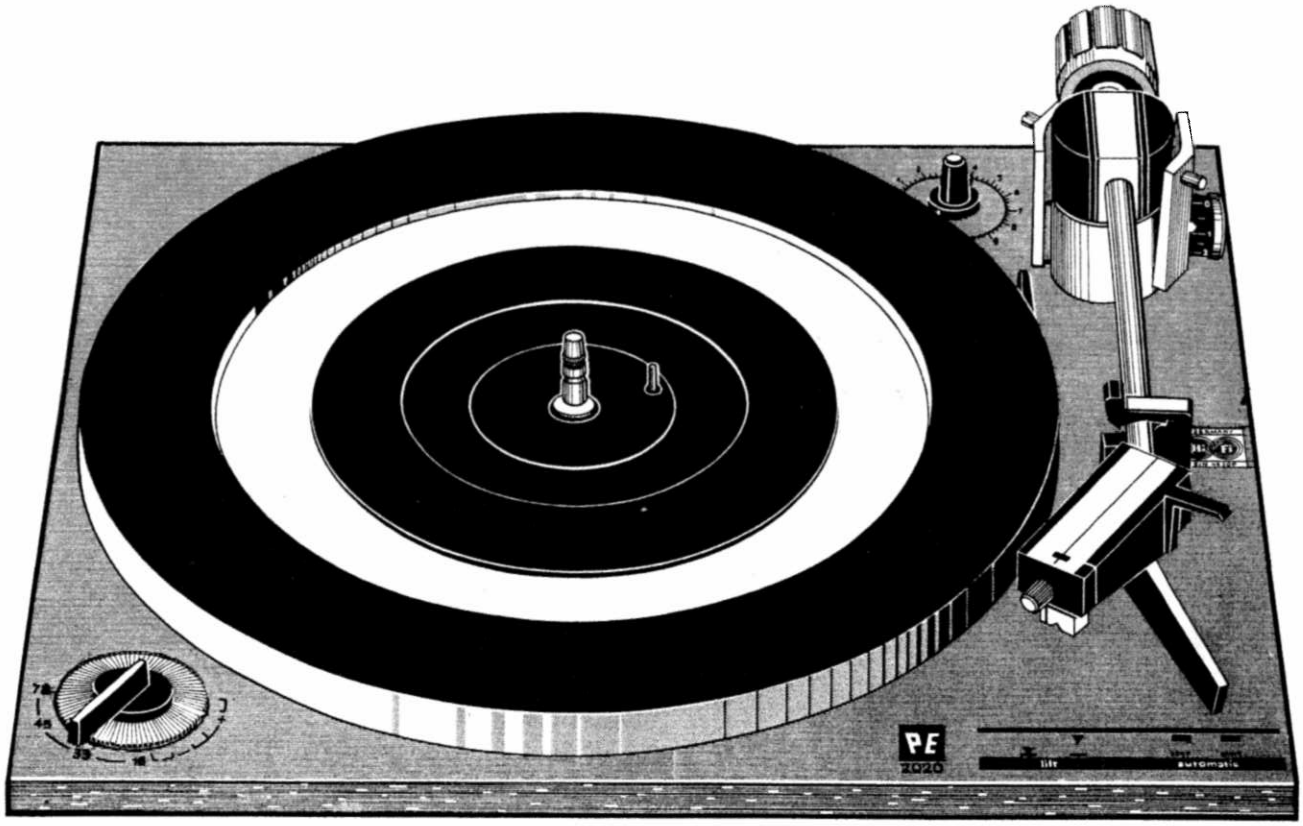
Technical Information

Service Instructions
Manual turntable
Automatic turntable
PE 2020

Contents

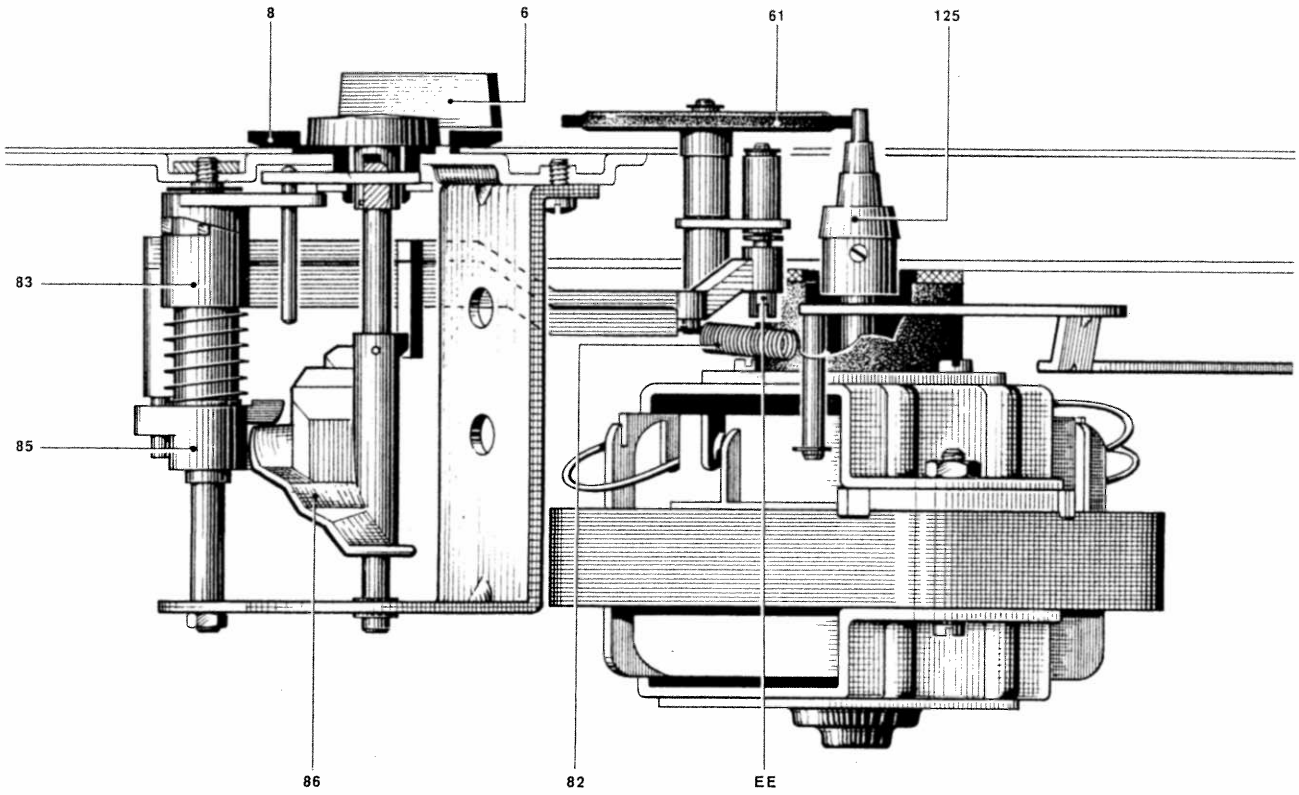


Hi-Fi manual turntable and automatic turntable PE 2020

Technical specifications

Mode of operation:	Automatic turntable Manual turntable Continuous turntable (repeat) Automatic record changer
Motor:	Four-pole induction motor SPM 4/15 with minimum stray field and central suspension with vibration dampers
Power consumption:	8 W
Voltages and frequency:	110/220 V AC, 50 or 60 Hz
Speeds:	16⅔, 33⅓, 45, 78 rpm
Speed precision control:	± 3 %
Turntable platter:	
Weight	7.1 lbs. (3.2 kg)
Material	Zinc die casting
Diameter	11 29/64" (291 mm)
Flutter and wow (to DIN 45 507):	± 0.1 %
Rumble: related to a velocity of 10 cm/sec and 1,000 cps (to DIN 45 500)	≧ 43 db
Signal to noise: related to a velocity of 10 cm/sec and 1,000 cps (to DIN 45 500)	≧ 58 db
Pick-up arm length:	8 3/16" (208 mm)
Offset angle:	27°
Tangential tracking error: with optimum adjustment	max. 1.8°
Tone arm friction:	≦ 0.07 p horizontal ≦ 0.05 p vertical
Vertical tracking angle:	Adjustable for 8 records
Stylus pressure:	Steadily adjustable from 0 to 6 p
Antiskating device:	Coupled with stylus force adjustment
Antiskating correction:	For differing stylus tip radii and for wet and dry playback
Suitable pick-ups:	For all pick-ups with ½" standard mounting facilities
Pick-up weight:	3 to 15 g
Chassis dimensions:	14 3/32" by 12 3/64" (358 x 306 mm)
Installation dimensions:	Height above mounting board with changer spindle 5 5/64" (129 mm) Depth below mounting board 3 5/32" (80 mm)

Functional description



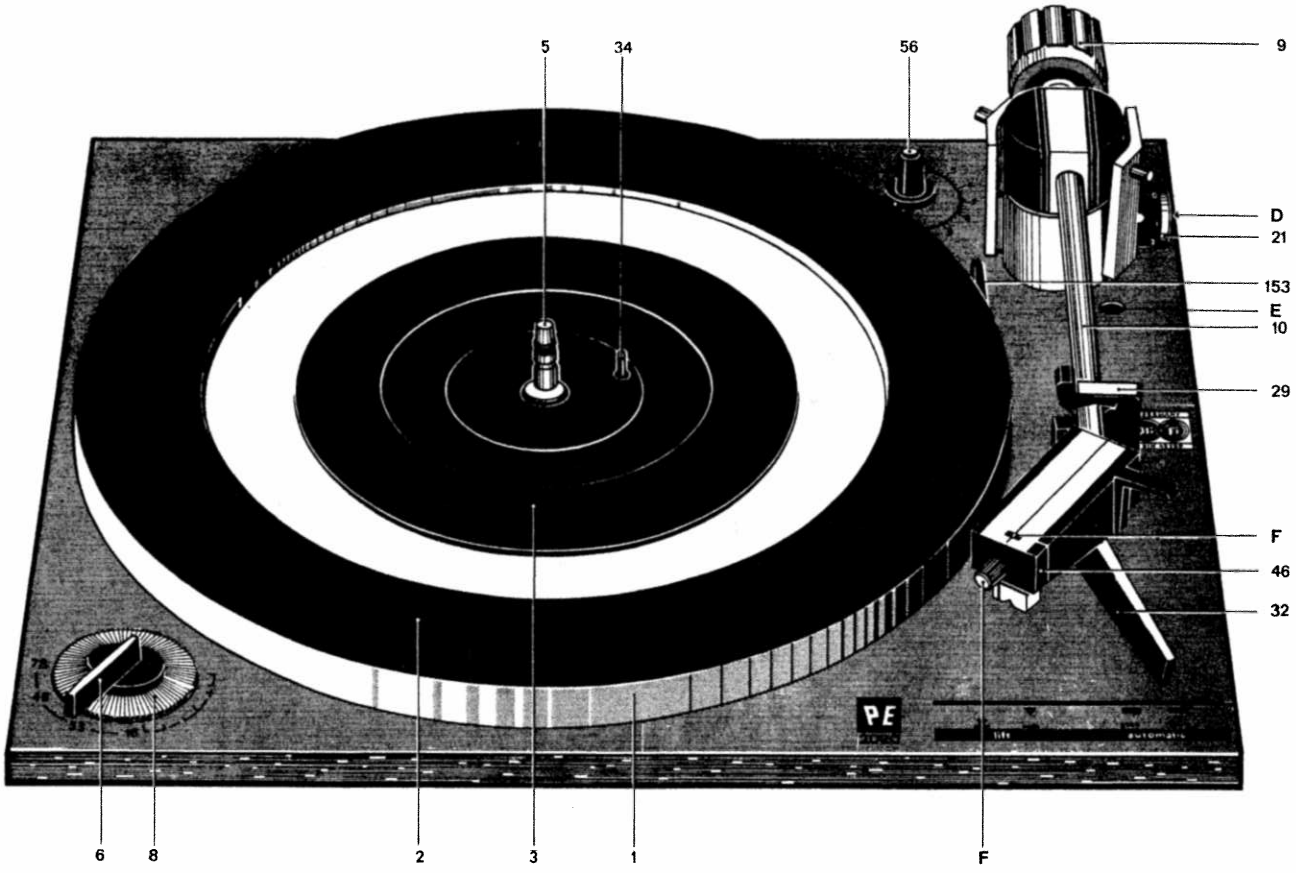
Item No.	Description
6	Speed selector knob
8	Knurled knob
61	Idler wheel
82	Drawspring for idler wheel
83	Idler wheel support
85	Shift fork subassembly
86	Speed selector cam
125	Motor pulley
EE	Idler wheel height

Speed control
The speed is selected by means of a speed selector knob (6) that is rigidly united with the speed selector cam (86). The speed selector cam (86) moves the idler wheel support (83) to the correct height with respect to the motor pulley (125).

Speed precision control
This adjustment is possible at any speed. A knurled knob (8) provided below the speed selector knob (6) moves the idler wheel support (83). The four steps of the step pulley (125) corresponding to the four turntable speeds are tapered. When adjusting the precise speed $\pm$ 3 %, the idler wheel (61) must engage in the middle of the step pulley (125). The knurled knob (8) has a red mark that must be positioned exactly midway between + and – when making this adjustment.

Control lever
Movement of the control lever (32) operates the starting lever (197) through a brass switching roller (176) that is mounted on the control lever bottom assembly (175). The starting lever (197) frees the ON/OFF switch (179) so that the motor (126) is connected to power and starts running. The idler wheel (61) is, at the same time, pressed against the drive shaft (125) of the motor (126) and against the inside rim of the turntable. The control lever (32) releases the spring-loaded ratchet lever (192) which is thus allowed to advance the reject lever. The cam of the spinning turntable (1) engages the advanced tip of the reject lever. The control cam (128) is thereby turned to such an extent that the pinion of the turntable meshes with the toothing of the control cam (128). Following one control operation, all the control elements are moved to the position required for the following function.

Pick-up arm movement
The rising portion of the cam track of the control cam (128) causes the feed lever (150) to lift the pick-up arm (10) by means of the lift rod (57). At the same time, the pick-up arm (10) is frictionally engaged and is then moved by the succeeding horizontal movement of the feed lever (150). Down the descending portion of the cam track the pick-up arm (10) is lowered and disengaged from the feed lever (150).

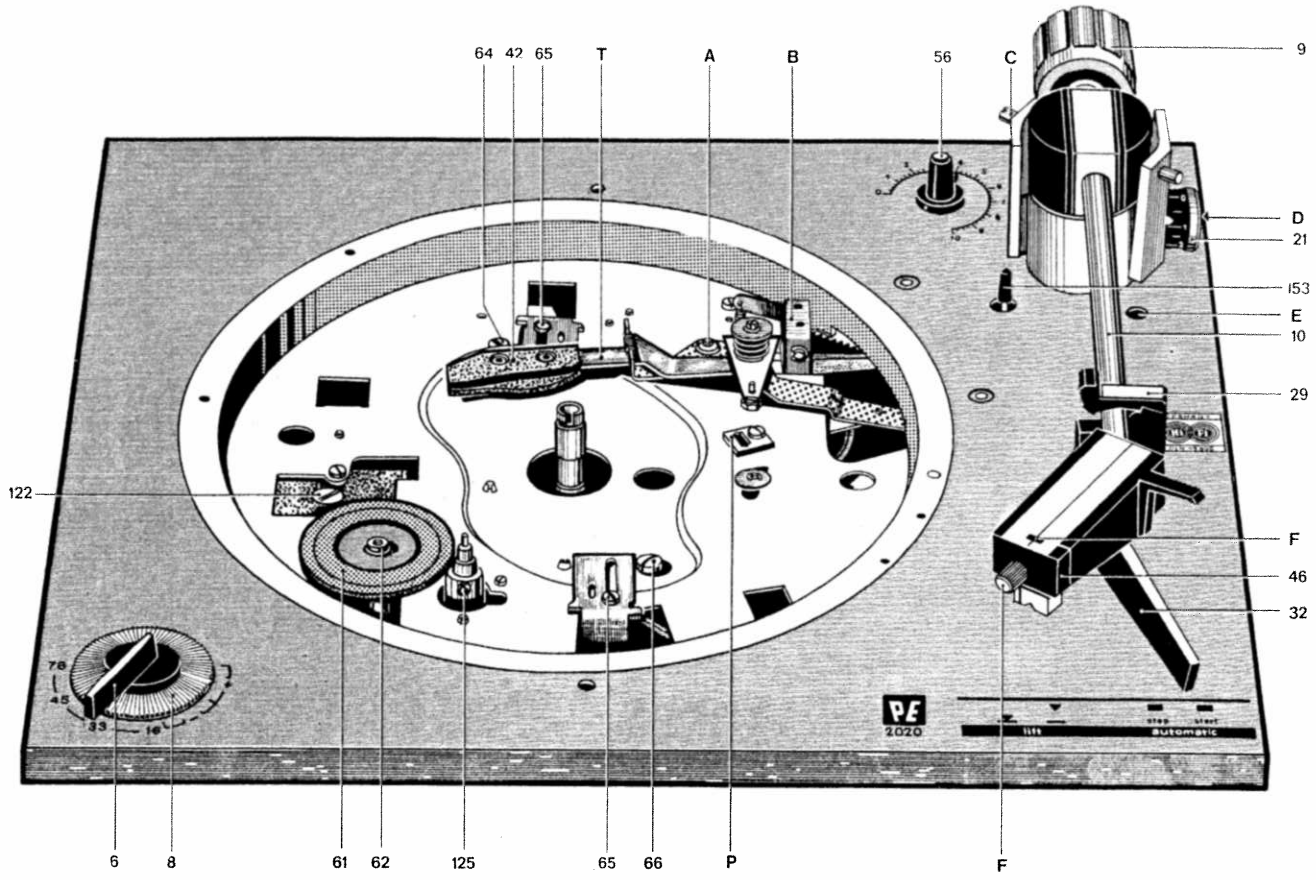


Item No.	Description
1	Cast metal turntable platter
2	Turntable matting, outside ring
3	Turntable matting, center ring
5	Single-play spindle
6	Speed selector knob
8	Knurled knob
9	Pick-up arm counterweight
10	Pick-up head with pick-up arm tube
21	Pick-up arm tracking weight adjustment knob
29	Pick-up arm lock
32	Control lever
34	Feeler pin, long
46	Slide carrier assembly
56	Antiskating precision control knob
153	Sensing pin
D	Stylus pressure zero adjustment
E	Landing point
F	Vertical tracking angle

Record dropping
The control cam (128) operates the drop lever (108) for the control of the automatic record spindle (4). As the push rod extension (96) is pulled down, the supporting levers are retracted to release the record which is thus dropped on the rotating turntable.

Record size discrimination
The upper locating lever (42) as controlled by the control cam (128) is moved inside the operating range of a feeler pin (34) rotating with the turntable. Depending on the size of the record, the feeler pin (34) is pressed down to a greater or smaller extent. The level of that pin controls the different distance by which the locating lever (42) is restored for the inward movement of the pick-up arm (10) to its position above a 7" or 10" record. In the presence of a 12" record, the upward movement of the sensing lever (154) as released by the control cam (128) is limited. The upper locating lever (42) is locked during its return movement and thus reduces the inward movement of the pick-up arm (10) to the starting grooves of the 12" record.

Tripping
As the pick-up arm (10) moves towards the center of the record, the trip link (186) supported on the pick-up arm locator segment (184) impells the reject lever towards the turntable cam. After the stylus has reached a record diameter of about $4^{23}/_{32}$" (120 mm), the reject lever touches the rotating cam for the first time and is repelled by the latter until the lead-out groove with its higher pitch causes the reject lever to be engaged by the cam of the turntable (1), thus starting the control cam (128).



Item No.	Description
6	Speed selector knob
8	Knurled knob
9	Pick-up arm counterweight
10	Pick-up head with pick-up arm tube
21	Pick-up arm tracking weight adjustment knob
29	Pick-up arm lock
32	Upper control lever
42	Upper locating lever
46	Slide carrier assembly
56	Antiskating precision control knob
61	Idler wheel
62	Washer for idler wheel
64	Fillister head screw 4 x 8
65	Fillister head screw 3 x 5
66	Fillister head screw 4 x 8
125	Motor pulley
153	Sensing pin

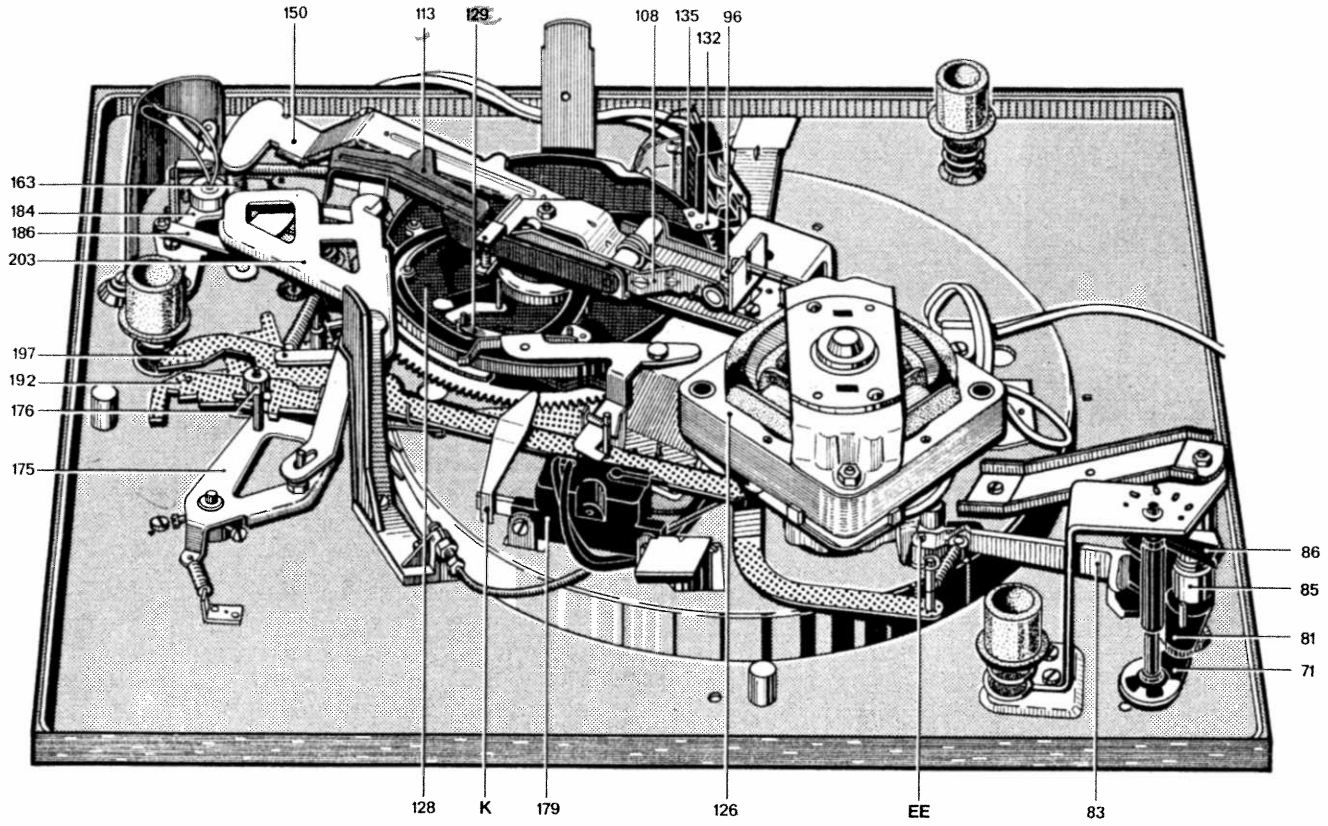
A	Locating lever eccentric
B	Sensing lever
C	Pick-up arm pivot screw
D	Pick-up arm tracking weight
E	Landing point
F	Vertical tracking angle
P	Trip link guide
T	Upper locating lever

Automatic shut-off

After the last record has been played, the pick-up arm (10) returns to the pick-up arm rest (30) and is not moved inward again. Because of the absence of records, the final shut-off is initiated inside the automatic record spindle (4). This has the effect that the stop switch (129) on the control cam (128) is no longer operated by the shut-off lever (113). Due to the unchanged position of the stop switch (129), the feed lever (150) is directed into the shut-off track of the control cam (128). In the course of the shut-off procedure, the idler wheel (61) is withdrawn from the motor pulley (125) and the inside rim of the turntable and the record player is disconnected from mains power.

Automatic single-play

By inserting the single-play spindle (5), the automatic turntable becomes a fully automatic single-play turntable. Depending on the size of the record, the pick-up arm lands within the standardized area of the lead-in groove as in the case of changer operation. Moreover, the single-play spindle (5), operating through a flexible pulling wire, actuates the cueing lever (159) and thus reduces the height of the pick-up arm. The centering portion of the single-play spindle rotates with the turntable (1) and thus avoids any friction at the record.

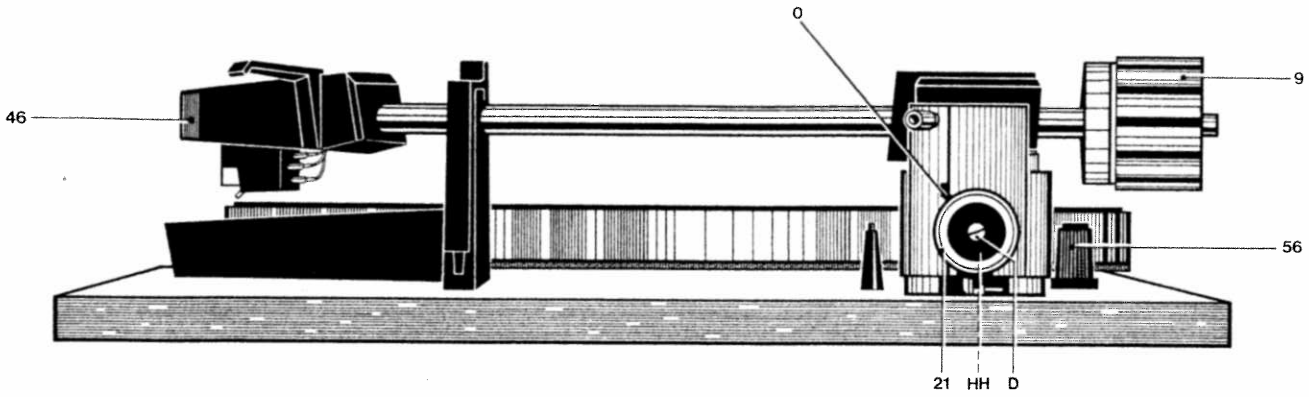


Item No.	Description
71	Lower locating lever
81	Adjusting arm
83	Idler wheel support
85	Shift fork
86	Speed selector cam
96	Push-rod extension
108	Drop lever
113	Shut-off lever
126	Shaded-pole motor
128	Control cam
129	Stop switch
132	Shorting cam
135	Muting switch
150	Feed lever
163	Cueing sleeve
175	Control lever
176	Switching roller
179	ON/OFF switch
184	Pick-up arm locator segment
186	Trip link
192	Ratchet lever
197	Starting lever
203	Actuator
EE	Idler wheel height
K	Switch operating lever

Manual single play
When moving the upper control lever (32) to "lift", the above-mentioned operations ensue and, in addition, the horizontal switch (131), for suppressing the horizontal pick-up arm movement, is moved to its respective operating position, while a gap is produced in the tooth rim by withdrawing the tooth segment (130). The movement of the control cam (128) is interrupted and the pick-up arm (10) remains in its lifted position in frictional engagement above the pick-up arm rest (30). From this position, the pick-up arm (10) can be manually moved to any position to be lowered on the record.

Stop
If the upper control lever (32) is moved to "stop", the actuator (203) brings the dropping mechanism out of engagement so that no additional records are dropped. The shut-off lever (113) is not allowed to move to operating position; the stop switch (129) is maintained in its position and frees the cam track for the automatic final shut-off.

Muting switch
During the changing cycle, the two channels are shorted against chassis to avoid disturbing extraneous noise in the loudspeaker. The muting switch (135) is operated by the shorting cam (132) provided at the outside edge of the control cam (128).



Item No.	Description
9	Pick-up arm counterweight
21	Pick-up arm tracking weight adjustment knob
46	Slide carrier assembly
56	Setting knob for antiskating precision control assembly
D	Zero-adjustment
HH	Eccentric, tracking weight

Pick-up arm

The pick-up arm is balanced by means of the counterweight by radial movement of the latter on the tail end of the pick-up arm. The pick-up with the slide carrier must be incorporated for this adjustment.

For protecting the pick-up arm bearing against shocks and for absorbing vibrations, the counterweight is elastically mounted to the pick-up arm tube. The tracking behaviour of the pick-up arm and thus the most important quality characteristic of the pick-up arm is determined by its bearings. To assure the minimum possible friction for the horizontal movement of the pick-up arm, we have, therefore, used a superfine twin ball-bearing, the brasses of which have an extra-fine finish. The bearing permitting the vertical movement of the pick-up arm also consists of two superfine ball-bearings with a specially treated surface. The very small frictional forces of the pick-up arm are of extreme importance for the antiskating device.

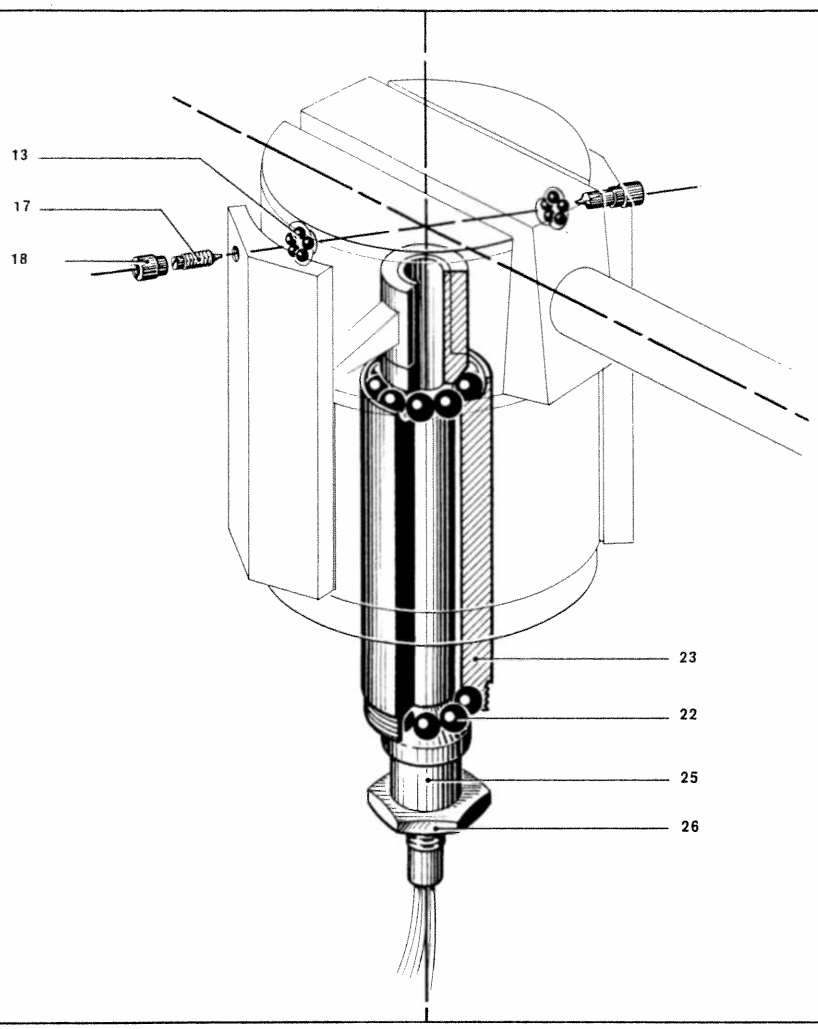
Dependability features

If the horizontal movement of the pick-up arm (10) is interfered with or if the unit is started while the pick-up arm (10) is still locked, this cannot affect the operation of the unit because the pick-up arm (10) is connected to the operating mechanism for the horizontal movements by means of a slipping clutch (184). The pick-up arm lifting elements are resilient to permit the lifted pick-up arm (10) to be pressed down without allowing any permanent deformation to interfere with the proper operation of the unit.

When the unit is started without a record on the turntable, the pick-up arm (10) remains on its rest. The feeler pin (34) and the sensing lever (154) remain unaffected by a recording during the sensing operation. Since the feeler pin maintains its position, the lower locating lever (151) is not repelled so that the pick-up arm is prevented from moving in on the record.

Chassis plate

The chassis plate is a laminated board. A .032" (0.8 mm) thick aluminium sheet is pressed upon the .06" (1.5 mm) steel plate, using a heat-sensitive adhesive at a high temperature. This ensures a high degree of rigidity and minimizes resonance



Item No.	Description
13	Steel ball .04" (1 mm)
17	Pivot screw
18	Cap for pivot screw
22	Ball race for pick-up arm bearing
23	Bearing bushing for pick-up arm
25	Lower tapered bushing
26	Hexagon nut M 5.8 x 0.35

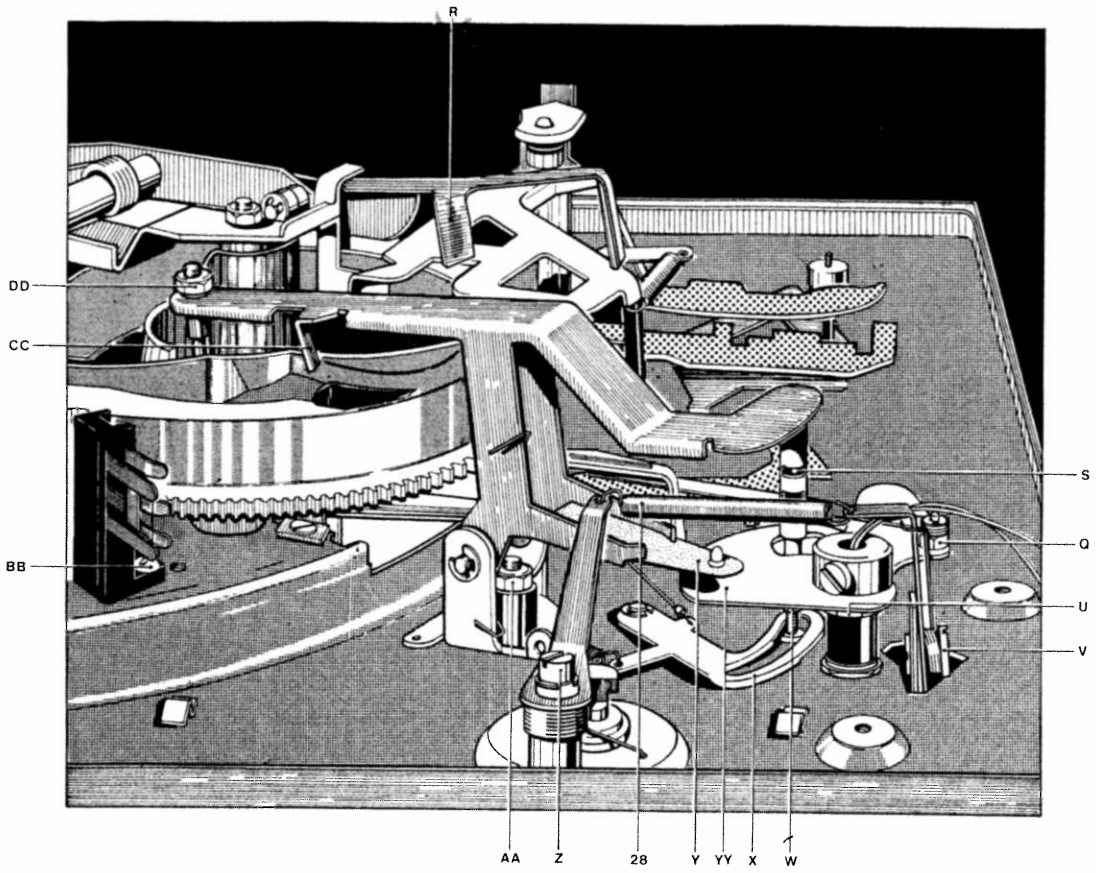
Antiskating device

Since the pick-up arm is not infinitely long and since the pick-up head is arranged to form a certain angle with the pick-up arm tube, a small force results at the pick-up arm that tries to impell the pick-up arm towards the center of the record. This skating force, as it is called, has the effect that the stylus exerts more pressure on the inside edge than on the outside edge of the record groove.
The skating force is a function of the stylus pressure, the stylus tip radius and the frictional conditions existing between the stylus and the record. The antiskating adjustment is made by adjusting the stylus force. This is done by means of a spring in axial alignment with the pick-up arm. The antiskating device is controlled by means of a control knob. Corrections are needed where different stylus tip radii, elliptical needles or wet playback are used.

Repeat

After unlocking the changer spindle, the record changer will play a record and then repeat it over and over again. The next record will only be dropped after the changer spindle has been locked.

Adjusting instructions



Item No.	Description
AA	Friction of feed lever
BB	Muting switch retaining screw
CC	Feed lever lug
DD	Feed lever guide post
Q	Locator segment eccentric pin
R	Shut-off lever lug
S	Lift rod
U	Pick-up arm bearing nut
V	Antiskating device
W	Lift rod hexagon nut
X	Cueing lever
Y	Friction spring
Z	Antiskating correction
28	Antiskating spring
YY	Pick-up arm locator segment

Adjusting instructions

Landing position of needle on record is not constant

Cause: Feed lever (150) is out of adjustment

Remedy: Adjust the guide post (DD) at the feed lever.

Adjust the tone arm height by means of the guide post (DD) of the feed lever (150) to about .04" (1 mm) in the upper position of the feed lever and with inserted record spindle. The amount of tone arm height is visible in the slot (S) of the guide bushing (163) With the automatic turntable spindle inserted, the edge of the pin is in about the middle of the lower slot (S). After the adjustment, the guide post (DD) must be locked by means of the locknut. Adjust the Tone arm height with the pick-up arm unlocked. When checking the parts, make sure to see that the feed lever has a little play in its bearing. The friction covering of the friction spring (Y) of the friction bearing must be seated on the pick-up arm locator segment (YY) in the middle of its cusp.

Adjusting tools: Screwdriver, hexagon wrench 5.5 mm pliers

Changing cycle occurs too early

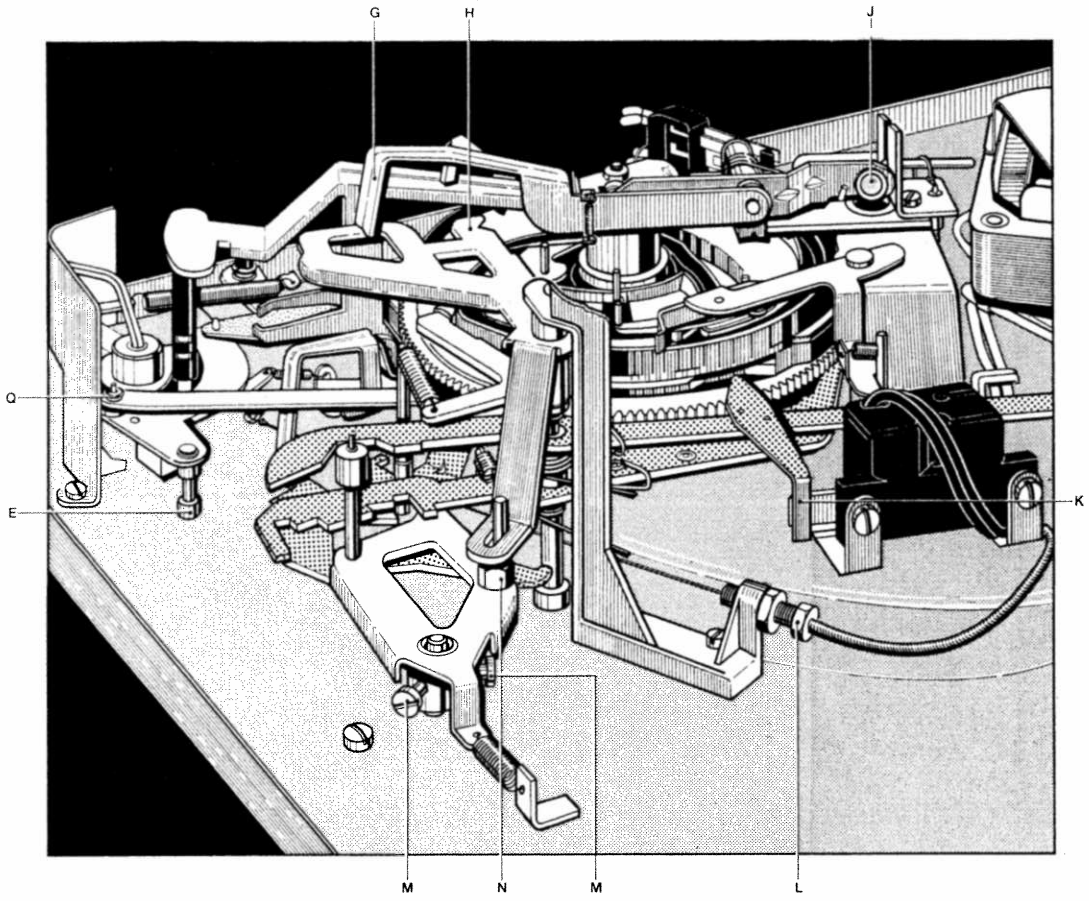
Cause: Trip link is adjusted too close to reject lever

Remedy: Adjust trip link as required by means of the eccentric on the pick-up arm locator segment

Begin of tripping cycle

The eccentric pin (Q) on the pick-up arm locator segment makes it possible to change the position of the trip link and thus to advance and retard the begin of the tripping cycle. The tripping cycle, i. e. the rejection of the trip link should occur at a diameter of $4^{23}/_{32}$" (120 mm) $\pm$ $^{13}/_{64}$" (5 mm). The position of the trip link (186) relative to the reject stud can be adjusted by moving the trip link guide (P) as required. Loosen the fastening screw in the first place. The trip link guide (P) can be moved in the longitudinal slot until the trip link does no longer change its position when the control cam continues to advance.

Adjusting tools: 5.5 mm hexagon wrench, screwdriver



Item No.	Description
E	Landing point
G	Shut-off lever
H	Actuator
I	Eccentric, dropping assembly
K	Lug, switch operating lever
L	Steel cable adjusting screw
M	Fixing screw for control lever bottom assembly
N	Eccentric, control lever bottom assembly
Q	Trip link adjusting pin (eccentric)

Needle fails to land at proper point

Cause: Pick-up arm locator segment (YY) is out of adjustment with the adjusting eccentric (E).

Remedy: Turn the eccentric (E) clockwise to move the needle landing point to the right, turn counter-clockwise to shift the landing point to the left.

Landing point

A hole (E) in the chassis plate permits adjustment of the needle landing point by turning the eccentric (E). Turn the eccentric clockwise to move the landing point towards the outside, turn it counterclockwise to move the landing point towards the inside.
Adjusting tool: Screwdriver

Records fail to drop from the spindle

Cause: Eccentric (J) at drop lever (108) out of adjustment

Remedy: Adjust eccentric (J) in such manner that the three small upper record fingers are flush with the outside diameter of the automatic record spindle.

Dropping assembly

Adjust the push-rod extension for the record spindle below the turntable bearing by means of the eccentric (J) so that the three small upper record fingers are even with or lightly withdrawn behind the outside diameter of the automatic record spindle.

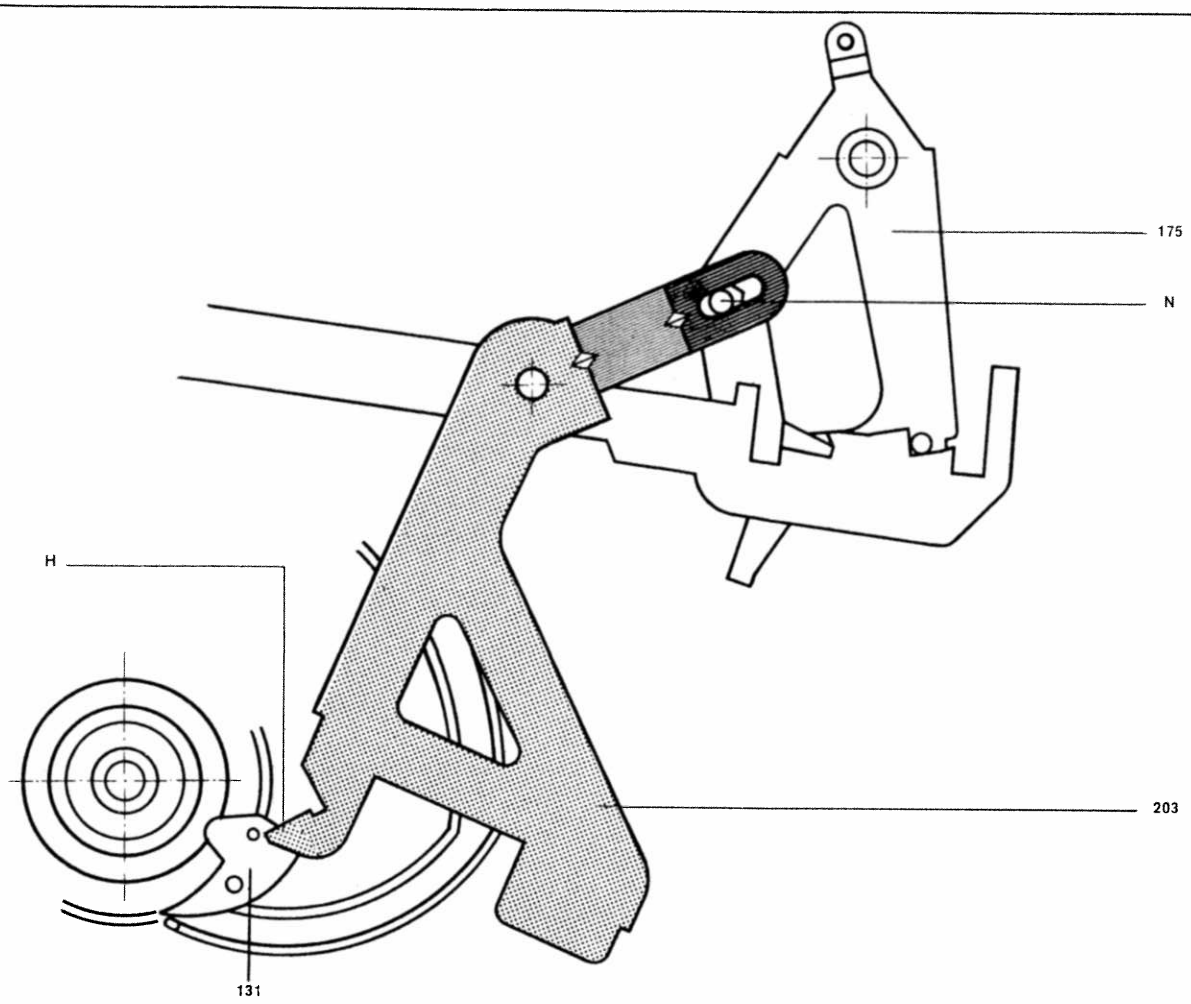
Adjusting tool: 7 mm hexagon wrench

Control lever

After loosening the retaining screws (M) in the control lever bottom assembly the control lever (125) can be shifted to agree with the operating symbols on the chassis plate.

Cueing lever

Adjustment of the cueing lever (X) is via a flexible wire (147) by means of the adjusting screw (L); the single-play spindle must be inserted for this purpose. The front edge of the reinforced portion of the cueing lever (X) must cover the lift rod (57) by one half. Make the adjustment by means of the adjusting screw (L).
Adjusting tool: 5.5 mm hexagon wrench



Item No.	Description
131	Horizontal switch
175	Control lever
203	Actuator
N	Eccentric, control lever bottom assembly

Pick-up arm fails to swing in after record has been dropped

Cause: Lug (R) at shut-off lever bent out of adjustment, stop switch (129) is not reversed

Remedy: Bend lug (R) of shut-off lever as required

Actuator position

Following the lifting operation, the control lever is deflected. When the control cam is turned, the horizontal switch must be reversed by the bent lug of the actuator (H). As the cam turns, the angle piece at the turntable bearing bracket must force the tooth segment to its outer position. To adjust, bend the angle piece as required. As the cycle continues, the tooth segment is moved to its inside position by the bent lug (H) of the actuator (H). Adjust the position of the actuator by means of the eccentric (N) of the control lever bottom assembly.

Adjusting tools: Hexagon wrench 7 mm, pliers

Pick-up arm too high or too low

Cause: Lift rod out of adjustment

Remedy: Adjust pick-up arm lift rod by turning the adjusting nut (W)

Adjusting the height of the pick-up arm

The height of the pick-up arm is adjusted by means of the pick-up arm lift rod. The adjusting nut can be turned up or down.

The height of the pick-up arm above the chassis plate should be 2 13/16" (72 mm) with automatic spindle inserted. The reduced height of the pick-up arm with single play spindle inserted follows automatically.

Adjusting tools: 5.5 mm hexagon wrench

Feed lever

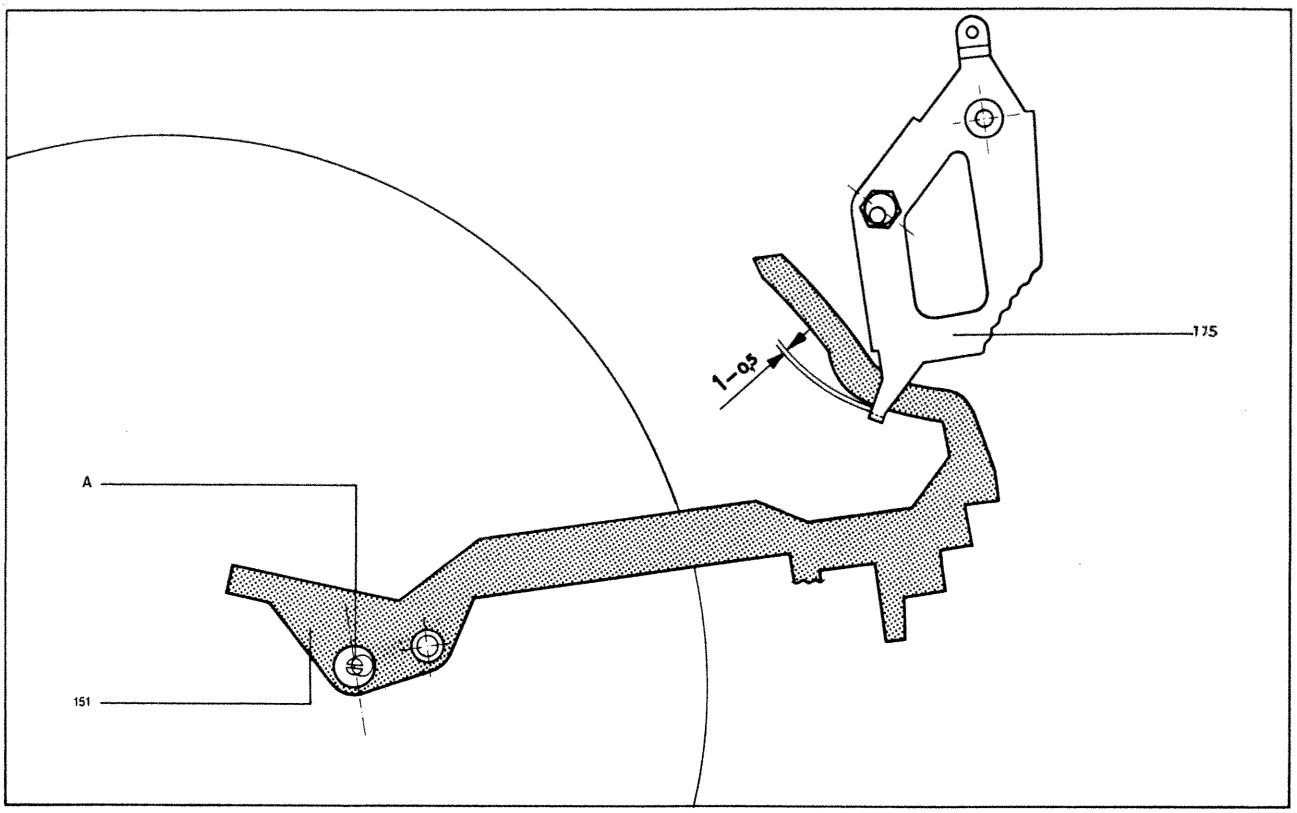
As the control cam (128) moves to position "LIFT", the lug (CC) of the feed lever (150) must operate the stop switch (129). If not, correct by bending the lug (CC) of the feed lever as required. Make this adjustment with a record spindle in place.

Adjusting tool: Pliers

Final shut-off

In the positions "STOP" and "LIFT 1", the shut-off lever (G) must be blocked by the actuator (H). In the normal position and in position "START", the shut-off lever (G) must not be allowed to rub on the actuator (H). Without a record spindle in place, the oblique lug of the shut-off lever must operate the stop switch. Correct by bending at the shut-off lever as required.

Adjusting tool: Pliers



Item No.	Description
151	Lower locating lever
175	Control lever
A	Eccentric, lower locating lever

Turntable bearing bracket
Loosen the retaining screws (64 and 66) and move the bearing bracket as required to ensure easy engagement of the turntable pinion.

Control lever cannot be moved to LIFT
Cause: Clearance between the lower locating lever (151) and the bent portion of the control lever bottom assembly (175) too small
Remedy: Adjust the eccentric (A) at the lower locating lever.

Position of lower locating lever
The clearance between the curved extension of the lower locating lever (151) and the control lever bottom assembly can be adjusted by means of the eccentric (A) at the left of the pivot. For this purpose, the control lever must be in the 1st lift position. The clearance should be between 20 and 40 mils (0.5 to 1 mm).

Adjusting tool: Screwdriver

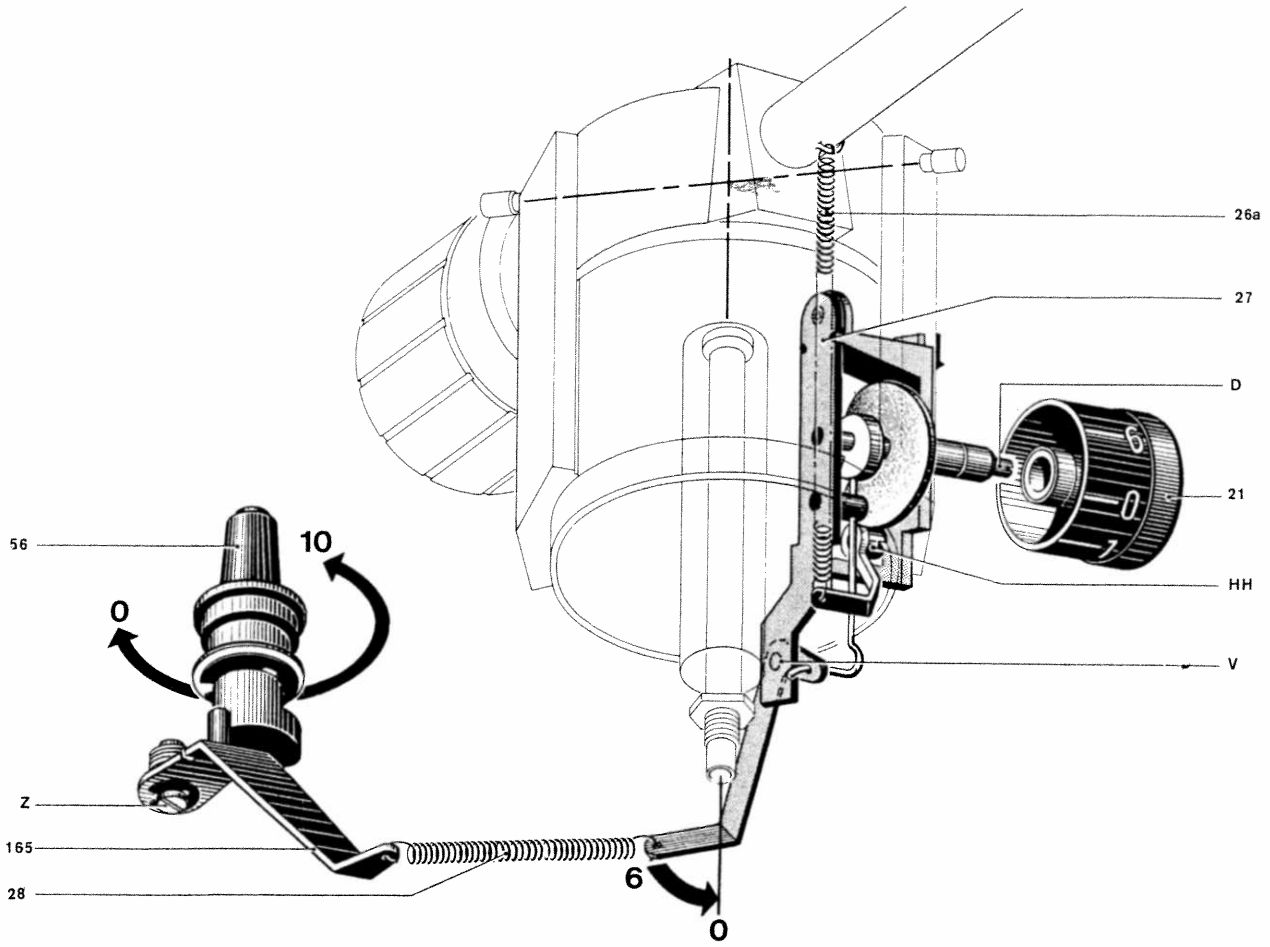
Switch operating lever
In the normal position of the control cam, the lever (K) must clear the ON/OFF switch about 20 mils (0.5 mm). When the control lever is moved to "START" or "LIFT", the red lever of the ON/OFF switch must be supported on the backstop. If the starting lever (197) is engaged with the stop pawl, the switching roller (176) must clear the starting lever (197) 8 mils (0.2 mm) in any position of the control lever.
Adjusting tool: Pliers

Pick-up arm has no friction
Cause: Insufficient spring contact (Y) on pick-up arm locator segment
Remedy: Adjust the friction spring (Y)

Pick-up arm friction
The pick-up arm friction amounts to 15 to 20 p. when the pick-up arm is raised.
Bending the spring supports (Y) permits changing the position of the spring with respect to the pick-up arm locator segment (YY). Care should be taken to see that a clearance of 0.571" (14.5 mm) exists between the lower edge of the pick-up arm locator segment (YY) and the chassis board.
Adjusting tools: Pliers, Force gauge 0-30 p.

Operating noise heard during change cycle
Cause: Muting switch fails to make contact properly
Remedy: Adjust muting switch

In playback position of the record player, the two shorting springs should clear the contact bars 0.020" (0.5 mm). Loosen the retaining screws of the muting switch and turn the muting switch until this clearance is obtained.
Adjusting tool: Screwdriver



Item No.	Description
21	Pick-up arm tracking weight adjustment knob
26a	Drawspring for pick-up arm tracking weight
27	Antiskating subassembly
28	Antiskating spring
56	Setting knob for antiskating precision control subassembly
165	Antiskating adjusting link
D	Zero-position
V	Eccentric, setting arm
HH	Eccentric, stylus force
Z	Eccentric, adjusting link

Stylus force too high or too low

Cause: Pick-up arm is not properly balanced. Adjustment knob fails to agree with the red mark.

Remedy: Balance the pick-up arm
Attach the adjustment knob properly.

Stylus force

Pull off the pick-up arm tracking weight adjustment knob (21) and turn the bearing sleeve (D) counterclockwise as far as it will go. Replace the adjustment knob with the red line to agree with the zero-mark. Set the stylus force at 1 p and check by means of a stylus force gauge. An eccentric (HH) in the bracket permits compensating a possible discrepancy.

Adjusting tools: Screwdriver, stylus force gauge 0-6p

Antiskating device

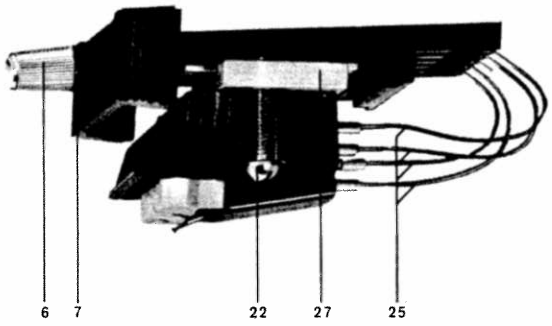
Move the adjusting knob for the stylus force to zero position. Then, adjust the setting arm by means of the eccentric below the chassis plate in such manner that the receiving point of the springlines up with the pivot point of the pick-up arm. If, when adjusting the stylus pressure, an overcompensation of the skating force is found to exist, the spring length tolerance can be corrected by means of the eccentric pin (Z) of the antiskating adjusting link (165).

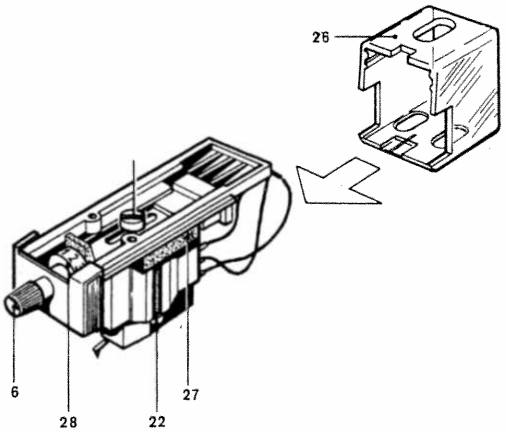
Sensing lever

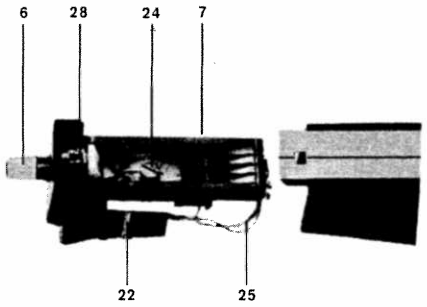
In the normal position of the record player, the sensing pin (153) must be in the center of the hole. If necessary, adjust in the middle of the sensing lever hole. Without a record on the turntable, the sensing pin must not be allowed to rub on the outside edge of the turntable, when in uppermost position.

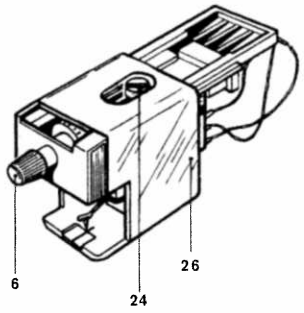
Vertical tracking angle adjustment

Since the master recordings are cut at an angle of 15°, the inherent distortions of the pick-up when reproducing a recording are at their lowest when the needle moves in the sound grooves at the same angle of 15°. The adjustment of the vertical tracking angle is possible in the pick-up head.









NOTE: The numbers indicated refer to the operating instructions.

Pick-up head
When mounting pick-ups on the pick-up head (7) it must be kept in mind that the playback needle must be in an accurately defined geometric position. The mounting gauge (26) supplied with turntables without pick-up makes it possible to check the pick-up for correct position.

Mounting pick-ups on the pick-up head
(only applicable to units without pick-up)

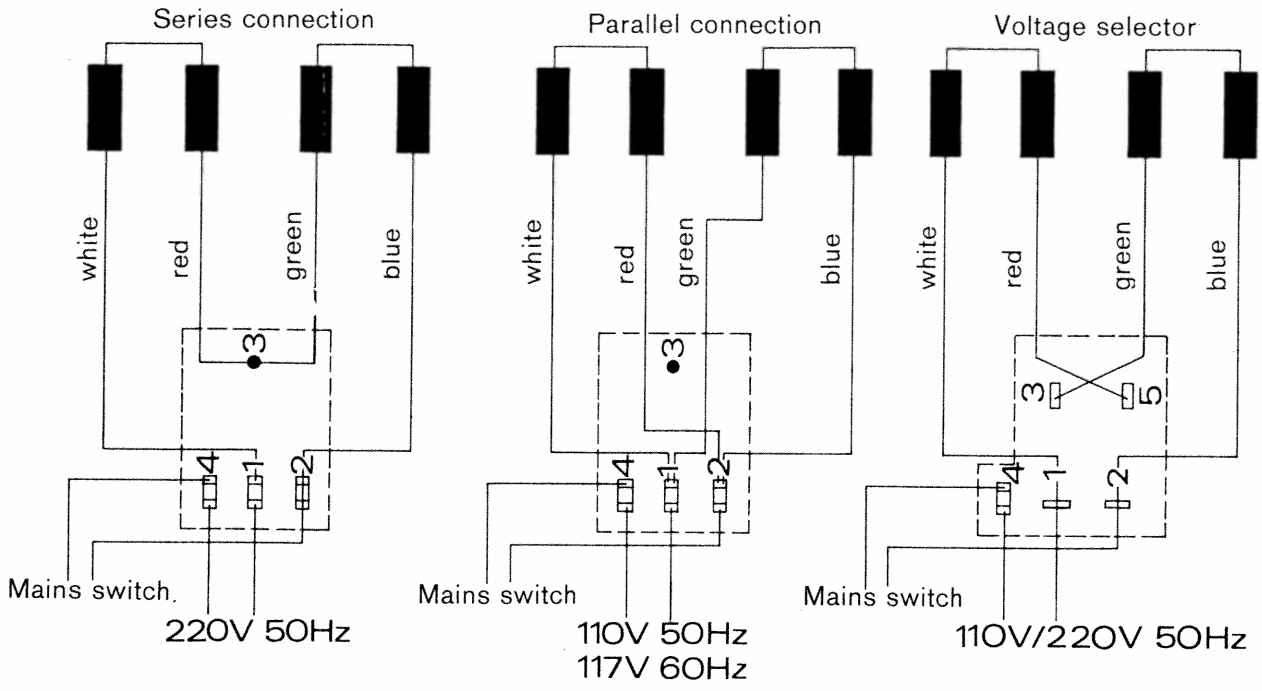
To mount a pick-up, please proceed as follows:

1) Turn the rotary knob for the tracking angle adjustment (6) to position 1. Then, mount the pick-up by means of the screws (22) and spacer rollers included in the accessories so on the pick-up retaining plate (27) that the needle of the pick-up is exactly in the center of the two intersecting lines of the mounting gauge (26) that has been slipped over the guide grooves of the pick-up head. In this position, the needle should just touch the inside surface of the mounting gauge. Choose the size of the screws and of the spacer rollers as required for the pick-up.
2) Loosen the retaining screws (22) of the pick-up up once more a little and move the pick-up sidewards until the needle agrees with the longitudinal line. Tighten the retaining screws again.
3) For the longitudinal movement of the pick-up, loosen the screw (24) and shift the pick-up until the needle coincides exactly with the cross-line of the two intersecting lines on the mounting gauge (26). Tighten the screw again.

The pick-up is now accurately adjusted and you have the guarantee that the needle will always land in the starting groove of the record in automatic operation.
The slide-in pick-up head is equipped with a 5-pole connector. Both the two chassis connections of the channels and also the grounds of the pick-up can be separately connected. In the case of a regular model, i. e. when the grounds in the pick-up head is connected to a chassis pin, the leads (25) should be connected as follows:

red = right-hand channel
white = left-hand channel
green = right-hand ground
blue = left-hand ground

Tracking check
To prevent geometric playback errors, the horizontal distance of the needle tip must also be correctly adjusted. In the PE 2020 pick-up arm this is the case when the pick-up needle coincides with the intersecting lines of the mounting gauge. If the pick-up is installed by the customer, adjustment to the optimum conditions is possible.



Wiring diagram for motor SPM 4/15

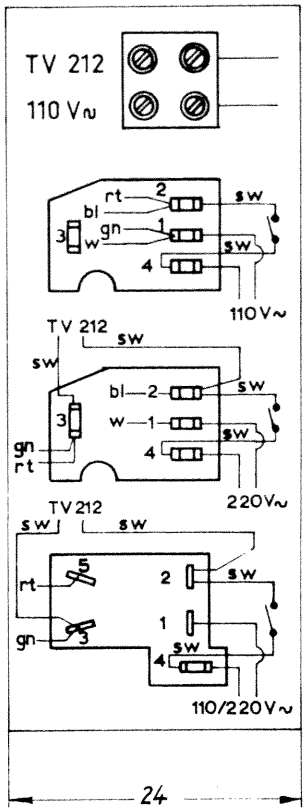
In the case of 220 volts, connect the motor by connecting the two associated windings in series. In the case of 110 volts, the two windings are to be connected in parallel. The windings are automatically switched to 110 or 220 volts through the voltage selector.

Replacing the 50 Hz motor pulley with one of 60 Hz

The motor pulley (125) is held in place by a grub screw (124). The position of the motor pulley on the armature shaft can be changed. The idler wheel (61) must contact the individual steps of the motor pulley exactly in the middle. Care should be taken to see that the red mark of the precision control isexactly in the middle of the range. A change from 50 to 60 cycles per second can be effected by exchanging the motor pulley.

Technical specifications
Alternating Current Motor SPM 4/15, 110/220 V, 50 Hz

Idle speed (rpm):	1460
Current drain (mA):	57
Power consumption (W):	7
Apparent power (VA):	12.5
Maximum output (W):	1.1
Pull-out torque (pcm) at (rpm):	100 (1100)
Starting torque (pcm):	64
Turns per winding:	1400
Wire thickness:	0.15 Cul DIN 46435
Resistance per winding at 25° C:	125 ohms
Exterior dimensions:	$2^{29}/_{32}$" x $2^{29}/_{32}$" x $2^{29}/_{32}$" (74 x 74 x 74 mm) (installation depth)
Stack height:	$^{19}/_{32}$" (15 mm)
Rotor diameter:	$^{20}/_{64}$" (33,5 mm)
Air gap:	0.010" (0,25 mm)



Wiring Diagram
of Pre-amplifier TV 212

Exchanging the pick-up arm

The pick-up arm is to be exchanged completely together with the bearing frame (14). After removing the cap (18) turn back the bearing screw (17) until the pick-up arm can be lifted out of the ball-bearing. Before removing the pick-up arm, unsolder the pick-up lead from the muting switch and unhook the drawspring for the stylus pressure (26a) from the antiskating subassembly by means of a bent wire. The drawspring for the stylus pressure (26a) is hooked to the antiskating subassembly below the chassis plate in the pick-up arm bracket. To provide easy access to the spring, adjust the stylus pressure by means of the adjustment knob (21).

When installing the pick-up arm, take care to see that the seven steel balls in the bearing frame (14) are embedded in Apex grease. Minimum possible friction of the bearing must be assured. A special screwdriver permits adjustment of the bearing screw (17) through the cap.

When exchanging the pick-up arm with the complete bearing, including the antiskating device, take care to see that the ball races for the pick-up arm bearing (22) are clean, free from dust and provided with Abrol oil when they are installed. The friction of this bearing must be adjusted with particular care. Tighten the hexagon nut 5,8 mm (26) by means of a special wrench until the desired bearing friction is obtained. When hooking back the antiskating spring (28) make certain that it is replaced in the correct position and without any change.

Exchanging the cueing lever cable

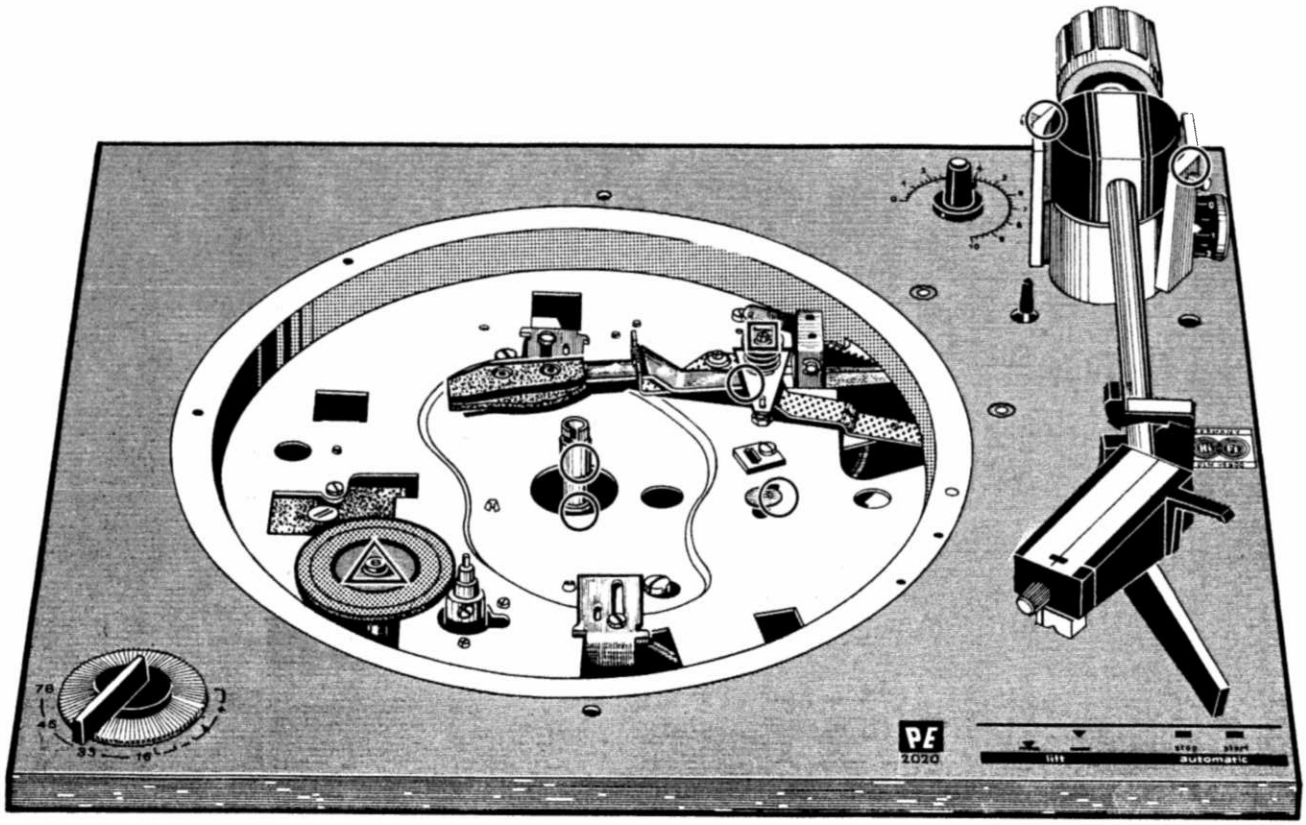
To exchange the flexible cable (147) the entire cueing lever subassembly (159) must be removed. When replacing the lever, take care to see that this is done in the correct position (see page 9).

Exchanging the lift rod

The lift rod (57) is only accessible after the pick-up arm with the entire bracket has been removed. Refill the silicone grease at the lift rod only when absolutely necessary. Take care to see that only a minimum quantity of silicone grease is applied to the lift rod. Also make sure that the drawspring (58) is hooked back to the lift rod (57).

Exchanging the control cam

After loosening the retaining screws (64, 66) for the turntable bearing and taking out the nut (133), the control cam can be lifted up and out. It should be noted that for this purpose the feed lever (150) and the actuator (203) must be disengaged from the control cam.

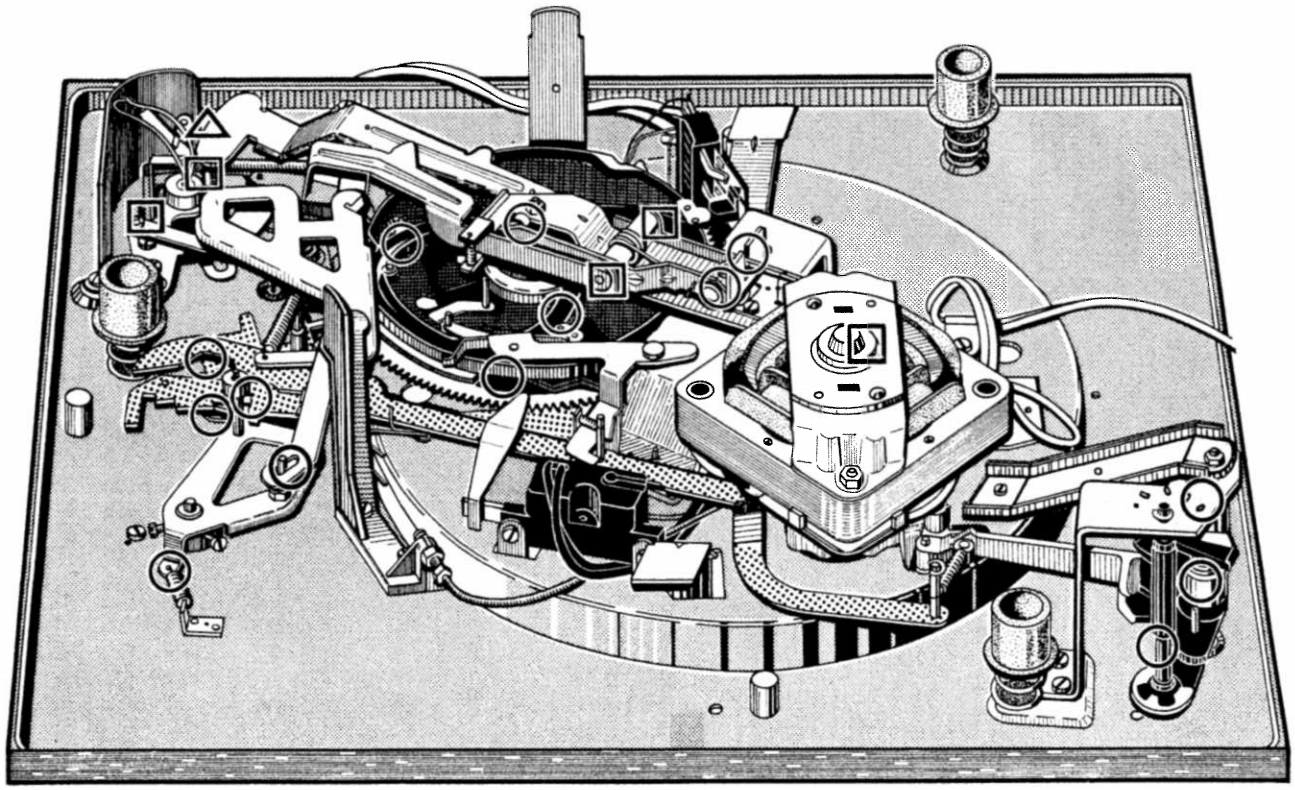


□ Abrol oil ○ Apex grease △ «Molycote»

Lubricating Instructions
When the record changer is assembled, all sliding and bearing points are sufficiently packed with lubricants. Relubrication of these points is required after about 1000 operating hours in normal operation. The following oils and greases should be used for this purpose:

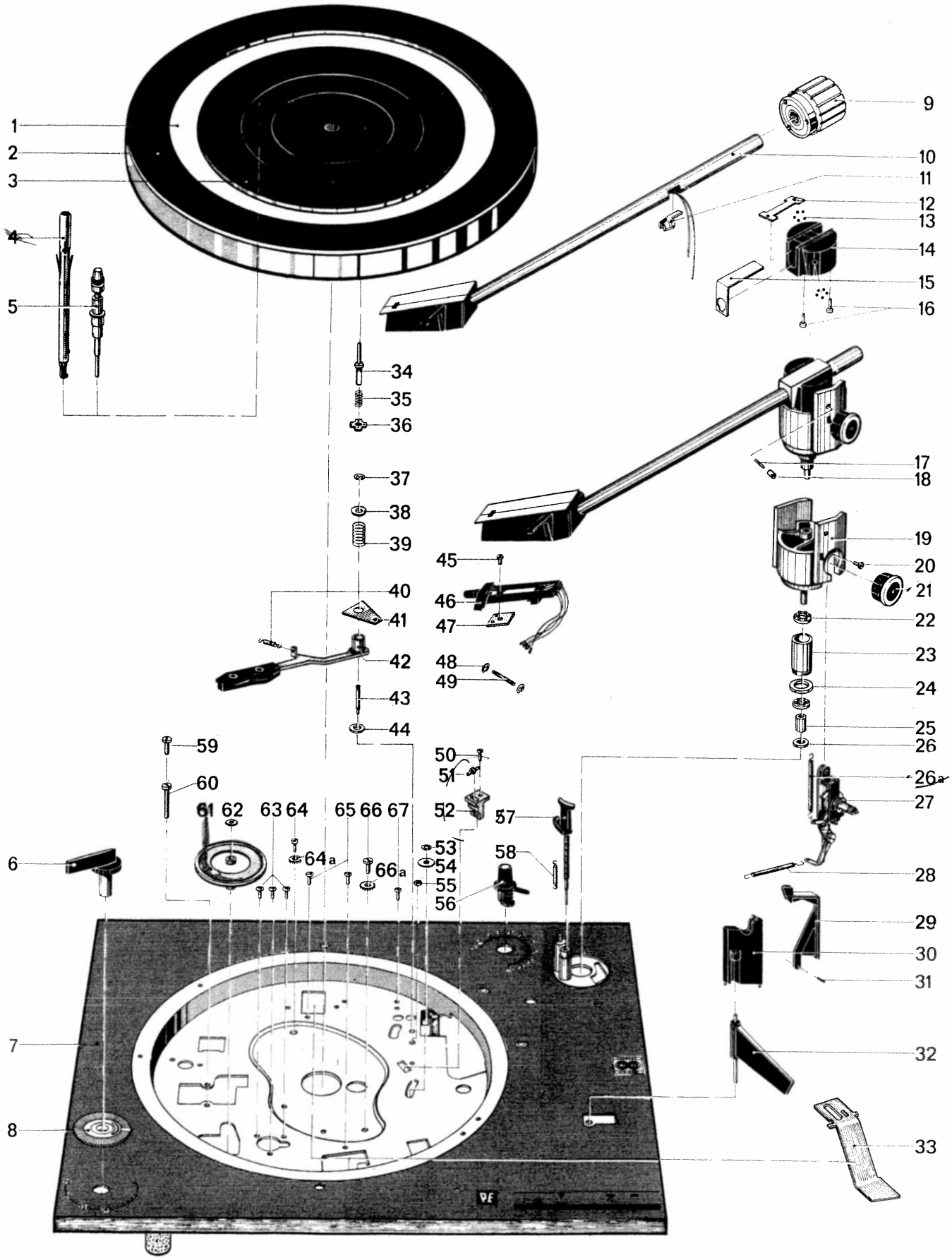
□ = Abrol oil O = Apex grease △ = Molykote

Lubricating points		Item No.
□	Upper control lever assembly bearing	32
□	Idler wheel support pivot	
□	Idler wheel arm bearing	76
O	Speed selector cam bearing and cam	
O	track with ball ratchet arrangement	86-90
□	Vertical pick-up arm bearing (lubricate thriftily)	22-26
□	Ratchet lever pivot bearing	192
□	Sensing lever bearing	154
□	Lower locating lever bearing	151
□	Trip link bearing at eccentric pin	186
□	Starting lever bearing	197
□	Lock pawl bearing	201
□	Actuator bearing	203
□	Lift rod – in the range of the	
□	guide bushing	
□	Feed lever bearing	
□	Cueing lever bearing	
O	Adjusting arm slot	81
O	Knurled knob bearing	8
O	Lift rod – ground surface	57
O	Horizontal bearing	13
O	Control knob for antiskating correction – bearing and cam track	
O	Antiskating adjusting link bearing	165
O	Bearing plate for feed lever	167
O	Ratchet lever bearing in elongated hole of chassis plate	
O	Upper locating lever – bearing and friction	42
O	Control cam bearing, sliding faces and cam track, except for tooth rim	128
O	Push rod extension	96
O	Drop lever eccentric	108
O	Shut-off lever/drop lever bearing	113/108
O	Turntable bearing with ball-bearing	97-99
O	Sliding faces of ratchet and starting levers for starting lever pin	
O	Actuator slot	203
O	Shift rod with guide	105
O	Lift rod friction face	57
△	Idler wheel bearing	
△	Feed lever sliding face for guide bushing	150



□ Abrol oil ○ Apex grease △ «Molycote»

It is important that no oil or grease be allowed to get to the friction faces of the idler wheel, of the turntable and the drive pulley. Lubricants other than those recommended by us are liable to undergo chemical decomposition. We would, therefore, advise you to use only the lubricants recommended by us.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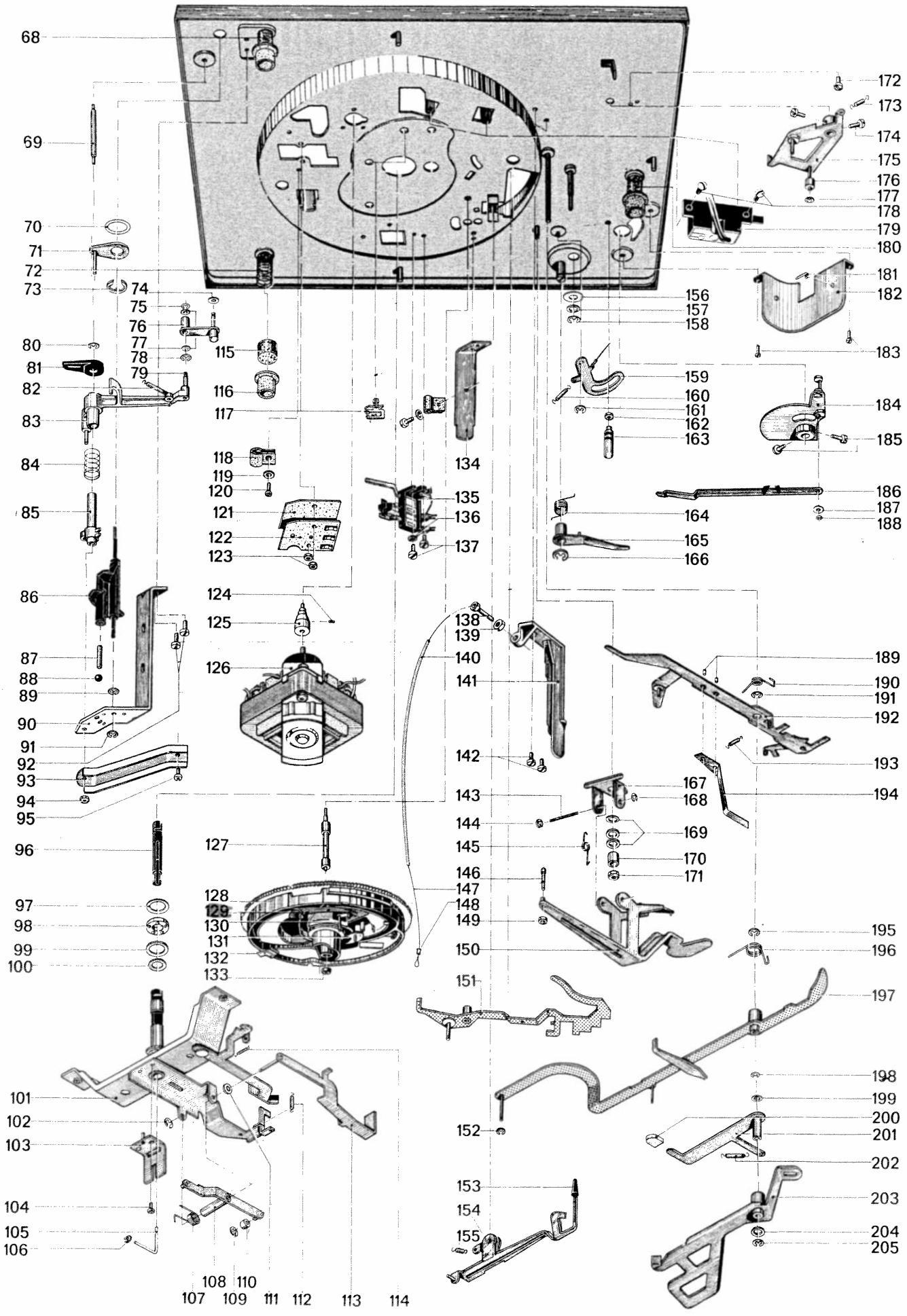
Item No.	Part No.	Description
1	15 0632 0	Turntable platter
2	15 3153 0	Turntable matting - ornamental ring
3	15 3154-0	Turntable matting - center ring
4	14 0600-0	Automatic record spindle 7 mm
5	15 1512	Single play spindle
6	15-1540 0	Speed selector knob assembly
7	15 0606 0	Chassis board assembly
8	15 3023 0	Knurled knob (Speed selector knob for fine speed control)
9	15 1519 0	Pick-up arm counterweight
10	15 0633 0	Pick-up head with pick-up arm assembly and shield for bearing frame
11	15 3091 0	Fixing clamp
12	15 3098 0	Holding plate
13	798 010	Steel ball 1 mm
14	15 1521 0	Bearing frame
15	15 3089 0	Shield for bearing frame
16	793 068 0	Fillister head screw 2,9 x 16
17	15 3107 0	Bearing screw
18	14 3186 0	Cap for bearing screw
19	15 0622 0	Pick-up arm base
20	791 066	Countersunk screw
21	15 1532 0	Pick-up arm tracking weight adjustment knob
22	798 103	Ball race (ball retainer) for pick-up arm bearing
23	15 3034 0	Bearing bushing for pick-up arm
24	15 3038 0	Hexagon nut M 13 x 0,5
25	15 3037 0	Lower tapered bushing
26	15 3039 0	Hexagon nut M 5,8 x0,35
26a	15 3105 0	Draw spring for pick-up arm tracking weight
27	15 0624 0	Antiskating subassembly
28	15 3126 0	Antiskating spring
29	15 1538 0	Pick-up arm lock
30	15 1539 0	Pick-up arm rest subassembly
31	790 618	Holding sleeve 1,5 x 5
32	15 0628 0	Upper control lever assembly
33	14 3164 0	Latch (Chassis securing)
34	15 3031 0	Feeler pin - long
35	00 350 0	Compression spring
36	14 3034 0	Guide disk
37	794 708	"C" clip 2,3
38	01 464 0	Washer 12×4×1,2
39	00 358 0	Compression spring
40	00 366 0	Draw spring for upper locating lever
41	14 3079 0	Securing clip
42	14 1520 0	Upper locating lever
43	14 3074 0	Pivot pin
44	01 465 0	Washer 8×3,2×1,5
45	791 276	Cylindrical screw M 2,6×3,5
46	15 0620 0	Slide carrier assembly without cartridge
47	15 3084 0	Fixing plate
48	794 708	"C" clip 2,3
49	14 3085 0	Pivot pin for sensing lever
50	791 624	Fillister head screw AM 3×5
51	15 3076 0	Guide roller (Friction roll)
52	15 3075 0	Trip link guide
53	794 706	"C" clip 1,9
54	01 463 0	Washer 10×2,5×0,5
55	794 167	Hexagon nut M 3,5
56	15 1527 9	Setting knob for antiskating precision control subassembly
57	15 0617 0	Lift rod
58	00 382 0	Draw spring for lift rod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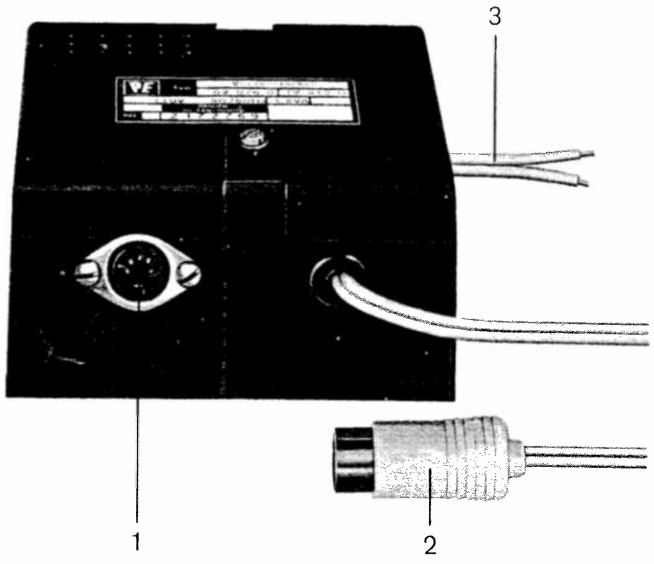
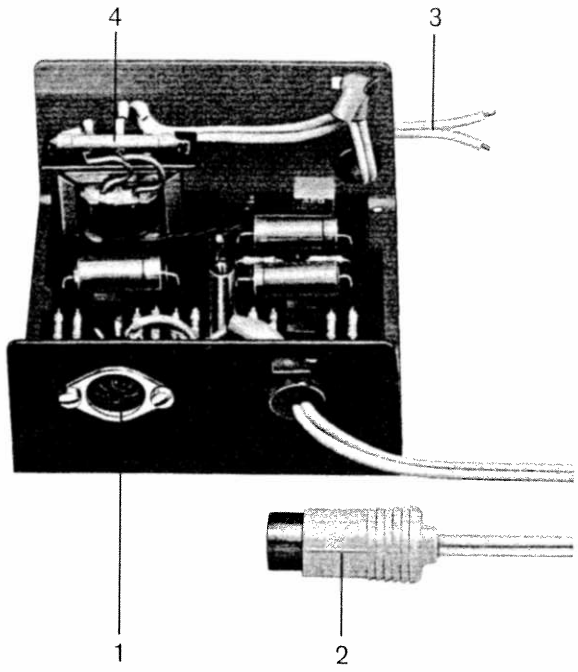
Item No.	Part No.	Description
59	791 637	Fillister head screw AM 3×15
60	791 648	Fillister head screw AM 3×28
61	14 0612 0	Idler wheel
62	01 482 0	Washer for idler wheel
63	792 402	Fillister head screw AM 3×5 for motor suspension
64	791 672	Fillister head screw AM 4×8
64a	794 618	Washer
65	791 624	Fillister head screw AM 3×5
66	791 672	Fillister head screw AM 4×8
66a	794 618	Washer
67	791 622	Fillister head screw AM 3×4
68	15 3013 0	Suspension spring - blue
69	14 3058 0	Guide pin
70	15 3024 0	Spring cup
71	15 1506 0	Lower locating lever assembly
72	15 3012 0	Suspension spring - green
73	794 722	"C" clip 9
74	01 460 0	Washer
75	794 708	"C" clip 2,3
76	14 1516 0	Idler wheel arm subassembly
77	01 315 0	Washer
78	794 708	"C" clip 2,3
79	15 3021 0	Pivot pin for idler wheel arm
80	794 716	"C" clip 6
81	15 3022 0	Adjusting arm
82	00 378 0	Draw spring
83	15 0600 0	Idler wheel support assembly
84	00 377 0	Compression spring
85	15 1503 0	Shift fork
86	15 1505 0	Speed selector cam subassembly
87	00 347 0	Compression spring
88	798 045	Steel ball 4 mm
89	794 710	"C" clip 3,2
90	14 3047 0	Holding bracket
91	794 710	"C" clip 3,2
92	791 622	Fillister head screw AM 3×4
93	15 3160 0	Angle bracket
94	794 165	Hexagon nut M 3
95	791 622	Fillister head screw AM 3×4
96	15 3060 0	Push red extension
97	01 497 0	Upper washer
98	798 102	Ball retainer
99	01 496 0	Lower washer
100	01 306 0	Cushioning washer
101	15 0615 0	Turntable bearing bracket assembly
102	794 708	"C" clip 2,3
103	15 1516 0	Guide bracket subassembly
104	793 070	Fillister head screw B 2,9×6,5
105	15 3059 0	Shift rod
106	794 708	"C" clip 2,3
107	00 365 0	Torsion spring for drop lever
108	14 1537 0	Drop lever subassembly
109	794 708	"C" clip 2,3
110	14 3150 0	Roller for drop lever
111	794 313	Washer 3,2
112	00 366 0	Draw spring for locating lever
113	14 1538 1	Shut-off lever subassembly
114	00 363 0	Draw spring for stop pawl
115	05 310 0	Chassis suspension cushion
116	04 439 0	Spring cup
117	795 934	Cable holder
118	795 929	Fixing clamp
119	794 313	Washer 3,2
120	791 624	Fillister head screw AM 3×5
121	01 316 0	Insulating clamp

Item No.	Part No.	Description
122	01 201 0	Terminal plate
123	794 165	Hexagon nut M 3
124	790 365	Grub screw M 3,5×5
125	15 1507 0	Motor pulley 50 Hz
125a	15 1508 0	Motor pulley 60 Hz
126	14 0702 0	Shaded-pole motor SPM 4-15 with motor suspension
127	14 3070 0	Bearing pin for control cam
128	15 0616 0	Control cam assembly
~~129~~	~~14 1529 0~~	~~Stop switch~~
130	14 1528 0	Tooth segment
131	14 1530 0	Horizontal switch
132	14 3119 0	Shorting cam
133	794 167	Hexagon nut M 3,5
134	14 3190 0	Seating bracket
135	14 0622 0	Short-circuiter
136	794 313	Washer 3,2 for short-circuiter
137	791 628	Fillister head screw AM 3×8
138	15 3058 0	Threaded sleeve
139	794 169	Hexagon nut M 4
140	15 3055 0	Protective sleeve
141	15 3073 0	Support bracket
142	791 306	Cylindrical screw AM 3×6
143	14 3085 0	Pivot pin for feed lever
144	794 708	"C" clip 2,3
145	00 367 0	Torsion spring for feed lever
146	14 3159 0	Guide screw for feed lever
147	746 400	Flexible wire
148	795 394	Tube rivet
149	794 165	Hexagon nut M 3
150	15 1518 0	Feed lever assembly
151	14 1519 0	Lower locating lever
152	794 708	"C" clip 2,3
153	15 1537 0	Sensing pin subassembly
154	15 0626 0	Sensing lever assembly
155	00 357 0	Draw spring for sensing lever
156	01 491 0	Washer
157	01 490 0	Spring cup
158	794 716	"C" clip 6
159	15 1515 0	Cueing lever subassembly
160	00 348 0	Draw spring
161	794 708	"C" clip 2,3
162	794 270	Lock nut
163	15 1514 0	Cueing sleeve subassembly
164	15 3134 0	Torsion spring
165	15 1533 0	Anti-skating adjust
166	794 712	"C" clip 4
167	15 3070 0	Bearing plate for feed lever
168	794 708	"C" clip 2,3
169	794 431	Spring washer A 5
170	14 3068 0	Compression sleeve
171	794 169	Hexagon nut M 4
172	791 624	Fillister head screw M 3×5
173	00 360 0	Draw spring
174	791 306	Cylindrical screw 3×6
175	14 1524 0	Control lever bottom assembly
176	14 3098 0	Switching roller
177	794 702	"C" clip 1,2
178	791 624	Fillister head screw AM 3×5
179	797 001 3	ON/OFF switch
180	15 3014 0	Suspension spring
181	795 801	Soldering terminal
182	15 1536 0	Protection angle bracket

Item No.	Part No.	Description
183	791 622	Fillister head screw 3×4
184	15 1517 0	Tonearm locator segment
185	791 304	Cylindrical screw AM 3×5
186	15 3074 0	Trip link
187	01 484 0	Paper washer
188	794 704	"C" clip 1,5
189	795 504	Tube rivet
190	00 361 1	Torsion spring for ratchet lever
191	794 710	"C" clip 3,2
192	14 1525 0	Ratchet lever subassembly
193	00 369 0	Draw spring
194	14 3226 0	Flat switch spring
195	794 710	"C" clip 3,2
196	00 362 0	Torsion spring for starting lever
197	14 1532 2	Starting lever subassembly
198	794 710	"C" clip 3,2
199	794 319	Washer 9×4,2×1
200	10 505 0	Lock segment
201	14 3135 0	Lock pawl
202	00 364 0	Draw spring for lock pawl
203	14 1534 1	Actuator subassembly
204	794 319	Washer 9×4,2×1
205	794 710	"C" clip 3,2





Item No.	Description
1	Five-pole jack
2	Five-pin plug
3	Mains connecting cord
4	Resistor

Mounting instructions

The TV 212 G Preamplifier is needed in conjunction with a magnetic pick-up if neither the playback unit nor the connected power amplifier have an integral preamplifier. Subsequent installation of the TV 212 G is easy and requires no soldering. In the case of the PE 720 and PE 2020 playback units proceed as follows:

a) Remove the playback unit from the frame or mounting board. For this purpose, loosen the screws of the two locking latches below the chassis plate through the hole in the turntable and slide the latches towards the center.

b) Place the preamplifier into the left-hand back corner of the frame or mounting board.

c) Remove the pick-up cable from the pull-relief at the automatic turntable, wrap up and plug into the pick-up jack (1).

d) Run the pick-up cable (2) of the preamplifier to the outside and secure the pull-relief again.

e) Connect the mains cord (3) of the preamplifier to the connector of the automatic turntable

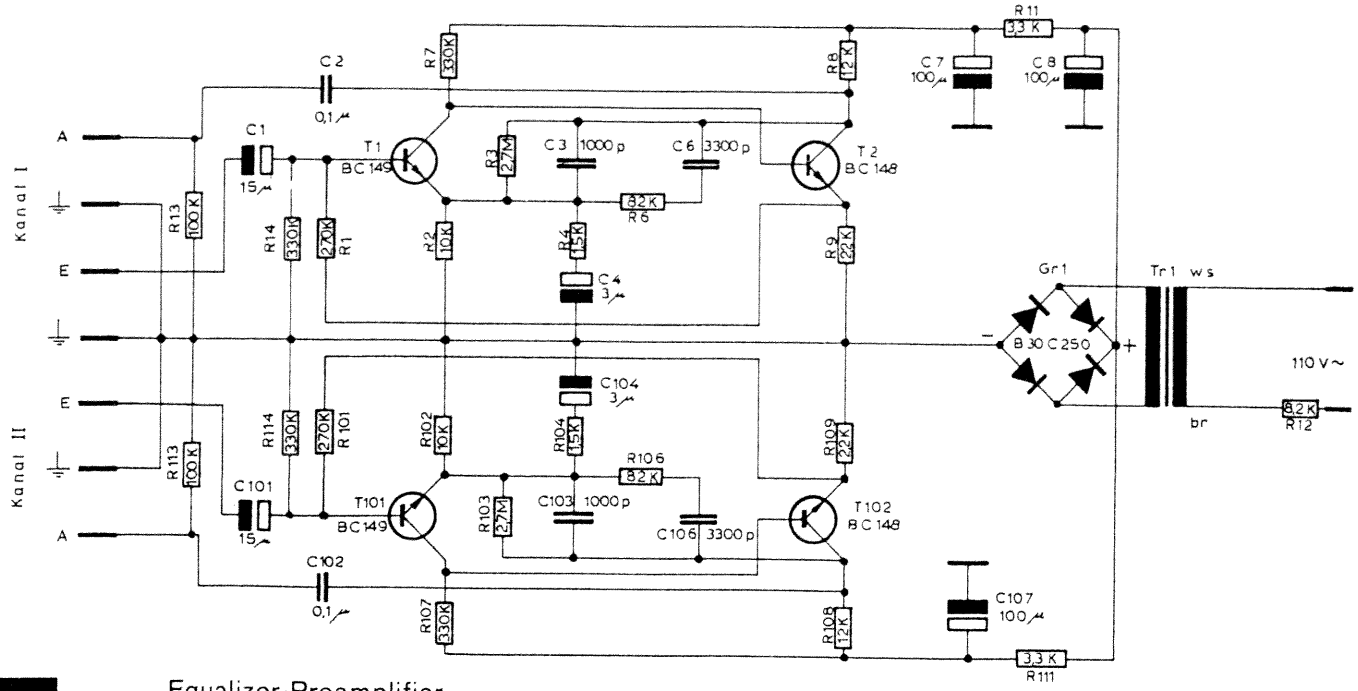
f) Secure the preamplifier to the bottom of the frame or housing, using the screws supplied with it. PE frames incorporate suitable mounting holes.

The preamplifier is now switched on and off by means of the ON/OFF switch of the automatic turntable. Regardless of the mains voltage, the connector is always connected to 110 V.

In the case of automatic turntables having no separate connector for the connection of the preamplifier, connect it to the terminals of the voltage selector or to terminals 2+3 of the terminal board. Through the ON/OFF switch, the preamplifier is connected in parallel with a 110 V winding.

If the preamplifier is to be operated on 220 volts, the built-in resistor (4) must be replaced with the 18 kilohm/3 W resistors supplied with the preamp. This change should, however, be made by a specialist.

If necessary, the TV 212 G preamplifier can also be connected direct to the mains if a mains plug is provided at the end of the mains cord (3). If this method is used, it should be kept in mind that the preamplifier will not be automatically disconnected from the mains together with the automatic turntable but can only be switched off by pulling the mains plug.



Equalizer-Preamplifier
TV 212
62 321 0

Technical spezifications TV 212

Frequency response:	Equalized in accordance with DIN 45547 with a slight frequency response deviation in the bass range to suppress rumble
Gain at 1000 cps:	34 db
Noise:	> 60 db
Channel separation at 1000 cps:	> 65 db
Distortion at 1000 cps:	< 0.1 % at E_{out} = 5 V
Operating voltage:	110 V (220 V by exchanging the resistor)
Power consumption:	1.5 VA
Dimensions:	$3^{13}/_{16}$" x $3^{55}/_{64}$" x $2^{3}/_{64}$" (97 x 98 x 52 mm)
Weight:	Approx. 1 lb. (500 g)

Spare parts list TV 212

Cat. No.	Description
620740	Preamplifier TV 212
621550	Housing subassembly
623190	Stud
034970	Mains connecting cord
033881	Connecting cord
034910	Twin pick-up cable
795936	Cable sleeve
023880	Spacer post
023890	Spacing roller
791646	Fillister head screw M 3 x 25
054290	Holding block
792817	Cylindrical head plate screw
623200	Housing cover
794858	Washer 3.2
797250 o	Five-pole jack
791622	Fillister head screw AM 3 x 4
	Amplifier board
	Cap
	Mains transformer
	Rectifier B 30 C 250
	Tantalum capacitor 15 µF 3/4 V
	Tantalum capacitor 3 µF 6/8 V
	Electrolytic capacitor 100 µF 35 V
	Wire-wound resistor 8.2 kilohms
	Resistor 18 kilohms, 3 W

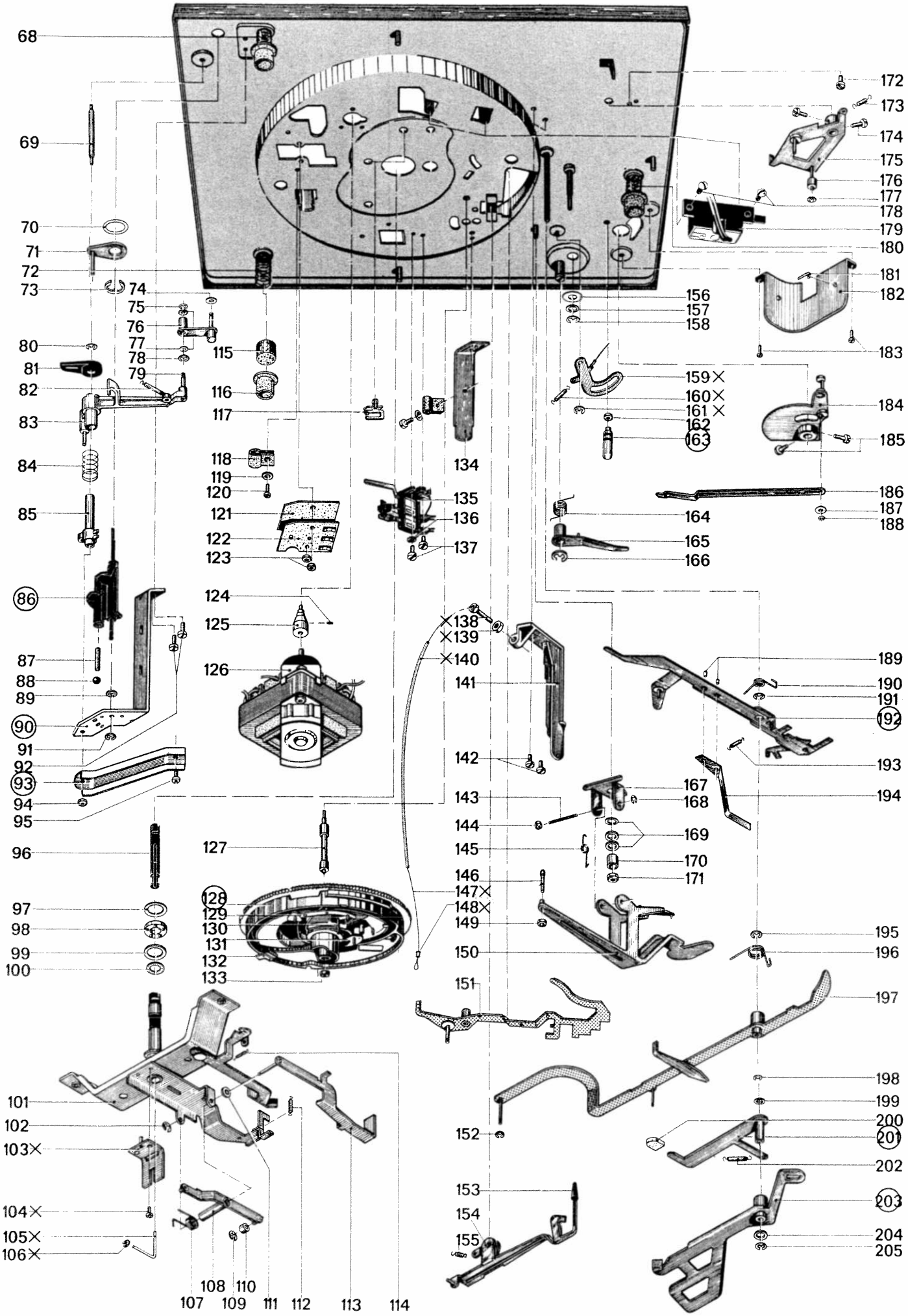
Perpetuum-Ebner

Perpetuum-Ebner 7742 St. Georgen/Schwarzwald

KU / 1126/968 Subject to change Printed in Germany

Technical Information

Supplement
Service Instructions
Manual Turntable
Automatic Turntable
PE 2020
for Model
PE 2020 L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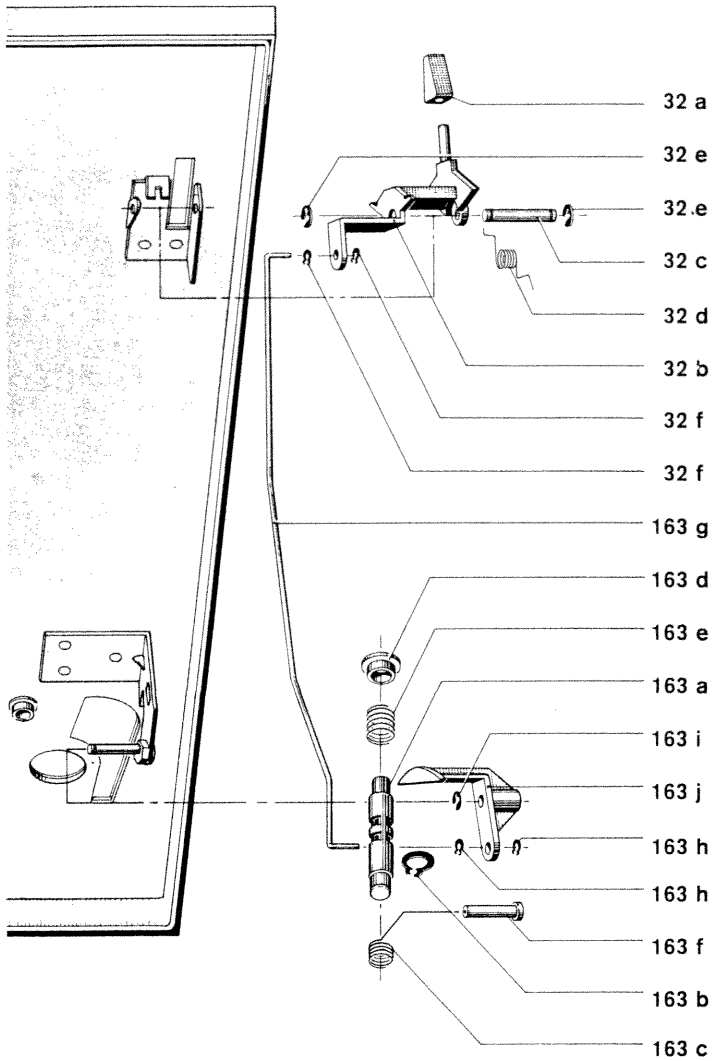


○ = **Changed parts of PE 2020 L**

Item No.	Part No.	Description
7	150606 0	Chassis board assembly
8	153023 0	Knurled knob
86	151505 0	Speed selector cam subassembly
90	143047 0	Holding bracket
93	153160 0	Stiffening bracket
128	150616 0	Control cam assembly
163	151514 0	Cueing sleeve subassembly
192	141525 0	Ratchet lever subassembly
201	141533 0	Lock pawl
203	141534 0	Actuator subassembly

X = Parts missing in PE 2020 L

103 to 106	X = missing
138 to 140	X = missing
147 + 148	X = missing
159 to 161	X = missing

New parts in PE 2020 L

7 a	150606 1	Chassis board assembly
8 a	163009 0	Setting lever
8 b	01513 0	Washer
32 a	153210 0	Knob for lift lever
32 b	153209 0	Lift lever
32 c	153085 0	Pivot pin for lift lever
32 d	00387 0	Lift torsion spring
32 e	794708	Circlip 2,3
32 f	794557	Retainer for shafts without groove, 2,5
69 a	01509 0	2 Spacers
86 a	161503 0	Speed selector cam subassembly
90 a	143047 0	Holding bracket (3 positions)
93 a	153160 0	Stiffening bracket
93 b	797250 6	Connector
93 c	791637	Fillister head screw 3×15
128 a	150616 1	Control cam assembly
161 a	794313	3 Washers for lift rod
163 a	151555 0	Cueing sleeve subassembly
163 b	794558	Retainer
163 c	153218 0	Retaining spring
163 d	153117 0	Friction sleeve
163 e	00388 0	Compression spring for cueing sleeve
163 f	153219 0	Retaining sleeve
163 g	151556 0	Push rod for lift subassembly
163 h	794557	Retainer for shafts without groove, 2,5
163 i	794708	Circlip 2,3
163 j	153216 0	Lift bracket
192 a	151551 0	Ratchet lever
201 a	151550 0	Lock pawl subassembly
203 a	151549 0	Actuator subassembly

ELPA MARKETING Technical Bulletin

PERPETUUM-EBNER

TECHNICAL BULLETIN NUMBER 7002 DATE: MAY 1, 1970

SUBJECT: SPEED CONTROL CAM

MODELS: PE 2018, PE 2020, PE 2038, PE 2040

When transporting the PERPETUUM-EBNER turntable, either in the original packing materials, as outlined in the instruction of the PERPETUUM-EBNER Owner's Manual, or when installed on a wood base, the speed selector knob should be set to the 78 rpm position.

When placed in this position, the plastic speed selector cam, part number 15-1505 for the model PE 2020 and 16-1503 for the models PE 2018, PE 2038 and PE 2040, will be protected by a metal bracket assembly. Failure to observe this precaution will expose the speed selector cam to possible damage.

NOTE: Technical Bulletin number 7002 supersedes PERPETUUM-EBNER Technical Bulletin number 5 dated July 18, 1969.

JFK:RG

ELPA MARKETING Technical Bulletin

PERPETUUM-EBNER

TECHNICAL BULLETIN NUMBER 7003 DATE: MAY 1, 1970

SUBJECT: IRREGULAR RECORDS

MODELS: PE 2018; PE 2020; PE 2038; PE 2040

In tests with various records, it has been found that some records have improperly formed, worn, or eccentric (off center) center holes or may be unevenly pressed, resulting in a record being thicker and heavier in some portion. These records may not lie horizontal when used on automatic turntables using an elevator type spindle.

If the record tilts down over the area traversed by the tonearm, the record may impede the cycling of the tonearm. The spindle will release the record, causing it to drop on top of the tonearm and possibly damage the stylus. This phenomena may occur in only one out of several thousand plays but, nevertheless, all PE turntables are adjusted at the factory with sufficient cycling friction force to carry the tonearm out from under the weight of the tilted record.

Cycle the turntable to the "cue up" position and measure the tonearm lateral friction force. It should be measured with a force gauge from zero (0) to fifty (50) grams and read between fifteen (15) and thirty-five (35) grams.

Increase the friction between the leaf spring "Y" and the tonearm locator segment "YY" by bending the two (2) arms of the feed lever assembly (150). Bend slightly both arms Y 1, Y 2, straight down the same amount so the plastic pin in the leaf spring remains parallel to the tonearm locator segment "YY".

JFK:RG

PERPETUUM-EBNER

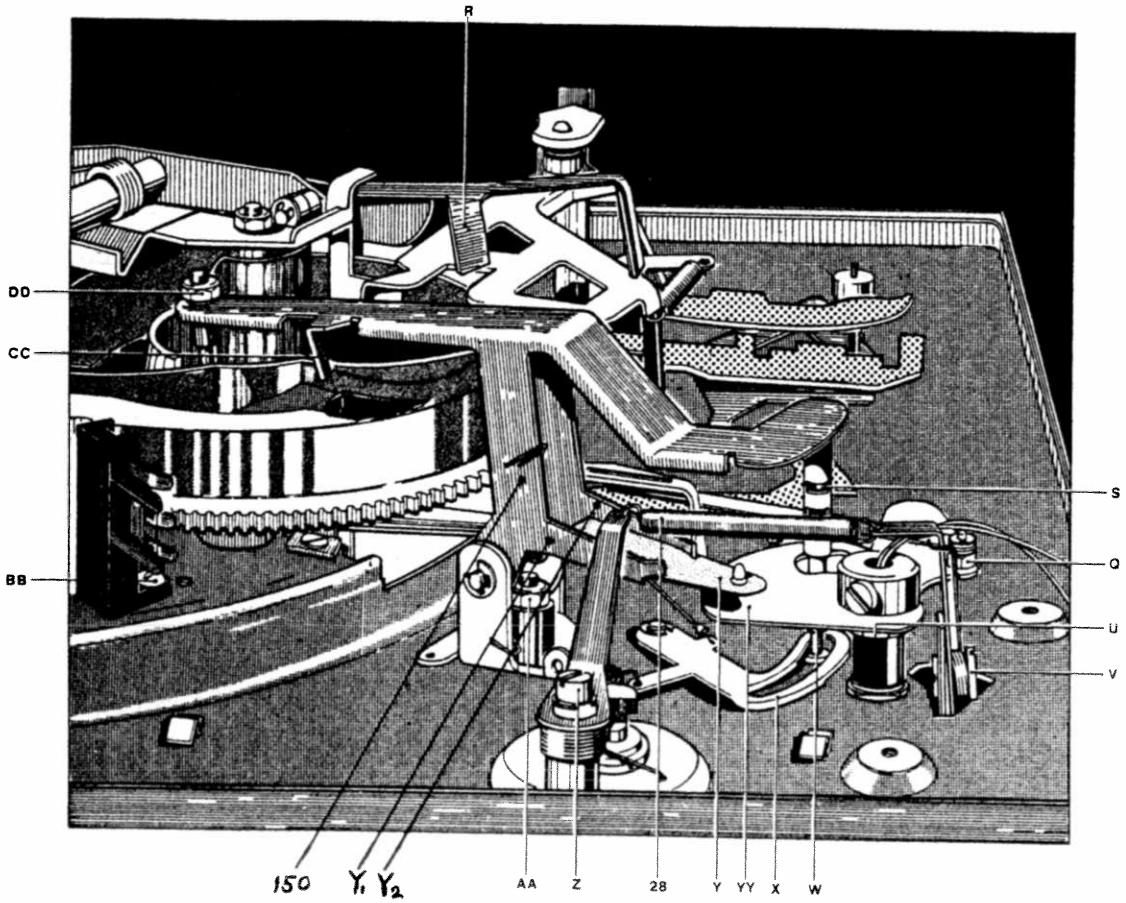
TECHNICAL BULLETIN NUMBER 7003 DATE: MAY 1, 1970

SUBJECT: IRREGULAR RECORDS

MODELS: PE 2018; PE 2020; PE 2038; PE 2040

ADJUSTMENT

TOOLS: Special tool or pliers



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PERPETUUM-EBNER

TECHNICAL BULLETIN NUMBER 7003 DATE: MAY 1, 1970

SUBJECT: IRREGULAR RECORDS

MODELS: PE 2018; PE 2020; PE 2038; PE 2040

Do not attempt to increase the friction by making the adjustment at point "DD". This will alter the height of the tonearm as well as disturb adjustments of other functions. Measure the tonearm friction (fifteen (15) to thirty-five (35) grams) after each adjustment.

Place a record on the turntable and cycle the turntable automatically at 33 1/3 rpm. Observe the tonearm action; at the highest point, prior to setdown on the record, the tonearm should exhibit a slight "kick" to the outside and lower straight down onto the record. If the tonearm wavers before lowering or the change in setdown point exceeds 1 mm, the two arms of the feed lever assembly were adjusted unequally and the plastic pin is not parallel to the locator segment "YY". After each adjustment of the feed lever assembly arms, the tonearm friction, in the cue up position, should be measured and the tonearm action, at the height of its movement over the record and setdown point, should be observed.

NOTE: All measurements of the tonearm friction should be made only with the automatic spindle.

NOTE: Technical Bulletin number 7003 supersedes PERPETUUM-EBNER Technical Bulletin number 6 dated December 20, 1968.

JFK:RG

PERPETUUM-EBNER

TECHNICAL BULLETIN NUMBER 7004 DATE: MAY 1, 1970

SUBJECT: ANTI-SKATING CHART

MODELS: PE 2018, PE 2020, PE 2038, PE 2040

For stylus sizes, elliptical and spherical, that are not listed on the anti-skating chart of the PE Owner's Manuals, the approximate setting may be obtained by extrapolation.

EXAMPLE: ELLIPTICAL STYLI ONLY

For an elliptical stylus of 0.2x0.9 mil, at a stylus force of 2 grams, the anti-skating setting would be 7.75, or one half (½) the difference between the anti-skating settings of 8.75 and 6.75 for the stylus sizes 0.2x0.7 mil and 0.4x0.7 mil listed. At 1 gram, the anti-skating setting would be 6.75 minus 5.75 equals 1.00 and one half (½) of 1.00 plus 5.75 equals 6.25.

EXAMPLE: SPHERICAL STYLI ONLY

For a spherical stylus of 0.8 mil, at a stylus force of 1.5 grams, the anti-skating setting would be 3.7, or the difference in stylus size divided by the difference in anti-skating setting added to the anti-skating setting of the next larger stylus size listed on the chart.

$$\frac{0.8-0.7}{4.0-3.5} + 3.50 = 3.7$$

NOTE: Technical Bulletin number 7004 supersedes PERPETUUM-EBNER Technical Bulletin number 7 dated June 9, 1969.

JFK:RG

ELPA MARKETING

Technical Bulletin

PERPETUUM-EBNER

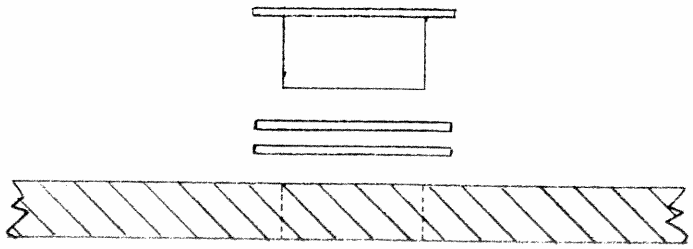
TECHNICAL BULLETIN NUMBER 7005 DATE: MAY 1, 1970

SUBJECT: CHASSIS TILT

MODELS: PE 2018, PE 2020, PE 2038, PE 2040

The PERPETUUM-EBNER factory maintains a tolerance of 3mm in the chassis mounting spring suspension. Evidence of extremes, of this tolerance, may be apparent in the form of a tilt in the chassis plate when the turntable is installed on the wood base (BV 18, BV 20 or LZ 2020).

To correct this problem, a kit consisting of plastic washers is available at no charge. The plastic washers are to be installed, as many as may be required to level the chassis, between the brass suspension cup and the wood base.



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PERPETUUM-EBNER

TECHNICAL BULLETIN NUMBER 7007

SUBJECT: THUMPING ONCE PER REVOLUTION DATE: SEPTEMBER 2, 1971

MODELS: PE-2035, PE-2038, PE-2040

A thumping sound once per revolution of the turntable platter may occur after the following sequence of three operations:

a. Automatic start with either automatic or single play spindle.

b. Automatic stop, let turntable platter come to halt unaided.

c. Manual start (move command control lever to left to start), and listen to once per revolution thump directly from turntable in a quiet room or place stylus on quiet groove of record and listen through speakers at normal listening level.

The cause of the thumping is the partial engagement of the teeth of the main cam assembly and the gear on the turntable platter once per revolution.

The complete bearing bracket assembly (item 101) must be shifted to the left of the turntable chassis. The bearing bracket assembly is secured to the chassis via two screws (items 64 and 66). Sufficient play should exist in the chassis holes to accomplish the necessary repositioning. If there is not, the two screws should be removed and the holes enlarged slightly with a small round file.

ELPA MARKETING Technical Bulletin

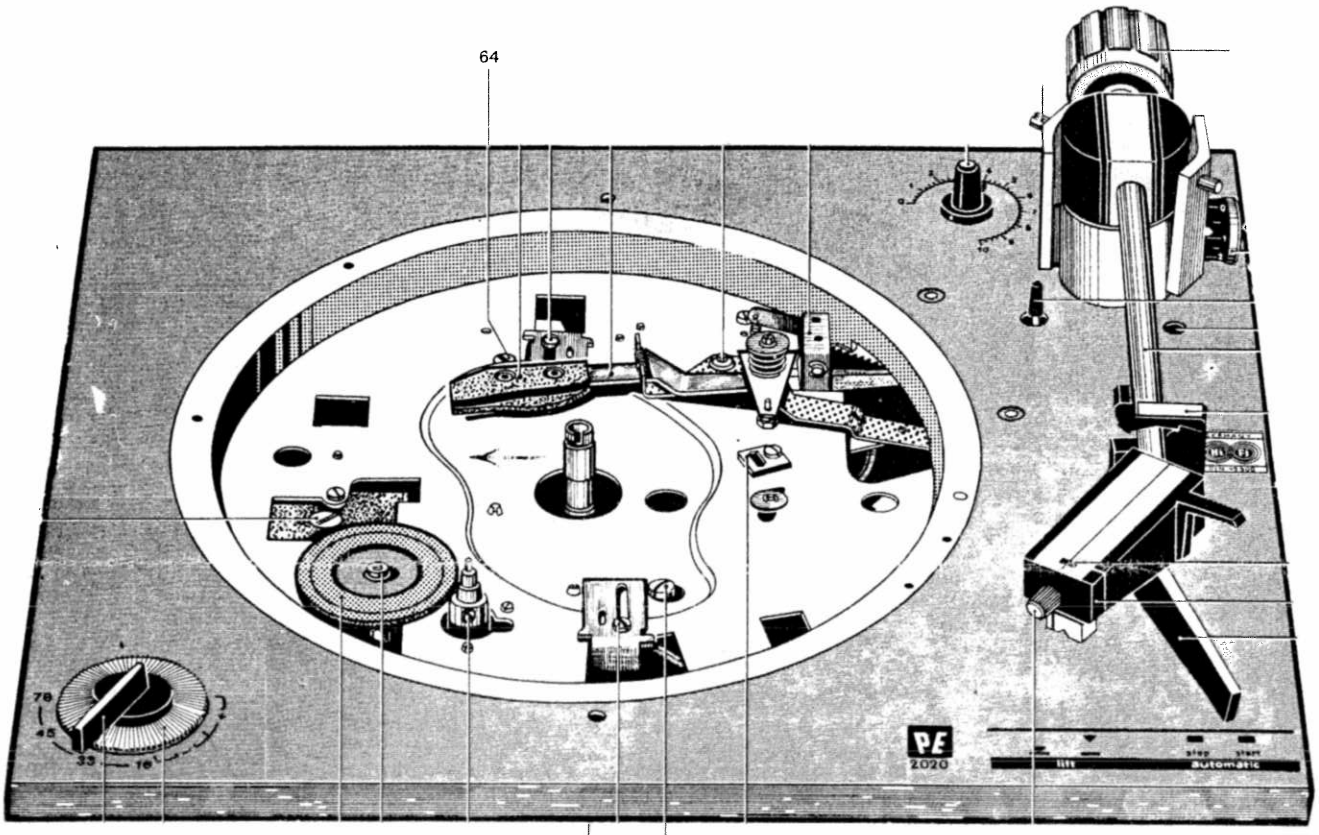
PERPETUUM-EBNER

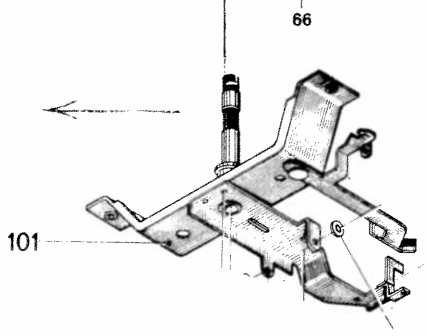
TECHNICAL BULLETIN NUMBER 7007

SUBJECT: THUMPING ONCE PER REVOLUTION

DATE: SEPTEMBER 2, 1971

MODELS: PE-2035, PE-2038, PE-2040





PERPETUUM-EBNER

TECHNICAL BULLETIN NUMBER 7007

SUBJECT: THUMPING ONCE PER REVOLUTION DATE: SEPTEMBER 2, 1971

MODELS: PE-2035, PE-2038, PE-2040

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c. Manual start (move command control lever to left to start), and listen to once per revolution thump directly from turntable in a quiet room or place stylus on quiet groove of record and listen through speakers at normal listening level.

The cause of the thumping is the partial engagement of the teeth of the main cam assembly and the gear on the turntable platter once per revolution.

The complete bearing bracket assembly (item 101) must be shifted to the left of the turntable chassis. The bearing bracket assembly is secured to the chassis via two screws (items 64 and 66). Sufficient play should exist in the chassis holes to accomplish the necessary repositioning. If there is not, the two screws should be removed and the holes enlarged slightly with a small round file.

PERPETUUM-EBNER

TECHNICAL BULLETIN 7007a (Supplement to 7007)

SUBJECT: THUMPING ONCE PER REVOLUTION DATE: October 28, 1971

MODELS: PE-2035, PE-2038, PE-2040

Refer to Perpetuum-Ebner Technical Bulletin number 7007 of 9/2/71, sections a,b and c, to identify the once per revolution thumping as the main cam gear partially engages the turntable platter gear.

The lock pawl (201) plastic tip secures the main cam after completion of each cycle. However, after the "stop" operation the cam cycle may be incomplete. A slight pressure on the lock pawl, where the spring connects, will produce a "click" indicating the cam has not fully completed the cycle. Remove the lock pawl spring (202) and cut off approximately 1/3 of the coils (approximately 7 coils). Bend the last coil flat to form a hook and replace on the lock pawl and fixed post. Follow operational sequences a, b and c as described in PE Technical Bulletin No. 7007 and check for thumping once per revolution.

PERPETUUM-EBNER

TECHNICAL BULLETIN NUMBER 7008

SUBJECT: REPLACEMENT OF CUEING DAMPING FLUID OCT. 28, 1971

MODELS: PE-2018, PE-2020, PE-2035, PE-2038, PE-2040

Loss of damping fluid in the cueing mechanism will result in a rapid or erractic descent of the tonearm and stylus assembly to the record after record change or cueing operations.

NOTE: Only Perpetuum-Ebner special purpose silicone grease or Dow Corning 200 fluid of 100,000 centistoke viscousity should be used.

To replace the silicone grease damping fluid:
Models: PE-2018, PE-2020

1. Remove the feed lever (item 150) Refer to figure 1
2. Disconnect and remove the trip link (item 186)

NOTE: Do not lose the guide roller (item 51) which will fall out when the trip link is removed.

3. Remove the tonearm locator segment (item 184)
4. Remove the cueing sleeve subassembly (item 163)
5. Remove the lock nut (item 162)
6. Remove Hex Nut (item 24)
7. Release the tonearm wiring harness by bending the tiedown tabs. It is not necessary to unsolder the tonearm wires from the muting switch.
8. The tonearm and console assembly may be removed from the chassis and laid aside exposing the lift rod (item 57).
9. Disconnect the draw spring (item 58) and remove the lift rod and cylinder fitted to the chassis with a pipe cleaner moisten with alcohol or lighter fluid.
10. Apply a small quanity of silicon grease evenly to the notched shaft of the lift rod. Replace the lift rod and draw spring.
11. Fit a counterweight and weighted cartridge slide to the tonearm. Zero balance the tonearm and apply approximately 2 grams stylus force by holding the tonearm and console assembly in place on the chassis by hand.

NOTE: Do not replace parts on underside of the chassis until the speed of descent has been checked.

PERPETUUM-EBNER

TECHNICAL BULLETIN 7007a (Supplement to 7007)

SUBJECT: THUMPING ONCE PER REVOLUTION DATE: October 28, 1971

MODELS: PE-2035, PE-2038, PE-2040

Refer to Perpetuum-Ebner Technical Bulletin number 7007 of 9/2/71, sections a,b and c, to identify the once per revolution thumping as the main cam gear partially engages the turntable platter gear.

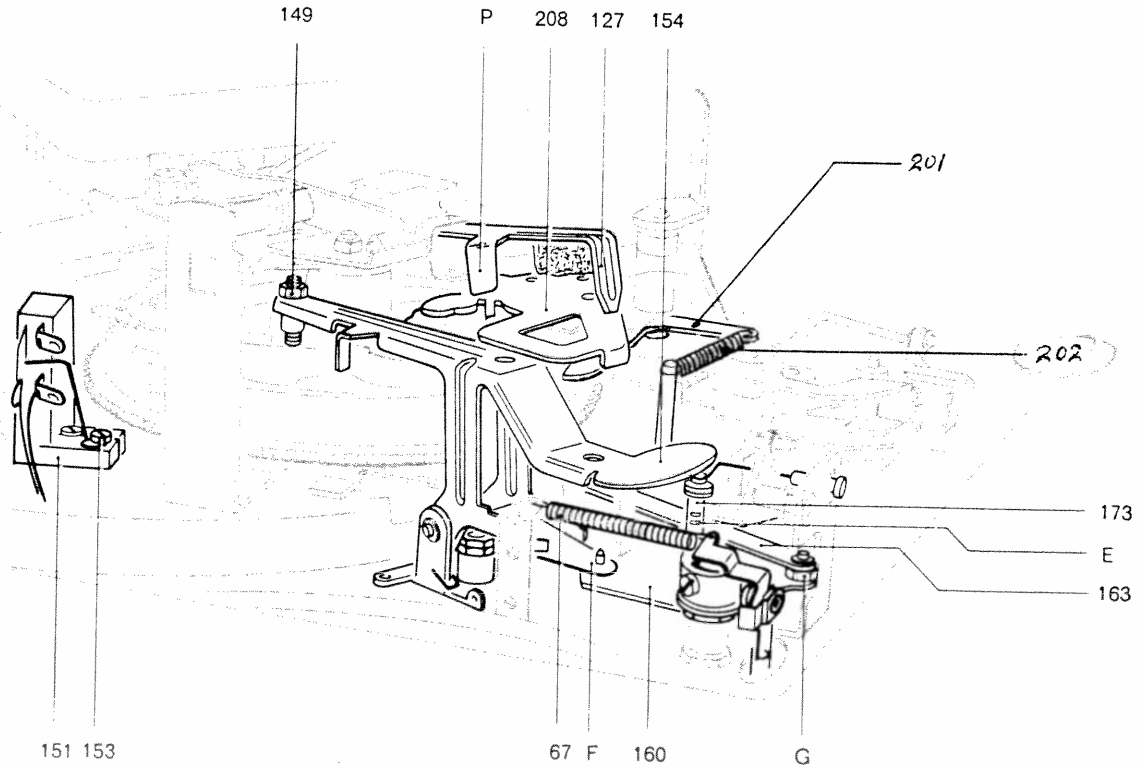
The lock pawl (201) plastic tip secures the main cam after completion of each cycle. However, after the "stop" operation the cam cycle may be incomplete. A slight pressure on the lock pawl, where the spring connects, will produce a "click" indicating the cam has not fully completed the cycle. Remove the lock pawl spring (202) and cut off approximately 1/3 of the coils (approximately 7 coils). Bend the last coil flat to form a hook and replace on the lock pawl and fixed post. Follow operational sequences a, b and c as described in PE Technical Bulletin No. 7007 and check for thumping once per revolution.

PERPETUUM-EBNER

TECHNICAL BULLETIN 7007a (Supplement to 7007)

SUBJECT: THUMPING ONCE PER REVOLUTION DATE: October 28, 1971

MODELS: PE-2035, PE-2038, PE-2040



PERPETUUM-EBNER

TECHNICAL BULLETIN NUMBER 7008

SUBJECT: REPLACEMENT OF CUEING DAMPING FLUID DATE:OCT. 28, 1971

MODELS: PE-2018, PE-2020, PE-2035, PE-2038, PE-2040

12. While holding the tonearm in place by hand push up from the underside of the chassis on the lift rod and ovserve the speed and smoothness of the descent of the stylus. If the descent is erractic (slow then fast) the silicone grease is unevenly distributed over the lift rod. If the descent is too fast it is insufficently coated, if too slow there is too much. The recommended speed of descent is approximately 5 to 6 seconds.
13. Reassemble the turntable reversign the dissassembly procedures.

NOTE:Lock nut (item 162) adjusts the tonearm height in the automatic spindle in place, cycle the turntable by hand to the point where the tonearm is moving from the arm rest to the turntable platter. Adjust the lock nut (item 162) until the distance from the top of the chassis to the top of the tonearm head assembly measures between 70mm to 72mm for the PE 2020 and PE 2040 or 65mm to 67mm for the PE 2018 and PE 2035 and PE-2038.

NOTE:When the tonearm is locked in place on the arm rest the eccentric screw adjustment for the tonearm set-down point located on top of the tonearm locator segment (item 184) should be visable through the hole in the top of the chassis. Loosen the screws (item 185) and adjust as necessary.

MODELS: PE-2038 and PE-2040

1. Follow steps 1 and 2 above for model PE-2018
2. Remove "c" clip (item 74e) refer to figure 2 and slide the pivot shaft (item 74c) out releasing the spring and cam (item 74d and 74b).
3. Move the cueing lever (item 187q) to position the lift cam (item 187j) so the cueing sleeve subassembly, spring and step washer (item 187a,b,c,d,e) may be lifted off.
4. Follow steps 5 through 13 for model PE-2018. Refer to Figure 1.

ELPA MARKETING Technical Bulletin

PERPETUUM-EBNER

TECHNICAL BULLETIN NUMBER 7008

SUBJECT: REPLACEMENT OF CUEING DAMPING FLUID DATE: OCT. 28, 1971

MODELS: PE-2018, PE-2020, PE-2035, PE-2038, PE-2040

FIGURE 1

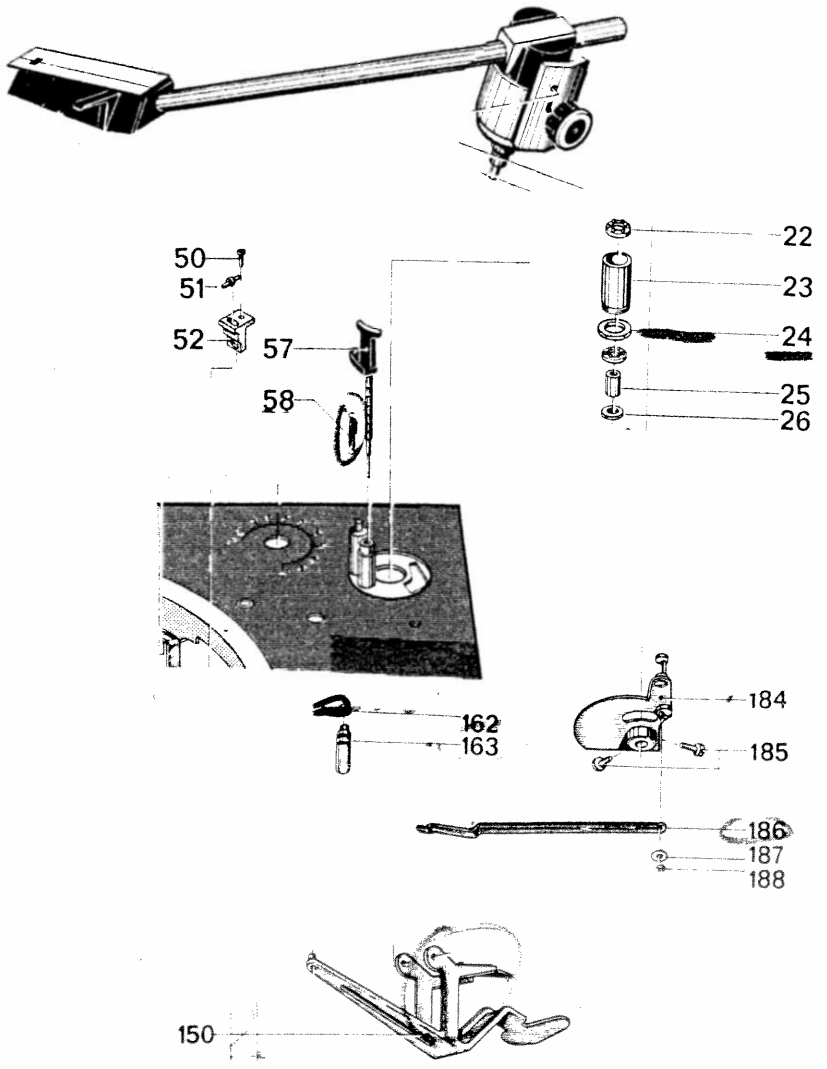
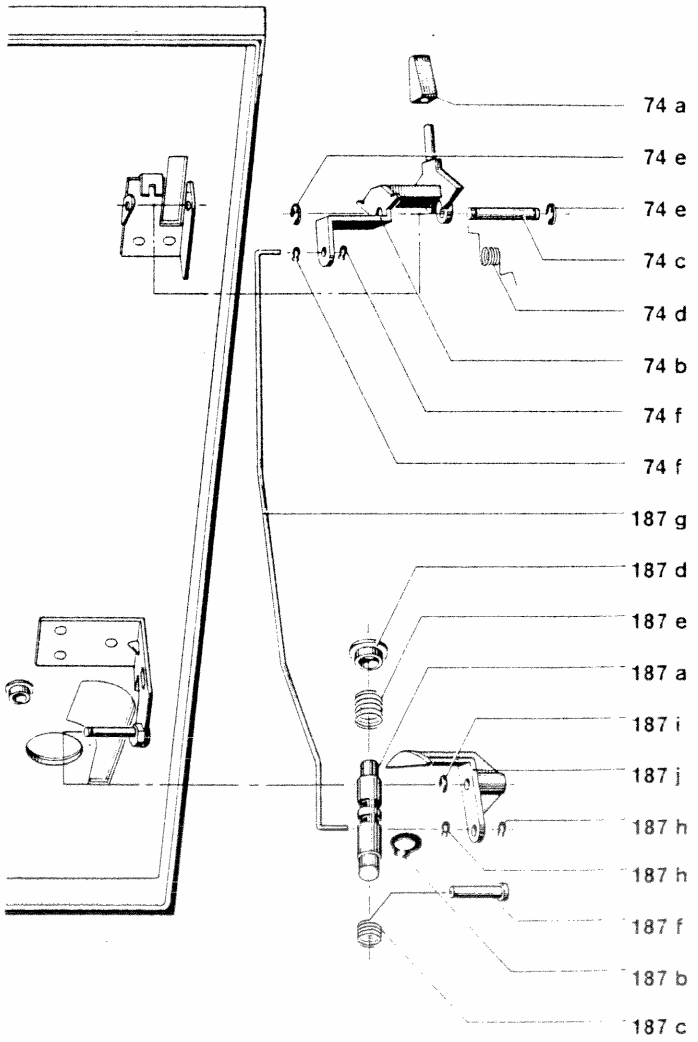


FIGURE 2



PERPETUUM-EBNER

TECHNICAL BULLETIN NO. 7008

SUBJECT: REPLACEMENT OF CUEING DAMPING FLUID DATE: OCT. 28, 1971

MODELS: PE-2018, PE-2020, PE-2035, PE-2038, PE-2040

MODEL: PE-2035

1. Follow steps 1 thru 3 for model PE-2038
2. Undcrew the adjusting nut (item 166) refer to figure 3 from the top of the lift rod (item 169) assemble from the top of the chassis beneath the tonearm.
3. Remove the lift rod (item 169) and spring (item 168) from the underside of the chassis.
4. Replace the silicone grease and check the cueing action as described in steps 9 thru 13 for model PE-2018.

NOTE: Cueing height adjustment on the PE 2035 is accomplished by adjusting the nut (item 166).

FIGURE 3