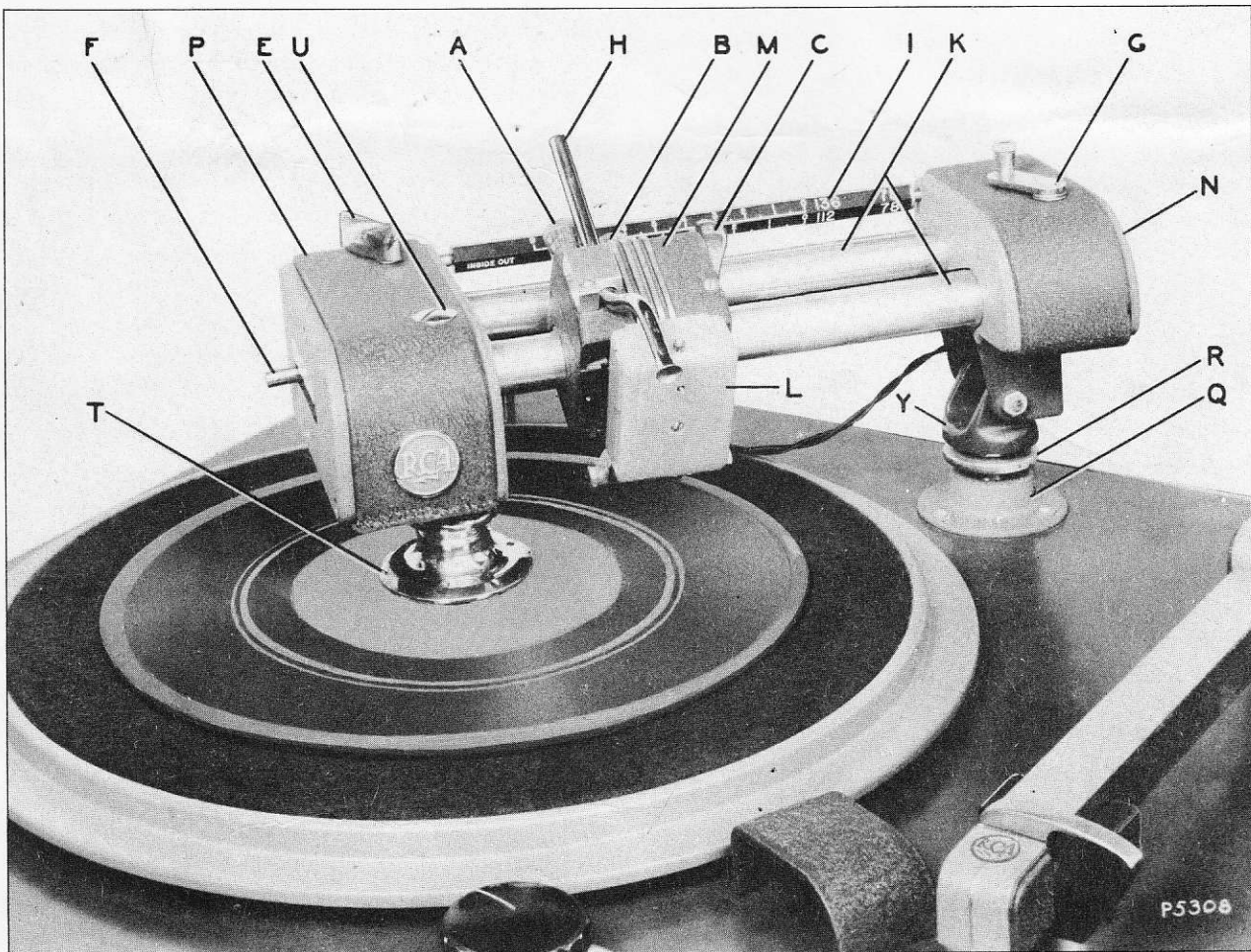


Figure 1—Recording Attachment MI-11852 Set Up for Operation

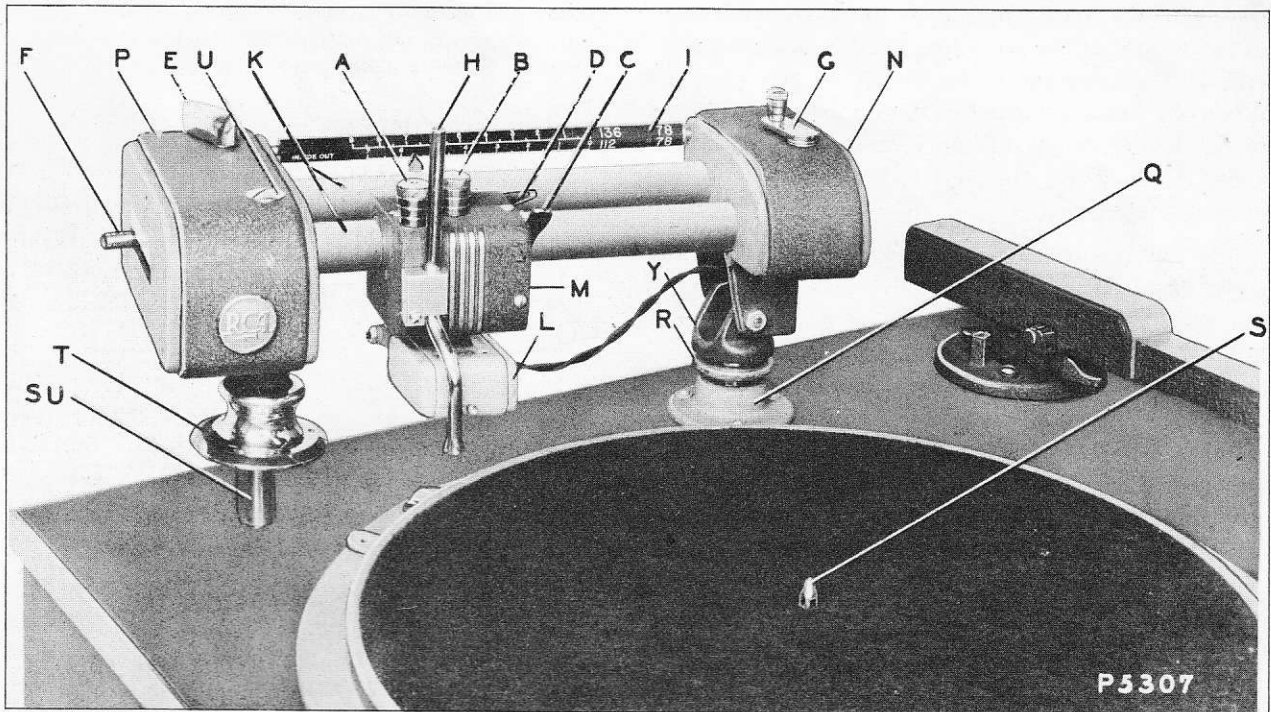


Figure 2—Recording Attachment in Position for Change of Record

gether. The front tube serves as a support for the carriage and a cover for the feed screw, and the back tube provides mounting facilities for Automatic Equalizer MI-11101. On the lower side of each tube is a lengthwise slot through which the feed screw and the automatic equalizer can be reached.

9. The feed screw extends into the head-drive housing (P) on the left and into the end bracket (N) on the right. Inside N it turns in a ball bearing and terminates in the bevel gear that engages a similar gear on the hand crank shaft. In the head-drive housing it terminates in a drive flange which is faced with a friction pad.

10. When the carriage (M) is raised (fig. 1), lever D (fig. 2) latches it in that position. Pressing levers C and D toward each other releases the latch and permits lowering the carriage to the position shown in figure 2. When the carriage is in this position, a feed nut in the carriage automatically engages the feed screw as soon as lever D is released. The recording head (L), however, remains in the raised, or stand-by, position until lever C is pressed down.

11. The head-drive housing (P) contains the head drive, the clutch, and the pitch control. Drive flange T (fig. 2) fits over spindle S of the turntable platter so that the flange rests on top of the

recording blank. The drive pins (one to three) in the flange pass through the holes in the blank and in the platter. The drive shaft extends up to a steel ball directly under screw U. This ball supports the weight of the head end of the attachment and serves as a bearing for the vertical shaft. The vertical shaft is geared to the head drive, which transmits the power through a friction wheel to the drive flange on the feed screw.

12. Knob E controls the engagement of the friction wheel with the drive flange on the feed screw. In figures 1 and 2 the knob is shown in the engaged position. Lever F controls the speed and the direction of carriage travel, in relation to the turntable spindle, by varying the point of contact between the friction wheel and the feed-screw flange along the diameter of that flange. It has six predetermined positions, marked IN and OUT to indicate direction of carriage travel with respect to the center, and "96", "112", and "136" to indicate lines per inch.

Groove Controls

13. The depth of groove cut depends on the effective weight on the stylus. This weight in turn is determined by the weight of the recording head, as this is relieved by the tension of a spring controlled by Knob A. When this knob is turned to

the right, the spring tension is increased and part of the weight of the recording head is taken off the stylus. This decreases the depth of the groove. When the knob is turned in the opposite direction, more of the weight of the recording head is allowed to bear on the stylus, and the depth of groove is increased.

14. The quality of groove obtained with a given stylus depends on the angle the stylus makes with the record surface. This angle is adjusted with knob B. Turning this knob lowers or raises the bracket to which the recording head (L) is attached and thus tilts the stylus more or less in respect to the record blank. A sharp stylus is essential for a good groove regardless of the angle.

INSTALLATION

Mounting on Turntable MI-11211-B

15. Figures 3 and 4 show the top of turntable MI-11211-B before and after, respectively, the recording attachment MI-11852 has been mounted. The mounting facilities, which comprise base Q, adjusting sleeve R, support SU, and terminal jacks J, are already in place on this turntable and consequently no preliminary preparations are required. Proceed as follows:

a. Securely attach a recording head (MI-11850-C or MI-11853) to the bracket provided for this purpose on the recording attachment carriage. Leave the carriage in the raised position (fig. 1).

b. With the clamps provided, fasten the recording-head leads to the carriage and also to the under side of the end bracket (N).

c. Place a recording blank on the turntable platter (fig. 3).

d. Insert the round shaft of the yoke (Y, fig. 1) into the adjusting sleeve (R).

e. Set the head-drive end of the attachment over the record blank so that the drive flange T (fig. 2) engages the spindle (S) of the turntable. Adjust until the drive pins mate with the holes in the blank and the drive flange (T) settles down squarely on the record blank.

f. Insert the terminals of the recording head into the pin jack (J).

g. Insert a sharp stylus, steel or sapphire, into the recording-head chuck and secure it.

NOTE: If the suction tube (H) is to be installed, use the clamp and the No. 6 round-head screw sup-

plied and mount it as shown in figures 1 and 2. This tube is usually not installed on portable equipment because its use requires a suction pump.

Leveling Attachment

16. If the groove cut from the record blank is to be uniform throughout the record, the carriage support tube should be parallel to the record blank. (See exception discussed under Recording Technique.) To make the adjustment, proceed as follows:

a. Loosen the setscrew in the base (Q) and turn the sleeve (R) to raise or lower the end bracket (N) until the distance between the support tube and the record-blank is the same throughout the run of the carriage.

b. When the adjustment is satisfactory, tighten the setscrew and thus lock the sleeve. (This adjustment need not be repeated unless the setting of the sleeve has been disturbed or a record blank of a different thickness is used. A record blank of a different thickness will alter the angle of cut but will not cause variable depth of groove.)

Mounting on Transcription Turntable

17. When the Type 72-D/72-DX recording attachment is to be used on a transcription turntable of the Type 70 series, an MI-11854 recording attachment base kit must be installed on the turntable. This kit comprises the mounting facilities enumerated in paragraph 15 and shown in figure 3. Figures 1 and 2 show parts Q and R of this kit, mounted on a transcription turntable. The 70-A and 70-B require in addition an MI-4910-A conversion kit.

a. *Base and sleeve.* In order to mount the sleeve, proceed as follows:

(1) Locate and remove the round cover plate at the rear of the motor board of the turntable. Clear the hole under it by pushing the wooden plug upward out of the hole.

(2) Mount the base (Q) over the hole and secure it with the three screws that previously held the cover plate.

(3) Insert the threaded sleeve (R) into the base and turn the sleeve down nearly as far as it will go.

(4) Lock the sleeve with the No. 8-32 setscrew in the base.

b. *Twin-tip jack.* Mount the twin-tip jack about 1½ inches to the left of the base just in-

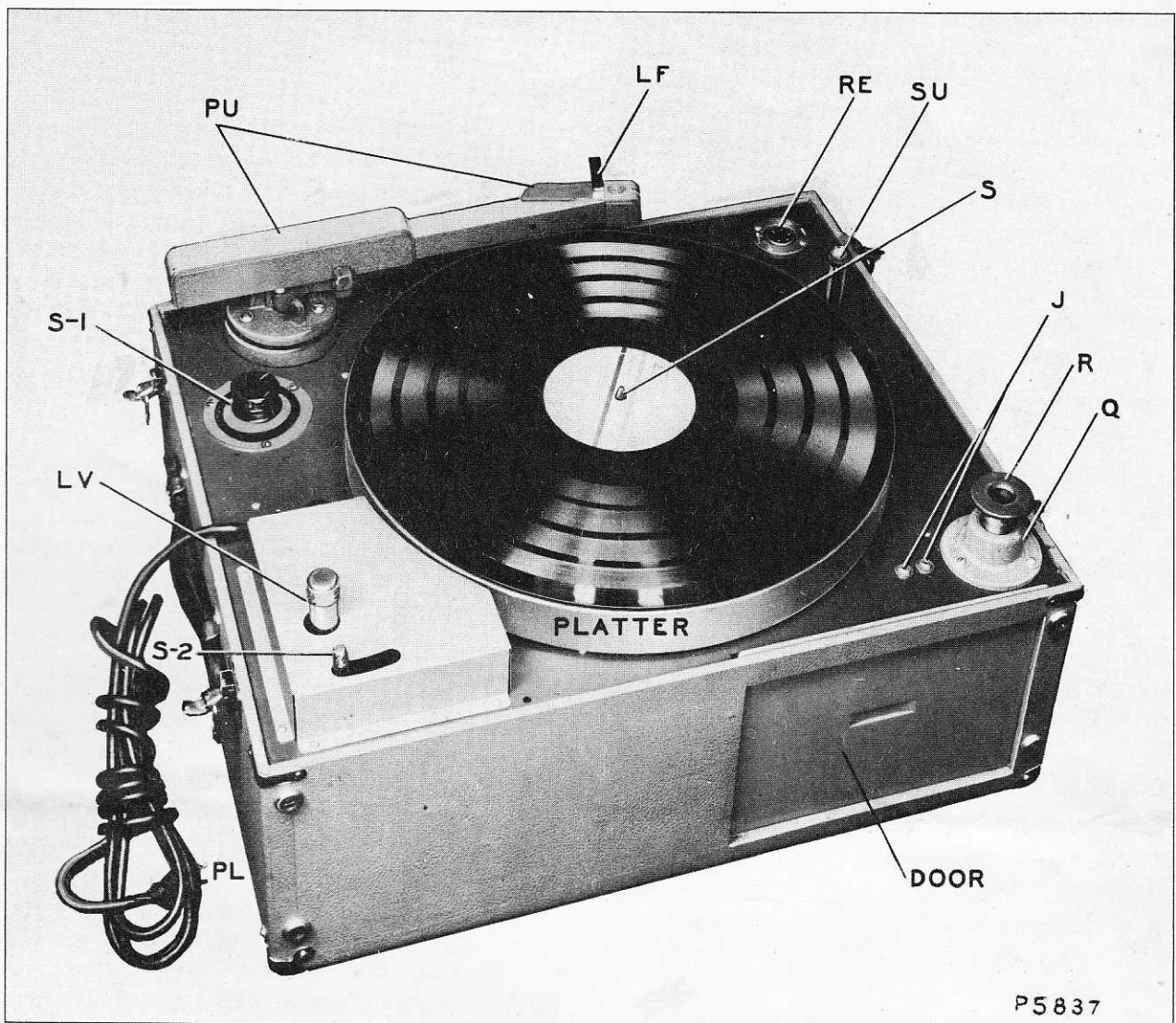


Figure 3—Portable Turntable MI-11211-B

stalled and about half way between the turntable platter and the rear edge of the motor board.

(1) Drill two 7/16-inch clearance holes $\frac{3}{4}$ inch apart, center to center.

(2) Insert the twin-tip jack in the holes and spot two mounting holes. Be careful that the clearance holes do not show on either side of the tip-jack plate.

(3) Secure the tip jack with the two No. $6 \times \frac{5}{8}$ round-head woodscrews supplied with the MI-11854 base kit.

(4) Run two shielded leads from the terminals of the twin-tip jack to terminals No. 4 and No. 5 on the audio terminal board of the turntable. Connect the shield of the leads to terminal No. 3 and solder all connections.

c. *Support.* A hole is already provided in the turntable motor board. Locate this hole and clear it by pushing the wooden plug upward out of the hole. Mount the support.

Mounting Automatic Equalizer

18. The automatic equalizer MI-11101 is mounted inside the rear support tube (K) and is inserted through the end bracket (N). For details of mounting and of making connections, consult the instructions accompanying the MI-11101 equalizer (IB-24440).

Selecting Pitch and Direction

19. In order to select a given pitch and direction of carriage travel, pull out lever F on the head-drive housing and move it along the horizon-

tal slot to the notch marked by the desired number of lines per inch, on the **OUT** side of center if recording is to be from the inside out and on the **IN** side of center if it is to be from the outside in. Make sure that the proper indicator (**I**) is in place and that it is turned so that, with the carriage in the lowered position, the pointer on the carriage points to the scale having the desired combination of lines per inch and turntable speed. The **INSIDE OUT** indicator should be in place if lever **F** is set on the **OUT** side of center and the **OUTSIDE IN** indicator if lever **F** is set on the **IN** side of center.

Changing Indicator

20. In order to change the indicator, push the one in place toward the head-drive housing against the spring until the indicator clears the end bracket (**N**). Then remove the indicator. Install the other indicator in a similar manner.

Routine Recording

21. When the preliminary adjustments have been completed, proceed with sound recording as follows:

a. Turn on the audio amplifier. Test the audio system from the microphone (or other source) to the recording-head terminals.

b. Place a fresh record blank of proper diameter on the platter and mount the recording attachment in the manner previously explained.

c. Check the settings of the speed-change lever (**F**) and the indicator (**I**).

d. Start the turntable motor and turn lever **E** to the **ON** position to engage the feed screw.

e. Move the carriage to the desired starting point and leave it in the latched position.

f. When the sound is about to start, lower the recording head to the stand-by position and then press lever **C** to start recording.

g. Remove the thread as fast as it is cut from the blank.

h. When the index reaches "0" on the scale, or when the sound is concluded, swing up and latch the carriage, turn knob **E** to **OFF**, and stop the turntable motor.

i. Clean the record of all debris.

NOTE: The removal of thread from the cutting point should be continuous, for accumulated thread may foul the stylus and spoil the record. The removal is particularly important when the cutting proceeds from the outside toward the center. A suction

tube should be used for removing the chips whenever it is practical to do so.

Spiraling

22. When different recordings are to be put on the same blank, with an automatic pause between them during playback, it is not necessary to remove the stylus from the blank but only to turn the hand crank **G** until the stylus reaches the point where it is desired to start the second installment.

23. If a closed groove is desired, it can be obtained by pressing down on lever **D** while the stylus is cutting and letting the blank make one complete turn. In holding the lever down, side pressure should be avoided, for it might prevent the groove from closing on itself. As soon as the circle has been completed, the stylus should be raised off the record before the groove becomes excessively deep.

RECORDING TECHNIQUE

Care of Blanks

24. Dust on a record blank during recording is likely to produce a noisy record. Wiping the blank with a dry cloth does not remove the dust. On the contrary, it makes the dust adhere, for the friction develops an electric charge that attracts the dust particles. A satisfactory way of removing the dust is to wipe the blank with a moist wad of cotton.

25. A smooth thread is easily cut from the surface of a new recording blank, for the lacquer is comparatively soft. In time, however, the plasticizer evaporates, leaving the surface of the blank hard and brittle and unsuitable for recording. Therefore if blanks cannot be used immediately after purchase, they should be stored in an airtight container from which evaporation is negligible.

The Stylus

26. The cutting stylus should be changed frequently, for a dull stylus will produce a noisy record. A steel stylus should not be used longer than 15 minutes. A sapphire stylus, on the other hand, may be used from 3 to 6 hours before it must be replaced or reconditioned. A sharp stylus cuts with a faint, steady hiss which may be heard if the ear is placed near the record when there is no audio signal present to mask the hiss.

27. The amount of noise heard while a blank groove (one without audio modulation) is being cut is a fairly reliable index of the amount of noise that will be present in the finished record. For this reason the operator should strive to minimize the

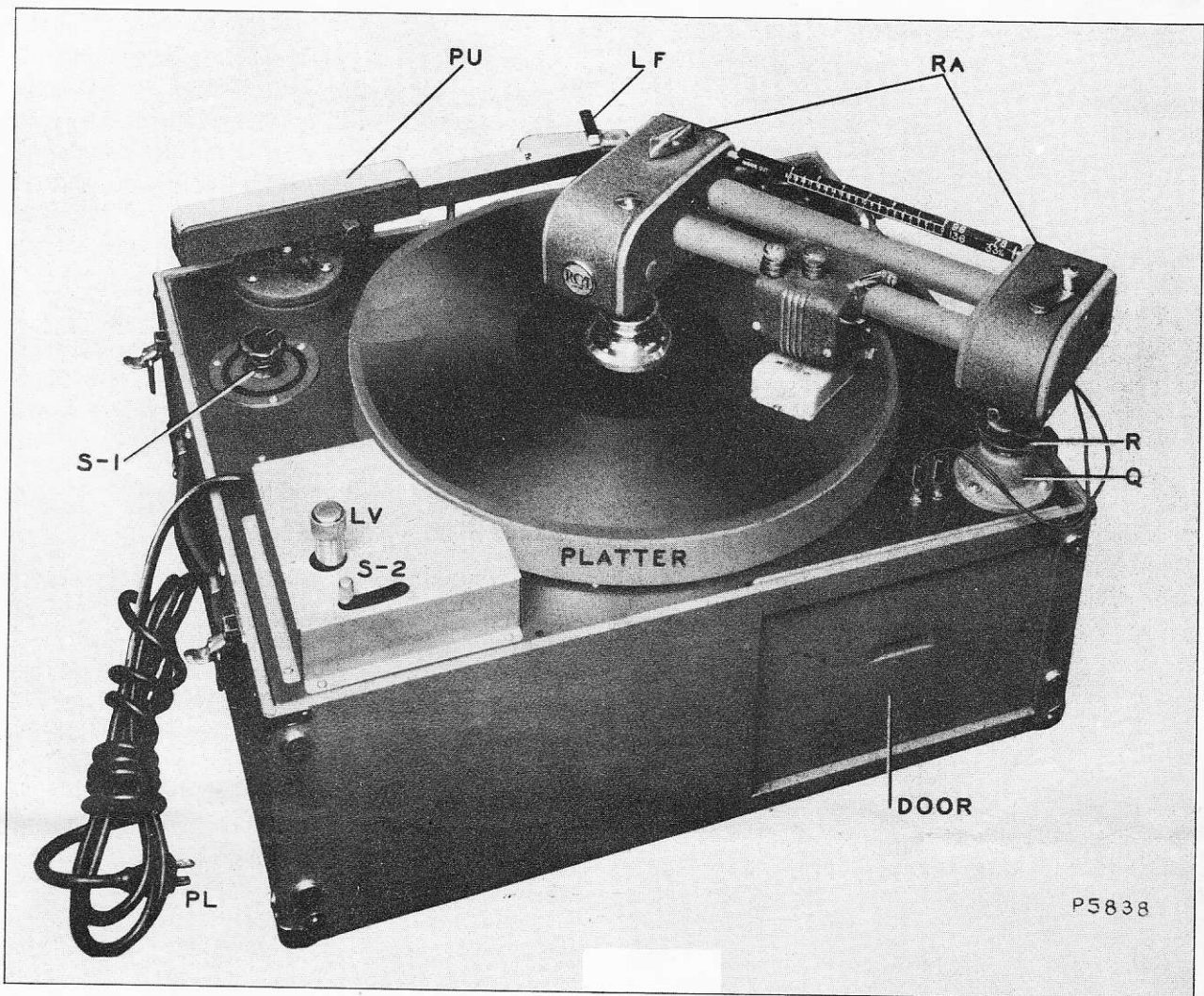


Figure 4—Turntable with Recording Attachment MI-11852

noise heard. It may be done by adjusting the cutting angle of the stylus (with knob B). If this does not succeed in reducing the noise to an acceptable level, a new stylus should be used. A groove of low noise level appears smooth, regular, and shiny when observed through a magnifier.

Distortion in Recording

28. As the stylus moves toward the center of a record, the relative speed of record and stylus decreases and the wavelengths for a given frequency become shorter. At the higher audio frequencies the wavelengths become comparable to the thickness of the stylus or the diameter of the playback needle. When this is true, the stylus cannot cut the required amplitude and the playback needle cannot follow the wave after it has been cut. The result is loss of brilliance in the reproduced sound for lack of the high audio frequencies. In order to

avoid some of this frequency distortion, recordings at $33\frac{1}{3}$ turns per minute should preferably be confined to diameters greater than 8 inches and recordings at 78 turns per minute to diameters greater than 5 inches. For smaller diameters than these, the high-frequency loss quickly becomes apparent. For example, at 4,000 cycles per second and for a turntable speed of $33\frac{1}{3}$ turns per minute, the response at 8 inches is 8 db below that at 16 inches. While this distortion is mostly due to the playback needle, it can be compensated for during recording.

29. The automatic equalizer, MI-11101, has been designed to effect this compensation. Hence if the frequency distortion is to be avoided, and at the same time the record surface is to be fully utilized, the equalizer should be used with the Type 72-D/72-DX Recording Attachment.

30. Another source of distortion is excessive recording level. The highest permissible audio voltage across the recording-head terminals depends on the number of lines per inch, on the type of recording blank used, on the sensitivity of the recording head, and on the type of program material. The optimum level in any particular case is best found by experience. As a beginning, however, it is suggested that the voltage across the recording-head terminals be made 3.5 volts at 1,000 cycles. (This is about 10 db higher than program level.) Excessive recording level is characterized, on playback, by bad distortion, loss of high frequency response, and cross-talk from adjacent grooves. This cross-talk is most likely to occur on the low frequencies at which the amplitudes are large. It is clear that the maximum permissible recording level is lower the greater the number of lines per inch.

Groove Dimensions

31. Because of the shape of the cutting point, the stylus cuts wider as it cuts deeper. And as the groove becomes wider, the wall between adjacent grooves becomes thinner. It is considered good recording practice to make the grooves and the walls equally wide. This condition applies when the recording level is zero, that is, when no audio signal is impressed on the recording head. When sound is being recorded, the stylus vibrates transversely in respect to the undisturbed groove, and hence the wall has no definite width.

32. If the widths of the grooves and the walls are to remain equal regardless of the lines-per-inch, it is clearly necessary to readjust the weight on the stylus each time the lines-per-inch is changed, the weight required being less the larger the number of lines per inch.

33. In general, the record blank and the carriage support tube should be parallel if the groove depth is to be the same throughout the record. However, as the stylus approaches the center and its surface speed decreases, it has a tendency to cut deeper. To offset this effect, the support tube is sometimes raised higher at the head drive than at the end bracket by an amount which assures a constant groove width throughout the record. This adjustment is critical and is best effected by trial and error with the aid of a calibrated microscope or higher-power magnifier. Tentatively, a few turns are cut near the outside rim of the record blank

and also a few near the center. The widths of the grooves at the two places are then compared with the microscope. If they are different, the elevation of the end bracket is changed with the adjusting sleeve (R) in the direction indicated by the results of the comparison. This process is repeated until the grooves are equally wide at the two places. The sleeve is then locked to secure the adjustment.

34. The depth of cut can also be adjusted in a similar manner by trial cuts and microscope comparison, but in this case the adjustment is made with knob A instead of the adjusting sleeve. Equal widths of grooves and walls is the object of this adjustment.

Placement of Recordings

35. In order to avoid slow surface speed and the consequent loss of high frequency response, recordings should be confined to the largest average diameter consistent with the length of the subjects. This condition is easily met when the recording proceeds from the outside toward the center, for then it is only necessary to start the stylus a quarter of an inch from the outside edge of the blank and to let it cut toward the end of the selection. When the recording proceeds in the opposite direction, however, it is not so simple. It is then necessary to know beforehand the duration of the selection so that the stylus may be set down at a suitable distance from the outside edge. If it is suitably started, the selection should terminate about one quarter inch from the outside edge. The calibrated scales can be used advantageously for determining the proper starting point.

MAINTENANCE

36. Careful handling of the Type 72-D/72-DX Recording Attachment is the main requirement for good maintenance. Occasionally, it should be cleaned with a dry, lintless cloth. No lubrication is required. However, a thin film of light grease may be applied once every six months to the gears in the head-drive assembly. Lubricant should not be put on the feed screw, for it will only collect dust and make cleaning more difficult. Neither should any lubricant be put where it might reach the friction wheel and the feed-screw drive flange, where it would cause slippage.

REPLACEMENT PARTS

The following parts list is included to provide identification when ordering replacement parts. Order from RCA Replacement Parts Department, Camden, New Jersey, giving the *stock number* and *description* of parts wanted. Replacement parts supplied may be slightly different in form or size from the original parts but will be completely interchangeable with them.

Description	Stock No.
MAIN ASSEMBLY	
Ball, pivot ball.....	10194
Bearing, ball bearing for feed screw.....	49139
Cam, on-off control cam.....	49148
Collar, spiraling handle collar.....	49159
(a) 1 collar	
(b) 1 setscrew	
Collar, feed screw retaining collar.....	49160
(a) 1 collar	
(b) 1 setscrew	
Collar, support yoke adjustment collar.....	49161
(a) 1 collar	
(b) 2 setscrews	
Cover, support bracket cover.....	49138
Cover, drive end cover plate.....	49144
Decalcomania, line designation decalcomania.....	49163
Decalcomania, "OFF"	49164
Decalcomania, "ON"	49165
Flange, drive flange.....	49135
Gear, drive shaft gear.....	49145
(a) 1 gear	
(b) 2 setscrews	
Gear, spiraling handle drive gear.....	49156
(a) 1 gear	
(b) 2 setscrews	
Gear, spiraling handle driven gear.....	49157
(a) 1 gear	
(b) 2 setscrews	
Handle, spiraling handle.....	49137
Housing, drive end housing.....	49143
Indicator, carriage position indicator.....	49154
Knob, ON-OFF control knob.....	49149
Pad, friction drive pad.....	52933
Pin, scale support pin.....	49151
Pin, scale support fixed pin.....	49162
Plug button	49155
Plug, phone tip plug.....	49153
Screw, feed screw and flange.....	49134
Screw, pivot ball retaining screw.....	49142

Description	Stock No.
Screw, support end pivot screw.....	19703
(a) 1 pivot screw	
(b) 1 hex nut	
Scale, recording time scale 96 33 $\frac{1}{8}$	49140
Scale, recording time scale 112 33 $\frac{1}{8}$	49141
Shaft, drive shaft.....	49136
Spring, line setting knob spring.....	49146
Spring, scale support pin spring.....	49152
Washer, line setting knob spring washer.....	49150
Washer, scale support spring washer.....	31608
Yoke, end support yoke.....	49147
HEAD DRIVE ASSEMBLY	
Spring, head drive gear tension spring.....	52932
Washer, head drive gear tension spring retaining "C" washer.....	2917
Wheel, friction drive wheel.....	52931
CARRIAGE ASSEMBLY	
Arm, feed nut support arm.....	49170
(a) 1 arm	
(b) 2 setscrews	
Arm, carriage lift arm.....	49179
Bracket, slide bracket.....	49180
Bracket, recorder head support bracket and pin	49184
Carriage and bushing.....	49181
(a) 1 carriage and bushing	
(b) 1 pin	
Cover, carriage cover.....	49178
Guide strip, left.....	49182
(a) 1 guide strip	
(b) 2 machine screws	
Guide strip, right.....	49183
(a) 1 guide strip	
(b) 2 machine screws	
Handle, recorder head lift handle.....	49167
Knob, depth adjustment knob.....	49204
Latch, feed nut and carriage latch.....	49166
Nut, feed nut.....	49171
Pin, feed nut arm support pin.....	49189
Pin, feed nut disengaging pin.....	49169
Plate, carriage back support plate.....	49168
Screw, recorder head pivot screw.....	48018
Screw, retaining, for slide tightening spring..	49176
Shaft, recorder head lift shaft.....	49175
Spring, latch spring.....	49173
Spring, feed nut engaging spring.....	49174
Spring, slide tightening spring.....	19716
Spring, slide support spring.....	49177
Spring, lift lever friction spring.....	49185
Spring, depth adjustment spring.....	49188
Stud, depth adjustment stud.....	49187
Stud, latch shoulder stud.....	49172

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