BANG & OLUFSEN A/S
DK - 7600 STRUER
DENMARK

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CABLE ADRESS BANGOLUF

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Form. 7307

Bang & Olufsen

BEOGRAM 1102 - 1902

TYPE 5715 - 5711

SERVICE MANUAL

INTRODUCTION

Beogram 1102 and 1902 are developed on the basis of earlier record players using radial pickup arms: Beogram models 3400, 1900, and 1100. Like Beogram models 4002 and 6000, they employs a tacho-controlled DC motor and associated electronics. The turntable is driven by a flat belt.
The PC unit has position numbers, printed on the component side.
This service manual is complete with description, parts list and circuit diagram.

CONTENTS SEC.

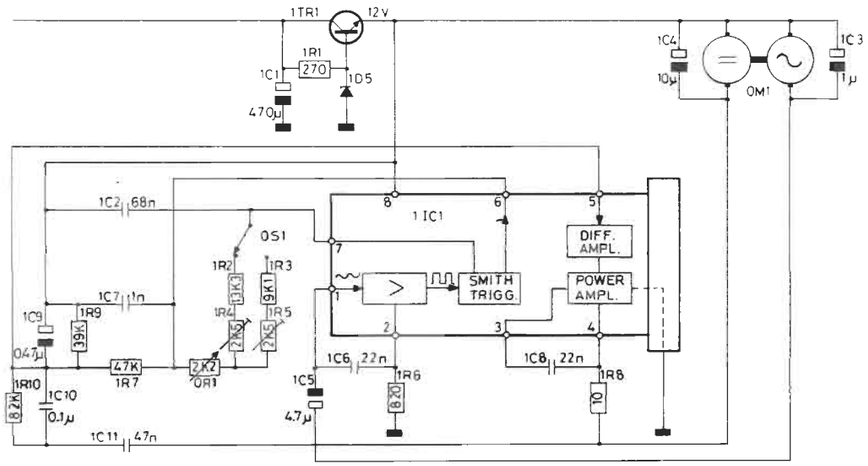
TECHNICAL DATA	BEOGRAM 1102	BEOGRAM 1902
Type No.	**5715**	**5711**
Sound system	Stereo, matrix	Stereo, matrix
Output DIN	2 x 6 mV/47 kohms	2 x 6 mV/47 kohms
Speeds	33 - 45 rpm	33 - 45 rpm
Tonearm	Radial	Radial
Automatic record-size	Yes, 17 and 30 cm	Yes, 17 and 30 cm
Automatic pickup movement	Yes	Yes
Automatic speed selection	Yes	Yes
Wow and flutter, DIN	< ± 0.09%	< ± 0.06%
Wow and flutter, WRMS	< ± 0.045%	< ± 0.03%
Rumble DIN unweighted	> 42 dB	> 43 dB
Rumble DIN weighted	> 62 dB	> 63 dB
Speed deviation	< 0.05%	< 0.05%
Speed control range	> ± 3%	> ± 3%
Stylus pressure range	0 - 2 gram	0 - 2 gram
Tracking error	0.126°/cm	0.126°/cm
Lift system	Mechanical	Mechanical
Antiskating	Yes, automatic	Yes, automatic
Motor	Servo controlled DC	Servo controlled DC
Drive system	Flat belt	Flat belt
Turntable	30 cm 0.5 kg	30 cm 0.8 kg
Dust cover	Hinged	Hinged
Power supply	220 (110 - 130 - 240) volts	220 (110 - 130 - 240) volts
Frequency	50 - 60 Hz	50 - 60 Hz
Power consumption	8 watts	8 watts
Dimensions W x H x D	44 x 8.5 x 33 cm	44 x 8.5 x 33 cm
Weight	6 kg	6 kg
Pickup	MMC 3000	MMC 4000
Stylus	Diamond Spherical	Elliptical naked diamond
Radius of curvature	15 µm	5 x 17 µm
Frequency range	20 - 20.000 Hz +2 —3 dB	20 - 25.000 Hz ± 1.5 dB
Channel separation 1000 Hz	> 20 dB	> 25 dB
400 - 10.000 Hz	> 15 dB	> 20 dB
Channel difference	< 2 dB	< 1.5 dB
Intermodulation	< 1%	< 1%
Recommended stylus pressure	1.2 gram	1 gram
Compliance	25 x 10^{-6} cm/dyn.	30 x 10^{-6} cm/dyn.
Effective tip mass	0.5 mg	0.4 mg

Subject to change without notice

ELECTRICAL DESCRIPTION

The turntable is driven by a tacho-controlled DC motor. In principle the circuit is identical to the tacho control in Beogram 4002 - 6000 type 5511 to 5514.

A generator in the motor furnishes an AC voltage whose frequency is dependent on the motor speed. This AC voltage is via 1C5 fed to pin 1 off 1IC1. The AC voltage is converted into a square which is passed on to a Schmitt trigger. The frequency of the square, dependent on the motor speed, controls one of the output levels of the Schmitt trigger, the other output level is controlled from a variable time constant consisting of 1C2, 1R2, 1R4, and 0R1 for 33 r.p.m., and 1C2, 1R3, 1R5, and 0R1 for 45 r.p.m.

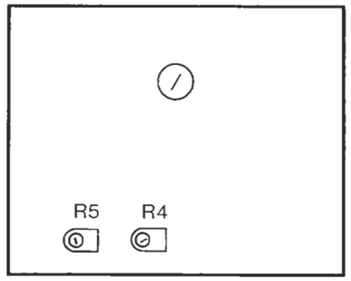


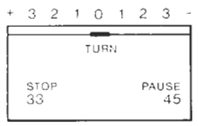
The output signal of the Schmitt trigger (pin 6) is integrated across 1R9 - 1C9 and fed to pin 5 which is differential amplifier. The integrated signal at pin 5 will be a DC voltage which varies with the motor speed. This DC voltage is fed via the differential amplifier. The power amplifier is connected as a variable resistor to chassis potential. 1C11 - 1C10 - 1R10 provide negative feedback for the power amplifier, preventing "overregulation".

1R8 is connected as current limiter in series with the motor to prevent the motor from catching when starting up.

ADJUSTMENTS

Speed adjustment



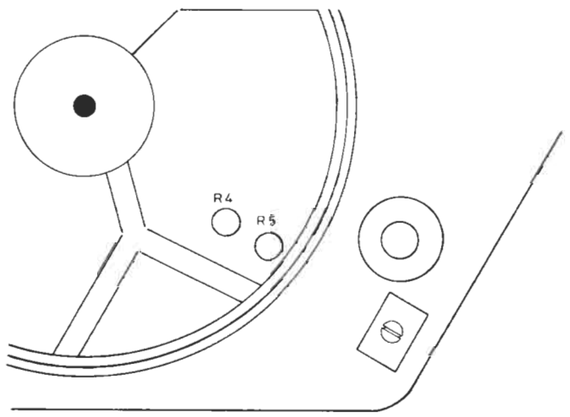


Set the scale for speed adjustment to 0.
Adjust 33 rpm with potentiometer 1R4.
Adjust 45 rpm with potentiometer 1R5.

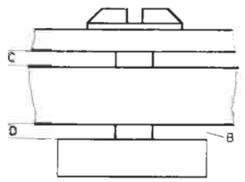
Speed can be checked in more than one way.

1. Stroboscope disc and a lamp connected to the mains. This check has an inherent uncertainty af approx. 2% since the mains frequency deviates by approx: ± 1 Hz at 50 Hz.
2. Stroboscope disc and stroboscope lamp. This gives an accuracy corresponding to the tolerance of the stroboscope lamp, usually much better than that of the mains frequency.

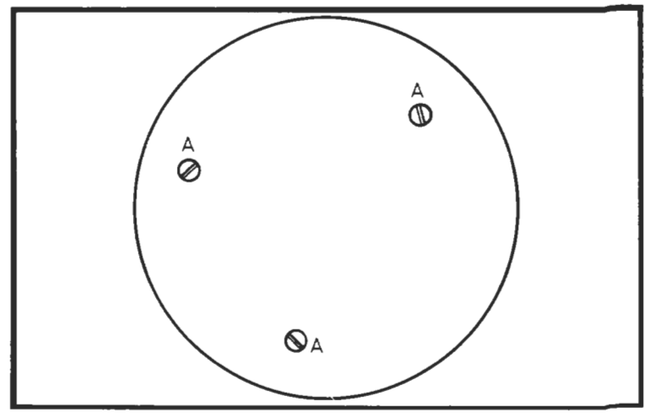
NB. 1R4 und 1R5 may be adjusted from above.
Dismount the turntable and the black washer on the flywheel.
See fig. 1.



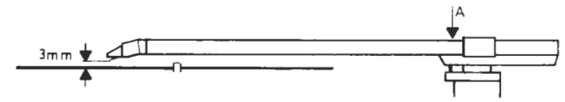
Chassis Height



Place the turntable and two weight-wise normal LP records on it.
The chassis should then float freely from all three transit bushings (see points B).
The turntable should likewise be parallel with the cover plate.
Adjustments are performed with screws A.

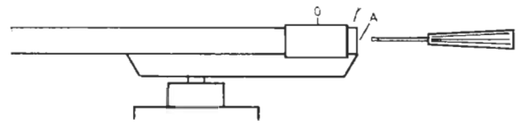


Pickup Height



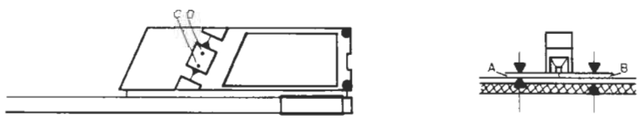
Put a record on the turntable.
Place the pickup arm above the run-off groove.
Adjust the screw A until the distance from the stylus to the record is 3 mm.
Adjustment is performed with a counterbalance weight inserted.

Pickup Arm Balance



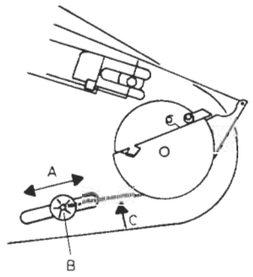
Set the stylus-force adjustment slider to the 0 position.
Adjust screw A until the pickup arm is only just in balance.
Thereafter set the stylus force to the recommended value.

Pickup Parallelism



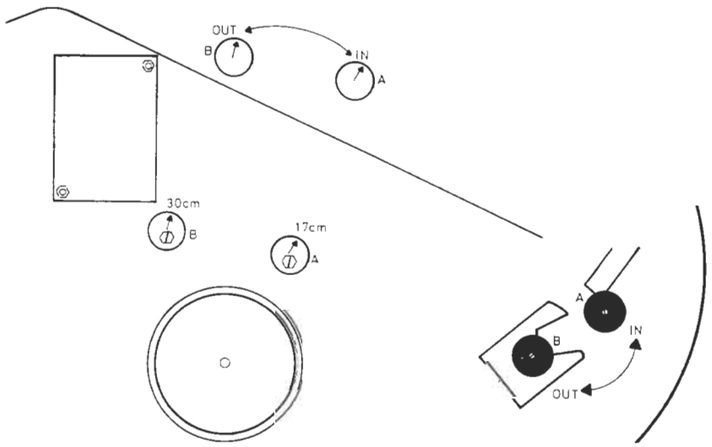
With screws C and D adjust so that distances A and B are identical and the plane portion of the pickup is parallel with the top side of the record.
Adjustment is performed with a counterbalance weight inserted.

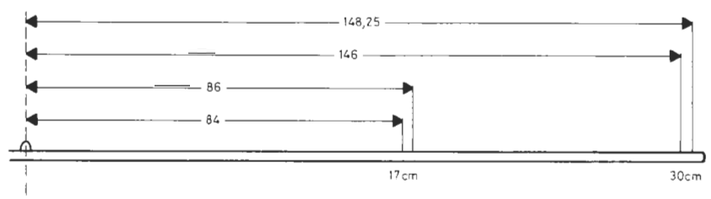
Antiskating



Put test record 3621004 on the turntable.
Set stylus force to 1.2 grams with MMC 3000 and to 1 gram with MMC 4000.
Play cut 1.
Connect oscilloscope to right and left channels.
Push arm B in direction of arrow A until the same amount of distortion is present in both channels (in case of distortion in left channel, slacken spring C; for right channel, tighten the spring).
Check:
Set stylus force to 1.4 grams with MMC 3000 and to 1.2 grams with MMC 4000.
Again play cut 1 with oscilloscope connected to right and left channels; no distortion should occur.

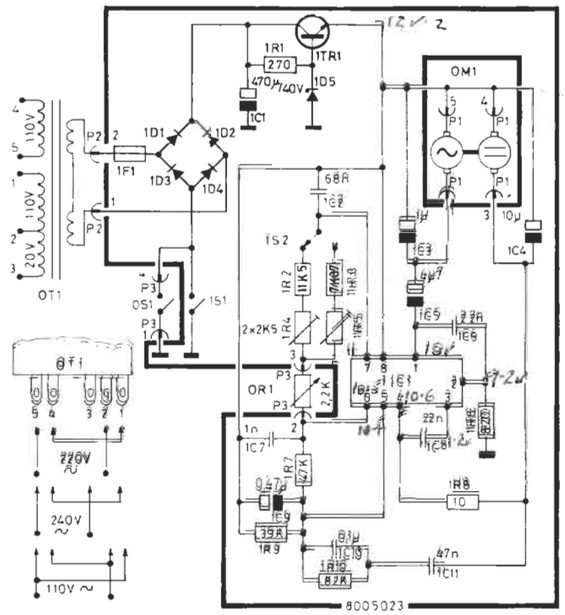
Pickup Arm Landing

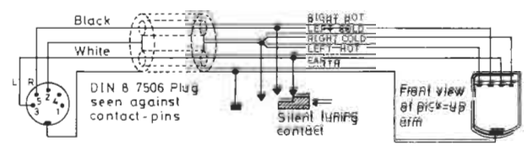




With "45" activated, adjust excentric A so that the pickup when travelling in automatically will lower into the field marked 17 cm in the sketch above. Excentric B should be adjusted so that the pickup lowers into the field marked 30 cm with "33" activated.

DIAGRAM





ELECTRICAL PARTS LIST

PC 1 8005023

1R1	5010000	270 Ohms 5% 1/8W
1R2	5020114	11K5 Ohms 1% 1/8W
1R3	5020116	7K87 Ohms 1% 1/8W
1R4	5370173	2K5 Ohms 20% 0,1W
1R5	5370173	2K5 Ohms 20% 0,1W
1R6	5010068	820 Ohms 5% 1/8W
1R7	5010045	47 KOhms 5% 1/8W
1R8	5100023	10 Ohms 10% 1W
1R9	5010060	39 KOhms 5% 1/8W
1R10	5010091	82 KOhms 5% 1/8W

1C1	4201029	470 uF 40V
1C2	4100098	68 nF 2,5% 63V
1C3	4201057	1 uF 35V TANT.
1C4	4201081	10 uF 63V
1C5	4201061	4u7F 63V
1C6	4010060	22 nF 40V
1C7	4010027	1 nF 10% 100V
1C8	4010060	22 nF 40V
1C9	4201058	0,47 uF 35V TANT.
1C10	4130103	100 nF 20% 250V
1C11	4130087	47 nF 10% 250V

1F1	6600028	315 mA-T 250V

TR-LIST

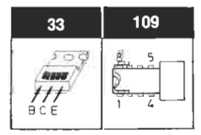
1TR1	8320266	**33**	TIP 31

IC-LIST

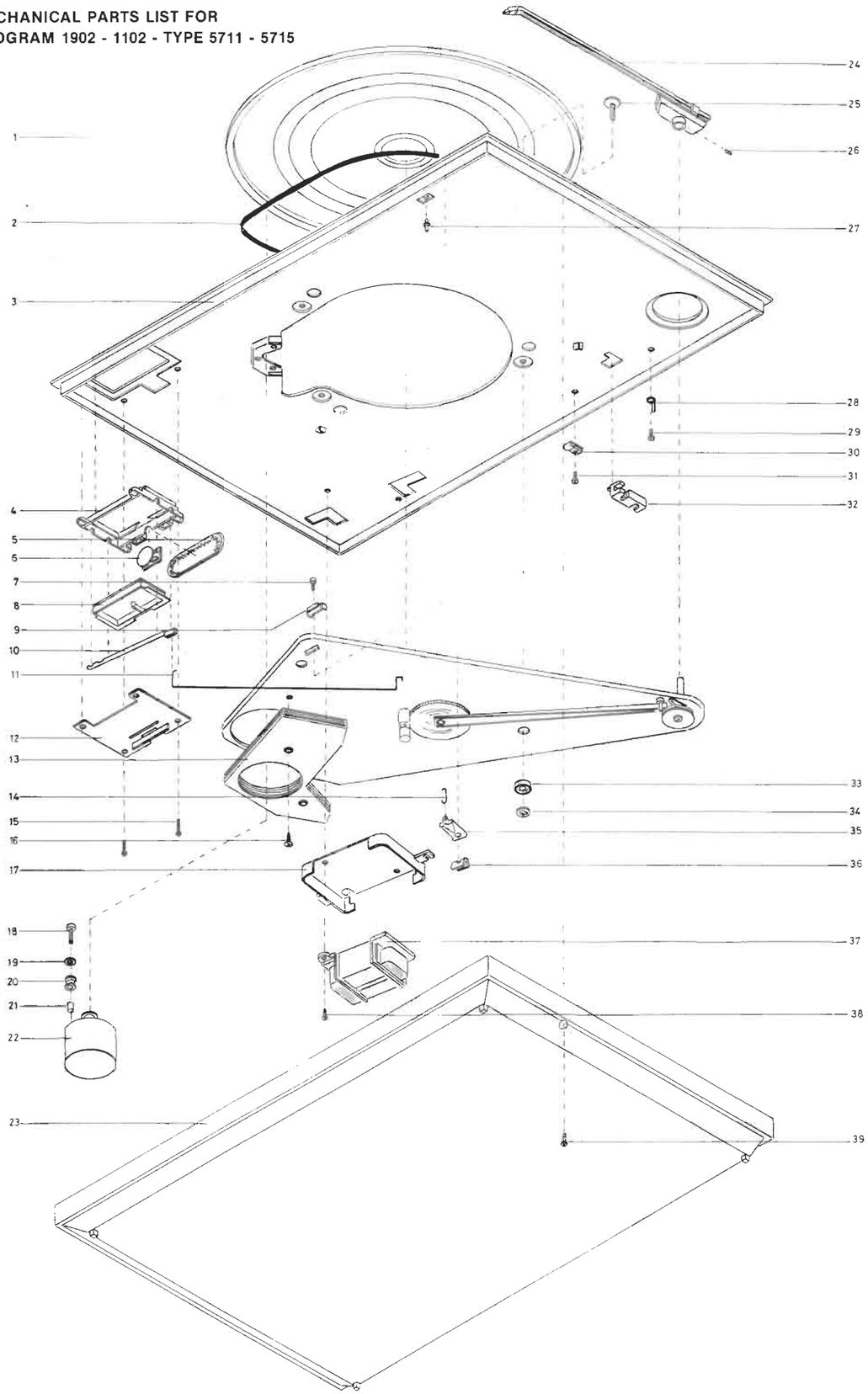
1IC1	8340108	**109**	1003C2

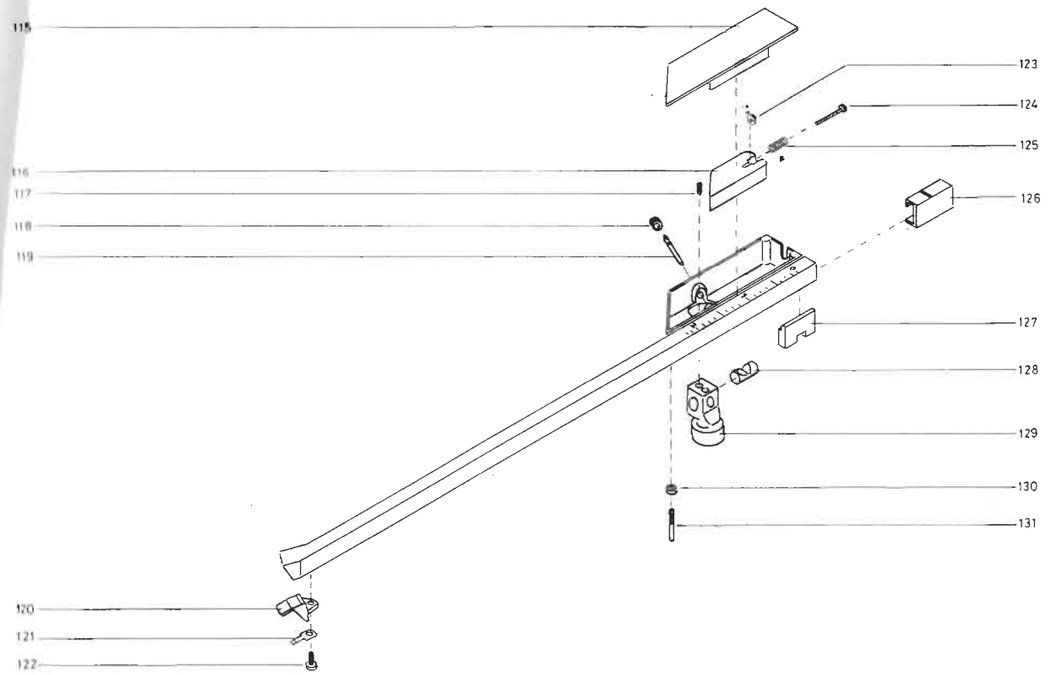
DIODE-LIST

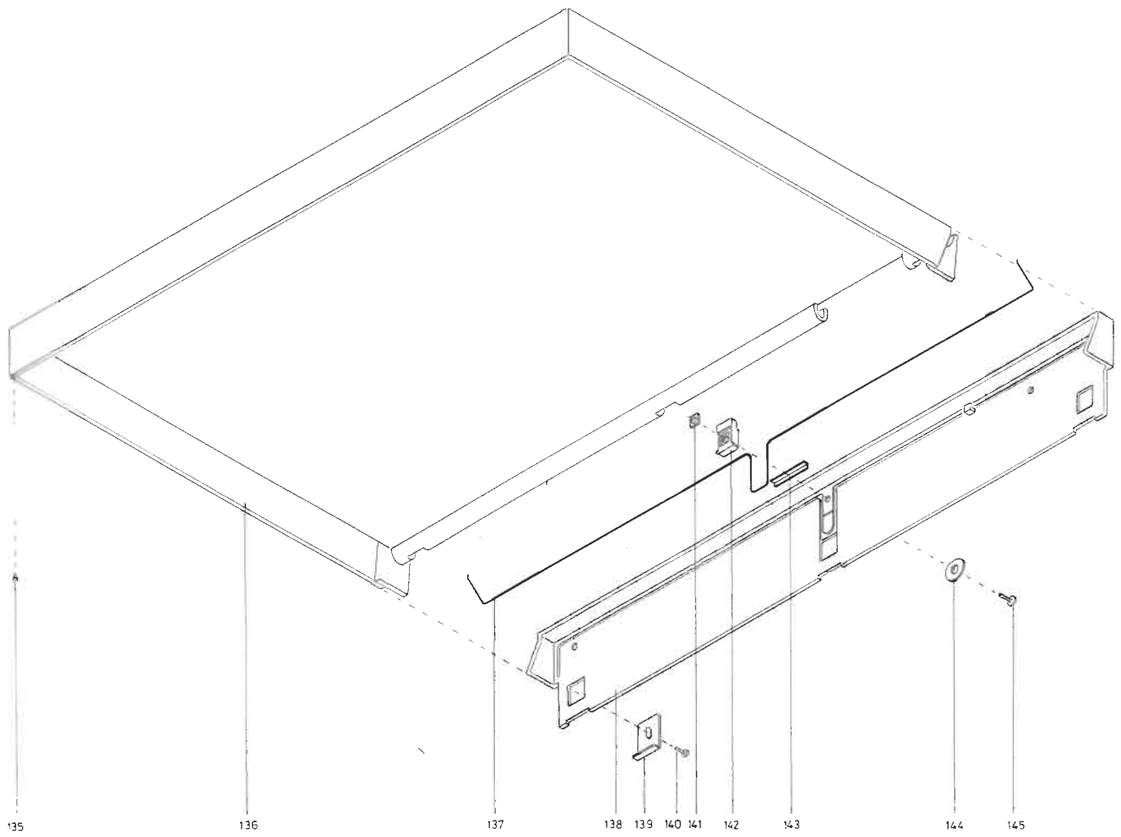
1D1 - 1D4	8300023	1N 4002
		1N 4003
1D5	8300029	ZPD 12 5%
		BZX 79C 12V
		BZX 83C 12V



MECHANICAL PARTS LIST FOR
BEOGRAM 1902 - 1102 - TYPE 5711 - 5715



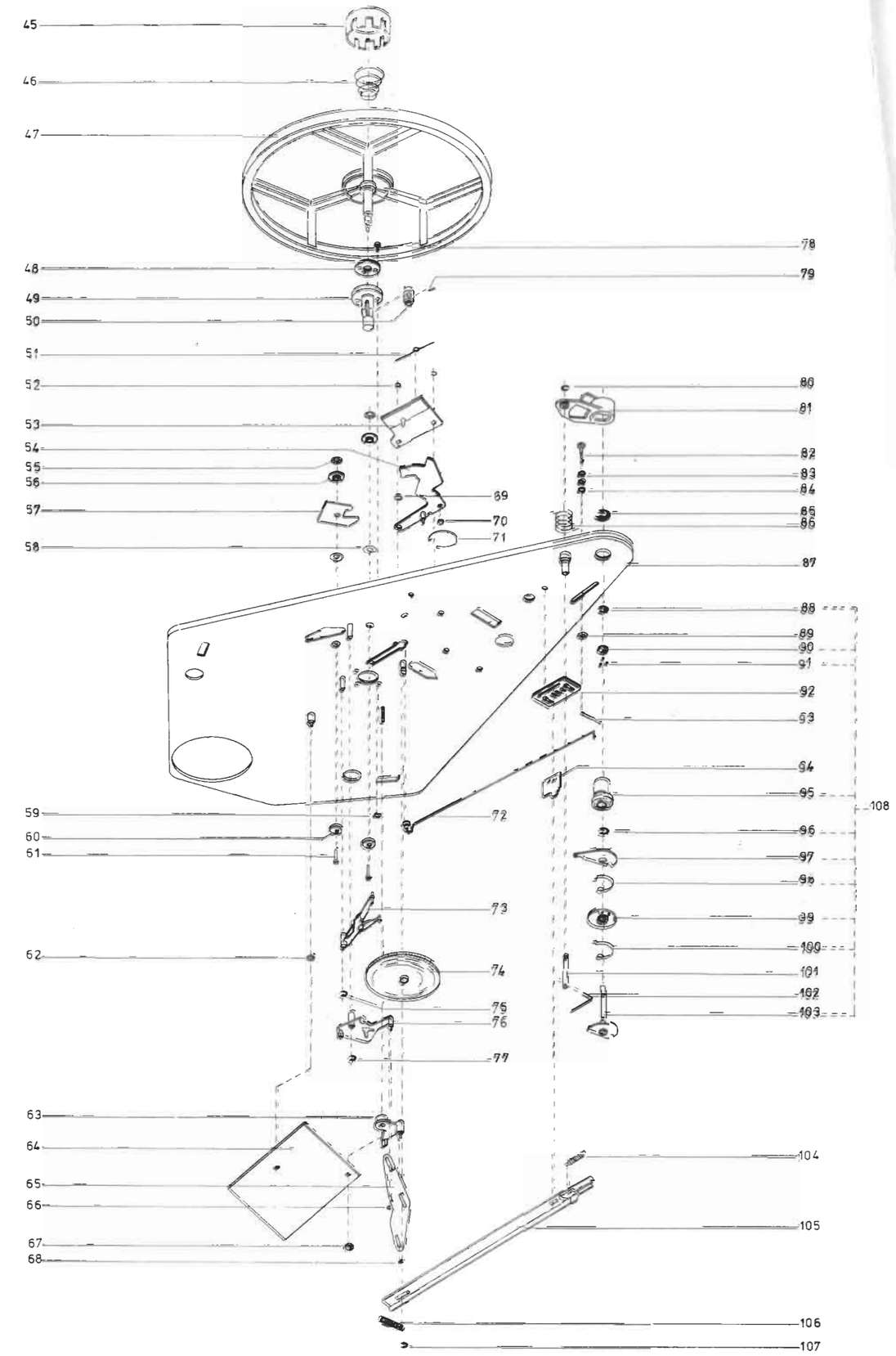




1	2726111	Turntable 1902
	2726113	Turntable 1102
2	2732037	Drive belt
3	3458169	Top plate complete 1902
	3458171	Top plate complete 1102
	3412261	Cabinet, teak, 1902 - 1102
	3412263	Cabinet, rosewood, 1902 - 1102
	3412264	Cabinet, oak, 1902 - 1102
	3412265	Cabinet, white, 1902 - 1102
	3412266	Cabinet, black, 1902 - 1102
4	3320048	Holder
5	2700020	Belt for fine adjustment
6	5390014	Potentiometer
	6273763	Set of wires with socket
7	2042209	Screw AM 4 x 10 DIN 84
8	2775575	Square knob
9	2640031	Clamp
10	2854042	Gear Lever
11	2570051	Switch arm
12	3152236	Holder
*13	3342038	Counterweight
14	2514028	Hook
15	2039905	Screw AM 3 x 12 DIN 7985
16	2015010	Screw 3.5 x 16
17	3172075	Insulating piece
18	2039905	Screw 3 x 12 DIN 7985
19	2622272	Washer
20	2938137	Rubber Bushing
21	2930074	Bushing
22	8400093	Motor
	2722022	Pulley
23	3454172	Bottom plate
24	2850084	Pickup arm complete
	8954390	Pickup MMC 3000, 1102
	8954410	Pickup MMC 4000, 1902
	3302230	Cap for Pickup
25	2046910	Transport screw
26	2072707	Threaded pin AM 3 x 6
27	3341013	Stopper
28	7530005	Solder tag
29	2038208	Screw AM 3 x 5 DIN 84
30	2515024	Clamp
31	2038203	Screw AM 3 x 5 DIN 84
32	2515024	Clamp
33	2938100	Bushing
34	2622228	Washer
35	2815007	Leaf spring
36	2640032	Clamp
37	8013180	Mains transformer
	6273762	Set of wires with socket
	5020087	Fuse resistor
38	2043005	Washer
39	2043207	Screw AM 4 x 6 DIN 7985

45	3014036	Adaptor
46	2818051	Spring
47	2794072	Flywheel
	2622264	Cover washer
	2620071	Felt washer
48	2905075	Bearing ring
49	3150037	Bearing bushing
50	2700023	Gear-Wheel
51	2819141	Friction spring
52	2390002	Locking ring
53	3014037	Friction plate
54	3014031	Arm positioning guide
55	2395030	Locking ring
56	2938088	Washer
57	3014033	Arm positioning guide
58	2622198	Washer
59	2380013	Nut M3
60	2803005	Eccentric
61	2992048	Pin
62	2622263	Rubber washer
63	2853047	Release
64	8005023	PC unit
	7220132	Plug 5/4 - contact
	7220133	Plug 4 - contact
	7220134	Plug 2 - contact
	7400115	Micro switch
	7459016	Switch
65	2851097	Switch arm
66	2390066	Locking ring
67	2380016	Nut M4
68	2390066	Locking ring
69	2622136	Washer
70	3035020	Plastic Foot
71	2819075	Spring
72	2850092	Arm
73	2853055	Hammer Complete
74	3017011	Cam-lifting wheel
75	2390002	Locking ring
76	2853056	Release
77	2390002	Locking ring
78	2038220	Screw AM 3 x 12 DIN 84
79	2361048	Locking pin
80	2390002	Locking ring
81	2623033	Lifting clamp
82	2992073	Pin
83	2622013	Washer
84	2620067	Washer (felt)
85	2938141	Locking ring
86	2812082	Spring
87	3110017	Chassis
	2938129	Transport bushing
88	2390033	Locking ring
89	2395030	Lock disc
90	2938114	Bushing
91	2917017	Ball
92	7459014	Contact (silent)
	7530072	Solder tag
93	2810089	Spring
94	7459015	Contact (slide valve)
95	2938135	Pile bearing
96	2390033	Locking ring
97	2851095	Arm
98	2819106	Spring
99	2750018	Clutch disc
100	2819107	Spring
101	2850093	Lifting bar
102	2530326	Bracket
103	2938142	Pile
104	2810090	Spring
105	2852032	Lifting arm
106	2810082	Spring
107	2390002	Locking ring
108	2938136	Pickup bearing complete

* Not included in Beogram 1102, Type 5715



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115	3162093	Cover
116	3342034	Counterweight
117	2070400	Threaded pin M2 x 3
118	2905071	Pointed bearing
119	2834056	Shaft
120	7200037	Socket with wires
121	2816143	Chassis spring
122	2033007	Screw
123	2380068	Nut
124	2034913	Screw
125	2812072	Spring
126	3190064	Pointer
127	3342033	Counterweight
128	3151137	Holder for shaft
129	3152207	Holder for arm
130	2938096	Bushing
131	2072098	Lifting screw

135	3010007	Stop
136	3164292	Dust cover
137	2819128	Spring
138	3452261	Back part
139	2530312	Bracket
140	2039010	Screw 3 x 6 DIN 7985
141	2380103	Nut
142	2572020	Friction Piece
143	2530328	Bracket
144	2624034	Washer
145	2042946	Screw AM 4 x 10 DIN 963
	3164241	Dust cover complete

PARTS NOT SHOWN

6271101	Mains lead with plug
6270182	Pickup lead with plug
3535055	Instruction diagramme
3391463	Outer carton
3391464	Top/bottom insert
3397263	Foam packing
3397264	Lid insert
3917025	Foam for arm 15 x 3.5 x 1 cm