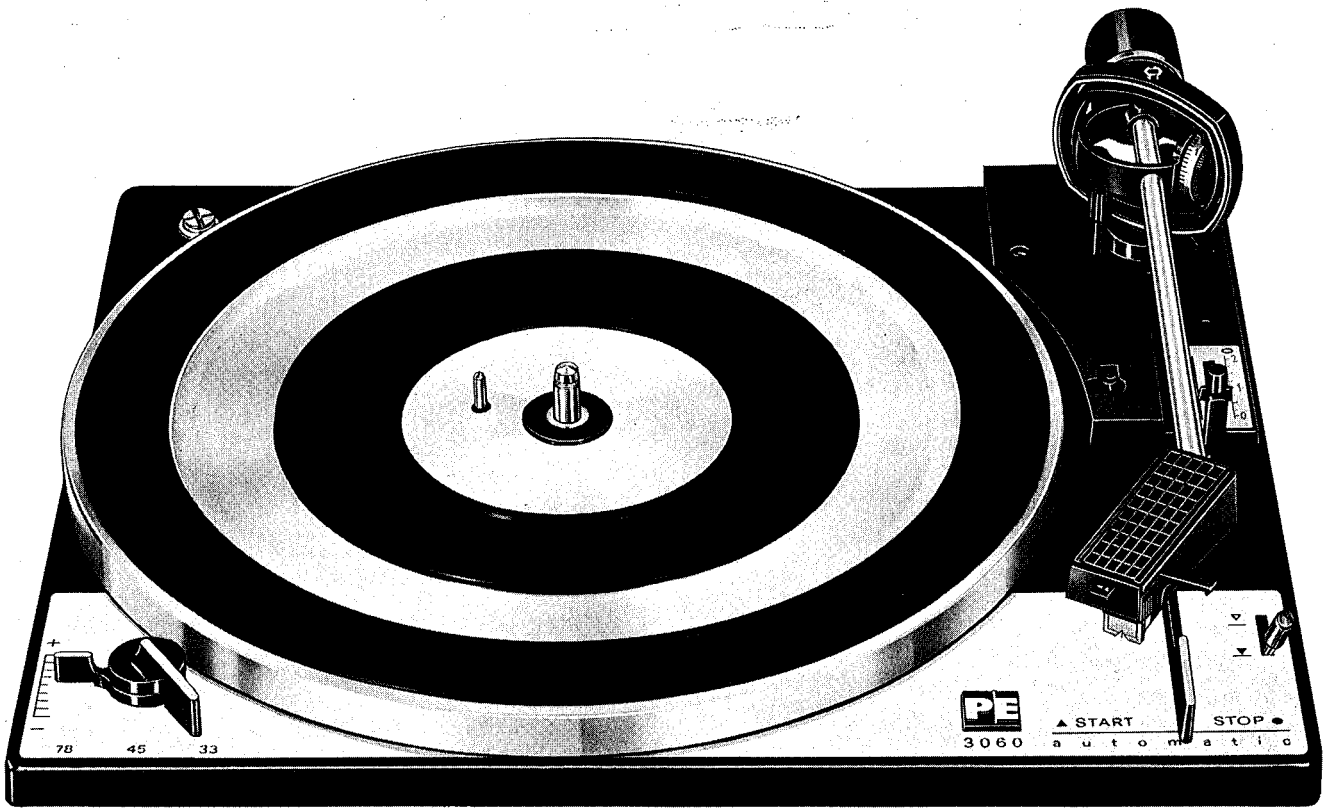
PE 3060
Service Manual

Edition March 1973



Technical data

Power source	alternating current, 50 or 60 Hz; conversion by interchanging motor pulley.
Supply voltage	110 or 220 volts, switchable, pole-changing 2-coil 4-pole synchronous motor with radially located elastic mounts.
Power consumption	approx. 10 watts, 15 VA
Current consumption	at 220 volts, 50 Hz, approx. 70 mA at 120 volts, 60 Hz, approx. 130 mA
Turntable platter	pressure-cast non magnetic, 2.0 kg (4.4 lb), 271 mm (10.5 in.) diameter
Turntable speeds	33 1/3, 45 and 78 rpm
Pitch adjustment range	6% on all three speeds (approx. 1 semitone)
Speed variation	$\leqq$ + 0.08% according to DIN 45 507
Rumble and other noise	unweighted, $\geqq$ 43 dB) according to weighted, $\geqq$ 59 dB) DIN 45 544
Tonearm	torsionally rigid aluminium tube, 4-point gimbal suspension
Maximum tracking error	$\leqq$ 0.18° / cm
Bearing friction	vertical $\leqq$ 0.01 gram) horizontal $\leqq$ 0.02 gram) referred to stylus tip
Cartridge holder	removable, accepts all types of cartridges weighing between 1 and 10 grams with internationally standard 1/2" mounting centres
Weight	4.8 kg (10.6 lb.) less packing
Mounting dimensions and mounting-board cut-out	see mounting instructions

PERPETUUM - EBNER KG · 7742 St. Georgen/Schwarzwald · Germany

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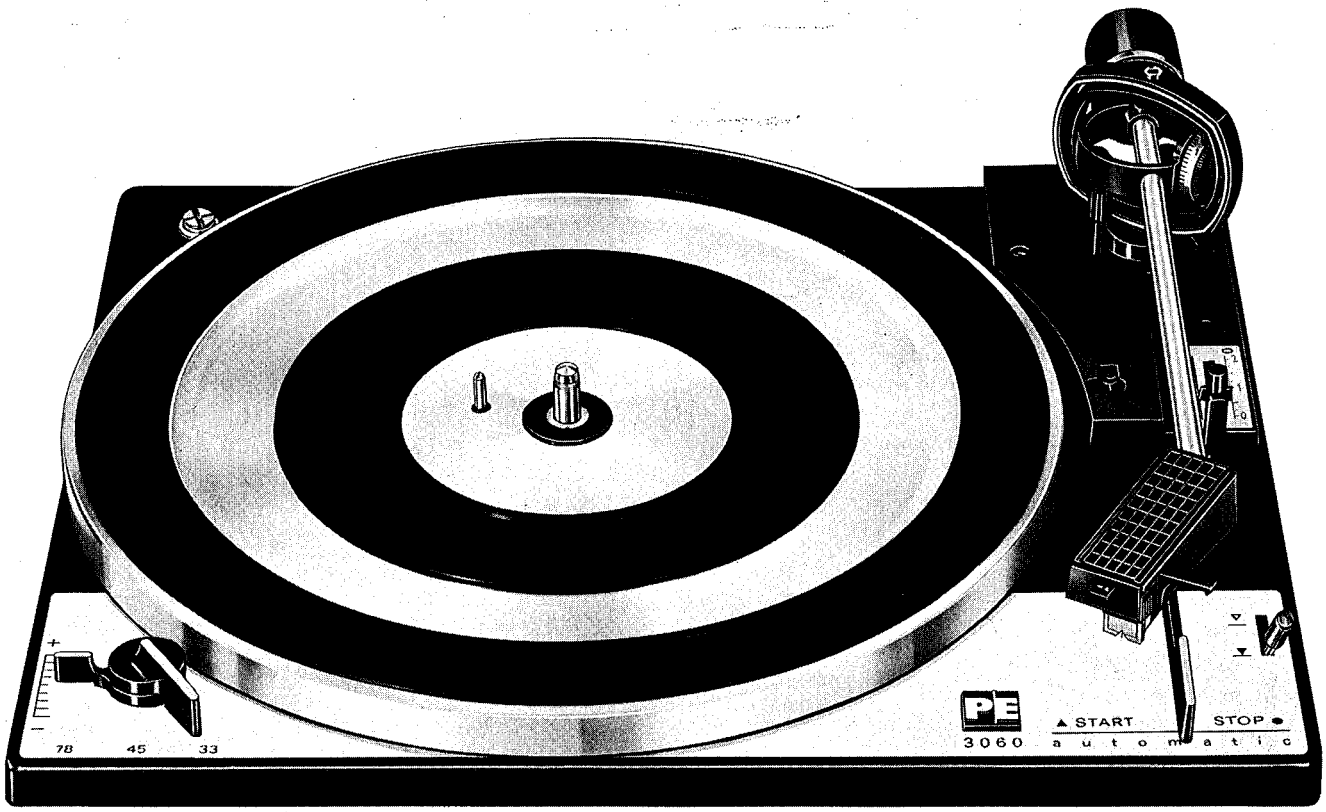

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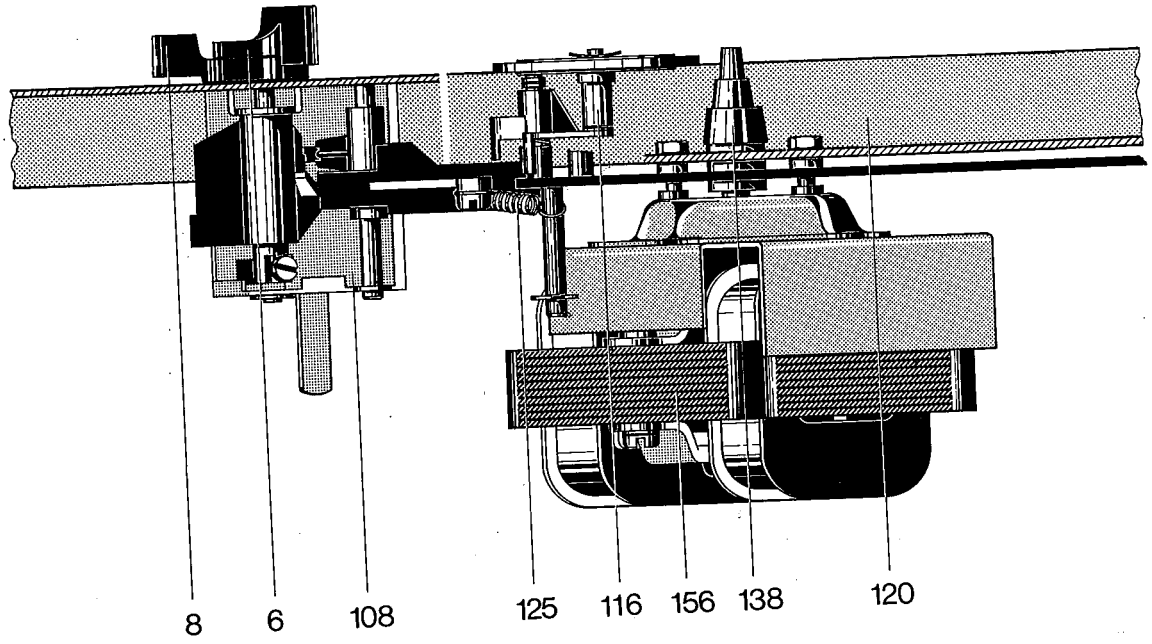
Contents

Fig. 1 Motor suspension and turntable drive



Motor and drive

Power for the turntable platter and the changing mechanism is supplied by a four-pole, split pole synchronous motor (156) suspended by radially located resilient mounts and having a very small stray magnetic field and minimum vibration.

The speed of the motor is independent of line-voltage,temperature or load variations. Speed is dependent on, and proportional to, power-line frequency. The motor is adapted to 50 or 60 cycle (Hz) power-line frequencies by the correct choice of motor pulley.

Motor pulley for 50 Hz operation : Part No. 218 273
Motor pulley for 60 Hz operation : Part No. 218 274

The motor pulley (138) is fastened to the motor shaft by a setscrew (139). When changing pulleys, ensure that the new pulley is set to the correct height (see page 4).

The turntable platter is driven by the idler wheel (116) which, to prevent damage to its friction surface, is automatically disengaged when the unit is shut off. Setting the turntable speed to

Setting the turntable speed to 33 1/3, 45 or 78 rpm is carried out by raising or lowering the idler (116) to bear against the proper step of the motor pulley.
Upon actuation of the switch lever (6), the switch segment (102) rotates once. This causes the idler carrier (111) fitted into a slot on the segment to move vertically. The drive wheel (116) carried on the swinging arm (118) is then lifted off the motor pulley and moved and replaced on the motor pulley step corresponding to the selected speed.

Fig. 2 Motor field connections (less voltage selector)

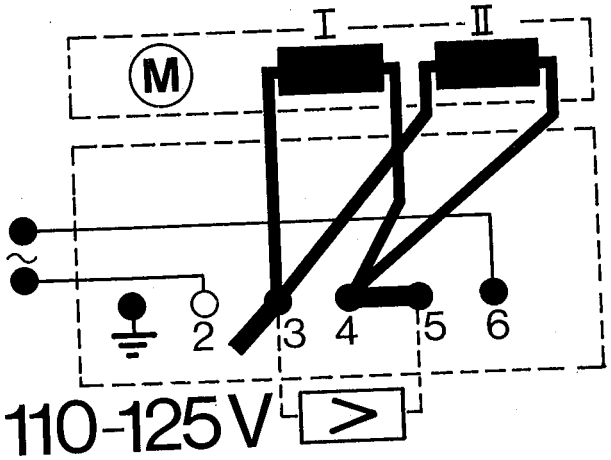
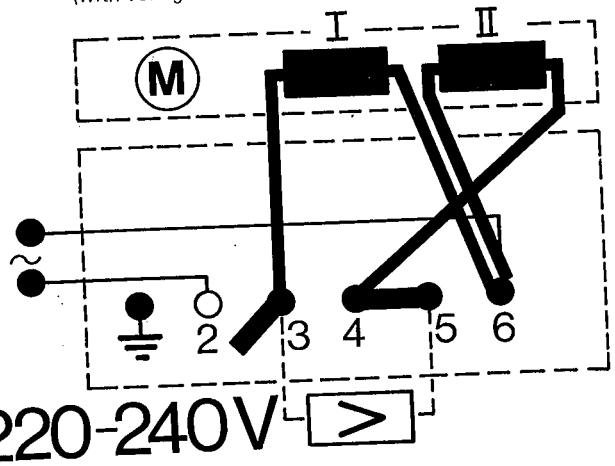


Fig. 3 Motor field connections (with voltage selector)

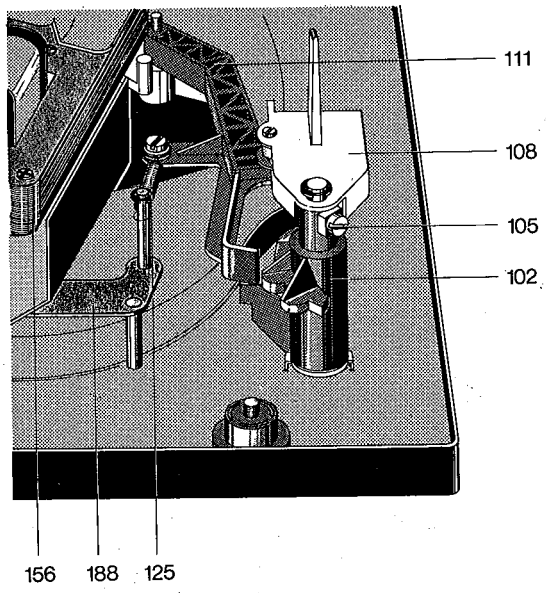


Fine-speed adjustment (pitch control)

A fine speed adjustment for all three speeds permits a turntable speed variation of 6% (about 1 semitone) at the 33 1/3, 45 and 78 rpm speeds.

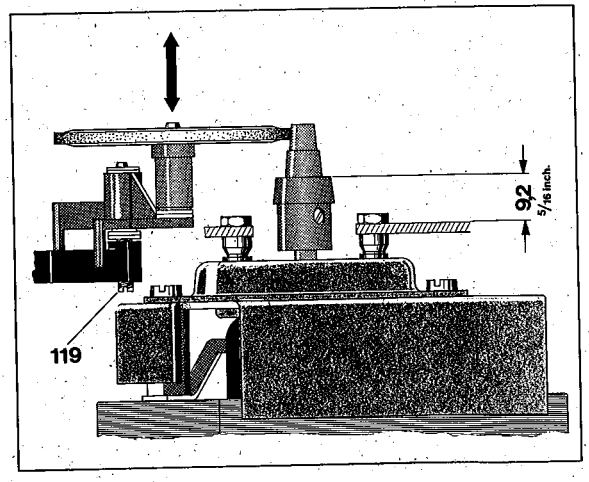
Turning the pitch-control knob (8), causes the selector segment (102) and the idler carrier assembly (111) to move up and down, changing the position of the idler wheel on whatever motor pulley step it has been placed on. The conical pattern of the motor pulley gives an adjustment range of ± 3% from the nominal speed.

Fig. 4 Turntable speeds and idler wheel shift mechanism



Fault	Cause	Remedy
Turntable does not run when unit is plugged in and start switch operated	a) Current path to motor interrupted	a) Check connection at switch plate and voltage selector
	b) Idler wheel (116) not in contact with platter	b) Check idler carrier assembly (111)
	c) Motor pulley loose	c) Tighten motor pulley
Turntable does not come up to speed	a) Motor pulley is not correct for local line frequency	a) Change motor pulley
	b) Slippage between idler wheel (116) and motor pulley or turntable	b) Clean friction surfaces of idler wheel, motor pulley and turntable platter. If necessary replace drive wheel Once the drive surface of the turntable platter has been cleaned, do not touch it with your fingers during assembly
	c) Excessive friction in motor, drive wheel or turntable bearings	c) Clean and oil bearings
Rumble affecting reproduction	Worn idler wheel	Replace idler wheel (116), clean turntable platter drive surface and motor pulley with grease removing solvent. Once surfaces are cleaned, do not touch inside of platter or pulley with your fingers

Fig. 5 Motor pulley position



Fault

Correct nominal speed obtained only at extreme settings of pitch control

Cause

Idler wheel does not contact motor pulley correctly

Remedy

Check alignment of motor pulley. Gap between top of 78 rpm step and chassis bedplate should be 9.2 ± 0.1 mm. If necessary, re-align. Then turn bearing screw (119) to re-align idler carrier until at the center position of the pitch control lever (8) the idler wheel is in the center of the corresponding step on the motor pulley.

Tonearm and tonearm bearing

The PE 3060 has a light, torsionally rigid metal tonearm in a gimbal type suspension. The actual support is provided by four hardened and precision-polished steel points resting in precision ball bearings. Tonearm pivot friction is thus reduced to a minimum.

Vertical pivot friction	0.01 gram)	referred to stylus tip
Horizontal pivot friction	0.02 gram)	

The arm therefore guarantees exceptionally good tracking characteristics. The cartridge slide is removable. Before setting the correct stylus force for the particular cartridge installed in the tonearm head, the tonearm should be balanced with the stylus force setting dial at the zero position. Coarse balancing is accomplished by sliding the counterweight (68) on pin (69), after which fine adjustment is by turning the weight. The counterweight is proportioned so that cartridges with a weight of from 1 to 10 grams can be balanced. For the absorption of vibration and rapid slight shocks, the counterweight is coupled to its threaded shaft through an elastic medium, and braked to prevent unintended rotation. The tonearm head accommodates all cartridges that conform to the internationally standard 1/2 inch mounting centers, and whose weight does not exceed 10 grams. Stylus force is set by turning spring housing (72), which is equipped with calibrations and which tensions or releases a spiral spring inside it. The scale is calibrated for a range of zero to 3.0 grams, and permits exact settings every 0.1 g within the range 0 – 1.5 g, and every 0.25 g within the range 1.5 – 3 g.
To replace to tonearm complete with tonearm bearings, the following procedure is recommended:

Fig. 6 Tonearm bearing assembly

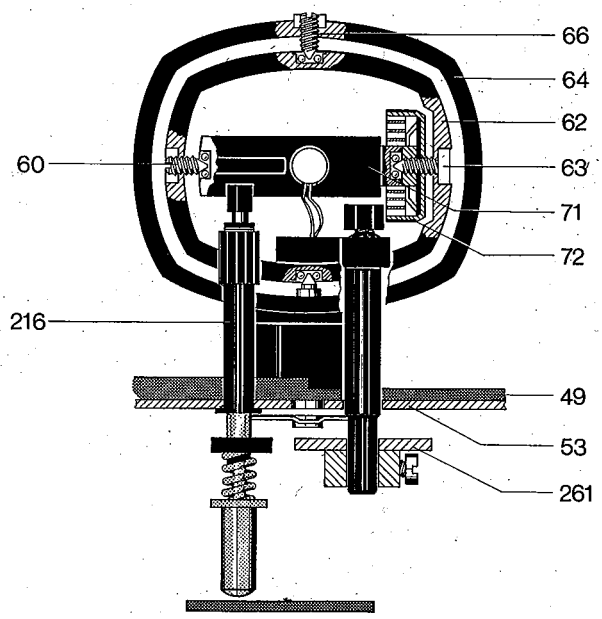
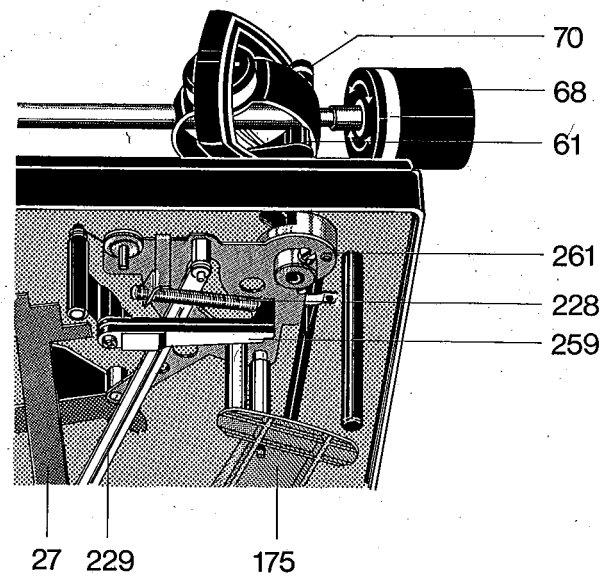


Fig. 7 Tonearm bearing assembly (view from below)



1. Fasten complete unit in repair fixture. Set stylus force to zero and lock tonearm.
2. Turn unit upside down and unsolder tonearm leads.
3. Remove main lever (175) and thrust sleeve (222).
4. Unhook tension spring (218)
5. Unfasten C-washer (260) and remove skating lever (259).
6. After loosening C-washer (231) and removing friction washer (230), separate shutoff slide (229) from segment (186). Prevent the guide roller (263) for the shutoff side from falling out.
7. Loosen cylinder screws (262) and remove driving segment (261) with great care.
8. Take off lock washer (67) and remove tonearm complete with bearing.

When replacing the tonearm and bearing assembly, follow the procedure in reverse. The unit is first in the upright position. Insert the tonearm and lock it. Turn unit upside down, and insert curved safety washer (67).

When assembling the driving segment, note the following alignment points:

Gap between chassis and driving segment should be 8.5 to 8.8 mm.

At the same time, the stop edge should be 0.1 to 0.3 mm from the pin of the lower adjusting lever when the latter is swung forward. Ensure that the tonearm can move without being hindered by other components.

To remove the tonearm from the bearing ring, after unsoldering the tonearm leads set the stylus force dial to zero. Unscrew locknut (59) with threaded rod (60) and bearing screw (63) (left-hand thread). Take tonearm carefully out of bearing ring. To adjust the tonearm head, a hole is provided in the chassis to make this possible without first removing the tonearm (Fig. 21).

Adjusting tonearm bearings

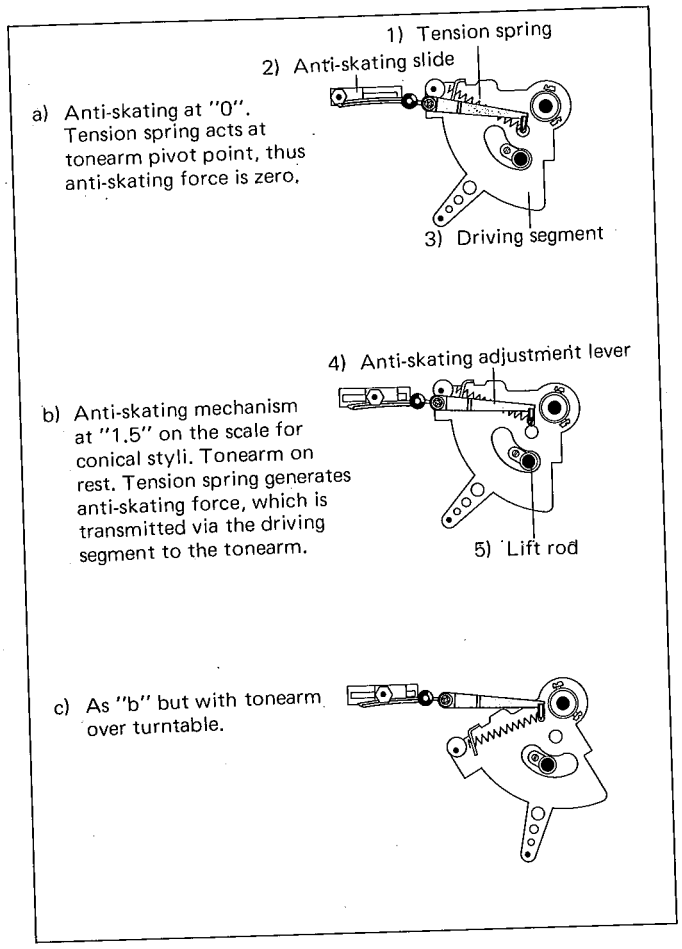
Both bearings require a small, barely noticeable play. Adjustment of the vertical bearing should be undertaken only at the left screw (threaded rod 60), and of the horizontal bearing at threaded rod (66). The horizontal tonearm bearing is correctly set when, at an antiskating setting of "0.5" (tonearm previously exactly balanced), the tonearm glides smoothly from the inside (center) to the outside without sticking.

Anti-skating device

The tendency of a tonearm with an offset (angled) head to "skate" inward across the record is largely eliminated in PE 3060 by a precision anti-skating mechanism.
Skating force depends on tonearm geometry, downward stylus force and the tip radius of the stylus. The inward pull on the tonearm caused by the skating effect gives rise not only to undesirable jumping of the tonearm when it is set down on the record either by hand or automatically, but also to unequal forces on the two opposite groove walls, with corresponding ill effects. This can be corrected with proper anti-skating adjustment such as a good Hi-Fi record player should possess.
By altering the position of the anti-skating slide on the cover (49), the adjusting lever (259) is moved. The opposing force exerted on the driving segment (261) by the tension spring (261), and thus on the tonearm, can be selected by reference to the red anti-skating scale (for conical styli) or the black scale (for elliptical styli).

Skating compensation is set at the factory for conical styli with a tip radius of 15 ± 2 µm or elliptical styli with measurements of 0.20 5/6 x 18/22 µm. Adustments should be attempted only by an authorized service agency.

Fig. 8 Anti-skating force

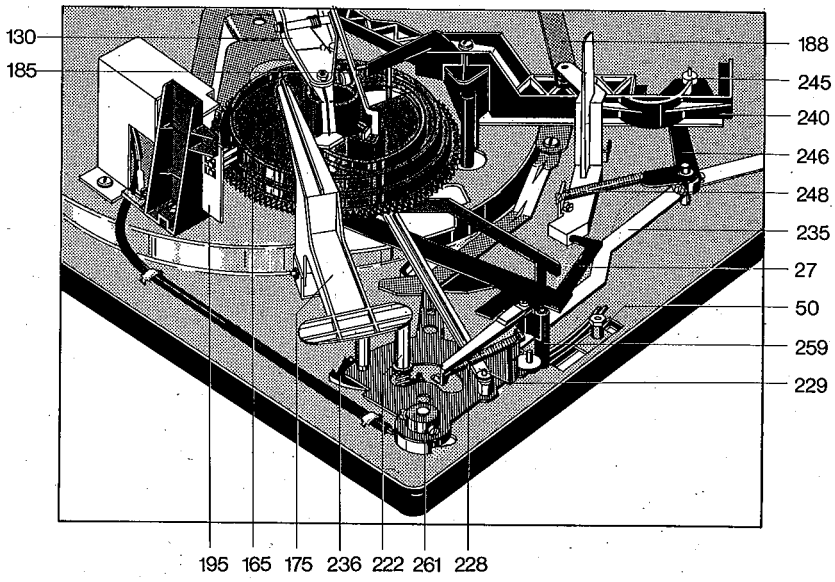


Fault	Cause	Remedy
Stylus skips	a) Tonearm not balanced	a) Balance tonearm
	b) Stylus downward force too low	b) Check tonearm balance, set stylus downward force to value recommended by cartridge manufacturer
	c) Anti-skating wrongly adjusted	c) Correct the anti-skating setting
	d) Stylus worn or chipped	d) Replace stylus
	e) Excessive friction in tonearm bearing	e) Check tonearm pivot. Both bearings should have barely noticeable play. Adjust vertical bearing only with the left bearing screw (60) and the horizontal bearing with screw (66). Horizontal bearing is correctly adjusted when the tonearm, with anti-skating set at "0.5", swings freely from center to outside, (tonearm previously balanced accurately).
	f) Guide roller (263) missing from shut-off rail	f) Replace roller (263).
Vertical movement of tonearm is impeded during set-down cycle	a) Bearing friction too high	a) Remove friction by adjusting bearing screw (60) and check arm balance.
	b) Driving segment (261) is impeded by other components	b) Align driving segment as described on page 5.

Tonearm movements

A guide groove located on the underside of the main cam (165) controls the automatic lift and set-down of the tonearm as the cam rotates through 360°. Tonearm lift and lowering are controlled by the main lever (175) and the lift rod (216). Horizontal movements are controlled by the main lever (175) and the segment (261). The tonearm position is adjusted automatically to suit 7", 10" or 12" discs. The upper part of the adjusting lever (24) is moved by control cam (165) to the operating range of the feeler pin (39), which rotates with the turntable (5). Depending on disc size, the pin is pressed in to a varying extent, thus controlling the return movement of the upper adjusting lever. The lower part of the lever (27) reduces the inward movement range of the tonearm (71) to suit the run-in groove position of the 7" or 10" records. When a 12" record is encountered, the detector arm (267) is restricted in its movement. The lower adjusting lever is then locked, and reduces the swivel movement of the tonearm to suit the 12" record.

Fig. 9 Tonearm guide mechanism



The following adjustment settings are essential for correct functioning, and should be observed during repair work:

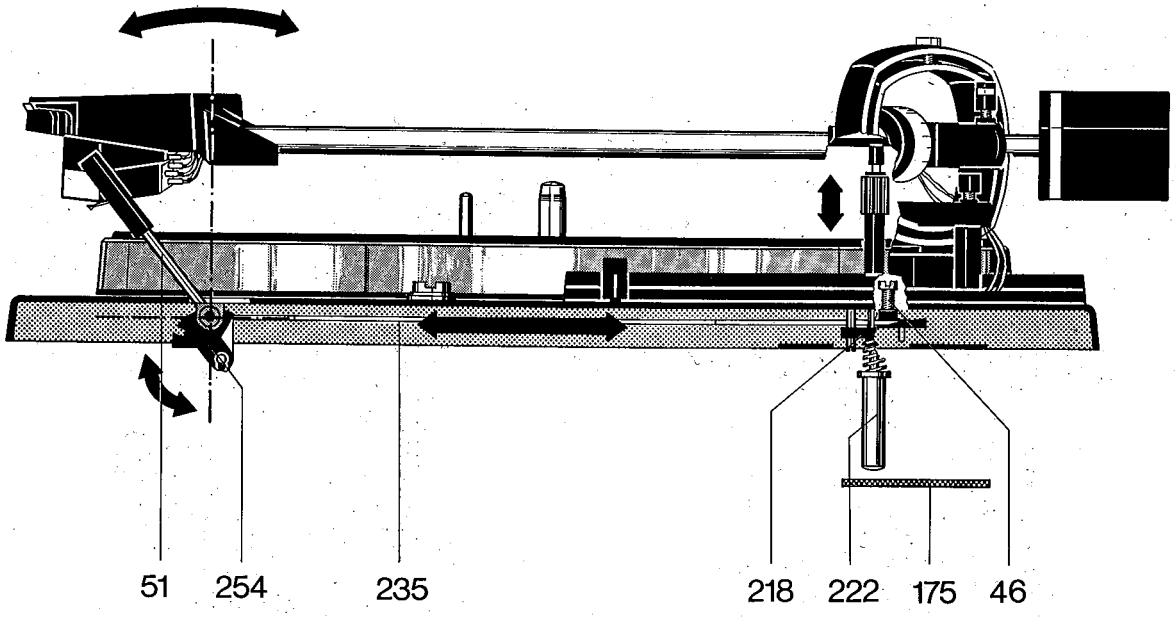
a) Gap between the upper disc of the cup bearing (126) and the top edge of the adjusting cam of the upper adjusting lever (24) should be 25.1 ± 0.1 mm.
Check gap with a depth gauge. Align by carefully bending the upper part of the adjusting lever (24) by a small amount.

b) The gap between the step end of the lower adjusting lever (27) and the driving segment stop pin (261) should be 2 ± 1mm.
Move the tonearm in until the stop pin and step end are opposite one another (control cam in rest position).
The lower adjusting lever should then be pressed lightly towards the driving segment, and the mechanism aligned by turning the guide pin on the lower part of the adjusting lever.

Tonearm lift (Cue control)

The tonearm lift permits the tonearm to be set down on the record safely at any desired point except the shutoff area (near the record label). Moving the handle (51) to the rear actuates the lift arm (254). This is coupled to the thrust rod (235), which transmits movement to the lift segment (236). The lift rod (216) is thus moved up its slide, and raises the tonearm.
After the tonearm is moved (by hand) to the desired spot on the record, the tonearm lift handle is lightly tapped towards the rear to release the mechanism. The connecting rod (235) is freed, and the coil spring (215 returns the lift rod to its normal position, allowing the tonearm to fall. The rate of fall is controlled by silicone oil in the lift tube. The height of the stylus above the record can be varied by adjusting setscrew (46). Turning it to the right increases the height, turning it to the left decreases the height between record and stylus.

Fig. 10 Tonearm lift (tonearm raised)



Fault	Cause	Remedy
Tonearm misses edge of record	a) Tonearm incorrectly adjusted	a) Adjust set-down as in operating instructions so that stylus touches record approximately 1.5 mm inside edge of record. Adjustment will be correct for other sizes if carried out for a 12" record.
	b) Automatic disc size selector out of adjustment	b) Align as described on page 7.
	c) Record not standard size	c) Use standard records
	d) Friction surfaces of tonearm clutch dirty	d) Clean friction surfaces
Tonearm does not move on to record when drop cycle is started	a) Damping too great; silicone fluid in guide tube dirty	a) Remove tonearm complete with bearing assembly (described on page 5). Remove slider (211) on lift rod spring washer (212), positioning sleeve (213) and second spring washer (214). Lift out lift rod. Clean guide tube and lift rod. Coat lift rod uniformly with "Wacker Silicon Oil AK 500 000". Re-assemble components.
	b) Spring guide of lift rod broken	b) Remove tonearm complete with bearings (described on page 5). Take off slider (211) on lift rod, remove spring washer (212), take off positioning sleeve (213) and second spring washer (214). Renew lift rod and reassemble components.
Tonearm lowers too quickly when drop cycle is started	Too little damping — wrong fluid added	Remove tonearm complete with bearing assembly (described on page 5). Remove slider (211) on lift rod spring washer (212), positioning sleeve (213) and second spring washer (214). Lift out lift rod. Clean lift rod. Coat lift rod uniformly with "Wacker Silicone Oil AK 500 000". Re-assemble components.

Start cycle

Moving the upper control lever (56) to "Start" initiates the following sequence:

a) The set screw of the lower control lever assembly (246) turns the switch arm (188), mounted on the grooved shaft (257). Via a tension spring, this actuates the idler carrier (111) and the idler (116) between the platter and the motor pulley (138). At the same time, the power switch (157) is actuated by the turntable begins to rotate.

b) The lower section of the control lever (246) also releases notched lever (240), which pushes the impact arm forwards. This brings the stop switch to the swing-in position. The cam on the rotating turntable (5) engages on the pushed-forward tip of the impact arm, and the control cam turns until the turntable pinion engages the control cam.

Fig. 11 Start position

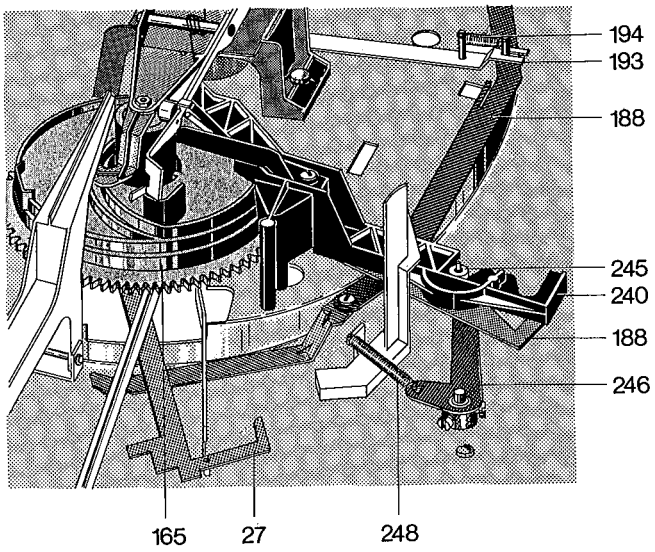
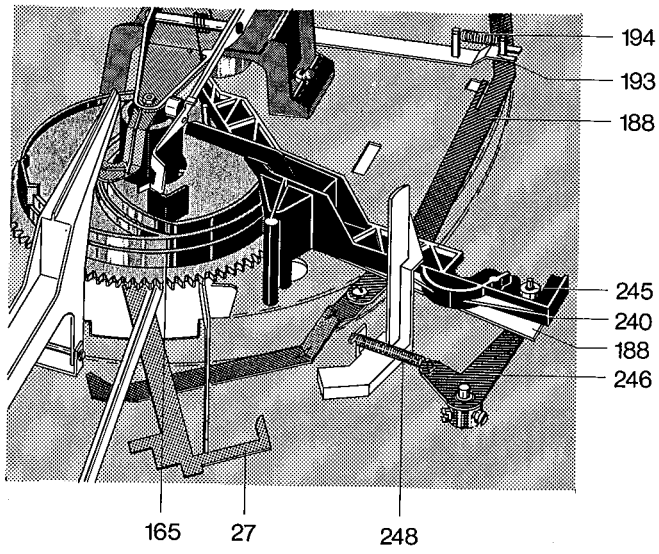


Fig. 12 Stop position



Manual start

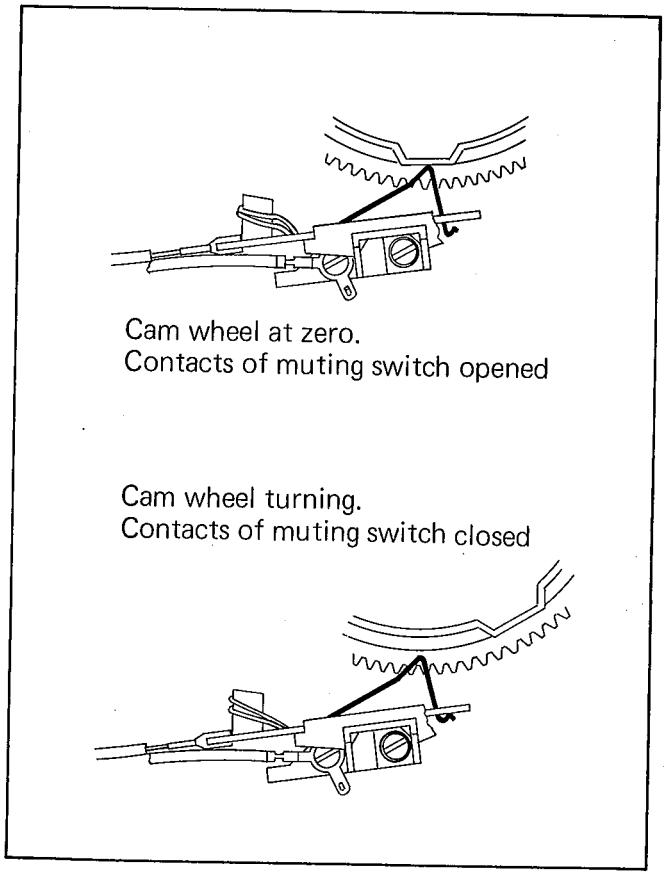
When the tonearm (71) is swung inward by hand, the driving segment (261) operates the switch-on arm (188) via the switch roller; the switch-on pawl (250) holds the switch-on arm in this position and the idler wheel (116) in contact with the turntable platter. The slide (193) linked with the switch-on arm (188) actuates the power switch and sets the turntable platter rotating.

On reaching the run-out groove, the tonearm automatically returns to its rest position and the unit shuts itself off. However, if the tonearm is lifted off the record manually and returned to the rest, the pawl notches are released. The torsion spring (184) then re-returns the switch-on arm to its initial position, opening the power switch and disengaging the idler wheel.

Stop switching

When the upper part of the control lever (56) is moved to "Stop" the stop arm (91) disengages the drop mechanism. This does not alter the setting of the stop switch (169). However, the main lever is diverted into the switch-off track of the control cam. This lifts the idler wheel (116) away from both the motor pulley (138) and the inner edge of the turntable, and opens the power switch.

Fig. 13 Muting switch



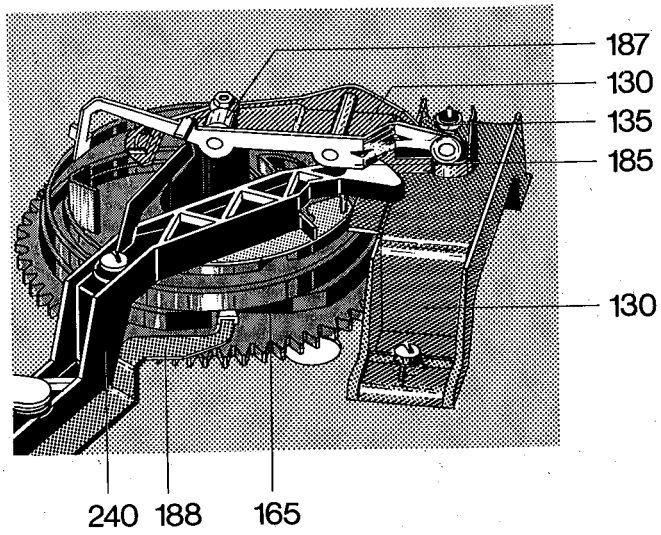
Muting switch

To prevent the noises of the change cycle from being sent through the audio system, the apparatus is fitted with a short-circuiting (muting) switch. The switch springs for both channels are actuated by the main cam. In the tonearm rest position, the muting switch of the pick-up lines is inoperative.
The muting contact springs should locate the control cam (165) in the rest position in such a way that the turntable pinion engages symmetrically in the tooth gap on the control cam (Fig. 13). To align, hold the control cam firmly, then move the muting switch in the retaining bracket (197) until the contact springs are precisely in the rest position.

Record drop

Insert the appropriate stacking spindle – AW 3 for standard records (7 mm center hole) or AS 12 for 45 rpm records (38 mm center hole). Record drop is initiated by a rotation of control cam (165), the drop cam of which actuates the drop arm (185) and thrust rod extension (133). The downward movement thus obtained causes a disc to be released from the changer shaft or column. The drop cam in the main cam is designed so that a record can drop only when the tonearm is above the tonearm rest and thus out of the reach of the largest possible record (12" diameter).

Fig. 14 Record drop



Shut-off and change cycle

The dog (M) on the turntable platter gear (PR) and the shut-off lever actuate both the change cycle at the end of the record as well as the shut-off after the last record in a stack is played.
At the end of a record, the tonearm moves towards the center at an accelerated rate due to the increased pitch of the grooves. This motion carries the shut-off lever towards the dog.
The eccentric dog pushes the shut-off lever back at each revolution as long as the tonearm advance is only one normal record groove (Fig, 15a).
The run-out groove with its steeper pitch moves the shut-off lever against the dog with greater force, engaging the shut off-lever (Fig. 15b).
The main cam (165) is thus driven out of its neutral position and engages the turntable platter gear (Fig. 15c).

Fig. 15 Actuating "change" or "shut-off"

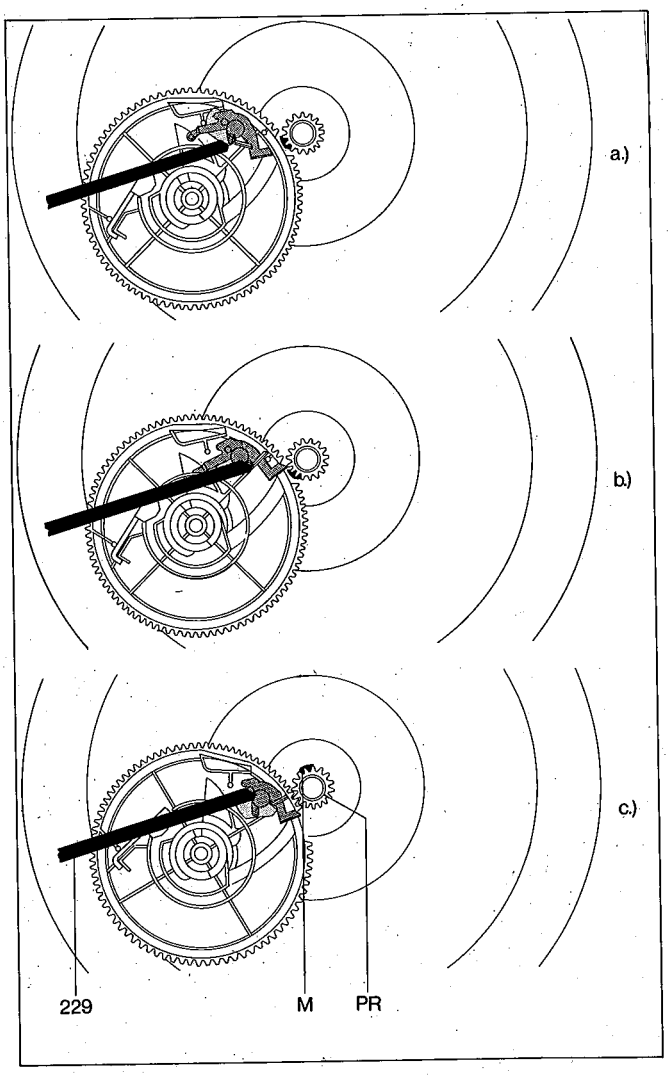
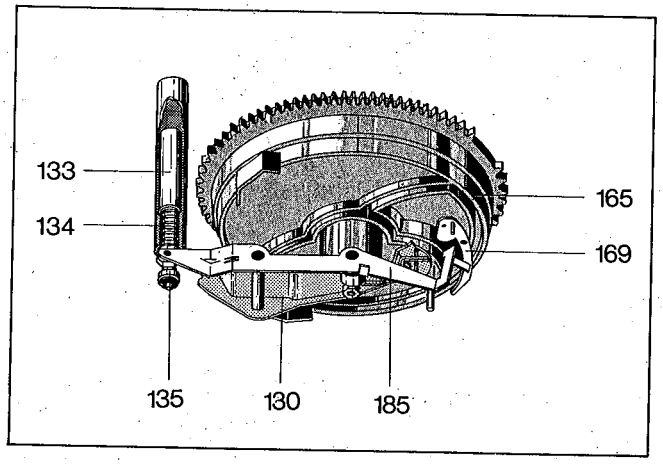


Fig. 16 Change cycle



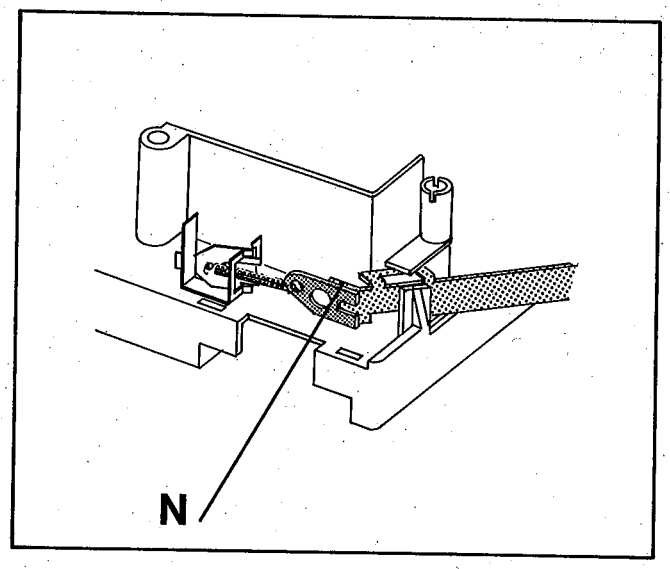
Shut-off mechanism

Shut-off and change functions are determined by the position of the stop switch (169). After every start or record-drop, the switch is brought to its stop position by the main lever (longer end towards the center of the main cam).
As the record is dropped, the switch is turned to its start position by the drop lever, so that the tonearm can swing in toward the record and be lowered on to it. If there are no more records on the spindle, and the drop lever cannot turn the stop switch, this remains in its stop position and allows the tonearm to swing to its rest position.

Fault

Turntable stops after automatic setdown of the tonearm on to disc.

Fig. 17



Cause

Power switch has been turned off.

Remedy

As the tonearm moves in, switch slide (153) must overtravel by about 0.3–0.5 mm. If necessary, re-align tab (N) in power switch.

Fault

Last record of stack keeps repeating.

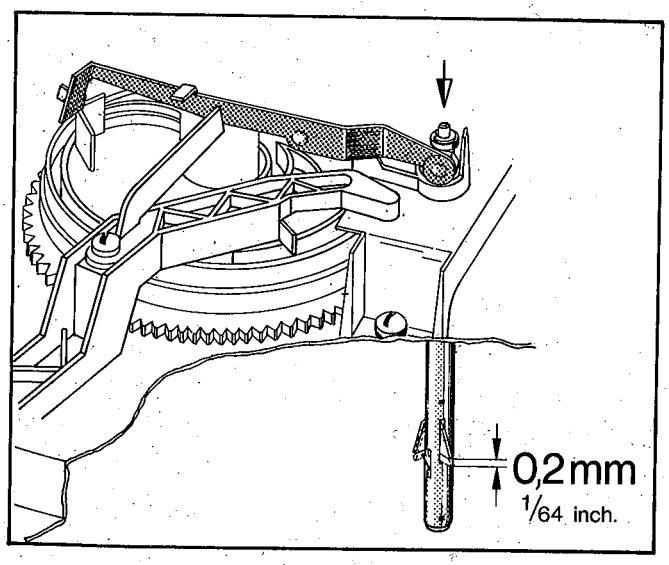
Cause

Defective spindle.

Remedy

Replace spindle.

Fig. 18



Fault

Records do not drop.

Cause

Drop arm has too little travel.

Remedy

Re-adjust eccentric so that when the three supports in the automatic spindle are held in and the main cam is at its neutral, pressing the change screw moves the support by about 0.2 mm.

Fault	Cause	Remedy
Tonearm moves with stylus force and anti-skating force at zero: a) outward	a) Anti-skating device out of adjustment	a) Adjust skating lever so that skating spring engages exact pivot center of tonearm. Check swing of anti-skating adjustment lever (259) 7.5 ± 0.5 mm between stops. Adjust by turning eccentric nut.
b) inward	b) Overtaut tonearm leads produce a twisting force	b) Allow some slack in tonearm leads
During disc change, stop and start operations, noises from the mechanism can be heard in system speaker	Muting switch maladjusted. Distance between contact springs and shorting contact is too great	Bend contacts so that in the neutral position of the main cam the spacing between springs and strips is about 0.5 mm. Clean contacts by spraying on solvent (e. g. "Kontact bl"), check alignment of strips.
No playback sound	Spacing between contact springs and strips too small, or gaps have closed.	Re-align contact strips until in the neutral position of the main cam the spacing is approx. 0.5 mm
Motor will not shut off when tonearm is on rest	Capacitor across power switch is defective (shortcircuited)	Replace capacitor in power switch (correct rating 10 000 pF, 700V).
Acoustic feedback	a) Chassis parts (for example leads) are touching base cut-out b) Connecting cables are too taut	a) Correct cut-out according to instructions supplied with unit. b) Allow more slack in cables, or lengthen.

Fault

Tonearm is hindered in its horizontal motion during change cycle.

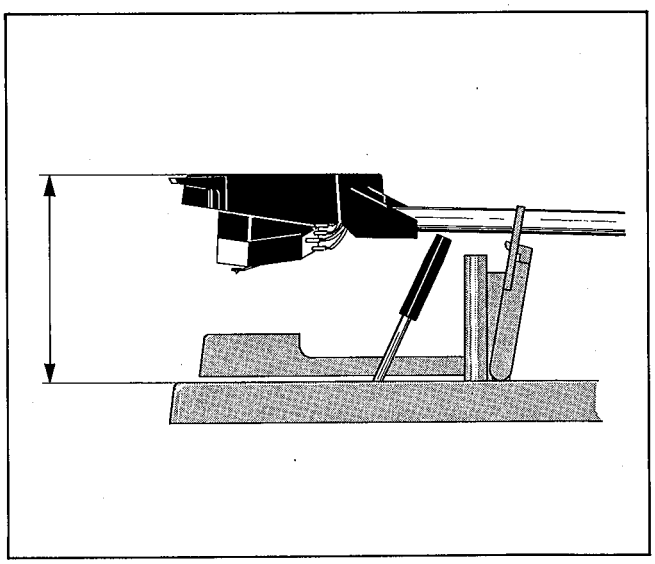
Cause

Positioning socket or positioning screw misadjusted.

Remedy

Re-align tonearm and reset lift height. Gap between upper edge of tonearm and chassis plate should be – 60 ± 0.5 mm when the main cam (165) has raised the tonearm. Adjust by turning the positioning sleeve. When using the tonearm lift, the gap between the upper edge of the tonearm and the chassis plate is 51 ± 2 mm.
Adjust the positioning screw (46).

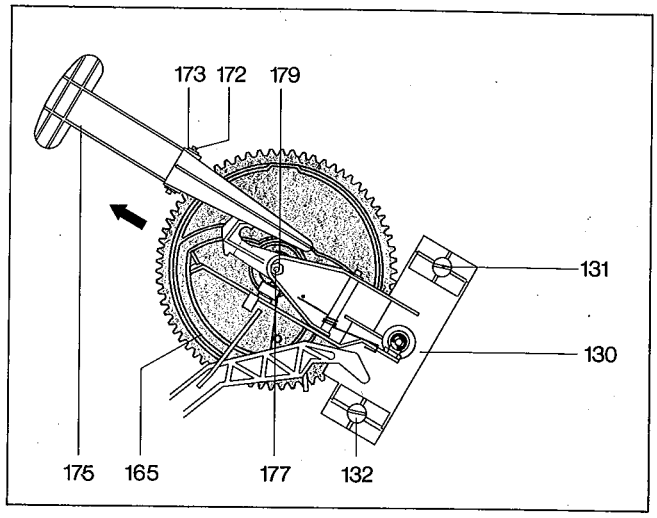
Fig. 19



Changing control cam

Remove spring washer (173) and pivot pin (172) .Take off main lever (175). Loosen nuts (179) and (47), then remove retaining screws (131) and (132) and cup bearing bracket (130).
Pull out the pivot pin (177) and remove the control cam (165) sideways.
Install in the reverse order of working.

Fig. 20



Fault

Tonearm head is not parallel to turntable platter.

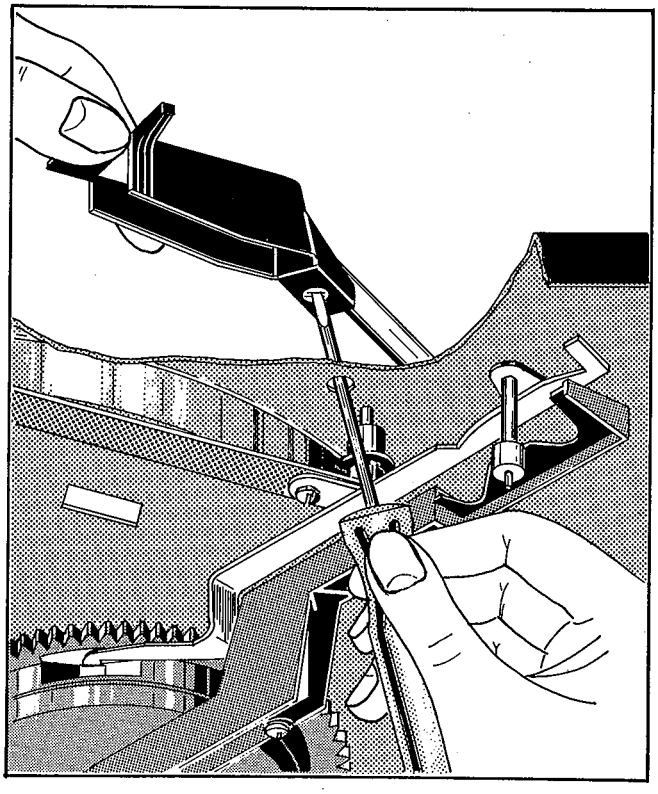
Cause

Orientation of tonearm head on tonearm tube has altered because of jolting in transport (shipping).

Remedy

Remove turntable platter with the help of a screwdriver inserted through the hole in the chassis placed there for the purpose. Loosen screw on tonearm head. After correcting the tonearm head, tighten screw. (Fig. 21).

Fig. 21



Replacement parts

Ref.No.	Part.No.	Description	Quantity	
1	224 037	Automatic spindle AS 12	1	
2	213 895	Changing spindle AW 3	1	
3	257 046	Turntable mat, compl.	1	
4	253 690	Protecting felt	1	
5	257 045	Turntable compl. with mat	1	
6	253 460	Idler arm, compl.	1	
7	257 112	Retaining ring	1	
8	253 559	Fine lever	1	
9	253 784	Friction spring	1	
10	214 047	Neck screw	2	
11	210 624	Washer 4.2/7/3.0 St	4	
12	200 718	Compression spring	2	
13	210 624	Washer 4.2/7/3.0 St	4	
14	201 632	Rubber washer	2	
15	200 713	Washer	2	
16	200 712	Spring cup	2	
17	200 711	Lockwasher	2	
18	214 210	Shipping screw assembly	2	
19	257 057	Spring mounted footing compl. (1 set = 3 pieces)	1	
20	210 145	"C" washer 2.3	1	
21	250 303	Washer 12/4.2/1.2	1	
22	250 069	Compression spring for lever	1	
23	253 554	Strip fuse	1	
24	253 456	Lever-upper part, compl.	1	
25	250 798	Over hose	1	
26	250 077	Tension spring for lever	1	
27	257 015	Lever base, compl.	1	
28	250 304	Washer 8/3.2/1.5	1	
29	252 503	Bearing bolt	1	
30	253 656	Friction sleeve	3	
31	253 657	Suspension spring	3	
32	253 658	Damping rubber	3	
33	253 659	Spring pot	3	
34	210 366	Hex nut BM 4	3	
35	220 213	Centering disc	1	
36	259 982	Centering pin SA 1	1	
37	250 116	Fuse ring for turntable	1	
38	257 048	Washer	1	
39	257 047	Feeler pin, compl.	1	
40	210 446	Machine srew M 2.6 x 3.5	1	
41	256 792	Washer 2.8	1	
42	257 058	Pic-up heat	1	
43	256 791	Holding plate	1	
44	251 332	Name plate PE	1	
45	257 071	Trimplate	1	
46	253 542	Stop screw for spindle	1	
47	210 360	Hex nut M 3	2	
48	253 750	Knob for antiskating	1	
49	257 055	Cover, compl.	1	
50	257 059	Gate for antiskating	1	
51	253 509	Arm lift lever, compl.	1	
52	213 260	Pin 2 x 6	3	
53	257 063	Chassis board, compl.	1	
54	257 051	Tonearm rest, compl.	1	
55	257 110	Flat head screw AM 3 x 5	1	
56	253 484	Operating lever-upper part	1	
57	257 050	Sound head, compl.	1	
58	257 083	Supporting plate	1	
59	216 831	Stop nut	1	
60	221 486	Threaded rod	2	
61	257 193	Control nut	1	
62	257 052	Internal bearing ring, compl.	1	
63	216 829	Bearing screw	1	
64	257 054	External bearing ring, compl.	1	
65	216 834	Stop nut, high	1	
66	221 486	Threaded rod	2	
67	223 146	Protecting spring	1	
68	257 056	Weight compl.	1	
69	253 778	Pin for weight	1	
70	253 734	Set screw	1	
71	257 049	Tonearm, compl.	1	
72	257 053	Spring barrel, compl.	1	

Fig. 22 Exploded view, parts above chassis

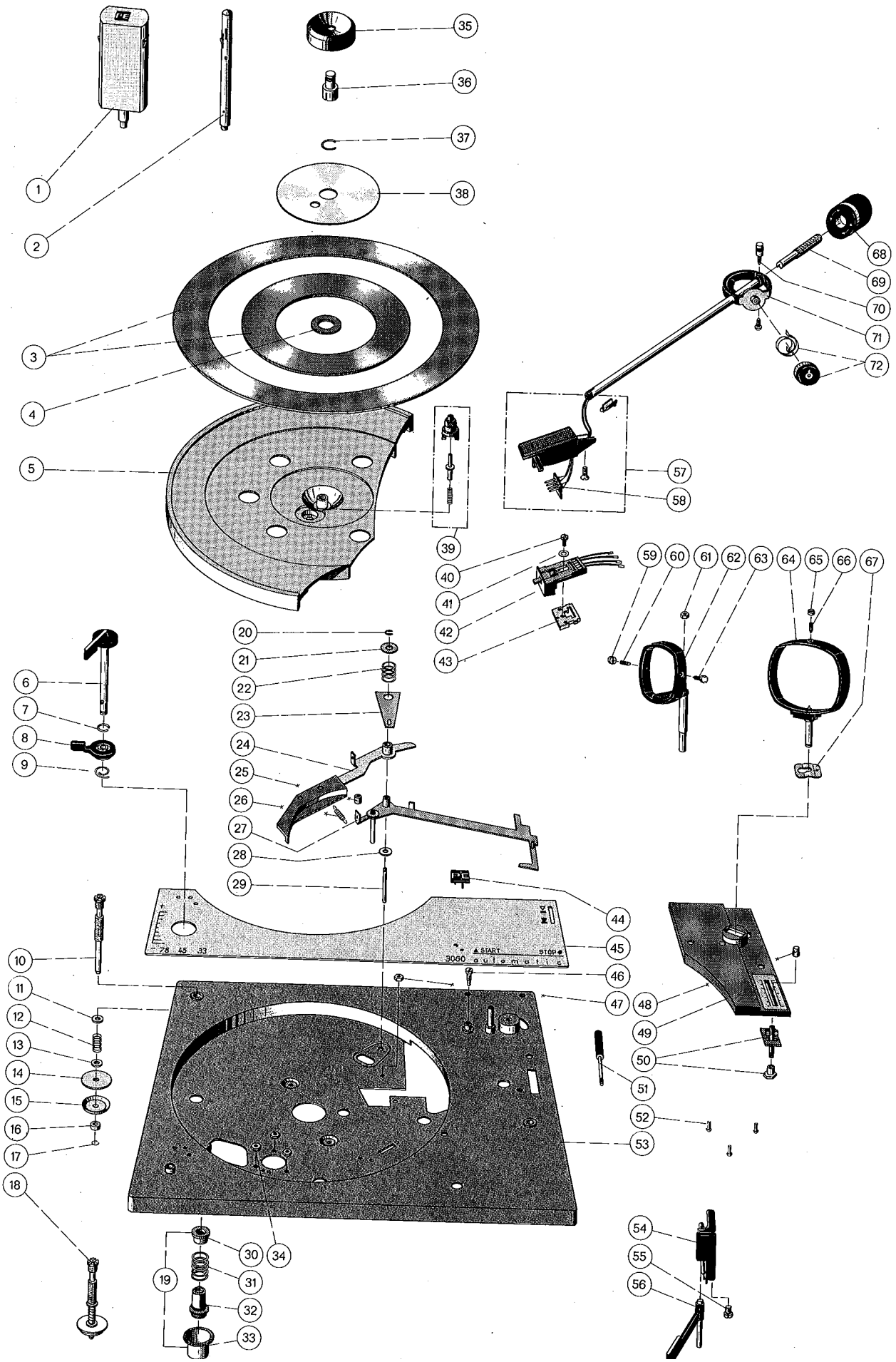
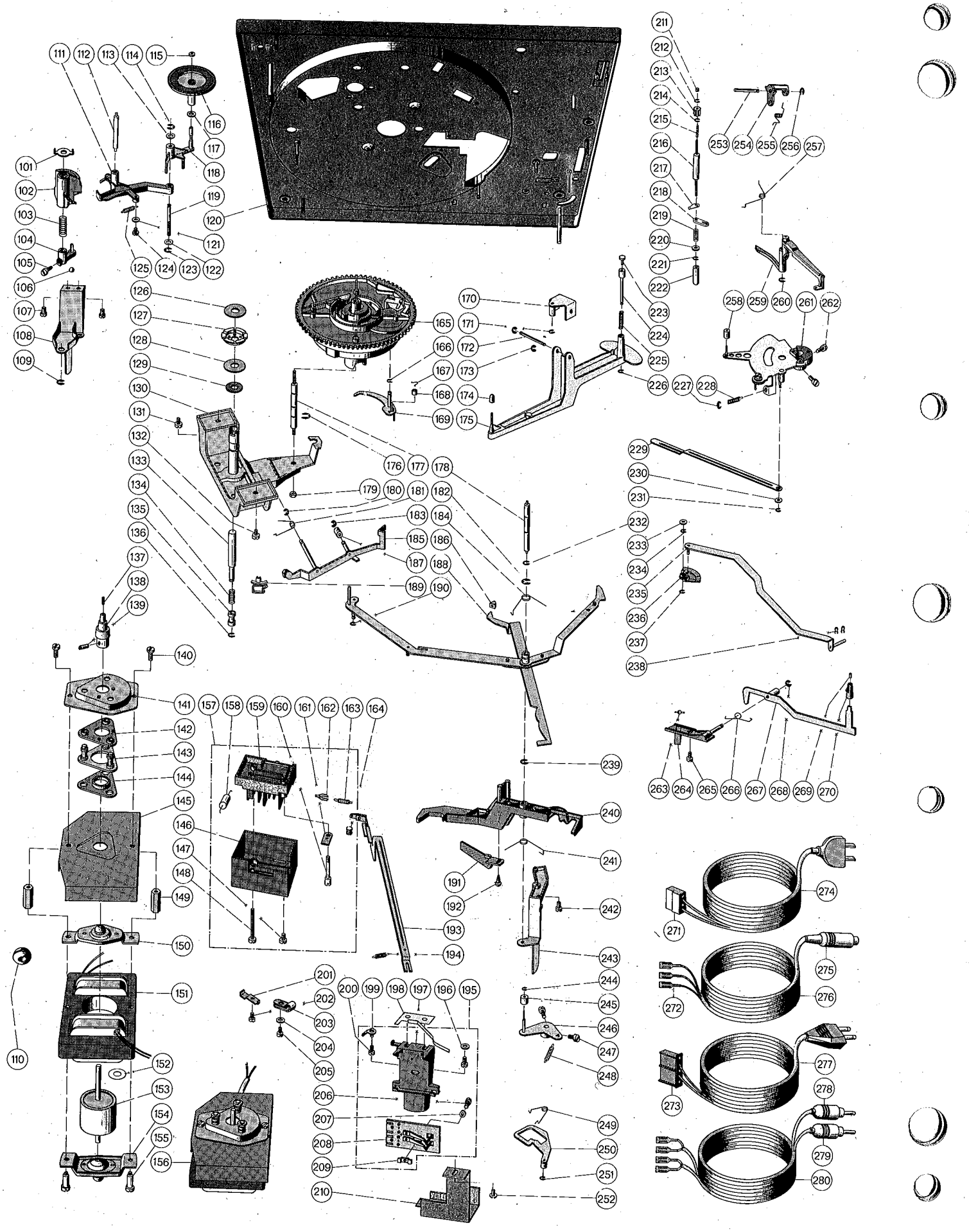


Fig. 23 Exploded view, parts below chassis



Pos.No.	Part.No.	Description	Quantity	
101	253 560	Set lever	1	
102	253 561	Change curve for speed	1	
103	250 111	Compression spring	1	
104	253 562	Driver	1	
105	210 480	Machine screw AM 3 x 6	1	
106	257 111	Steel ball 4 mm Ø h 5	1	
107	227 402	Flat head screw AM 3 x 4	2	
108	257 108	Retainer	1	
109	210 147	"C" washer 4	1	
110	209 939	Sleeving	1	
111	253 476	Friction wheel support, compl.	1	
112	256 955	Bearing spindle	1	
113	250 166	Washer	2	
114	210 145	"C" washer 2.3	1	
115	250 299	Sliding washer	2	
116	257 067	Friction wheel, compl.	1	
117	250 358	Sliding washer	1	
118	253 477	Friction wheel strip	1	
119	252 324	Bearing bolt for friction wheel strip	1	
120	257 063	Chassis plate, compl.	1	
121	257 109	Washer 3.2	1	
122	250 166	Washer	2	
123	210 145	"C" washer 2.3	2	
124	227 402	Flat head screw AM 3 x 4	1	
125	250 112	Tension spring	1	
126	253 614	Upper sliding washer	1	
127	253 613	Ball cage, compl.	1	
128	253 612	Lower sliding washer	1	
129	200 643	Rubber washer	1	
130	253 495	Washer bearing brace, compl.	1	
131	257 117	Flat head screw AM 4 x 8	2	
132	257 117	Flat head screw AM 4 x 8	2	
133	253 716	Shearing pol elongation	1	
134	213 920	Compression spring	1	
135	253 713	Guide wheel	1	
136	210 145	"C" washer 2.3	1	
137	217 751	Threaded pin M 2.6 x 8	1	
138	218 273	Motor pulley 50 Hz	1	
	218 274	Motor pulley 60 Hz	1	
139	210 220	Threaded pin M 2.6 x 3.5	1	
140	210 509	Machine screw AM 3.5 x 8	2	
141	204 669	Protection	1	
142	204 668	Isolation mount plate	1	
143	222 306	Mounting bracket, compl.	1	
144	222 283	Isolation washer lower	1	
145	204 665	Motor shield	1	
146	227 217	Switch cover with voltage selector	1	
	227 218	Switch cover less voltage selector	1	
147	210 480	Machine screw AM 3 x 6	1	
148	210 501	Machine screw AM 3 x 35	1	
149	200 167	Motor spacer	2	
150	215 843	Motor bearing top compl.	1	
151	228 495	Stator 110/220 V, compl.	1	
152	215 839	Protecting washer	1	
153	218 389	Rotor, compl.	1	
154	215 840	Motor bearing top, compl.	1	
155	215 848	Screw bolt	2	
156	228 494	Synchron-motor T 501 M 1218 S 110/220 V, compl.	1	
157	227 222	Power switch, compl. with voltage selector	1	
	227 224	Power switch, compl. less voltage selector and SEMKO capacitor	1	
158	223 603	Capacitor 10 nF/1000 V	1	
	223 633	SEMKO capacitor	1	
159	227 215	Switch plate, compl. with voltage selector	1	
	227 214	Switch plate, compl. less voltage selector	1	
	227 216	Switch plate, compl. with voltage selector and SEMKO capacitor	1	
160	224 183	Screw bolt	1	
161	223 617	Holding-down clamp	1	
162	219 200	Snap spring	1	
163	213 968	Tension spring	1	
164	223 621	Roller	1	
165	257 065	Control cam, compl.	1	
166	210 144	"C" washer 1.9	1	
167	252 544	Sweep spring	1	
168	251 013	Damping rubber	1	
169	253 467	Stop branch, compl.	1	

Pos.No.	Part.No.	Description	Quantity	
170	257 025	Transport lever bearing	1	
171	210 145	"C" washer 2.3	1	
172	252 512	Bearing bolt	1	
173	210 145	"C" washer 2.3	2	
174	253 632	Friction mat	1	
175	253 459	Transport lever, compl.	1	
176	210 148	"C" washer 5	1	
177	253 552	Bearing bolt for control cam	1	
178	253 621	Bearing bolt for selector lever	1	
179	210 360	Hex nut M 3	2	
180	210 146	"C" washer 3.2	1	
181	250 109	Torsion spring	1	
182	210 149	"C" washer 6	1	
183	210 144	"C" washer 1.9	1	
184	253 782	Torsion spring	1	
185	257 021	Damp lever	1	
186	253 722	Friction mat	1	
187	253 616	Roller for damp lever	1	
188	253 447	Selector lever, compl.	1	
189	257 167	Holder for cable	2	
190	210 145	"C" washer 2.3	1	
191	253 627	Stop lever	1	
192	210 285	Philips sheet metal screw with cross head B 2.9x9.5	1	
193	253 506	Switch slide	1	
194	250 121	Tension spring	1	
195	257 064	Muting switch, compl.	1	
196	210 586	Washer 3.2	1	
197	253 634	Angle for muting switch	1	
198	253 558	Reset spring	1	
199	257 166	Solder lug	1	
200	257 118	Flat head screw AM 3 x 8	2	
201	200 447	Cable clamp	1	
202	257 110	Flat head screw AM 3 x 5	1	
203	220 152	Mounting clip	1	
204	210 586	Washer 3.2	1	
205	257 110	Flat head screw AM 3 x 5	1	
206	257 110	Flat head screw AM 3 x 5	1	
207	257 109	Washer 3.2/8/0.5	1	
208	253 474	Muting switch	1	
209	253 635	To bolt flat	1	
210	253 709	Shielding angle for muting switch	1	
211	253 549	Sliding mat	1	
212	210 143	"C" washer 1.5	2	
213	218 318	Set housing for lifting bolt	1	
214	210 143	"C" washer 1.5	2	
215	256 931	Tension spring	1	
216	257 069	Lift rod, compl.	1	
217	253 686	Leaf spring for lift rod	1	
218	253 580	Fuse strip	1	
219	256 749	Tension spring	1	
220	257 038	Spring lead	1	
221	210 143	"C" washer 1.5	1	
222	257 106	Pressure housing	1	
223	252 482	Sliding mat	1	
224	253 633	Friction bolt	1	
225	250 108	Tension spring	1	
226	210 143	"C" washer 1.5	1	
227	201 184	Selector washer	1	
228	253 758	Antiskating spring	1	
229	253 553	Trip link	1	
230	250 323	Washer	1	
231	210 143	"C" washer 1.5	1	
232	210 145	"C" washer 2.3	1	
233	253 544	Washer	1	
234	210 143	"C" washer 1.5	2	
235	253 517	Drive rod, compl.	1	
236	253 783	Drive segment	1	
237	210 143	"C" washer 1.5	2	
238	257 113	Fuse ring	2	
239	210 145	"C" washer 2.3	1	
240	253 457	Stop lever, compl.	1	
241	253 681	Torsion spring	1	
242	210 480	Machine screw AM 3 x 6	1	
243	253 555	Brace angle	1	
244	210 142	"C" washer 1.2	1	
245	252 524	Switch roller	1	
246	257 070	Adjusting lever lower, compl.	1	

Pos.No.	Part.No.	Description	Quantity	
247	257 114	Machine screw AM 3 x 5	2	
248	250 107	Tension spring	1	
249	253 667	Torsion spring	1	
250	257 107	Switch latch	1	
251	210 145	"C" washer 2.3	1	
252	210 472	Flat head screw AM 3 x 5	1	
253	250 013	Bearing bolt for lift lever	1	
254	253 582	Lift lever	1	
255	253 584	Torsion spring	1	
256	210 145	"C" washer 2.3	1	
257	253 757	Torsion spring	1	
258	253 551	Spead roller	1	
259	253 515	Antiskating set lever, compl.	1	
260	210 145	"C" washer 2.3	1	
261	257 062	Driver segment	1	
262	257 110	Flat head screw AM 3 x 5	2	
263	252 474	Guide pulley	1	
264	253 466	Bearing plate	1	
265	227 402	Flat head screw AM 3 x 4	1	
266	250 110	Torsion spring	1	
267	257 060	Scanning lever, compl.	1	
268	210 144	"C" washer 1.9	1	
269	252 538	Scanning felt	1	
270	253 593	Scanning rod	1	
271	209 457	Inner casing for AMP plug	1	
272	209 436	Plug cover	3	
273	213 980	Socket housing	1	
274	200 604	Power cable compl. with flat plug	1	
275	209 424	Miniatur plug for audio cable	1	
276	250 555	Audio cable with miniatur plug	1	
277	220 142	Power cable, compl.	1	
278	209 426	RCA type plug yellow	1	
279	209 425	RCA type plug red	1	
280	250 565	Phono plug compl. with RCA type plug and earth lead	1	
**	250 360	Stroboscope disc	1	
**	253 719	Mounting instructions		
**	257 154	Shipping carton		
**	253 773	Operating instructions, 4 languages		

** Parts not ilustrated

Alterations reserved

Own notices

Lubrication

All bearings and sliding points have been properly lubricated during assembly. Relubrication is normally not necessary for about two years since all important bearings are provided with oil retainers (motor bearings).

Lubrication should be applied sparingly. It is of primary importance thet no oil or grease should get onto the friction surfaces of the drive wheel, motor pulley or turntable, to avoid slippage. For the same reason, avoid touching these parts.

Chemical reactions often occur between different lubricants and cause their breakdown. To avoid this risk, always use the following recommended lubricants if possible.

Fig. 24 Lubrication points above chassis

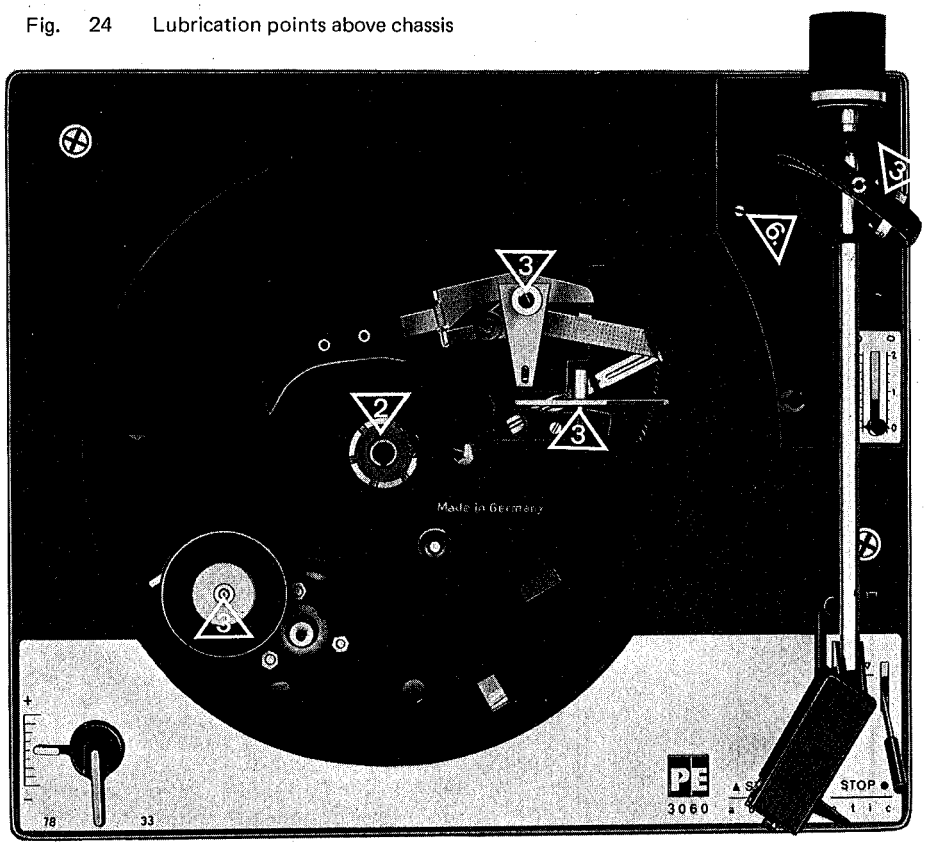
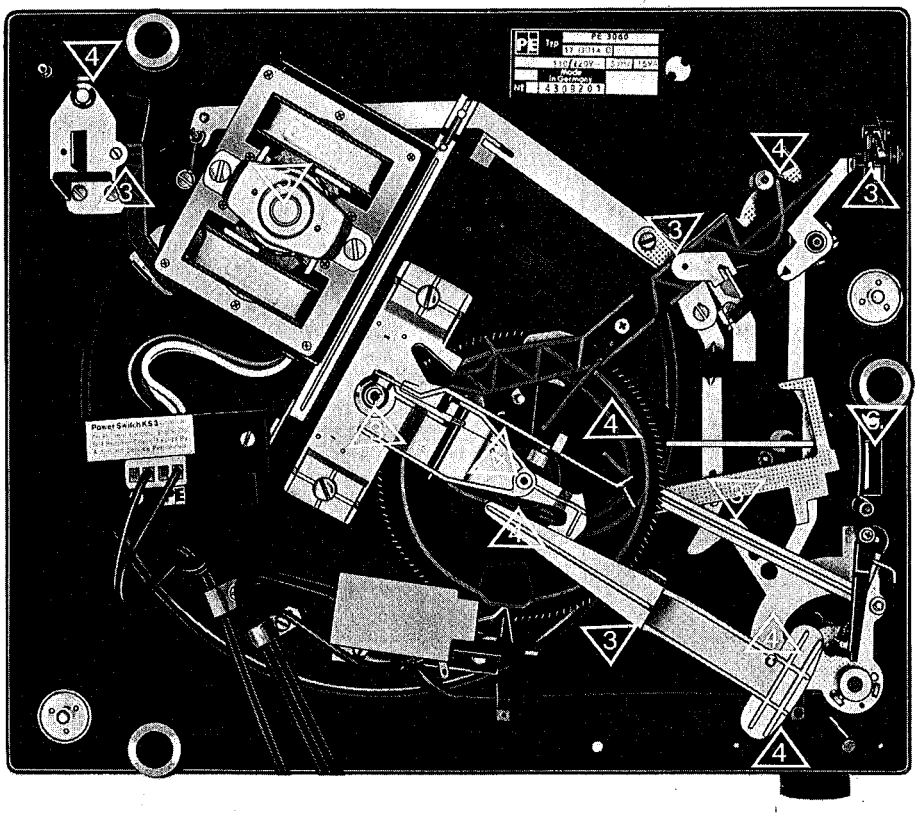


Fig. 25 Lubrication points below chassis



2 Renotac No. 342
High-grip oil

3 BP Super Viscostatic
10 W / 30 oil

4 Shell Alvania No. 2

5 Isoflex PDP 40

6 AK 500 000 silicone oil

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