PS-2251

USA Model

DIRECT DRIVE TURNTABLE SYSTEM

SPECIFICATIONS

GENERAL

Speed:	$33\frac{1}{3}$, 45 rpm ± 4 %, adjustable
Turntable drive:	Direct drive system
Wow and flutter: (weighted)	Less than 0.04 % (NAB)
Signal-to-noise ratio: (weighted)	Greater than 58 dB (NAB)
Motor:	AC servo-controlled motor
Turntable platter:	310 mm ($12\frac{3}{16}$") dia. 1.5 kg (3 lb 5 oz) diecasted aluminum
Start-up-time:	Less than 2.5 seconds
Power consumption:	15 watts
Power requirement:	120 V, 60 Hz
Dimensions:	491 (w) x 185 (h) x 410 (d) mm $19\frac{5}{16}$ (w) x $7\frac{5}{16}$ (h) x $16\frac{1}{8}$ (d) inches
Net weight:	15 kg (33 lb 1 oz)
Shipping weight:	17.4 kg (38 lb 6 oz)

TONEARM (PUA-113)

Type:	Static balanced
Arm length: (Pivot-To-Stylus)	245 mm ($9\frac{5}{8}$")
Over hang:	14 mm ($\frac{9}{16}$")
Stylus force adjustment range:	0 to 3 g. 0.2 g increments
Anti-skating force compensation range:	0 to 3 g. 0.2 g increments
Tonearm height precise adjustment range:	45.5 mm ~ 52.5 mm ($1\frac{25}{32}$") ~ ($2\frac{1}{32}$")
Cartridge weight range:	4 g to 17 g 8 g to 21 g (with subweight)

SONY®

SERVICE MANUAL

TABLE OF CONTENTS

SECTION 1
TECHNICAL DESCRIPTION

1-1. SPECIFICATIONS

General

Speed:	$33\frac{1}{3}$, 45 rpm ± 4 %, adjustable
Turntable drive:	Direct drive system
Wow and flutter: (weighted)	Less than 0.04 % (NAB)
Signal-to-noise ratio: (weighted)	Greater than 58 dB (NAB)
Motor:	AC servo-controlled motor
Turntable platter:	310 mm ($12\frac{3}{16}$") dia. 1.5 kg (3 lb 5 oz) diecasted aluminum
Start-up-time:	Less than 2.5 seconds
Power consumption:	15 watts
Power requirement:	120 V, 60 Hz
Dimensions:	491 (w) x 185 (h) x 410 (d) mm $19\frac{5}{16}$ (w) x $7\frac{5}{16}$ (h) x $16\frac{1}{8}$ (d) inches
Net weight:	15 kg (33 lb 1 oz)
Shipping weight:	17.4 kg (38 lb 6 oz)

Tonearm (PUA-113)

Type:	Static balanced
Arm length: (Pivot-To-Stylus)	245 mm ($9\frac{5}{8}$ ")
Over hang:	14 mm ($\frac{9}{16}$")
Stylus force adjustment range:	0 to 3 g. 0.2 g increments
Anti-skating force compensation range:	0 to 3 g. 0.2 g increments
Tonearm height precise adjustment range:	45.5 mm ~ 52.5 mm ($1\frac{25}{32}$") ~ ($2\frac{1}{32}$")
Cartridge weight range:	4 g to 17 g 8 g to 21 g (with subweight)

1-2. PRINCIPLE OF AC SERVO SYSTEM

Fig. 1-1 shows a simplified diagram of the ac servo system employed in this set. Since the ac motor speed is proportional to the applied ac voltage, it is controlled by varying the applied voltage (Em) to the motor. This is effectively performed by means of series resistor Rv.

In practice, series resistor Rv is replaced by the diode-bridge circuit and collector-emitter impedance of a power transistor as illustrated in Fig. 1-2. Note that the diode-bridge determines only the direction of the ac current which flows in the power transistor.

Motor speed is converted into ac signal by means of a direct-coupled frequency generator. The servo amplifier compares this signal against a very stable dc reference voltage, and then controls the collector-emitter impedance of power transistor. Any error in motor speed results in a correction voltage supplied to the motor.

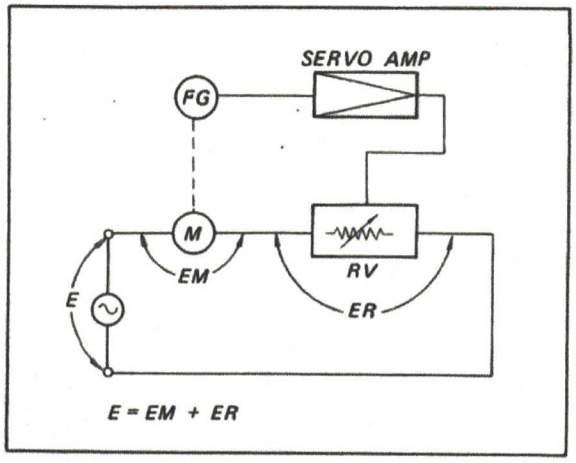


Fig. 1-1. Principle of ac servo system

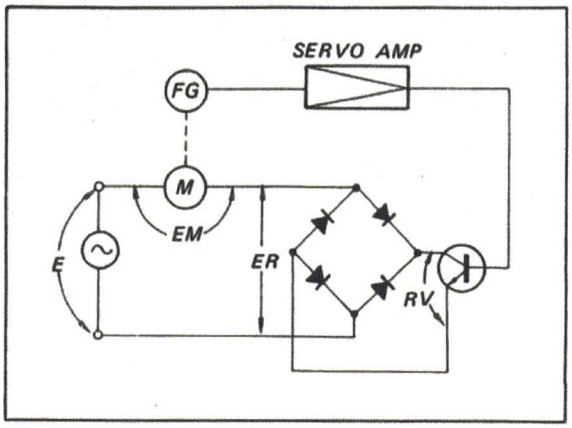


Fig. 1-2. Practical ac servo system

1-3. CIRCUIT DESCRIPTION

The following describes the functions of ac servo amplifier. Since stages are listed by transistor or IC reference designation, refer to the block or schematic diagram on page 4 and 15.

Stage/Control	*Function*
Start Operation	
	When the power switch is turned on, C8 is charged through R27, R8, VR2, R10, VR1 and R9 when the 33 rpm button is depressed. Note that VR2 and R10 are shorted during 45 rpm operation. Voltage comparator in IC1 is forced into conduction when C8 is charged up to some specified voltage. As a result Q3 ~ Q4 are ON, thereby a large ac voltage is supplied to the motor.
Correct Speed Condition	
Frequency generator	Frequency generator is installed in the motor (directly coupled to the drive motor shaft) and generates the ac voltage whose frequency is proportional to the motor speed.
Differential amplifier Q1, Q2	Q1 and Q2 form a differential amplifier which increases the input FG signal to the level required for the following limiter circuit.
Diode limiter D1, D2	Removes the amplitude variations from the signal. Each diode conducts when the signal across it exceeds the barrier potential (0.6 V) in a forward biased condition. Thus, the output signal is limited to about 1.2 V peak-to-peak.
IC1 (integrated circuit)	The integrated circuit used contains four circuit functions that is, flip-flop, dc buffer/phase inverter, saw-tooth wave generator and voltage comparator.
Flip-flop circuit	Flip-flop circuit generates square output in accordance with the input trigger signal (limiter output).
DC buffer/phase inverter	This supplies inverted flip-flop output to the differentiation circuit.
Differentiation circuit	Square wave is converted into spike pulses through the differentiation circuit formed by C7 and input impedance of saw-tooth wave generator.
Saw-tooth wave generator	The frequency of the saw-tooth wave is determined by the RC time constant circuit connected at terminal (6) of the IC1; C8, R9, VR1, R10 and VR2.
Voltage comparator	Generates the negative pulse of which width is proportional to the time when the saw-tooth voltage exceeds the reference voltage as illustrated in Fig. 1-3. The reference voltage is determined by the setting of Pitch Control (VR3 paralleled by R12).
Dc buffer/phase inverter	Supplying positive pulsating signal to the following filter circuit.
Low pass filter/buffer amplifier	Buffer amplifier Q3 and an RC network consisting of R15, C11, R16, C12, C13, R17 and C14 comprise a low-pass filter having a sharp rolloff characteristic. Notice that this stage acts as an integrator, converting the input positive pulses into a dc voltage proportional to the input pulse width.
Dc amplifiers Q4, Q5, Q6	Dc output from the low-pass filter is applied to the base of Q4. As Q4, Q5 and Q6 are directly coupled, a change in input dc voltage alters the conduction of Q6, controlling the voltage applied to the motor.
Servo Operation	
	When, by any cause, the motor speed becomes slightly faster or slower than the specified value, the servo system works as follows: Referring to Fig. 1-3, assume that the motor speed becomes faster. The FG output signal frequency becomes higher, resulting in a shorter interval between pulses for triggering the saw-tooth wave generator. The shorter interval between trigger pulses causes lower saw-tooth wave

Stage/Control	*Function*
	height, which in turn yeilds a shorter "ON" period for comparator. Therefore, the output pulse width becomes shorter, reducing the positive bias upon Q4. As a result, the collector-emitter impedance of Q6 increases, reducing the motor speed. Conversely, if the motor speed becomes slower, the collector-emitter impedance of Q6 decreases, increasing the motor speed.
Power supply D8, D9 C17, C19 D7	A positive 12 volts for the system is provided by the full-wave rectifier consisting of D8 and D9, filter capacitors C19, C17 and zener diode D7.
Speed selector switch S1	Speed changeover operation is performed by changing the saw-tooth wave frequency as previously described. Since the saw-tooth wave frequency is determined by the RC time constant circuit, a speed selector switch is connected in parallel with VR2 and R10. A smaller time constant results in faster motor speed and vice versa. So S1 is open when the speed selector switch is set to 33 rpm.

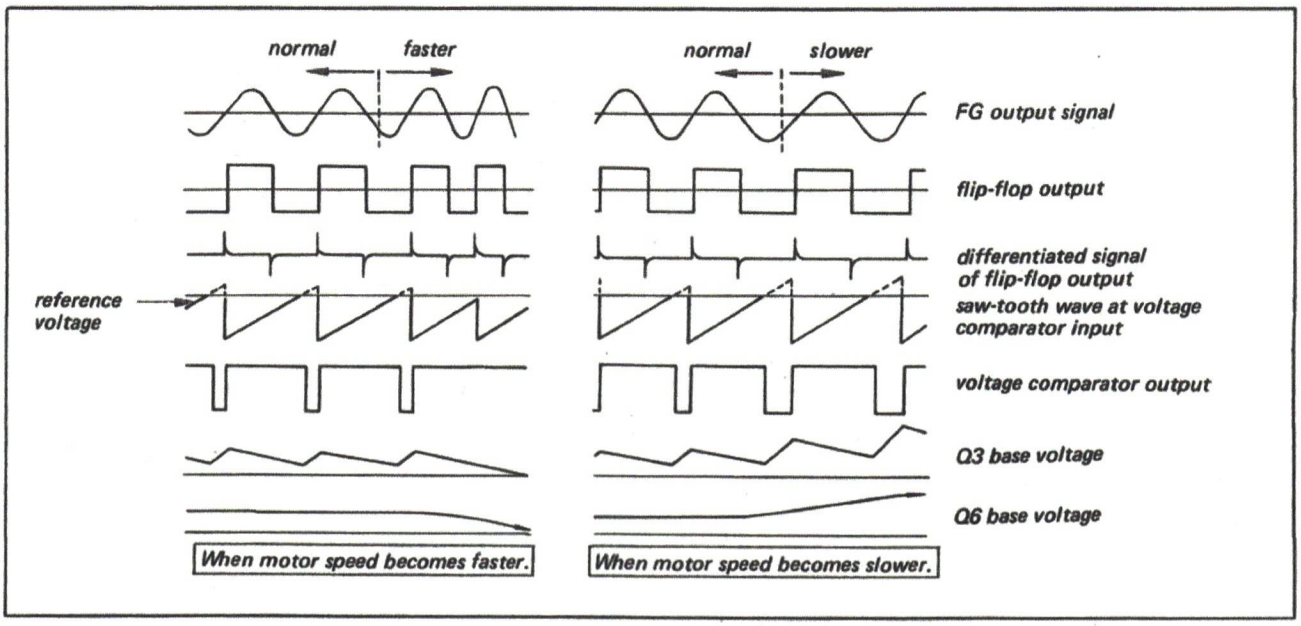
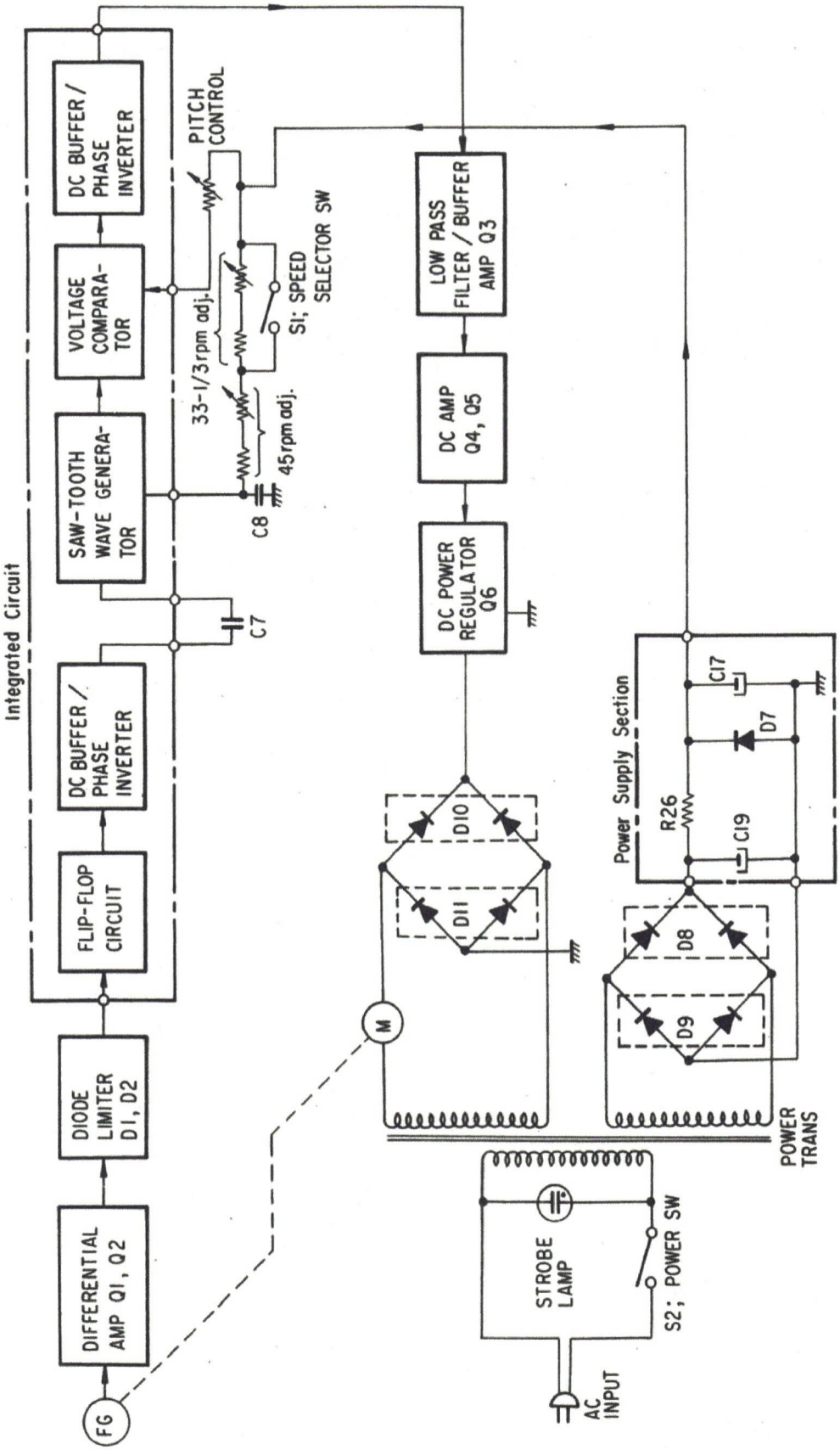


Fig. 1-3. Waveforms on servo control circuit

1-4. BLOCK DIAGRAM



SECTION 2

DISASSEMBLY AND REPLACEMENT

WARNING

Unplug the ac power cord before starting any disassembly or replacement procedures.

Note: All screws in this service manual are Phillips type (cross recess type) unless otherwise indicated.
(–): slotted head.
Tools required: Hex wrench set

2-1. TOP COVER REMOVAL

1. Open the top cover, and then carefully lift the top cover straight up as shown in Fig. 2-1.

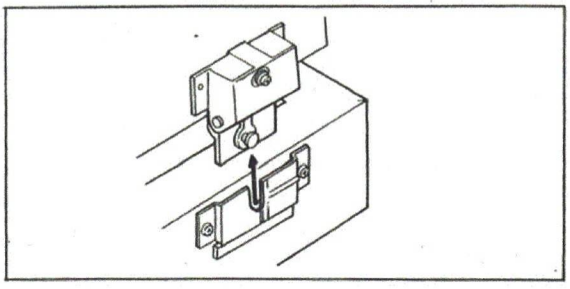


Fig. 2-1. Top cover removal

2-2. TURNTABLE PLATTER REMOVAL

1. Remove the top cover as described in Procedure 2-1.
2. Remove the rubber mat from the turntable platter, and then insert your fingers into the two holes of the turntable with both thumbs placed on the center spindle as shown in Fig. 2-2.
3. Carefully lift the turntable platter straight up.

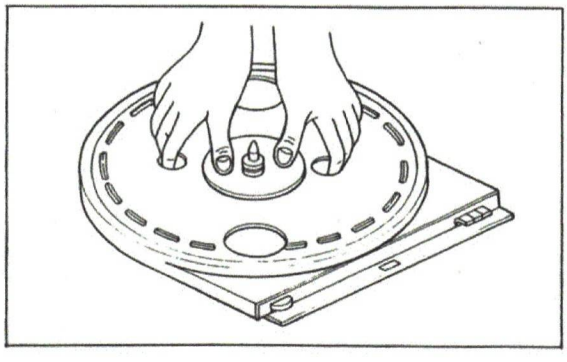


Fig. 2-2 Turntable platter removal

2-3. TURNTABLE ASSEMBLY REMOVAL

1. Remove the turntable platter as described in Procedure 2-2.
2. Remove the power cord strain relief at the rear with a pair of pliers.
3. Remove the three allen-head screws (M 6 x 20). See Fig. 2-3. This frees turntable assembly.

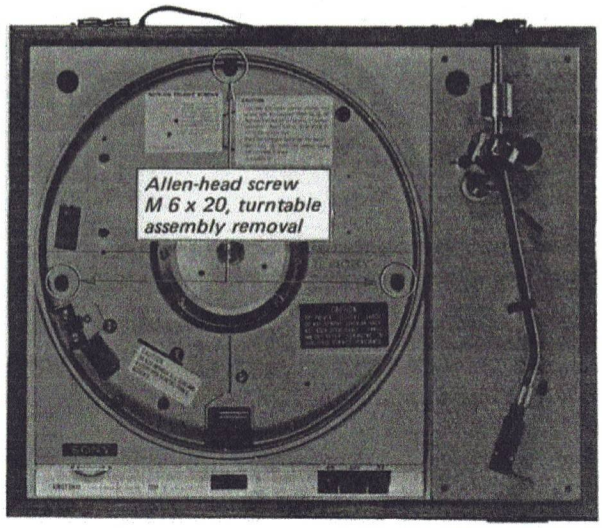


Fig. 2-3. Turntable assembly removal

2-4. SERVO AMPLIFIER COVER REMOVAL

1. Remove the turntable assembly as described in Procedure 2-3.
2. Remove the two self-tapping screws (T 4 x 16) shown in Fig. 2-4, and then slide it in the direction shown by the arrow as illustrated.
This frees the cover.

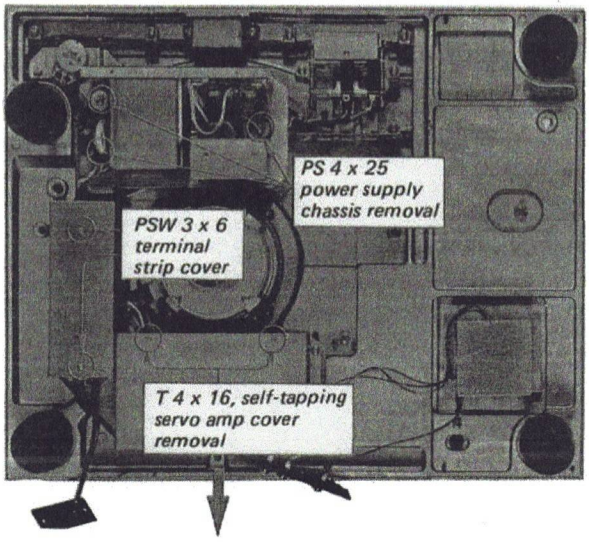


Fig. 2-4. Bottom view

2-5. SERVO AMPLIFIER CHASSIS REMOVAL

1. Remove the servo amplifier cover as described in Procedure 2-4.
2. Remove the four screws (PS 4 x 6) shown in Fig. 2-5. This frees the chassis.

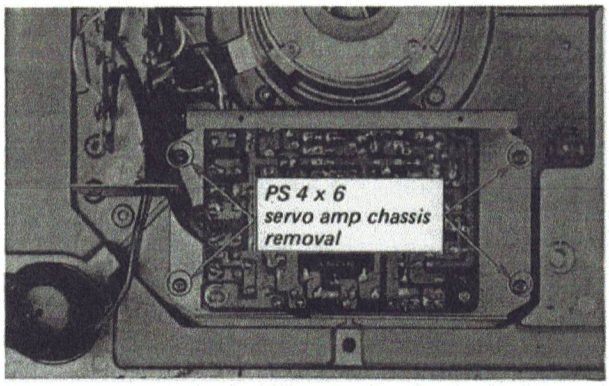


Fig. 2-5. Servo amplifier chassis removal

2-6. POWER SUPPLY CHASSIS REMOVAL

Note: The power supply chassis is an angled member on which the power transformer, power transistor and 2-P fuse holder are attached.

1. Remove the turntable assembly as described in Procedure 2-3.
2. Remove the three screws (PS 4 x 25) shown in Fig. 2-4. This frees the power supply chassis.

2-7. MOTOR REPLACEMENT

1. Remove the turntable assembly as described in Procedure 2-3.
2. Remove the two screws (PSW 3 x 6) securing the terminal strip cover as shown in Fig. 2-4.
3. Unsolder the motor lead wires at the terminal strip, and then remove the four screws (PS 4 x 12) from the top as shown in Fig. 2-6.
4. Install the replacement motor.

CAUTION

Electromagnetic brake adjustment (clearance between turntable and magnet mounted on turntable base) should be performed as follows after replacing the motor.

1. First of all, confirm that the turntable does not touch with the magnet on the turntable base (See Fig. 2-7). If it does, adjust the magnet height by replacing spacer. Three kind of spacer are available as specified in table below. To remove the magnet and spacer, apply a few drops of cement solvent to them.

Description	Thickness of spacer (mm)	Part Number
Magnet	1.6	4-808-445-02
spacer	1.0	4-808-445-11
	0.5	4-808-445-21

2. Set the turntable for $33\frac{1}{3}$ rpm operation, and then measure the voltage applied to the motor at the 5-P terminal strip as shown in Fig. 2-8.
   It should be within the limits of 21 ± 2 volts ac.
   If not, readjust the clearance between the turntable and the magnet by replacing the spacer as previously described.

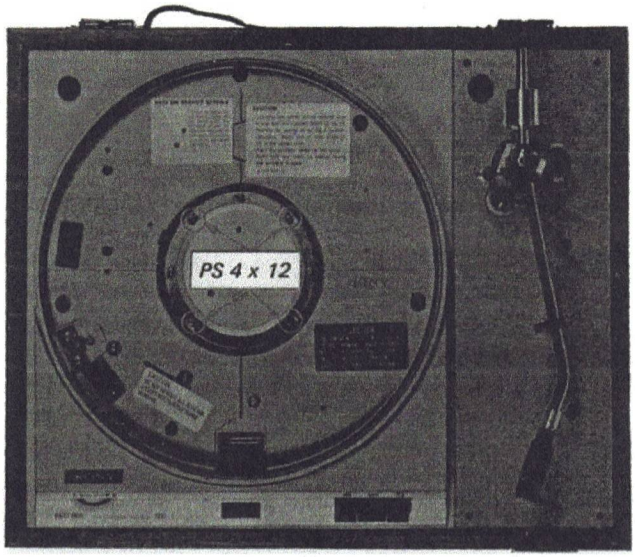


Fig. 2-6. Motor replacement

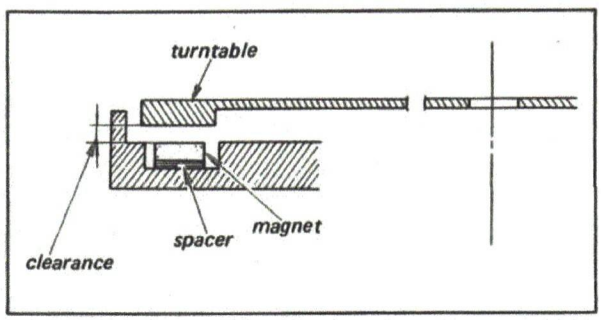


Fig. 2-7. Electromagnetic brake adjustment

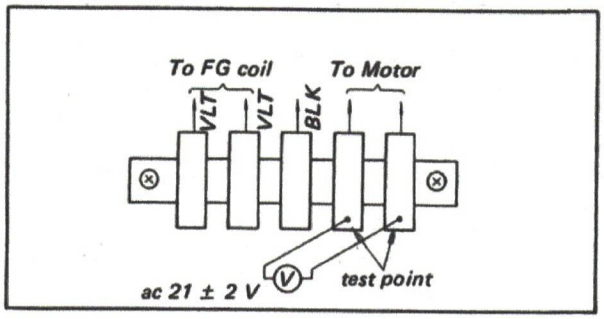


Fig. 2-8. Test point for electromagnetic brake adjustment

2-8. MICROSWITCH REPLACEMENT

1. Remove the turntable assembly as described in Procedure 2-3.
2. Unhook the spring pressing the microswitch holding shaft against its bracket. Carefully draw out the microswitches along with their holding shaft as shown in Fig. 2-9.
3. Remove the retaining rings at one side of the shaft, and then replace the defective microswitch as shown in Fig. 2-9. To reassemble, reverse the aforementioned procedures.

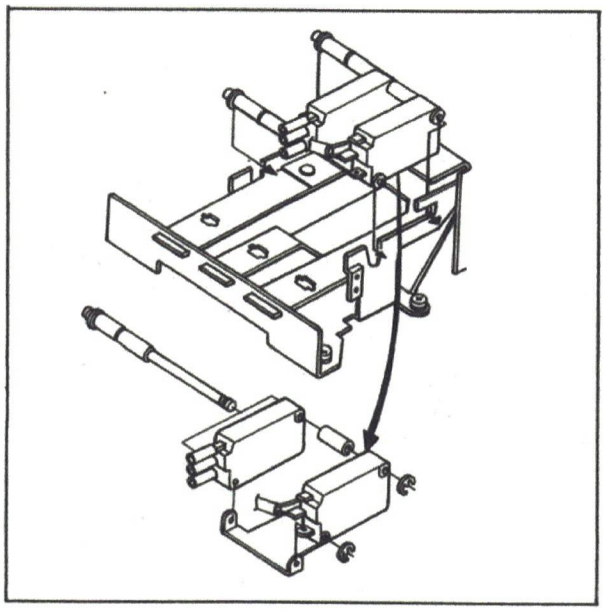


Fig. 2-9. Microswitch replacement

2-9. STROBE LAMP REPLACEMENT

1. Remove the turntable assembly as described in Procedure 2-3.
2. Remove the four screws (PS 4 x 6) securing the strobe unit to the turntable base.
   Pull out the unit.
3. Unhook the retaining spring from the lamp cover and then apply a drop of cement solvent to the lamp. Wait a few seconds, and then push out the defective lamp as shown in Fig. 2-10.

CAUTION

Too much cement solvent may cause damage to the unit. Only a few drops are required to dissolve the rubber-base adhesive.

4. Install a new strobe lamp. Take care that the glowing side (front) of the lamp is positioned as shown in Fig. 2-10.

Note: Apply a drop of rubber-base adhesive to the rear side of the lamp when installing the lamp.

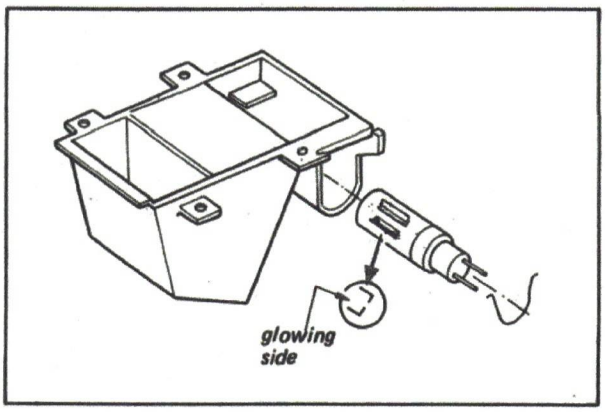


Fig. 2-10. Strobe lamp removal and installation

2-10. POWER TRANSISTOR REPLACEMENT

1. Remove the power supply chassis as described in Procedure 2-6.
2. Remove the screw (P 3 x 12) securing the power transistor to the heat sink.
3. Cut the emitter and base leads of the defective power transistor with a diagonal cutter.
   This prevents mica-washer damage when removing the defective power transistor.
4. When replacing the power transistor, apply a coating of heat-transferring grease to both sides of the mica washer. Any excess grease squeezed out when the mounting screw is tightened should be wiped off with a clean cloth. This prevents it from accumulating conductive dust particles that might eventually cause a short.

2-11. TONEARM ASSEMBLY REPLACEMENT

1. Remove the shell head.
2. Remove the four allen head screws (M 3 x 20). See Fig. 2-11. This frees the tonearm board.
3. Remove the two self-tapping screws (PS 3 x 6) securing the shield cover over the terminal strip as shown in Fig. 2-12.
4. Unsolder the leads from the terminal beneath the turntable base (See Fig. 2-13).
   The lead wires are color coded as follows:

   White . . . . . L-CH
   Blue . . . . . L-CH (ground)
   Red . . . . . R-CH
   Green . . . . . R-CH (ground)

5. Remove the hexagon nut securing the tonearm base to the tonearm board.
   This frees the tonearm assembly.

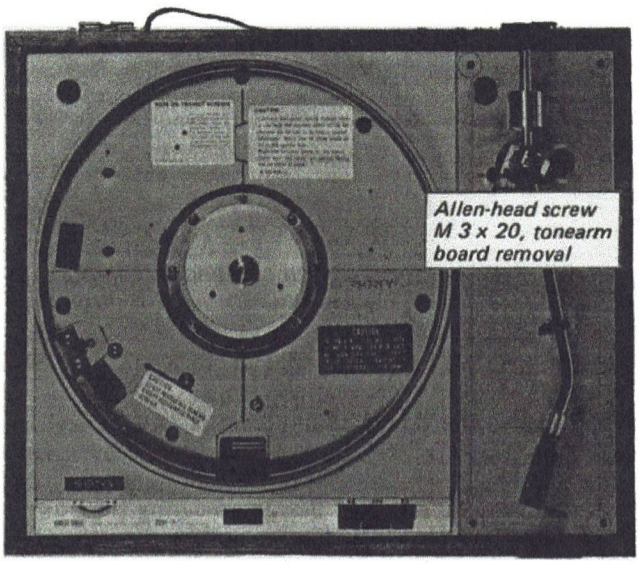


Fig. 2-11. Tonearm board removal

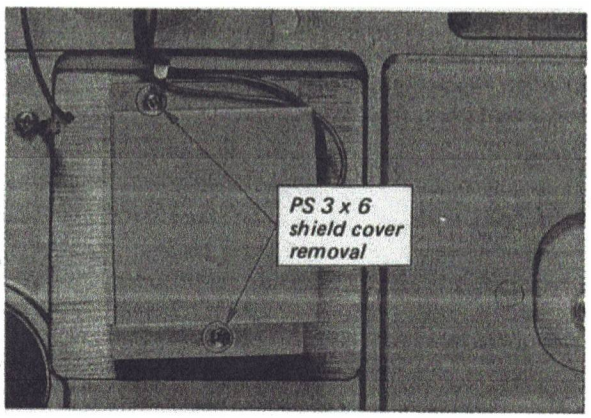


Fig. 2-12. Shield cover removal

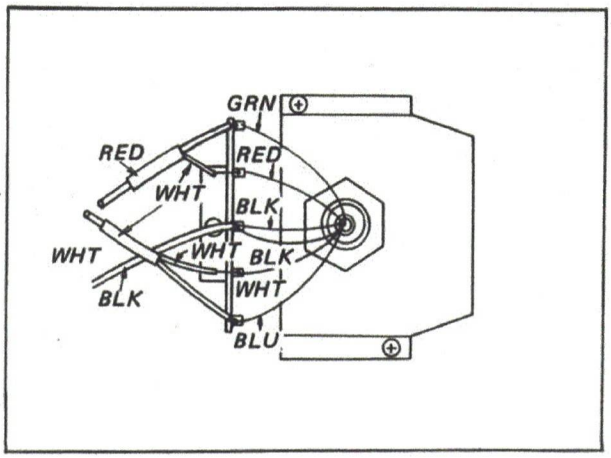


Fig. 2-13. Lead wire connection

2-12. TONEARM BASE REMOVAL

1. Remove the tonearm assembly as described in Procedure 2-11.
2. Remove the set screw by turning it counterclockwise as shown in Fig. 2-14.
3. The tonearm base can be removed by turning the tonearm height adjustment ring counterclockwise while holding the base.
4. When reassembling the base, care should be taken that the set screw meets with the slot on the tonearm shaft as shown in Fig. 2-14.

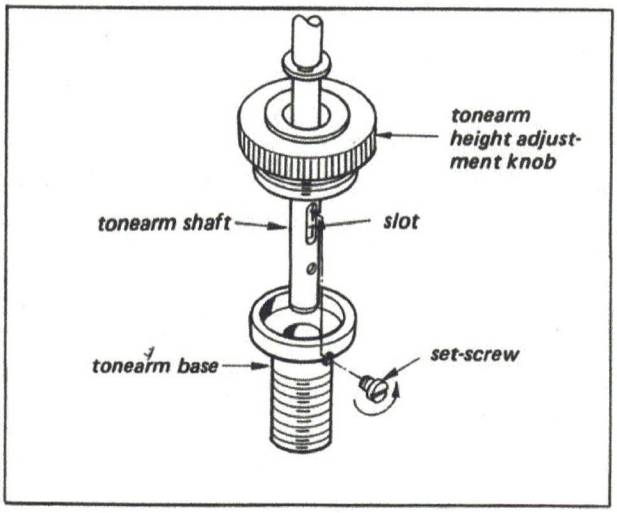


Fig. 2-14. Tonearm base removal

2-13. TONEARM LIFTER REMOVAL

1. Remove the tonearm assembly as described in Procedure 2-11.
2. Remove the set screw securing the tonearm lifting tab to the tonearm lifter as shown in Fig. 2-15.

3. Remove the tonearm lifting tab by turning it counterclockwise. This frees the lifting tab.

4. Remove the allen-head screw securing the tonearm lifter to the base plate as shown in Fig. 2-15, and then depress the lifter gently. This frees the lifter.

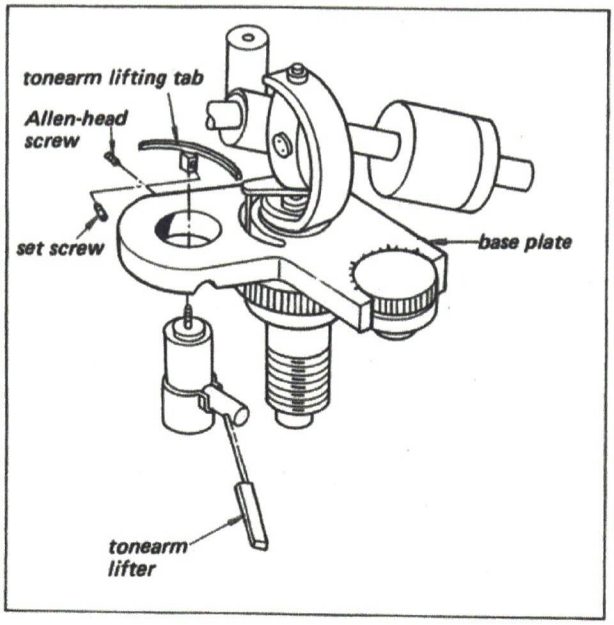


Fig. 2-15. Tonearm lifter replacement

2-14. BIAS CORD REPLACEMENT

Note: This should be performed if the bias cord of anti-skating force control mechanism breakes.
Tools required: Jeweller's screw driver, pair of tweezers

1. Remove the tonearm assembly and tonearm base as described in Procedures 2-11 and 2-12.

2. Prepare the anti-skating force pulley assembly (Part No. X-22024-08-1) including the bias cord and tension spring.

3. Remove the anti-skating force control knob by loosening the set screw with a jeweller's screw driver as shown in Fig. 2-16.

4. Remove the pulley by turning it counterclockwise from the bottom with a screw driver as shown in Fig. 2-17.

5. Install the new anti-skating force pulley assembly reversing the aforementioned procedures. Note that the pulley should be tightened as far as it will go.

6. Thread the tension spring through the opening of the base plate assembly as shown in Fig. 2-18.

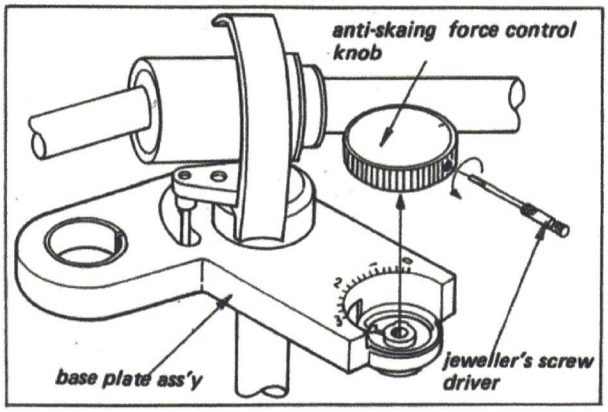


Fig. 2-16. Anti-skating force control knob removal

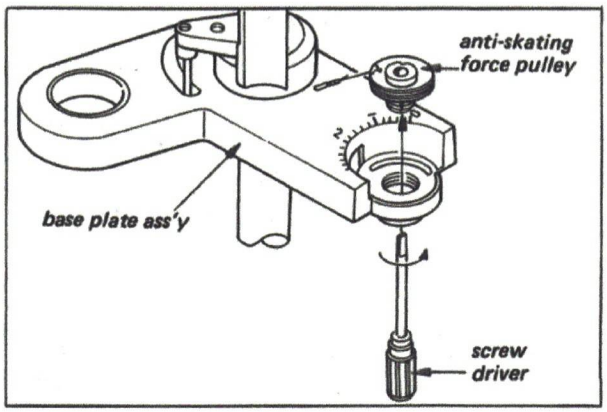


Fig. 2-17. Anti-skating force pulley removal

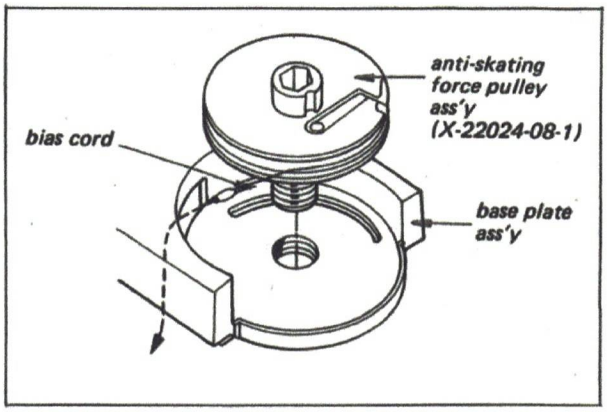


Fig. 2-18. Bias cord threading

7. Hook the tension spring to the groove on the anti-skating force arm rod with a pair of tweezers as shown in Fig. 2-20.

8. Slightly loosen the pulley and set to the position as shown in Fig. 2-19.

9. Set the anti-skating force arm rod to the position where it coincides with the mark on the base plate assembly as shown in Fig. 2-20, then adjust the pulley position as follows:

Lengthen the tension spring some extent by turning the pulley clockwise first, and then turn the pulley counterclockwise gradually until the tension spring becomes to its original length, as shown in Fig. 2-20.

10. Install the anti-skating force control knob as to indicate the zero reading.

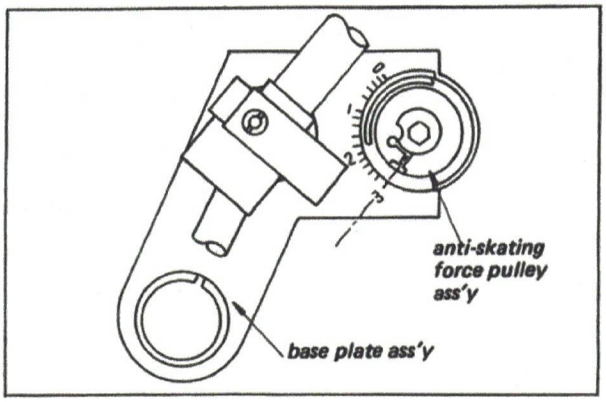


Fig. 2-19. Presetting of the pulley for calibration

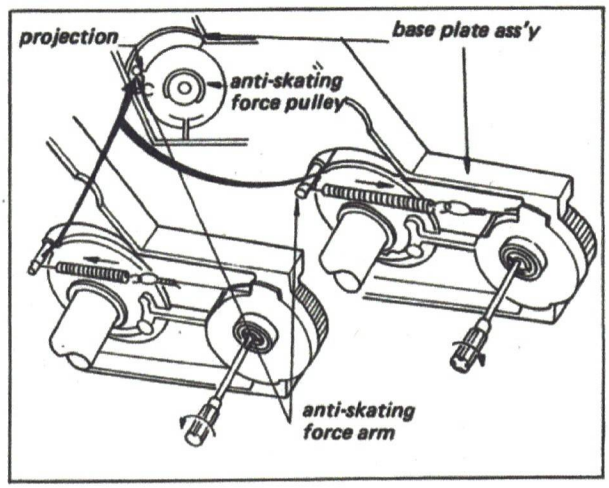


Fig. 2-20. Anti-skating force calibration

SECTION 3

ADJUSTMENTS

3-1. SPEED ADJUSTMENT

Note: Correct operating speed should be obtained when the front panel Pitch Control is at or near the midrange setting. If not, readjustment is needed.

Procedure:

1. Set the Pitch Control to mid position.
2. Place the turntable in the horizontal position.
3. Set the $^{33}/_{45}$ control to the 45 position and then turn adjustable resistor VR1 (See Fig. 3-1) to obtain the correct strobe indication.
4. After completing the 45 rpm adjustment, proceed to the 33 rpm adjustment as previously described, except turning adjustable resistor VR2 (See Fig. 3-1).

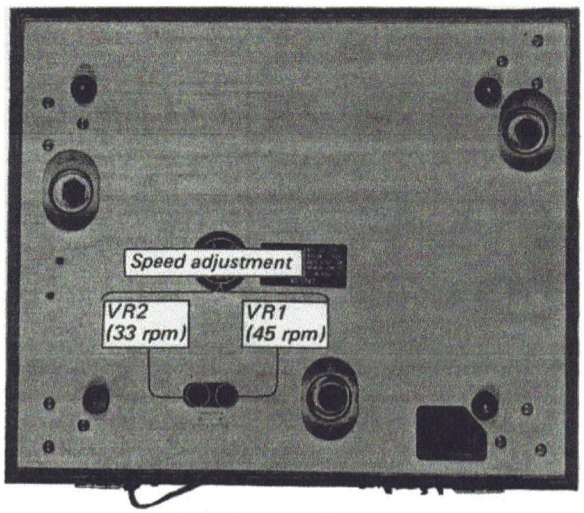


Fig. 3-1. Speed adjustment

3-2. TONEARM HEIGHT ADJUSTMENT

1. Loosen the tonearm height adjustment knob by turning it counterclockwise as shown in Fig. 3-2.
2. Tonearm height can be adjusted by simply pulling up or down the tonearm shaft as shown in Fig. 3-2.
3. Tighten the tonearm height adjustment knob by turning it clockwise.

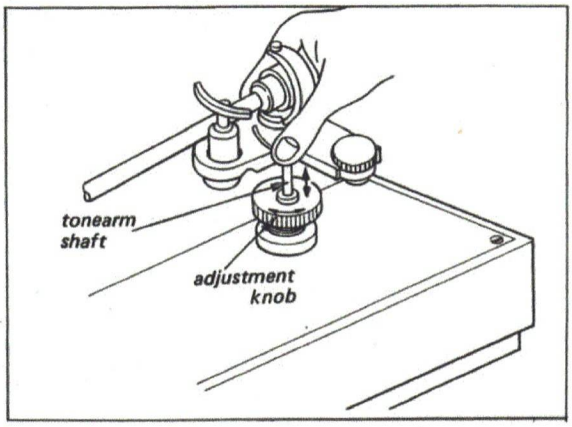


Fig. 3-2. Tonearm height adjustment

3-3. STYLUS-FORCE AND ANTI-SKATING FORCE ADJUSTMENT

1. Set the anti-skating compensator to its "0" position.
2. Release the tonearm from its arm rest. Make sure the tonearm floats freely.
3. Set the stylus force gauge to its "0" position.
4. Horizontally balance the tonearm by sliding the counter weight at the rear of the tonearm. Now the stylus force can be set by this scale.
5. Turn the stylus-force knob to obtain the proper (recommended) value of stylus force.
6. Set the anti-skating compensator to the same value set in step 5.

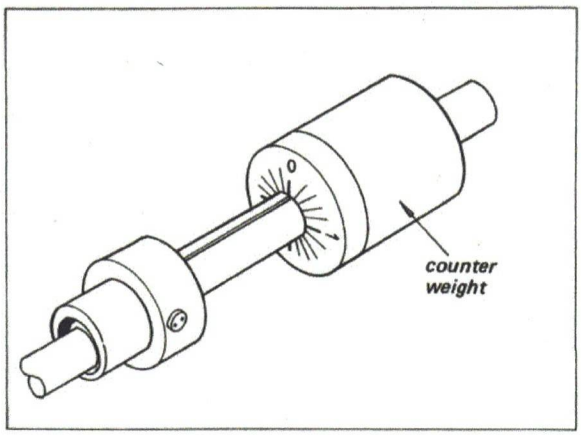


Fig. 3-3. Tonearm balance adjustment

3-4. LATERAL BALANCE ADJUSTMENT

1. Set the anti-skating compensator to its "0" position.
2. Release the tonearm from its arm rest, and then horizontally balance the tonearm.
3. Slowly lift the rear side of cabinet approximately 40 mm and observe the movement of the tonearm.
4. Slide the lateral balance weight towards the same direction as the tonearm movement until lateral balance is obtained (See Fig. 3-4.)

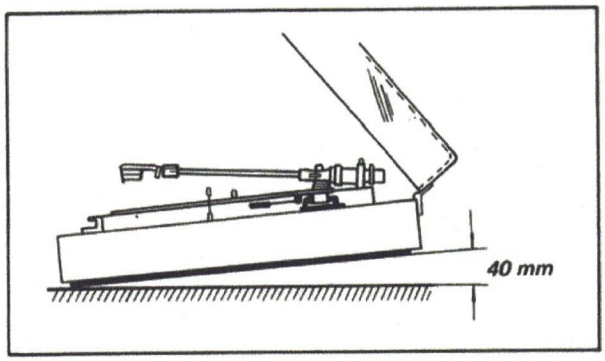


Fig. 3-4. Lateral balance adjustment

3-5. LUBRICATION

Lubricate the turntable shaft once a year. Use the SONY OL-2K oil supplied. Remove the top of the turntable shaft by turning it counterclockwise, and then apply two or three drops of oil to the opening of the shaft as shown in Fig. 3-5.

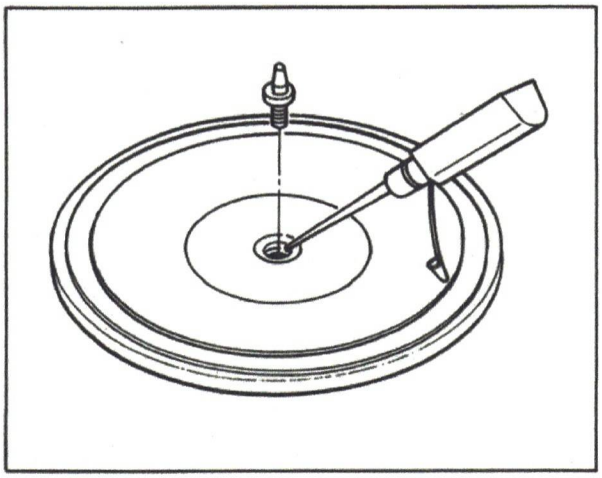
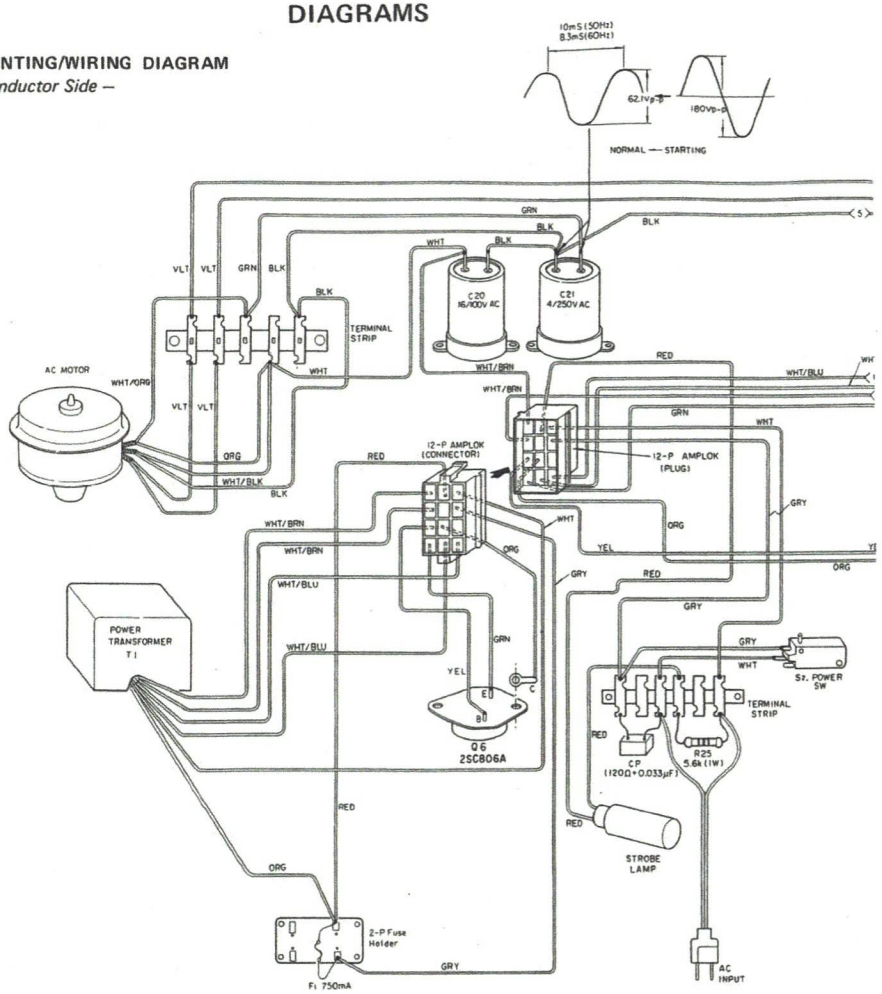
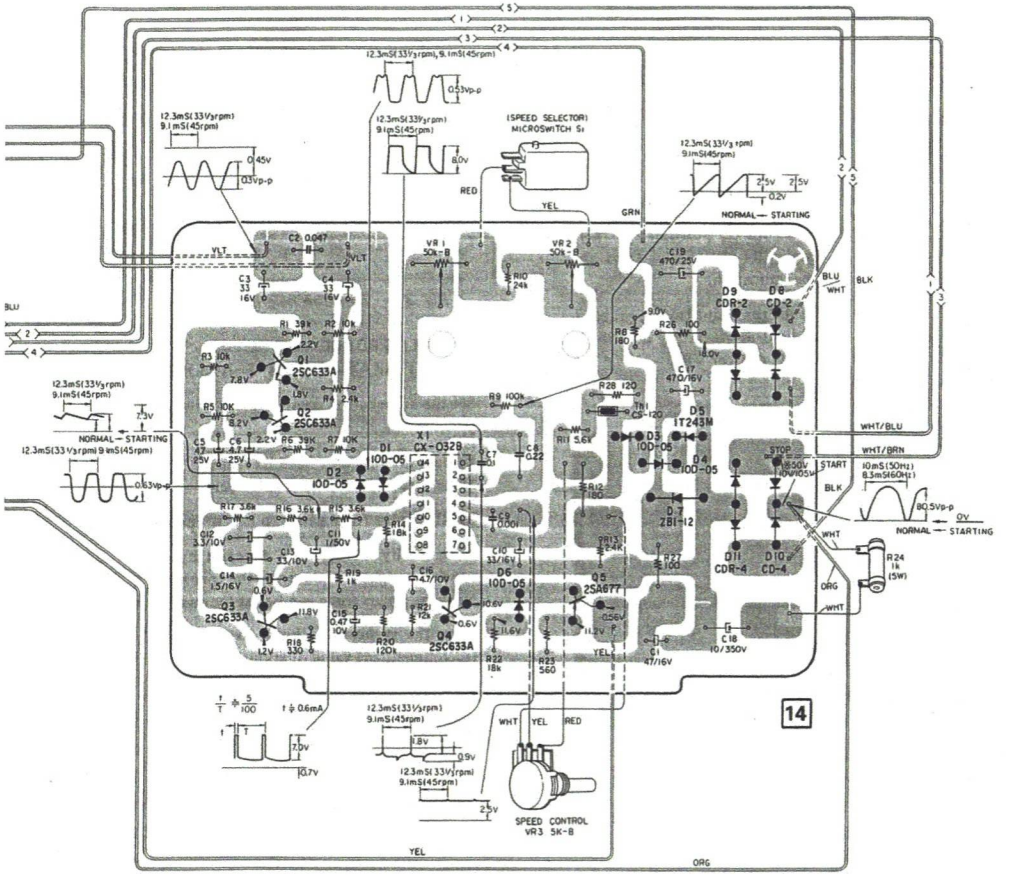


Fig. 3-5. Lubrication

SECTION 4
DIAGRAMS

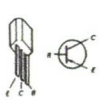
4-1. MOUNTING/WIRING DIAGRAM
– Conductor Side –



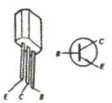


Transistors and Adjustment Parts Location

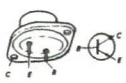
Q1		VR1	VR2
Q2			
Q3		Q4	Q5



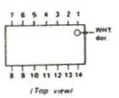
2SA677



2SC633A

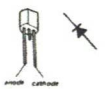


2SC806A

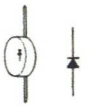


CX-032B

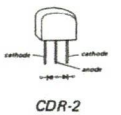
10D-05



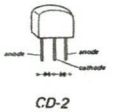
1T243M



ZB1 -12



CDR-2
CDR-4



CD-2
CD-4

Note:

All resistance values are in ohms. k = 1000, M = 1000 k

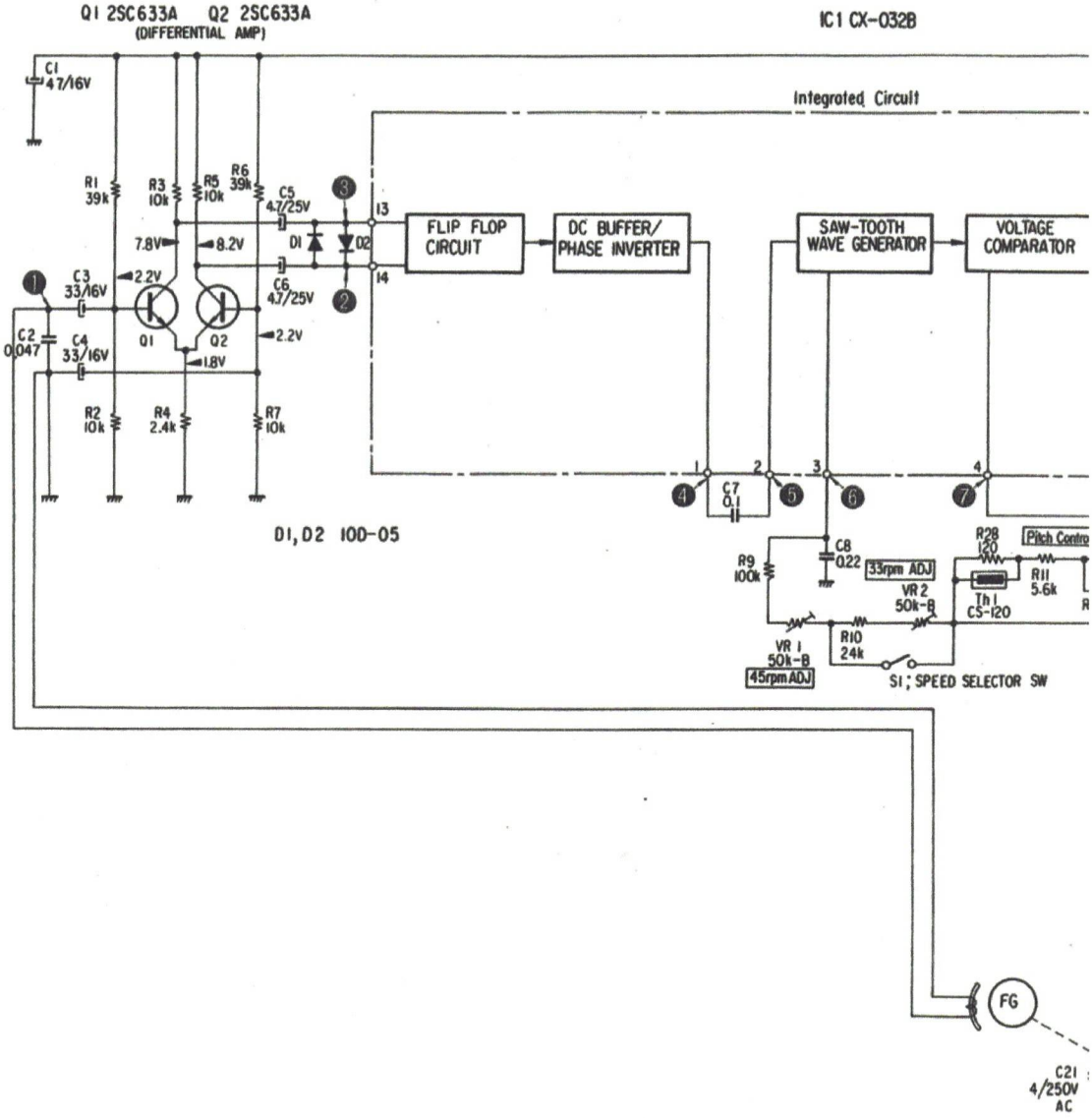
All capacitance values are in μF except as indicated with p, which means μμF.

All voltages represent an average value and should hold within ±20 %.

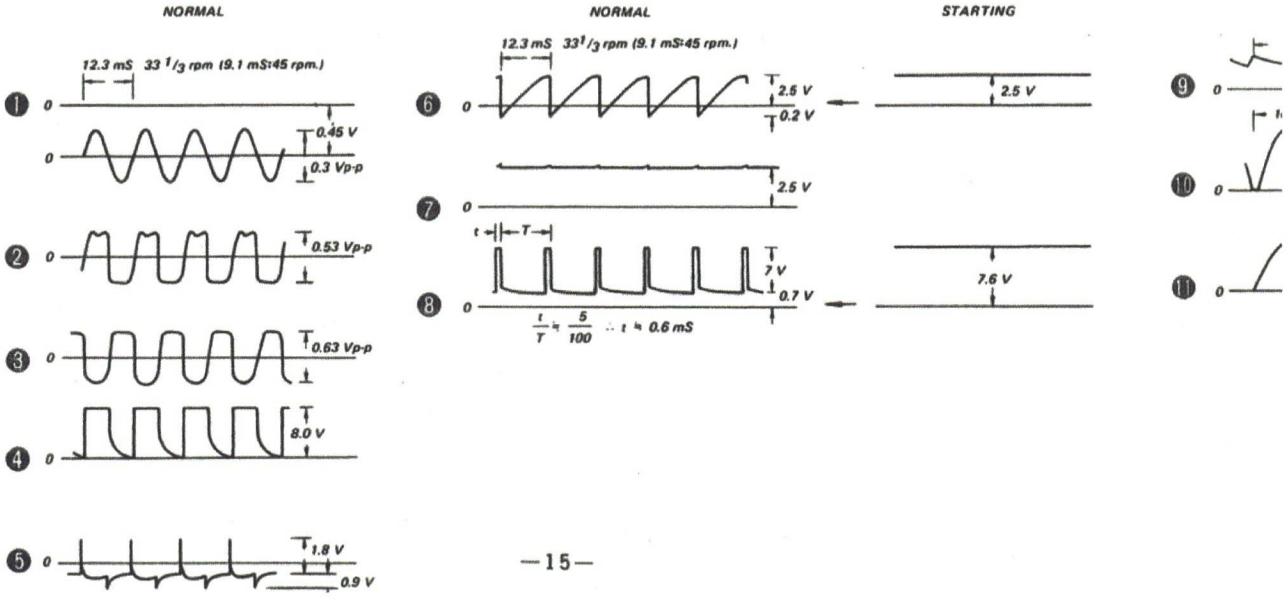
All voltages are dc measured with a VOM (DC 20 k ohms/V) at no signal.

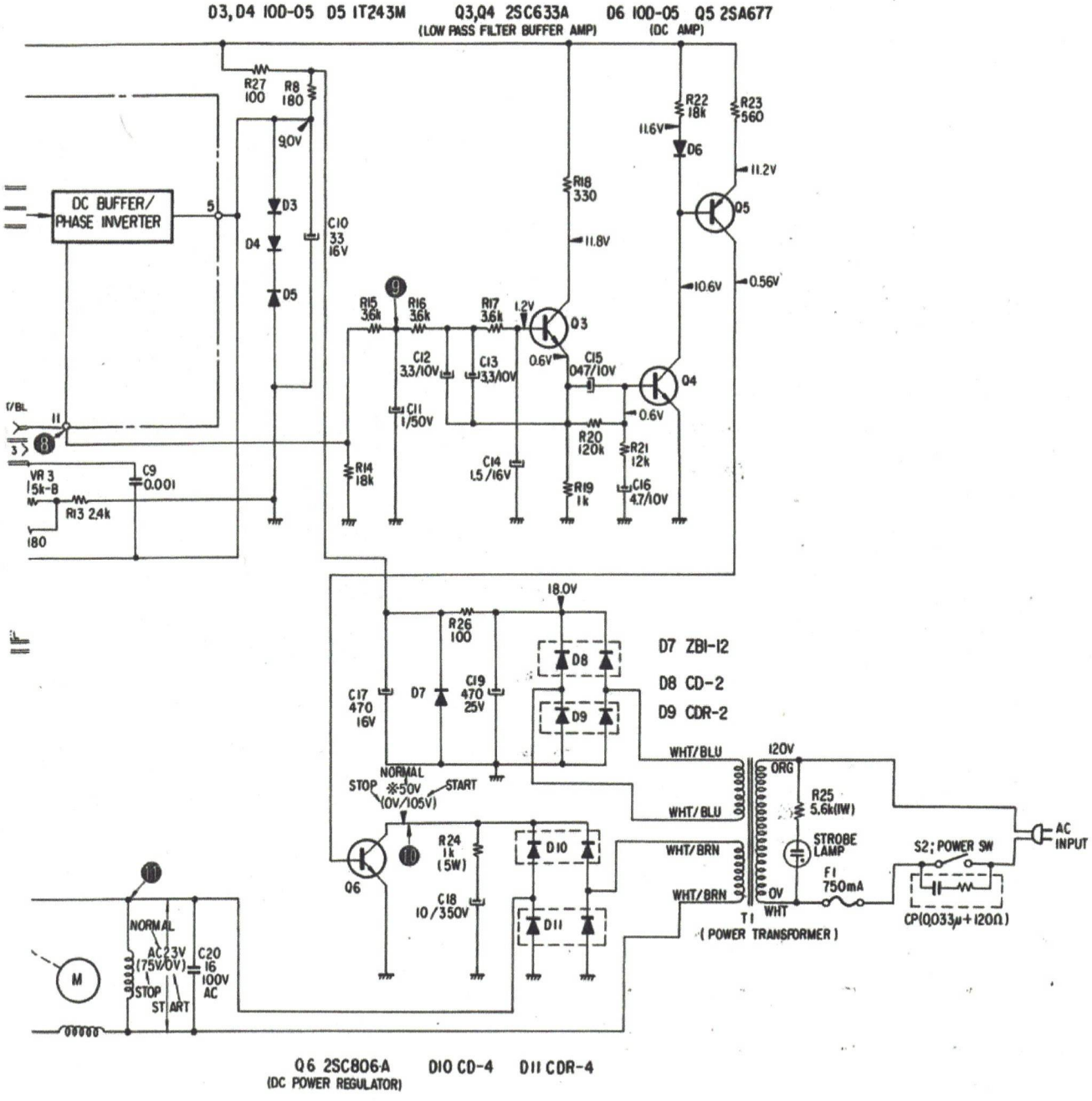
※ 33⅓ or 45 rpm operation.

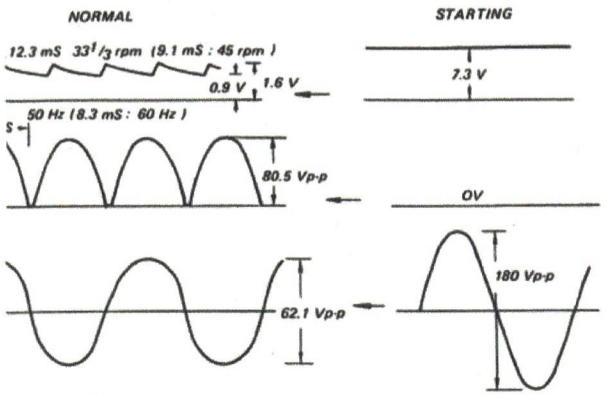
4-2. SCHEMATIC DIAGRAM



Waveforms







Note:

All resistance values are in ohms. k = 1000, M = 1000 k

All capacitance values are in μF except as indicated with p, which means μμF.

All voltages represent an average value and should hold within ±20 %.

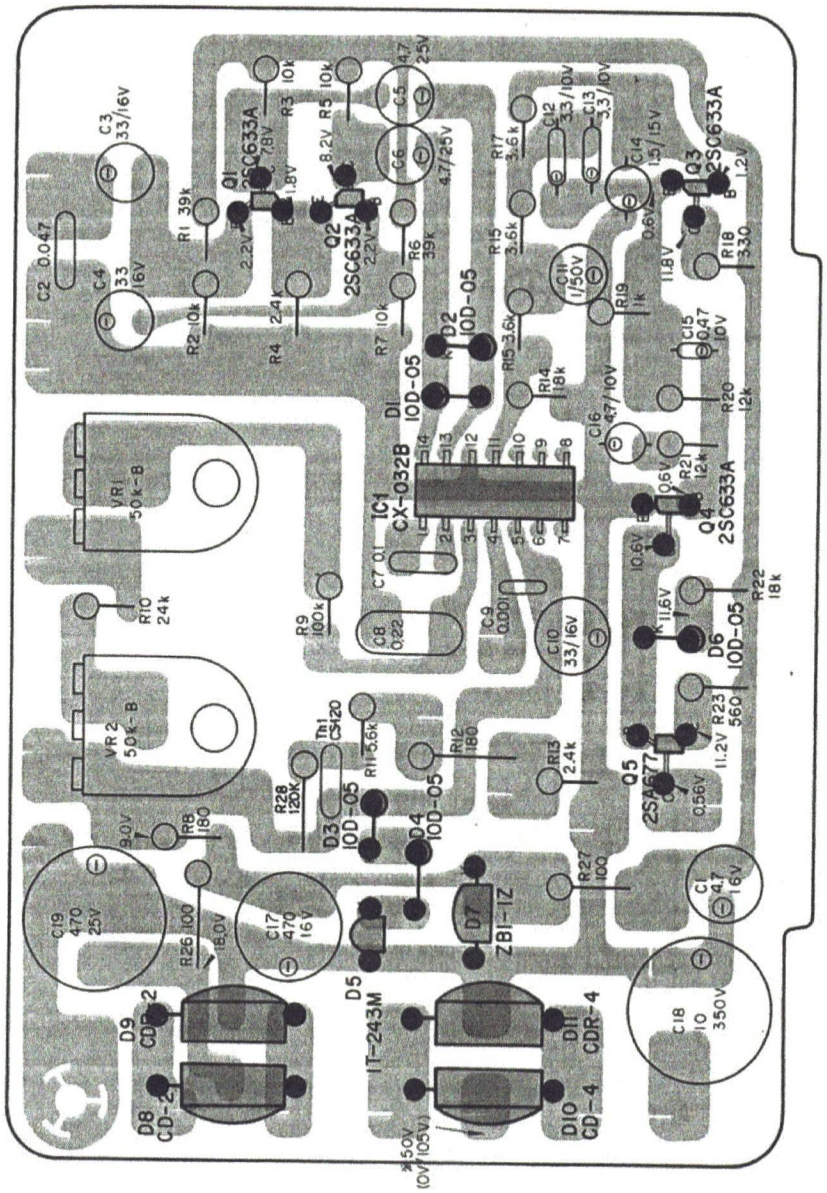
All voltages are dc measured with a VOM (DC 20 k ohms/V) at no signal.

Waveforms are measured by using an oscilloscope.

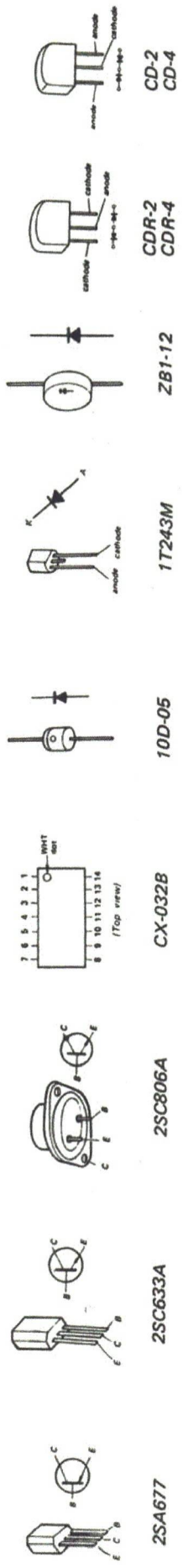
※ 33 1/3 or 45 rpm operation.

4-3. MOUNTING DIAGRAM

– Component Side –



Note: ※ $33\frac{1}{3}$ or 45 rpm operation

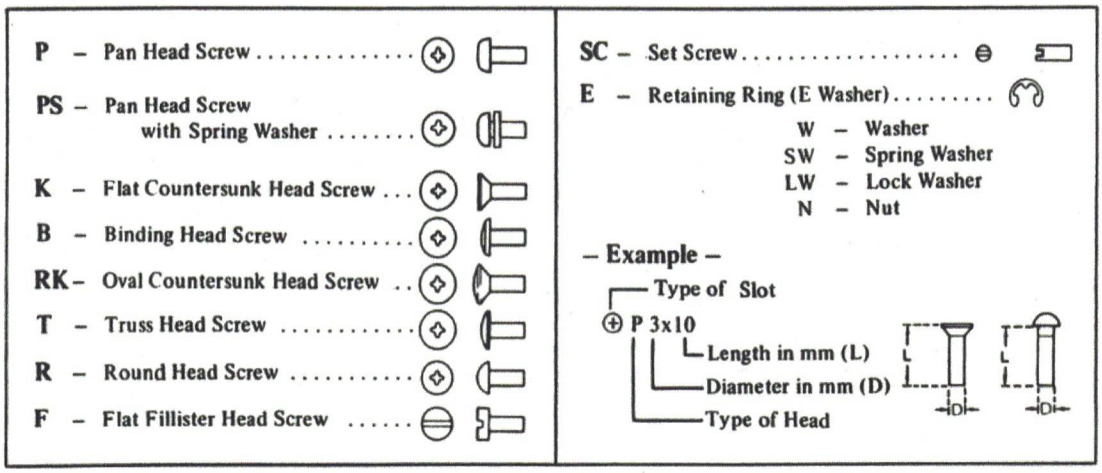


SECTION 5

EXPLODED VIEWS

(1) The following chart will help you to decipher the hardware codes given in the exploded views.

—— Hardware Nomenclature ——

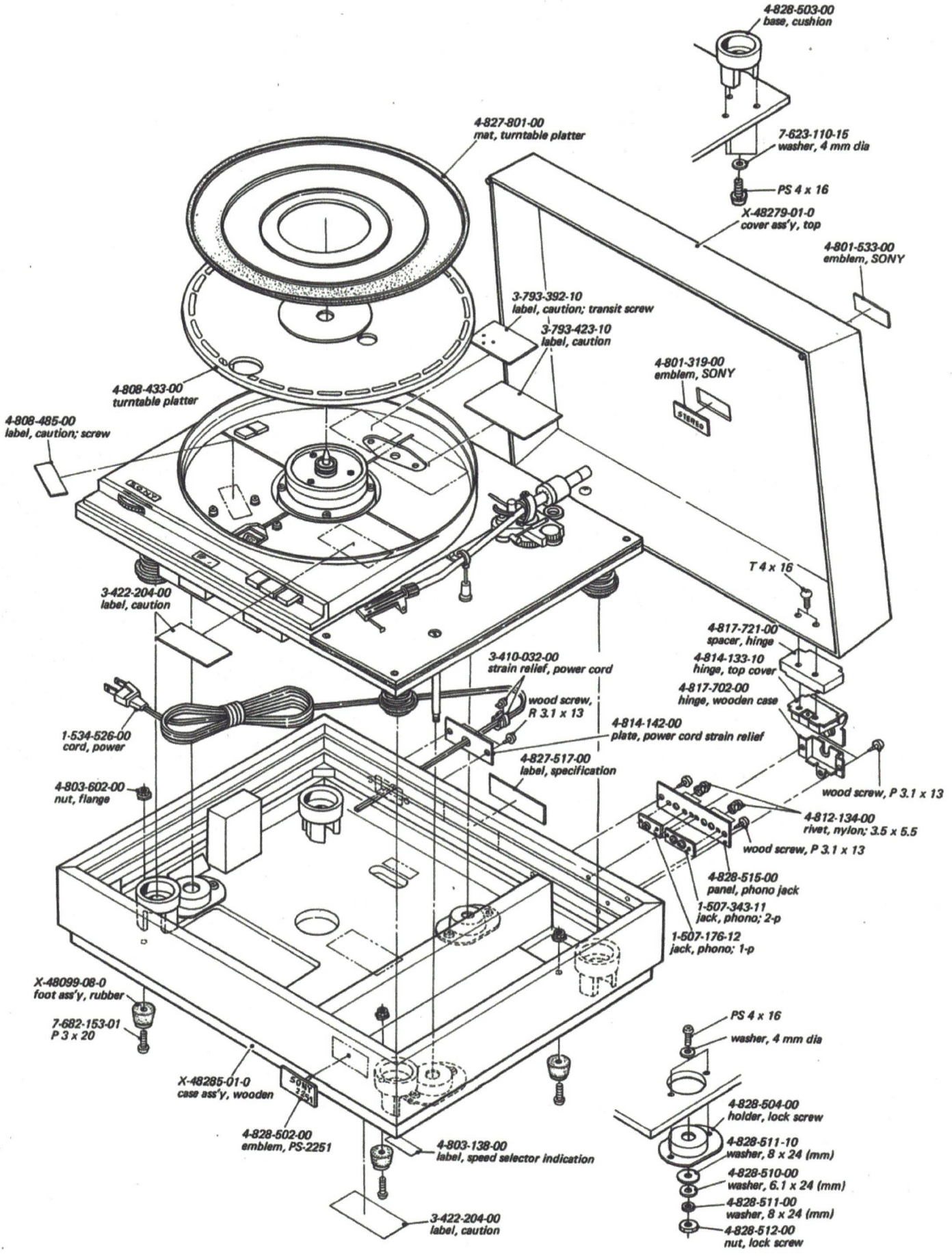


(2) To simplify the exploded view, the part numbers of normal screws, nuts, washers, and retaining rings are not expressed but summarized in the table below.

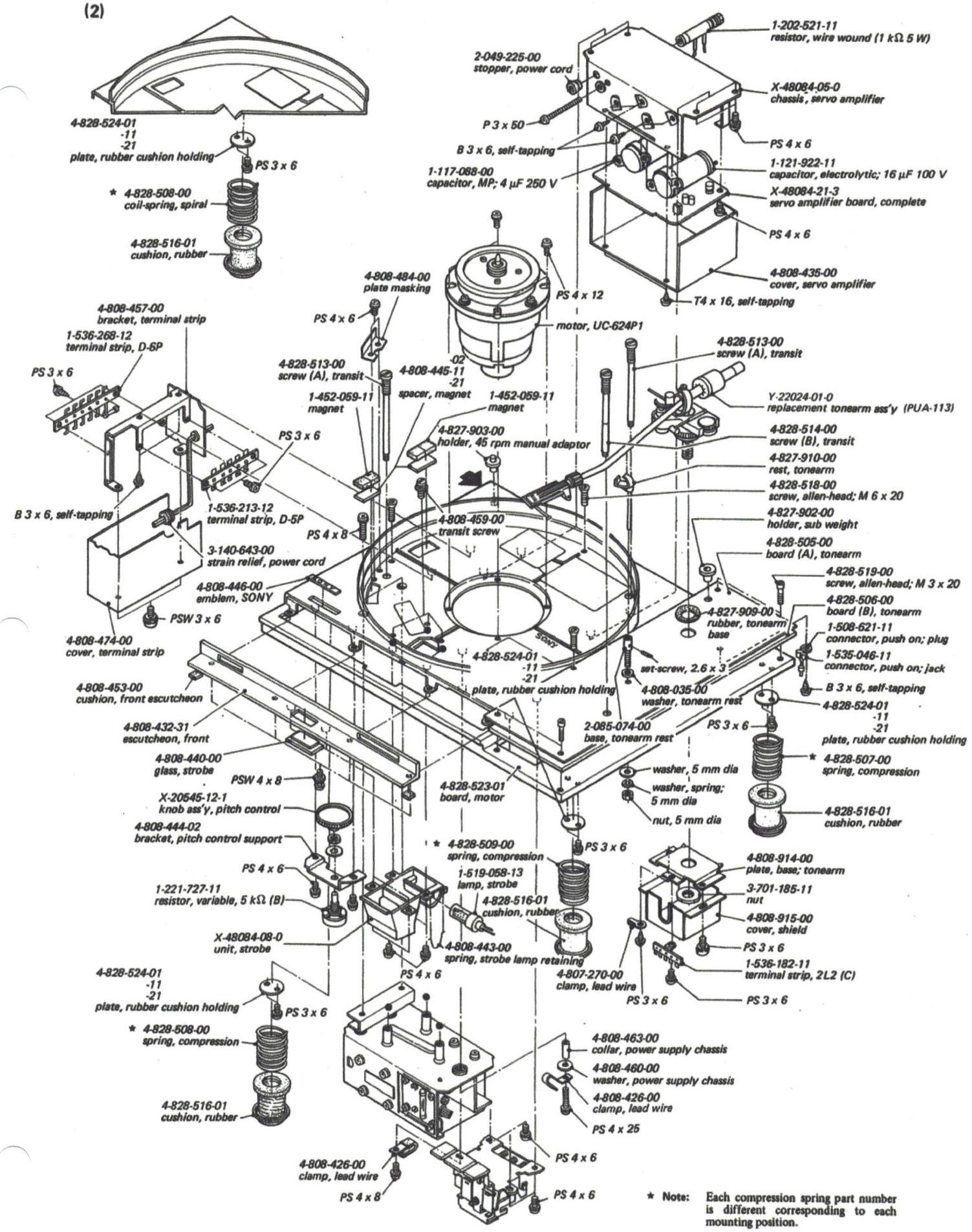
HARDWARES

Part No.	*Description*
	SCREWS
4-828-518-00	screw, allen-head; M 6 x 20
4-828-519-00	screw, allen-head; M 3 x 20
7-621-712-27	set screw, 2.6 x 3
7-621-843-39	screw, wood; R3.1 x 13
7-621-844-17	screw, wood; P 3.1 x 13
7-682-150-13	screw, P 3 x 12
7-682-198-01	screw, P 3 x 50
7-682-465-04	screw, T 4 x 16
7-682-545-21	screw, self-tapping; B 3 x 6
7-682-647-01	screw, PS 3 x 6
7-682-660-01	screw, PS 4 x 6
7-682-661-01	screw, PS 4 x 8
7-682-662-01	screw, PS 4 x 10
7-682-663-01	screw, PS 4 x 12
7-682-665-01	screw, PS 4 x 16
7-682-667-01	screw, PS 4 x 25
7-682-947-01	screw, PSW 3 x 6
7-682-961-01	screw, PSW 4 x 8
	NUT
7-622-212-05	nut, 5 mm dia
	WASHERS
7-623-112-12	washer, 4 mm dia
7-623-212-27	washer, spring; 5 mm dia
7-623-408-05	washer, lock; 3 mm dia
7-624-105-01	retaining ring, 2.3 mm dia

(1)

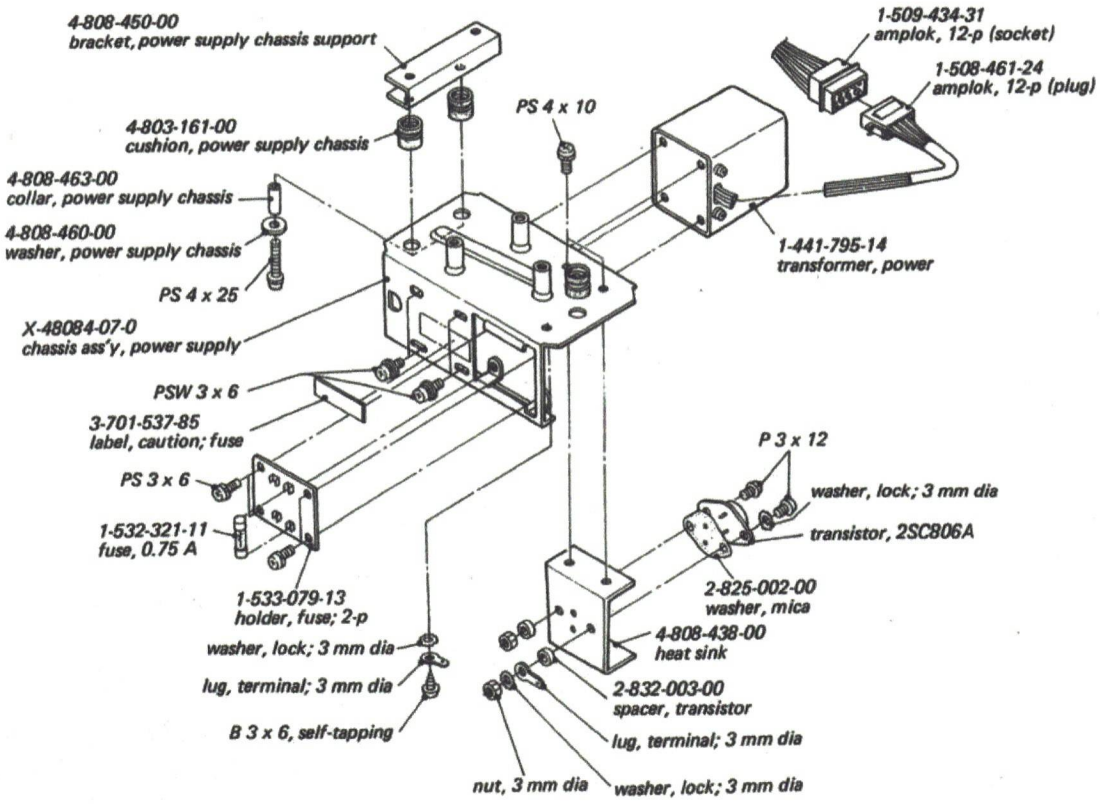

4-828-503-00
base, cushion
4-827-801-00
mat, turntable platter
7-623-110-15
washer, 4 mm dia
PS 4 x 16
X-48279-01-0
cover ass'y, top
4-801-533-00
emblem, SONY
3-793-392-10
label, caution; transit screw
3-793-423-10
label, caution
4-801-319-00
emblem, SONY
4-808-433-00
turntable platter
4-808-485-00
label, caution; screw
T 4 x 16
3-422-204-00
label, caution
4-817-721-00
spacer, hinge
4-814-133-10
hinge, top cover
4-817-702-00
hinge, wooden case
3-410-032-00
strain relief, power cord
wood screw,
R 3.1 x 13
4-814-142-00
plate, power cord strain relief
1-534-526-00
cord, power
4-827-517-00
label, specification
4-803-602-00
nut, flange
wood screw, P 3.1 x 13
4-812-134-00
rivet, nylon; 3.5 x 5.5
wood screw, P 3.1 x 13
4-828-515-00
panel, phono jack
1-507-343-11
jack, phono; 2-p
1-507-176-12
jack, phono; 1-p
X-48099-08-0
foot ass'y, rubber
7-682-153-01
P 3 x 20
PS 4 x 16
washer, 4 mm dia
4-828-504-00
holder, lock screw
X-48285-01-0
case ass'y, wooden
4-828-502-00
emblem, PS-2251
4-803-138-00
label, speed selector indication
4-828-511-10
washer, 8 x 24 (mm)
4-828-510-00
washer, 6.1 x 24 (mm)
4-828-511-00
washer, 8 x 24 (mm)
4-828-512-00
nut, lock screw
3-422-204-00
label, caution

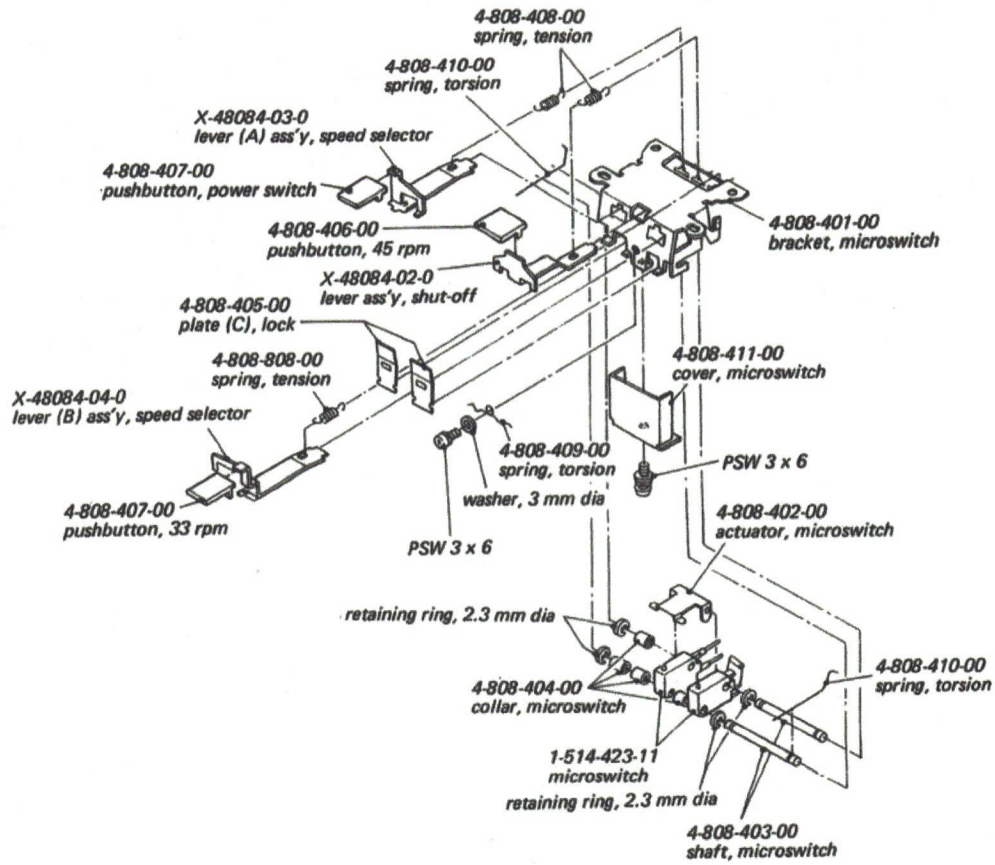
(2)

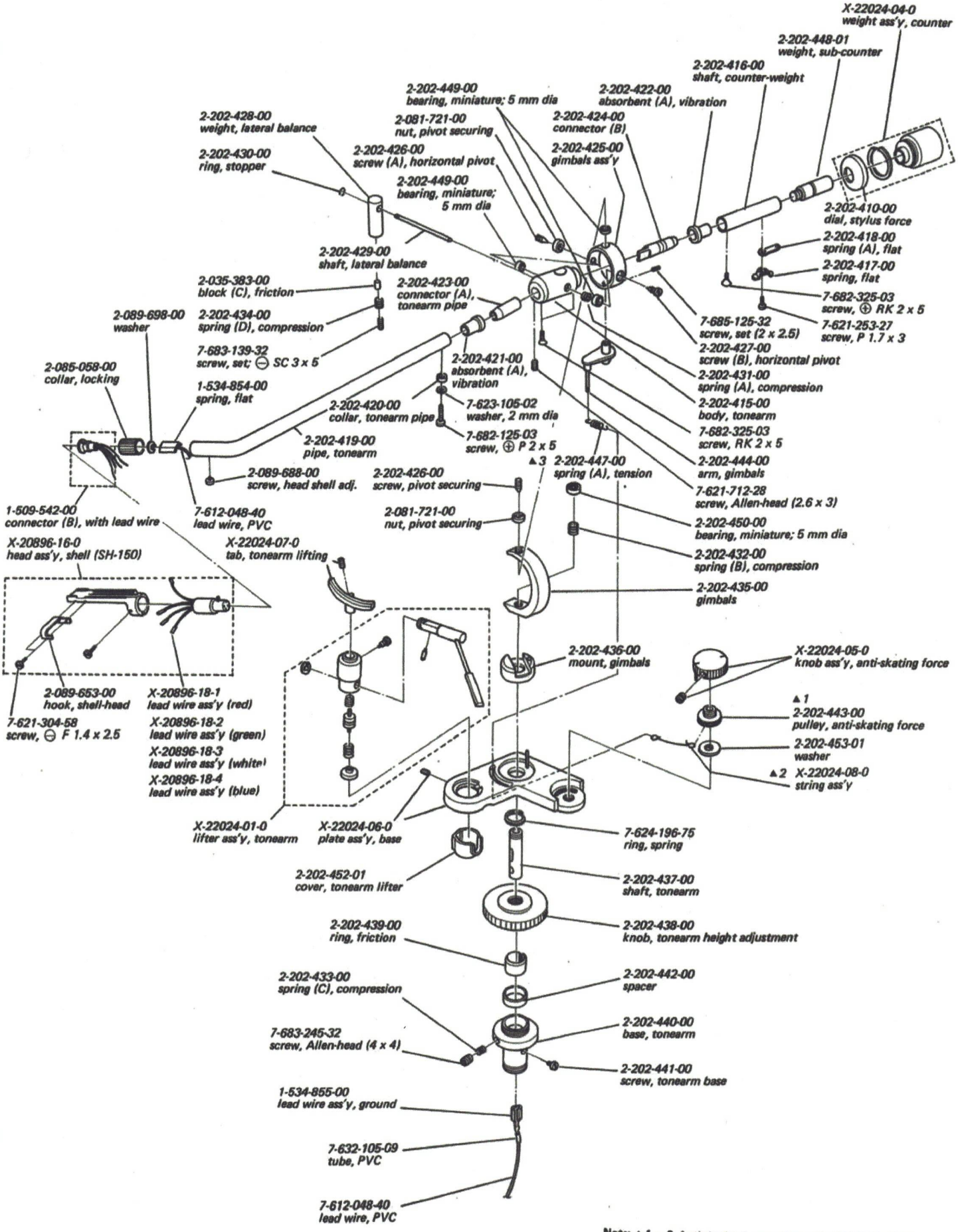


★ Note: Each compression spring part number is different corresponding to each mounting position.

(3)


4-808-450-00
bracket, power supply chassis support
1-509-434-31
amplok, 12-p (socket)
1-508-461-24
amplok, 12-p (plug)
PS 4 x 10
4-803-161-00
cushion, power supply chassis
4-808-463-00
collar, power supply chassis
4-808-460-00
washer, power supply chassis
PS 4 x 25
1-441-795-14
transformer, power
X-48084-07-0
chassis ass'y, power supply
PSW 3 x 6
3-701-537-85
label, caution; fuse
PS 3 x 6
1-532-321-11
fuse, 0.75 A
1-533-079-13
holder, fuse; 2-p
P 3 x 12
washer, lock; 3 mm dia
transistor, 2SC806A
2-825-002-00
washer, mica
4-808-438-00
heat sink
washer, lock; 3 mm dia
lug, terminal; 3 mm dia
B 3 x 6, self-tapping
2-832-003-00
spacer, transistor
lug, terminal; 3 mm dia
nut, 3 mm dia
washer, lock; 3 mm dia


4-808-408-00
spring, tension
4-808-410-00
spring, torsion
X-48084-03-0
lever (A) ass'y, speed selector
4-808-407-00
pushbutton, power switch
4-808-406-00
pushbutton, 45 rpm
4-808-401-00
bracket, microswitch
X-48084-02-0
lever ass'y, shut-off
4-808-405-00
plate (C), lock
4-808-808-00
spring, tension
4-808-411-00
cover, microswitch
X-48084-04-0
lever (B) ass'y, speed selector
4-808-409-00
spring, torsion
PSW 3 x 6
4-808-407-00
pushbutton, 33 rpm
washer, 3 mm dia
4-808-402-00
actuator, microswitch
PSW 3 x 6
retaining ring, 2.3 mm dia
4-808-410-00
spring, torsion
4-808-404-00
collar, microswitch
1-514-423-11
microswitch
retaining ring, 2.3 mm dia
4-808-403-00
shaft, microswitch



Note: ▲ 1 ~ 3 Anti-skating force pulley ass'y (X-22024-08-1) includes all the part marked ▲.

SECTION 6

REPACKING

The PS-2251's original shipping carton and packing materials are the ideal containers for shipping the unit. However to secure the maximum protection, the PS-2251 must be repacked in these materials precisely as before. The proper repacking procedures are shown in Fig. 6-1.

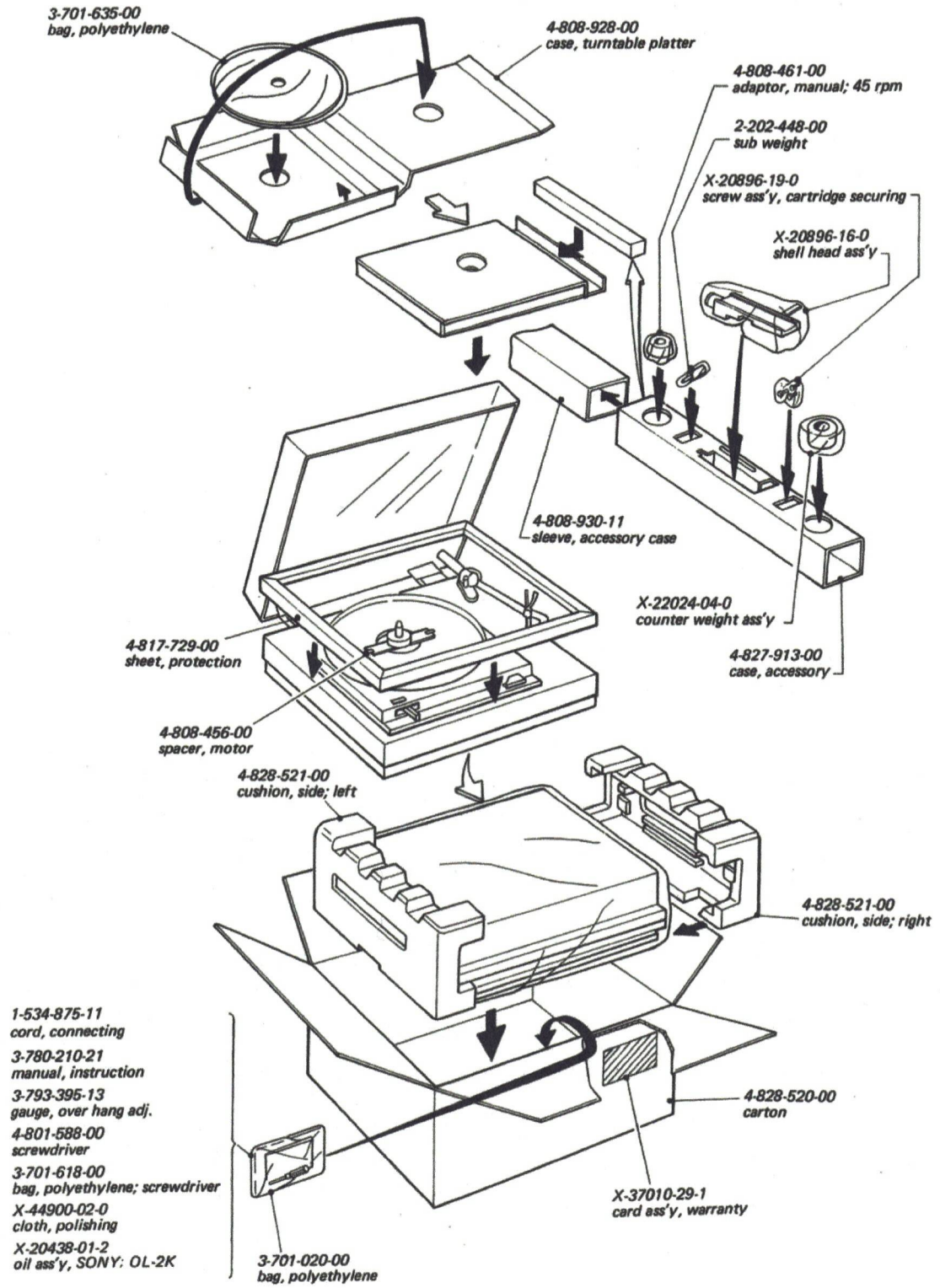


Fig. 6-1. Repacking

SECTION 7

ELECTRICAL PARTS LIST

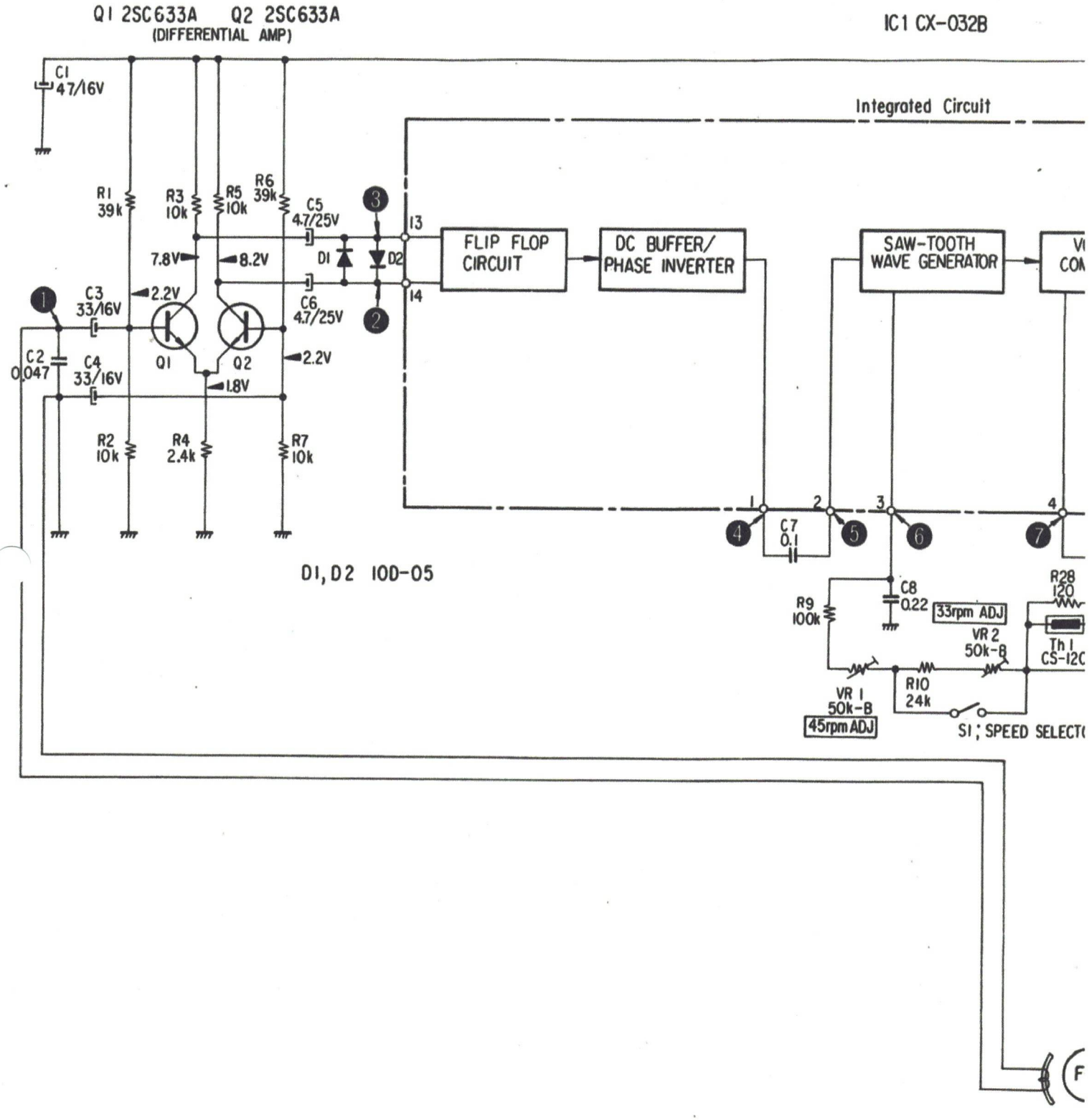
Ref. No.	*Part No.*	*Description*			
		COMPLETE CIRCUIT BOARD			
		servo amplifier circuit board			
		SEMICONDUCTORS			
D1		diode	10D-05		
D2		diode	10D-05		
D3		diode	10D-05		
D4		diode	10D-05		
D5		diode	1T243M		
D6		diode	10D-05		
D7		diode	ZB1-12		
D8		diode	CD-2		
D9		diode	CDR-2		
D10		diode	CD-4		
D11		diode	CDR-4		
Q1		transistor	2SC633A		
Q2		transistor	2SC633A		
Q3		transistor	2SC633A		
Q4		transistor	2SC633A		
Q5		transistor	2SA677		
Q6		transistor	2SC806A		
Th1		thermistor	CS-120		
IC1		IC	CX-032B		
		TRANSFORMER			
T1	1-441-795-14	transformer, power			
		CAPACITORS			
		All capacitance values are in μF, except as indicated with p, which means $\mu\mu$F.			
C1	1-121-409-11	47		16 V	electrolytic
C2	1-105-681-12	0.047	± 10 %	50 V	mylar
C3	1-121-403-11	33		16 V	electrolytic
C4	1-121-403-11	33		16 V	electrolytic
C5	1-121-395-11	4.7		25 V	electrolytic
C6	1-121-395-11	4.7		25 V	electrolytic
C7	1-105-685-12	0.1	± 10 %	50 V	mylar
C8	1-105-689-12	0.22	± 10 %	50 V	mylar
C9	1-105-661-12	0.001	± 10 %	50 V	mylar
C10	1-121-403-11	33		16 V	electrolytic
C11	1-121-391-11	1		50 V	electrolytic
C12	1-127-025-11	3.3	± 20 %	10 V	solid, aluminum
C13	1-127-025-11	3.3	± 20 %	10 V	solid, aluminum
C14	1-131-157-11	1.5	$^{+40}_{-20}$ %	16 V	tantalum
C15	1-127-022-11	0.47	± 20 %	10 V	solid, aluminum
C16	1-131-140-11	4.7	± 20 %	10 V	tantalum
C17	1-121-426-11	470		16 V	electrolytic
C18	1-121-180-11	10		350 V	electrolytic
C19	1-121-733-11	470		25 V	electrolytic
C20	1-121-922-11	16		100 V	electrolytic
C21	1-117-088-11	4	± 10 %	250 V	MP
		RESISTORS			
		All resistance values are in ohms, ± 5 %, ¼ W and carbon type unless otherwise indicated.			
R1	1-242-711-11	39 k			
R2	1-242-697-11	10 k			
R3	1-242-697-11	10 k			
R4	1-242-682-11	2.4 k			
R5	1-242-697-11	10 k			
R6	1-242-711-11	39 k			
R7	1-242-697-11	10 k			
R8	1-242-655-11	180			
R9	1-242-721-11	100 k			
R10	1-242-706-11	24 k			
R11	1-242-691-11	5.6 k			
R12	1-242-655-11	180			
R13	1-242-682-11	2.4 k			
R14	1-242-703-11	18 k			
R15	1-242-686-11	3.6 k			
R16	1-242-686-11	3.6 k			
R17	1-242-686-11	3.6 k			
R18	1-242-661-11	330			
R19	1-242-673-11	1 k			
R20	1-242-723-11	120 k			
R21	1-242-699-11	12 k			
R22	1-242-703-11	18 k			
R23	1-242-667-11	560			
R24	1-205-521-11	1 k	± 5 %	5 W	wire wound
R25	1-209-232-11	5.6 k	± 10 %	1 W	carbon
R26	1-244-849-11	100	± 5 %	½ W	carbon
R27	1-242-649-11	100			
R28	1-242-651-11	120			
VR1	1-222-781-11	50 k (B), adjustable			
VR2	1-222-781-11	50 k (B), adjustable			
VR3	1-221-727-11	5 k (B), adjustable			
		SWITCHES			
S1	1-514-423-11	switch, micro (SPEED SELECTOR)			
S2	1-514-423-11	switch, micro (POWER)			
		MISCELLANEOUS			
CP	1-231-057-12	encapsulated component, 0.033 μF + 120 Ω			

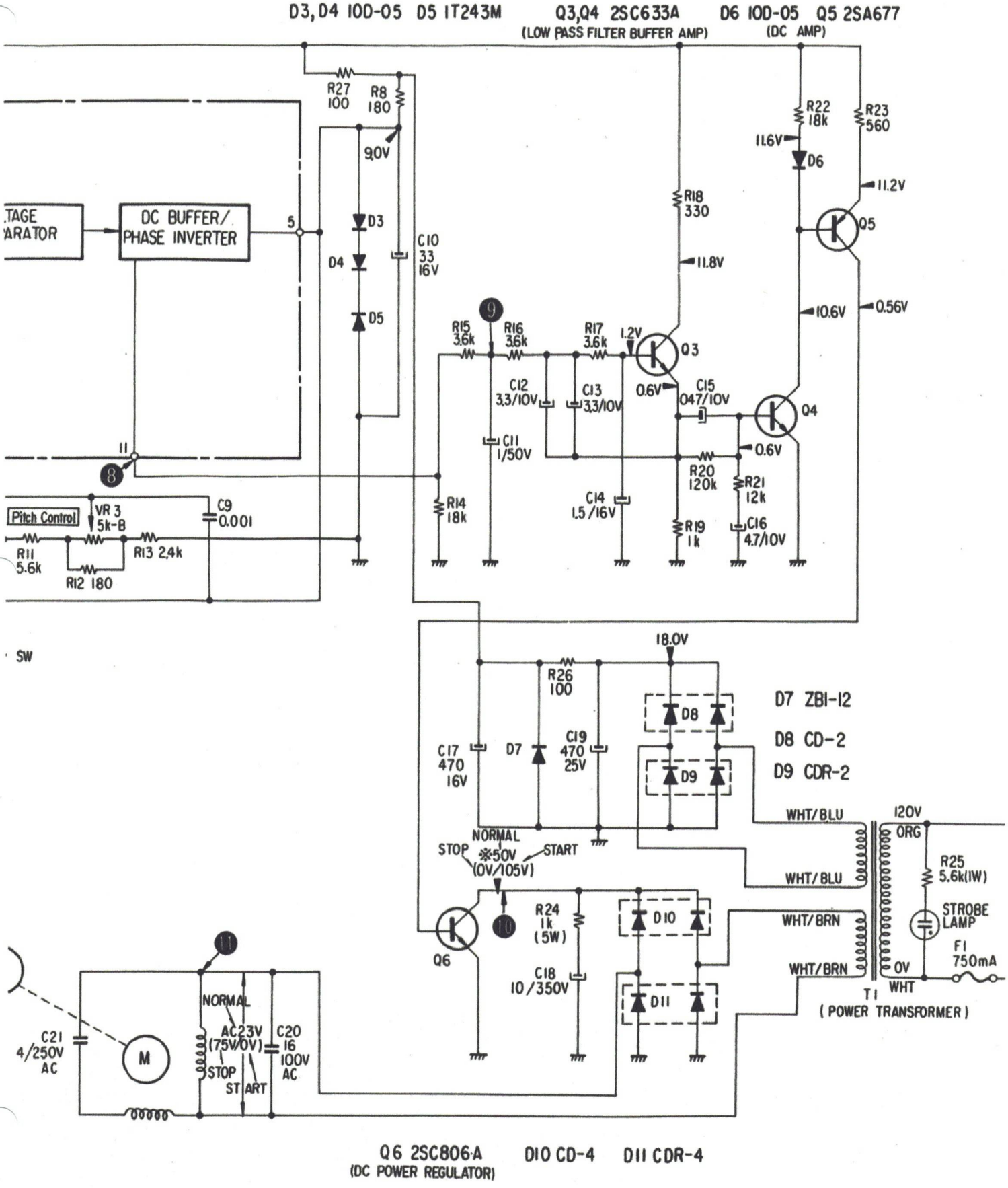
Ref. No.	*Part No.*	*Description*
F1	1-532-321-11	fuse, 0.75 A
M	8-836-624-15	motor, UC-624P1
	1-519-058-13	lamp, strobe
	1-452-059-11	magnet
	1-508-461-24	amplok, 12-p (plug)
	1-509-434-31	amplok, 12-p (socket)
	1-533-079-13	holder, fuse; 2-p
	1-534-526-00	cord, power
	1-536-213-12	terminal strip, D-5p
	1-536-268-12	terminal strip, D-6p

SONY CORPORATION

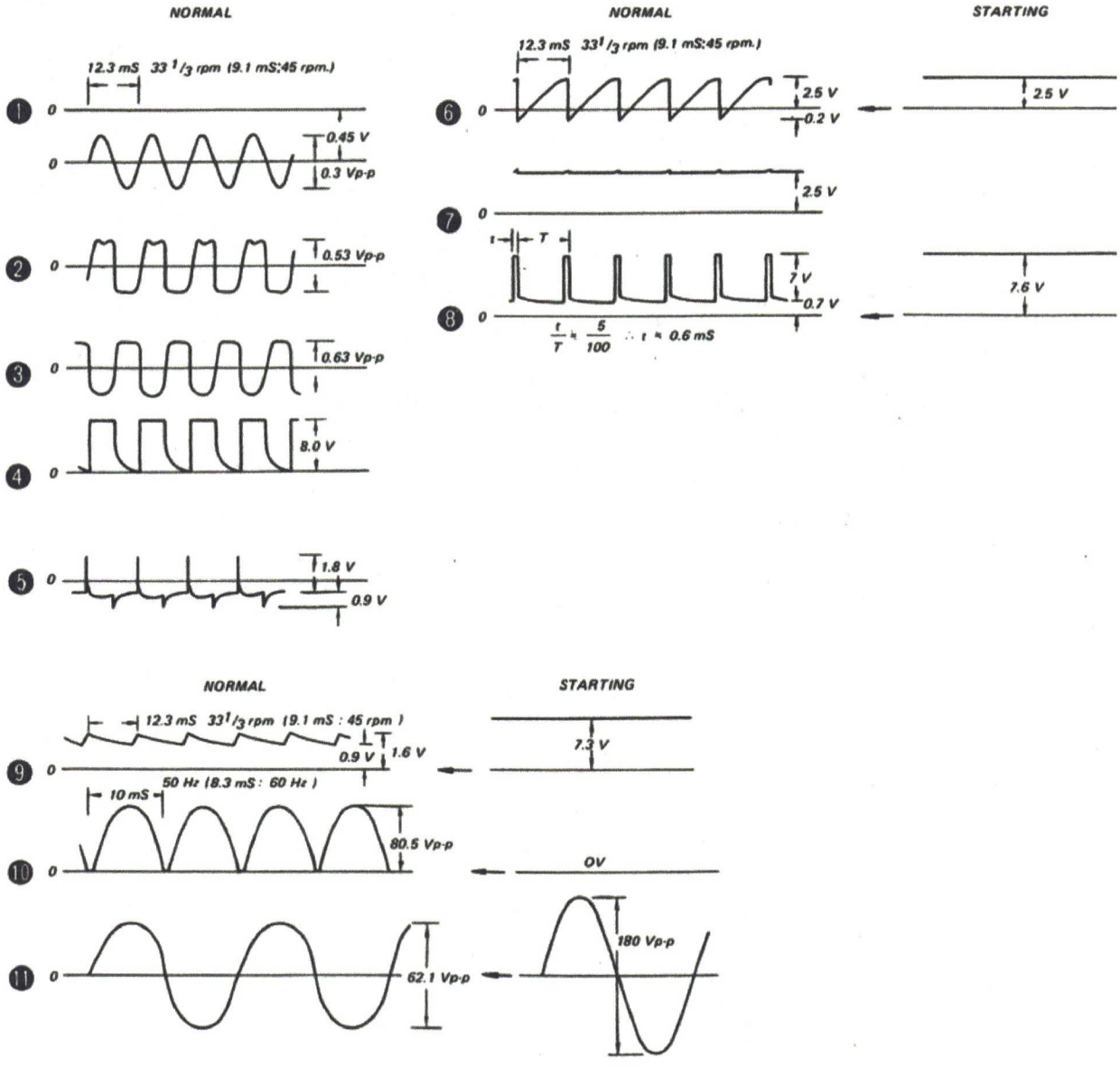
3B0514-1

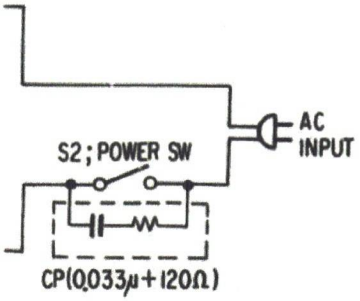
Printed in Japan


Q1 2SC633A Q2 2SC633A
(DIFFERENTIAL AMP)
IC1 CX-032B
Integrated Circuit
C1 47/16V
R1 39k
R3 10k
R5 10k
R6 39k
C5 4.7/25V
C6 4.7/25V
C3 33/16V
C2 0.047
C4 33/16V
R2 10k
R4 2.4k
R7 10k
7.8V
8.2V
2.2V
1.8V
2.2V
Q1
Q2
D1
D2
D1, D2 100-05
FLIP FLOP CIRCUIT
DC BUFFER/ PHASE INVERTER
SAW-TOOTH WAVE GENERATOR
C7 0.1
C8 0.22
R9 100k
33rpm ADJ
VR 2 50k-B
R28 120
Th 1 CS-120
VR 1 50k-B
45rpm ADJ
R10 24k
S1 ; SPEED SELECT


D3, D4 100-05 D5 1T243M
Q3,Q4 2SC633A
(LOW PASS FILTER BUFFER AMP)
D6 100-05 Q5 2SA677
(DC AMP)
DC BUFFER/
PHASE INVERTER
R27 100
R8 180
9.0V
D3
D4
D5
C10 33 16V
R18 330
11.8V
R22 18k
11.6V
D6
R23 560
11.2V
Q5
10.6V
0.56V
R15 3.6k
R16 3.6k
R17 3.6k
1.2V
Q3
0.6V
C12 3.3/10V
C13 3.3/10V
C15 047/10V
Q4
C11 1/50V
0.6V
R20 120k
R21 12k
R14 18k
C14 1.5/16V
R19 1k
C16 4.7/10V
Pitch Control
VR 3 5k-B
C9 0.001
R11 5.6k
R12 180
R13 2.4k
SW
18.0V
R26 100
D7 ZBI-12
D8 CD-2
D9 CDR-2
C17 470 16V
D7
C19 470 25V
D8
D9
WHT/BLU
120V
ORG
NORMAL
STOP
*50V (0V/105V)
START
R25 5.6k(1W)
STROBE LAMP
F1 750mA
R24 1k (5W)
D10
WHT/BRN
Q6
C18 10/350V
D11
0V
WHT
T1
(POWER TRANSFORMER)
NORMAL
AC23V (75V/0V)
C21 4/250V AC
M
C20 16 100V AC
STOP
START
Q6 2SC806A
(DC POWER REGULATOR)
D10 CD-4
D11 CDR-4

Waveforms





Note:

All resistance values are in ohms. , k = 1000, M = 1000 k

All capacitance values are in μF except as indicated with p, which means μμF.

All voltages represent an average value and should hold within ±20 %.

All voltages are dc measured with a VOM (DC 20 k ohms/V) at no signal.

Waveforms are measured by using an oscilloscope.

※ 33⅓ or 45 rpm operation.

PS-2251

SONY®

1973

SONY

STEREO TURNTABLE SYSTEM

PS-2251

Owner's Instruction Manual

The PS-2251 manual turntable offers precise speed and silent operation for true audio enthusiasts; wow and flutter is less than 0.04% and signal-to-noise ratio is over 58 dB.

The advanced servo-controlled ac motor rotates at the record speed (33 1/3 rpm or 45 rpm) and directly drives the turntable platter. No speed-transmission or speed-reduction mechanisms are required. Durability is another benefit of no idler or belt. The motor speed is never influenced by the ac power frequency as the independent servo system perfectly controls the ac drive motor. The well-balanced, die-cast, aluminum-alloy platter is a hefty 3 lb 5 oz. The resulting inertia moment provides an exceptionally good flywheel effect. The turntable mounting is carefully balanced and shock-mounted to resist extraneous mechanical vibration.

The newly-designed static-balanced tonearm provides outstanding performance with any high-compliance cartridge. This precision arm incorporates a direct-reading gauge to measure the tracking force, a simple anti-skating compensator and lateral balancer.

Other features of the PS-2251 are; a stroboscope to observe the turntable speed, a pitch control to obtain accurate speed, and electrically-controlled speed selection.

Before operating the PS-2251, read this manual thoroughly to obtain optimum performance and enjoyment. Keep the manual for future reference.

TABLE OF CONTENTS

PREPARING FOR USE

UNPACKING

All Sony equipment comes to you carefully packed in cartons designed to withstand the rigors of shipment. Do not throw this carton or the associated packing material away; they will come in handy if you ever have to transport or ship the PS-2251.

Inspect your PS-2251 immediately for signs of damage incurred in transit. If damage has occurred, consult your local Sony dealer for further instructions. Once again, save all packing materials; they will help substantiate your damage claim.

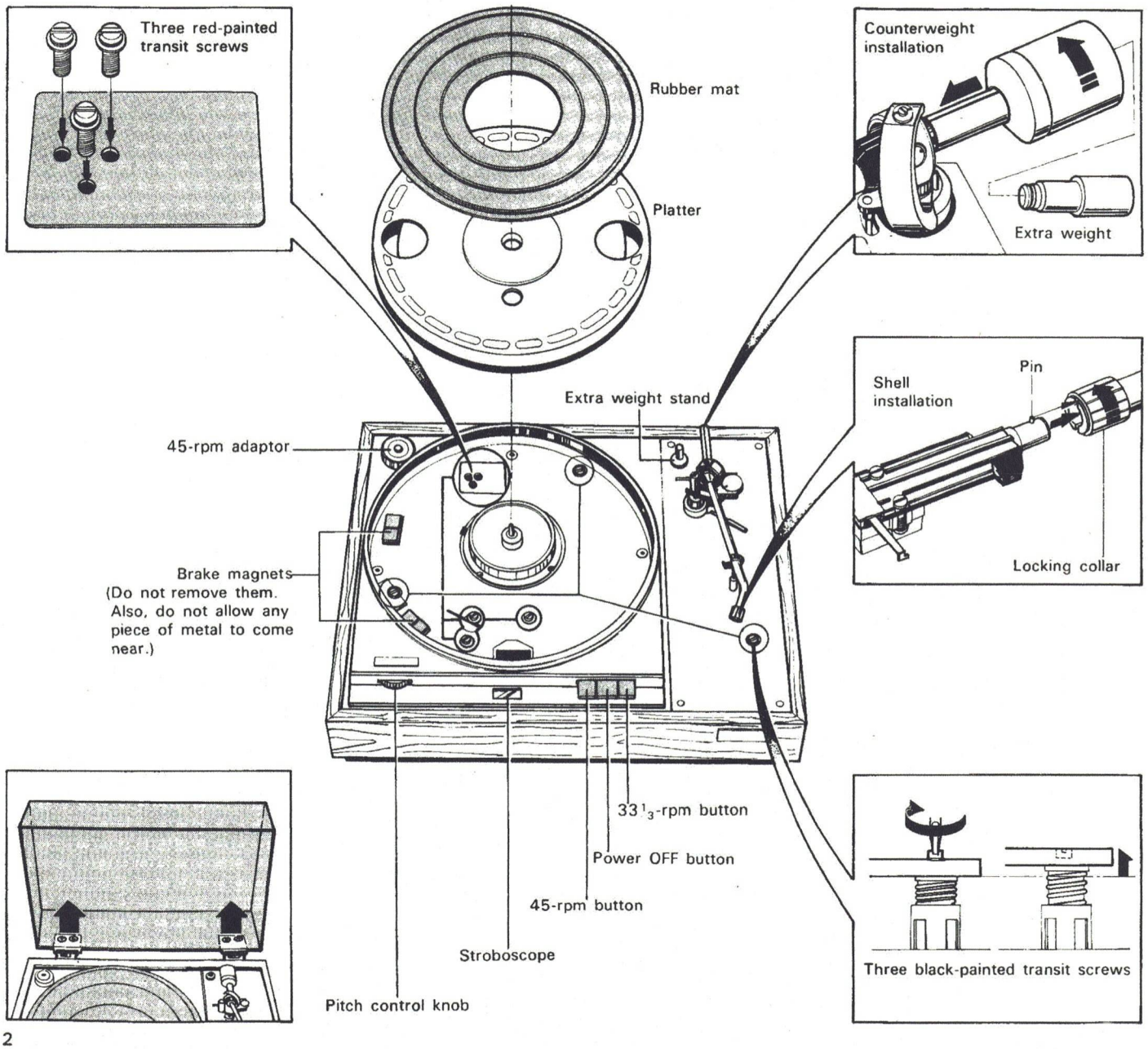
ASSEMBLY

The PS-2251 is shipped partially disassembled to withstand the rough handling usually encountered during shipment without affecting any of its high-precision parts.
Assemble and adjust the PS-2251 as described in the following procedure by performing each step exactly as directed and in the order given. Do not plug in or energize the PS-2251 until told to do so.

During assembly, and the other adjustments and operational routines which follow, refer to the illustrations below.

To take off the dust cover, lift the cover up as illustrated below.

1. Turn the three black-painted Transit Screws fully clockwise with the screwdriver supplied. The screws will move down and allow the mounting board to float freely on its suspension springs.
2. Remove the three red-painted Transit Screws from the Frame by turning them counterclockwise. Save them for future transportation.
3. Place the Platter on the Frame by matching the center hole to the spindle.
4. Place the Rubber Mat on the Platter.
5. Remove the ribbon securing the tonearm.
6. Install the Counterweight Assembly on the arm by turning the weight counterclockwise. A cartridge weighing between 4 g – 17 g can be used with this counterweight. When installing the extra weight supplied, you can use a cartridge between 8 g to 21 g; plug the extra weight into the end of the arm-pipe until it locks with a click.



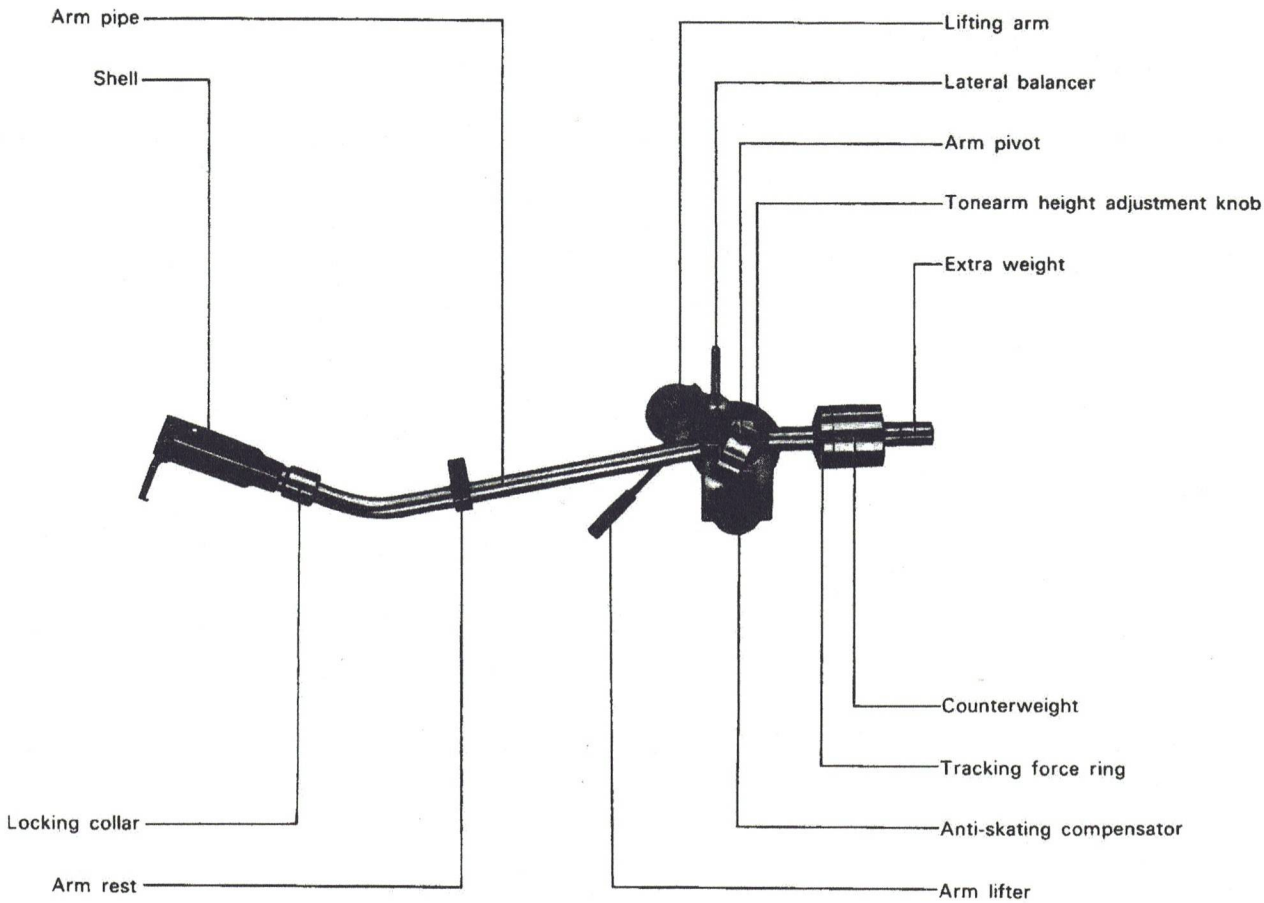
. Shell installation :

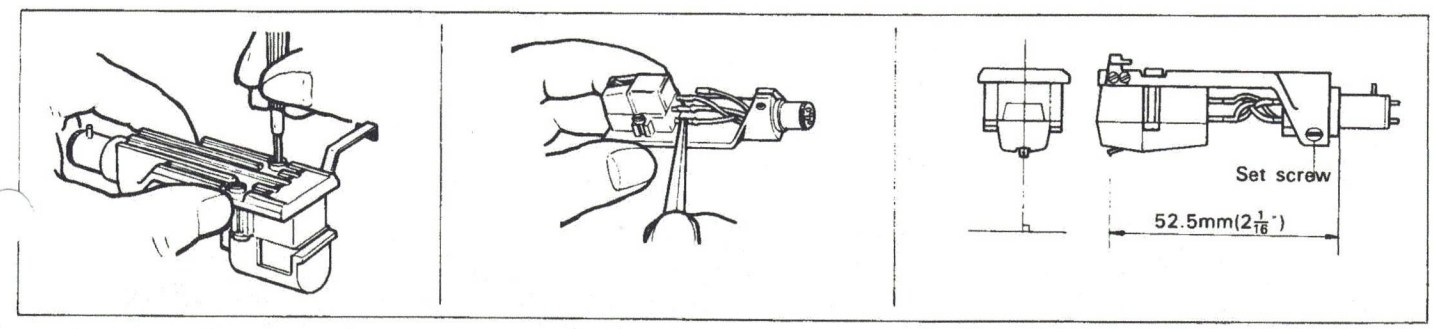
A. Secure the Cartridge to the Shell by turning the two mounting screws clockwise. Three pairs of screws of various lengths are supplied. Use the most suitable pair according to the height of your cartridge.

B. Connect the lead wires of the shell to the corresponding pins on the cartridge. The color-coding is as follows ;
White wire .....left channel signal (designated as L)
Blue wire .....left channel ground (E or G)
Red wire .....right channel signal (R)
Green wire .....right channel ground (E or G)
● If the ground terminal is connected to the cartridge shield, this may cause hum. If hum is severe, remove the shielding tab from the cartridge ground pin.

C. Perform the overhang adjustment as follows ; loosen the Set Screw located on the shell and slide the shell so that the distance from the stylus tip to the end of the shell is approximately 52.5 mm (2 1/16").

7. Plug the shell into the tonearm socket as follows ; engage the lock pin on the shell with the notch of the socket and turn the Locking Collar counterclockwise until the shell is firmly locked. Ensure that the stylus tip is vertically positioned when viewed from the front. If it is not, adjust the shell angle by turning the shell.



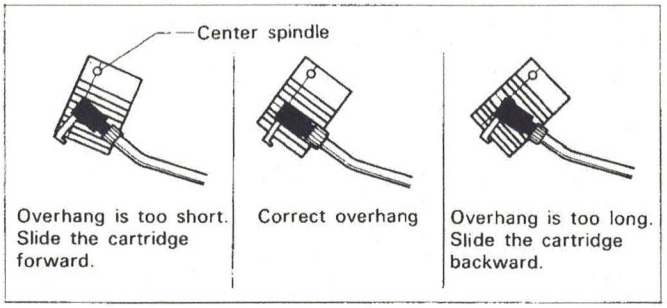


TONEARM ADJUSTMENTS

Overhang Check

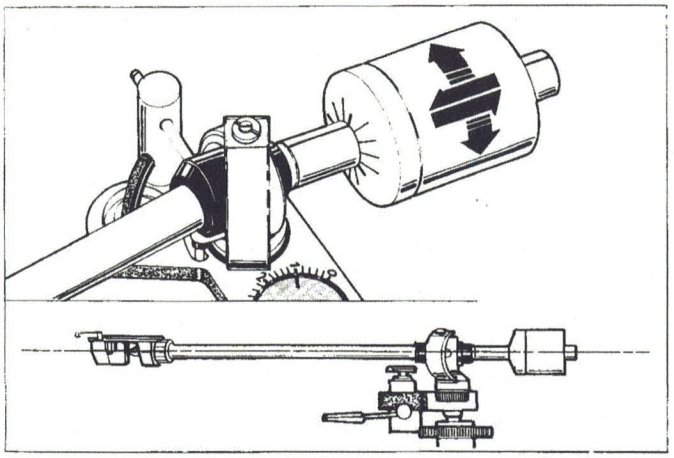
By using the Alignment Protractor supplied, ensure that the stylus overhang is set correctly.

1. Pierce the cross point of fine lines on the protractor with a pin.
2. Place the protractor on the center spindle through the hole on its corner.
3. Bring the tonearm above the pin hole, and carefully lower the stylus into the pin hole.
4. Ensure that the shell is parallel to lines on the protractor. If it is not, loosen the Set Screw on the shell and adjust the cartridge position.

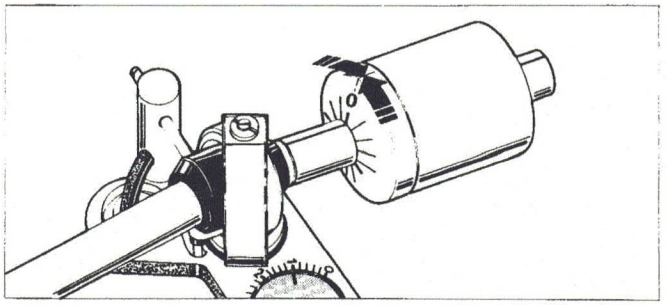


Longitudinal Balance

1. Remove the stylus guard.
2. Release the tonearm from the arm rest.
3. Turn and move the Counterweight Assembly to balance the arm. Be careful not to damage the stylus tip.

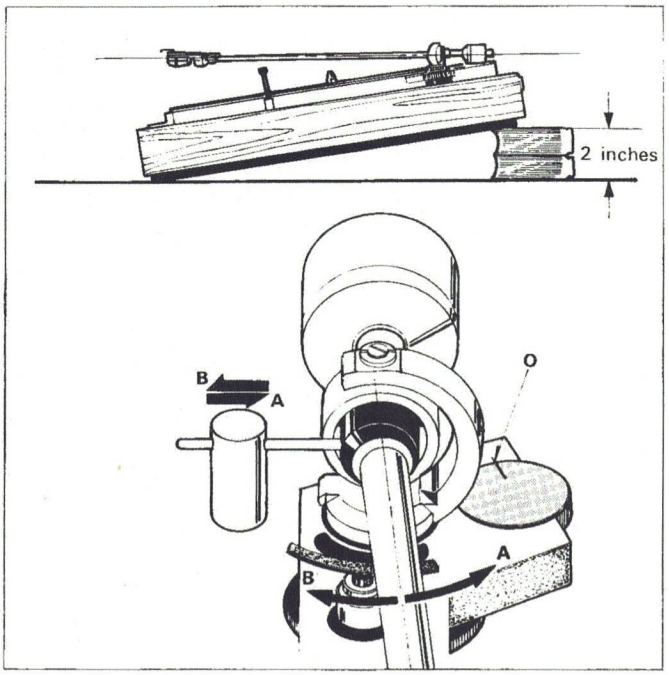


4. By holding the Counterweight at the balanced position (set in Step 3), separately turn the Tracking Force Ring to meet the "0" indication to the center line on the arm.



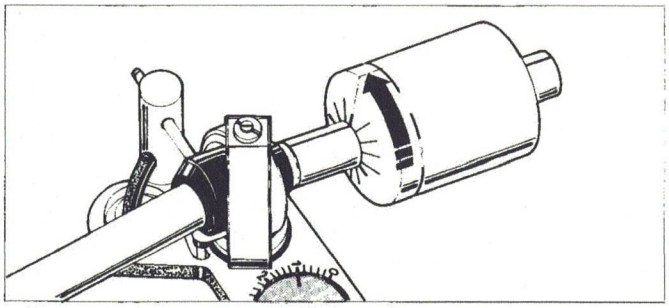
Lateral Balance

1. Before making lateral balance, take off the Platter and turn the three black-painted Transit Screws fully counterclockwise to secure the mounting board to the cabinet (refer to the illustration on page 2).
2. Release the tonearm from the arm rest and balance it longitudinally.
3. Keep the Anti-skating Compensator at "0".
4. Slowly tilt the player case by lifting the rear side of the case approximately 2 inches.
5. If the arm moves inward or outward with the case tilted, adjust the Lateral Balancer; slide the balancer in the same direction that the arm moved so that the arm stops (balanced laterally).
6. Secure the arm to the arm rest.
7. After balancing, be sure to turn the three black-painted Transit Screws fully clockwise to freely float the turntable. Replace the Platter and Rubber Mat.



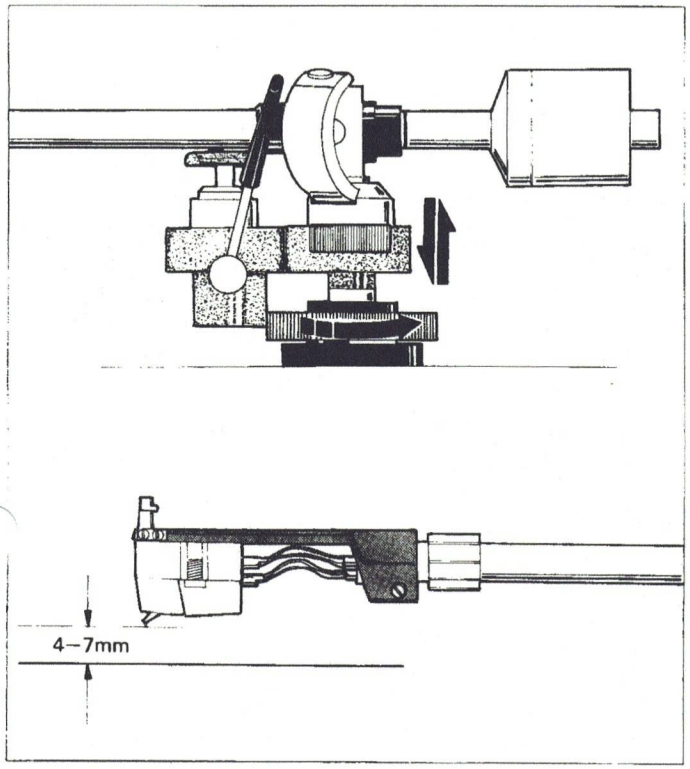
Tracking Force

After balancing the arm laterally and longitudinally, turn the Counterweight (with the Tracking Force Ring) counterclockwise so that the recommended figure for your cartridge is aligned with the center line on the arm. The maximum tracking force available is 3 grams.



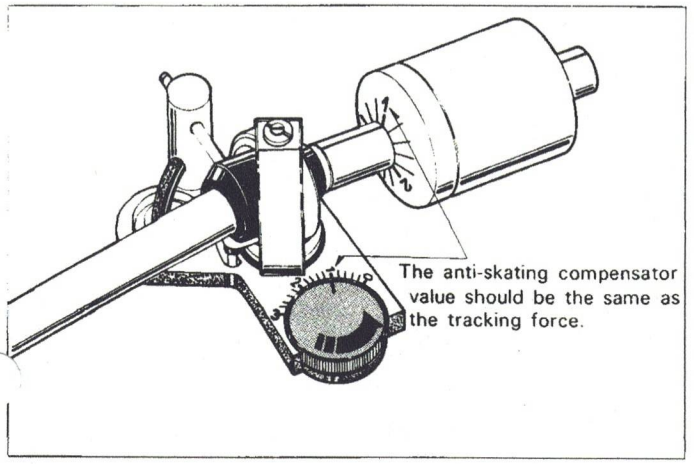
onearm Height Adjustment

1. By holding the tonearm deck, turn the Tonearm Height Adjustment Knob fully counterclockwise to release the arm axis.
2. Raise the Arm Lifter. Release the arm from the arm rest and move it above the record.
3. Adjust the tonearm height by hand so that the distance between the stylus tip and the record will be 4 - 7 mm. Turn the knob fully clockwise to lock the arm height.
4. Ensure that the arm is parallel to the record and the arm pipe does not touch the Lifting Arm when the stylus is lowered.



Anti-skating Compensator

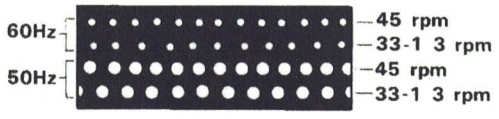
The anti-skating compensator cancels the natural inside skating force of a tonearm on a record. Move the Anti-skating Compensator until the white line matches the tracking force value used. Under ordinary conditions the anti-skating compensator value should be the same as the tracking force.



TURNTABLE SPEED ADJUSTMENTS

Before proceeding to the instructions on how to play records, you must adjust the turntable speed by using the Stroboscope as a guide. The stroboscope accurately measures the rotational speed of the turntable by matching the turntable speed to the power line frequency. The rotational speed can be checked by looking through the small window at the top front of the PS-2251.

Plug the PS-2251 power cord into a house-current outlet. Push either the 33-rpm Button or the 45-rpm Button. Notice the four strobo patterns moving past the window. If the pattern associated with the particular turntable speed you are using moves in a particular directions, slowly turn the Pitch Control in the opposite direction until the proper pattern appears stationary.



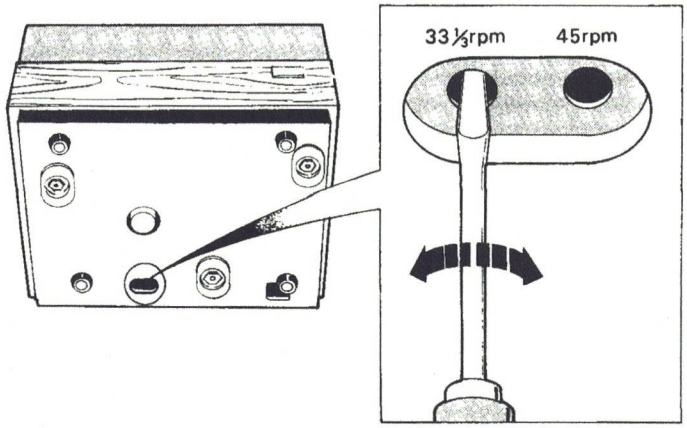
If the pattern moves to the right, turn the Pitch control knob to the left.

Adjust the turntable speed 30 to 60 seconds after power is applied so the motor speed has time to stabilize. The turntable-platter inertia is so great that the turntable cannot immediately follow speed changes. Therefore, wait a few seconds after adjusting the Pitch Control and check for accurate of turntable speed. Once the speed is set, it remains fixed due to the servo-controlled system.

Pitch Control Range Adjustment

The pitch control circuit is factory preset for correct operating speeds with the Pitch Control set to the center of its range. If, after transportation, correct speed cannot be obtained by adjusting the Pitch Control, readjust the semifixed adjustment screws at the bottom of the case as follows.

1. Connect the PS-2251 power cord to the ac outlet.
2. Center the Pitch Control.
3. Push the 45-rpm Button.
4. Slowly turn the "45" semifixed adjustment screw clockwise or counterclockwise until the 45 rpm stroboscope pattern for your power frequency remains stationary.
5. For 33 1/3 rpm adjustment, push the 33-rpm Button and adjust the "33" semified screw in the same manner.



OPERATING INSTRUCTIONS

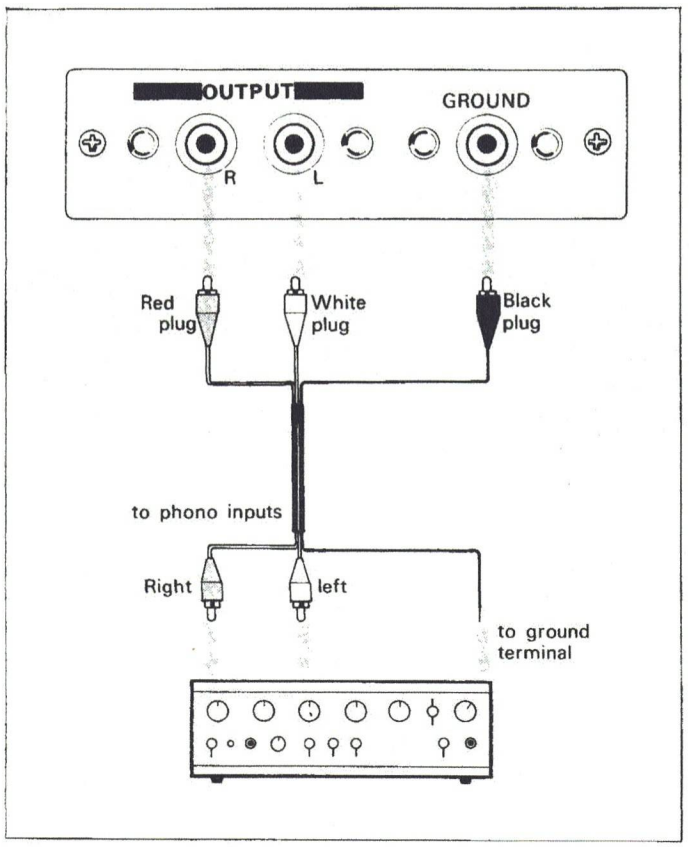
DO'S AND DON'T'S

No doubt you have already decided on a location for the PS-2251. However, before going ahead with the installation, make sure that your choice of location agrees with the following list of DO's and DON'T's.

DO play the PS-2251 on an even surface.
DO allow five inches clearance behind the PS-2251 so the cover can be opened.
DO cover the turntable when it is not in use.
DO replace the stylus when it is worn.
DON'T open the case. No user-serviceable parts are inside. Refer servicing to qualified service personnel.
DON'T turn on the motor without the platter being in place.
DON'T connect the PS-2251 to other than the proper power source (120 volts, 50/60 Hz).
DON'T leave records on the turntable when it is not in use.
DON'T subject the turntable to shock during operation. Avoid placing the unit near doors that are frequently slammed.

CONNECTIONS

1. Connect the player's phono-output jacks to the amplifier's phono inputs with the cord supplied: Connect the L jack to the left channel input with the white plug cord, and the R jack to the right channel input with the red plug cord. Connect the GROUND jack to the amplifier's ground terminal with the black plug and black wire.
2. Connect the PS-2251 power cord to ac outlet. If you use an amplifier's ac outlet, connect it to an unswitched outlet.



OPERATION

Before playing, be sure to clean the stylus with a soft brush (stylus brush, artist's paint brush, etc.) and the disc with a record cleaner. Then, proceed as follows:

1. Place a record on the turntable.
   NOTE: For 7-inch records, put the 45-rpm adaptor (supplied) on the spindle.
2. Push the 33-rpm Button or 45-rpm Button according to the speed of the record you wish to play.
3. Raise the Arm Lifter, and move the tonearm above the lead-in groove of the record. Then, lower the arm lifter.
4. Adjust the sound volume and tone quality with amplifier's controls.
5. After playing, raise the arm lifter and bring the tonearm back to the arm rest.
6. Push the power OFF button.

ACOUSTIC FEEDBACK CHECKS

Though the PS-2251 has high resistance to acoustic feedback due to its well-suspended mounting, if the player and speaker installations are not proper, the record sound will be degraded by acoustic feedback effect.

If you install the player and speakers in the same shelve or cabinet, or place them very close together, perform the following simple test to check the acoustic feedback value of your setup.

1. Lower the stylus on any portion on the record with the turntable stopped.
2. Turn on the amplifier and set the amplifier's function selector to PHONO.
3. Set the amplifier's tone controls to emphasize the bass more than usual.
4. Slowly increace the amplifier's volume to a somewhat higher level than usual.*
5. Gently tap on the record label with a fingertip—be careful not to bounce the stylus. If the speaker resounds with a single "thump", the installation is good. If you hear a continuous "thump" or "bong", acoustic feedback will affect the turntable operation.

   * If unusual sound occurs at this stage, the feedback is very severe.

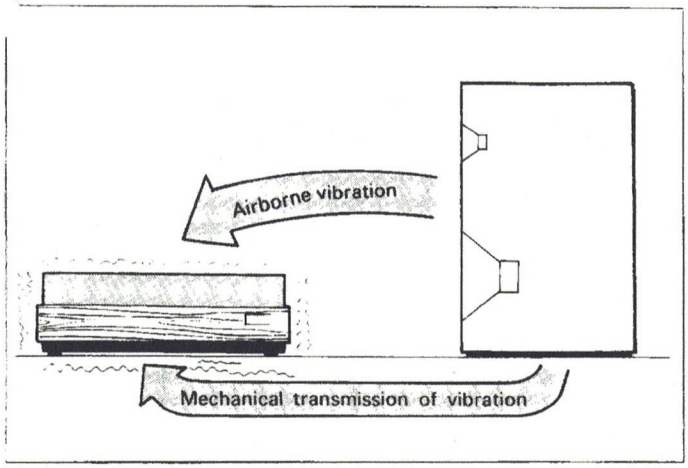
The main factor in acoustic feedback is direct mechanical transmission of vibration. Sound reproduced through speaker vibrates solid objects (shelves, cabinets, floor etc.), and the mechanical vibration of these objects is directly transmitted to player, picked up by cartridge stylus, amplified, and again reproduced through speakers.

To reduce feedback effects, move the speakers further away from the turntable.
Sometimes placing speakers on something resilient (pads, thick carpets, etc.) may be effective.

CARE OF YOUR PS-2251

CLEANING THE CASE

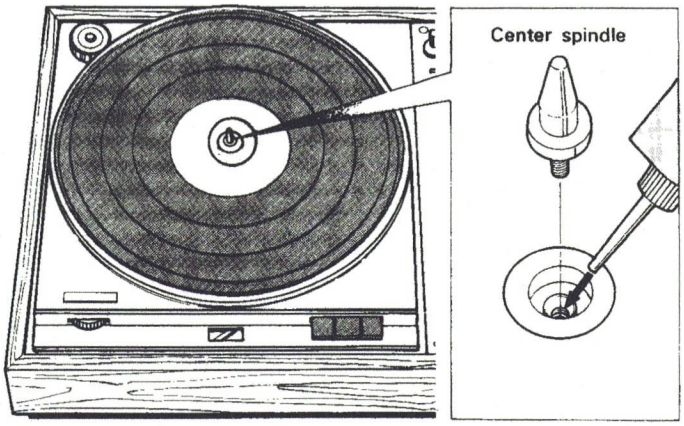
Clean the case with a soft polishing cloth. Never use solvents, such as thinner, acetone, or benzine, as they may mar the finish.



LUBRICATION

Lubricate the center spindle retainer once a year with the Sony Oil OL-2K supplied. No other parts require lubrication.

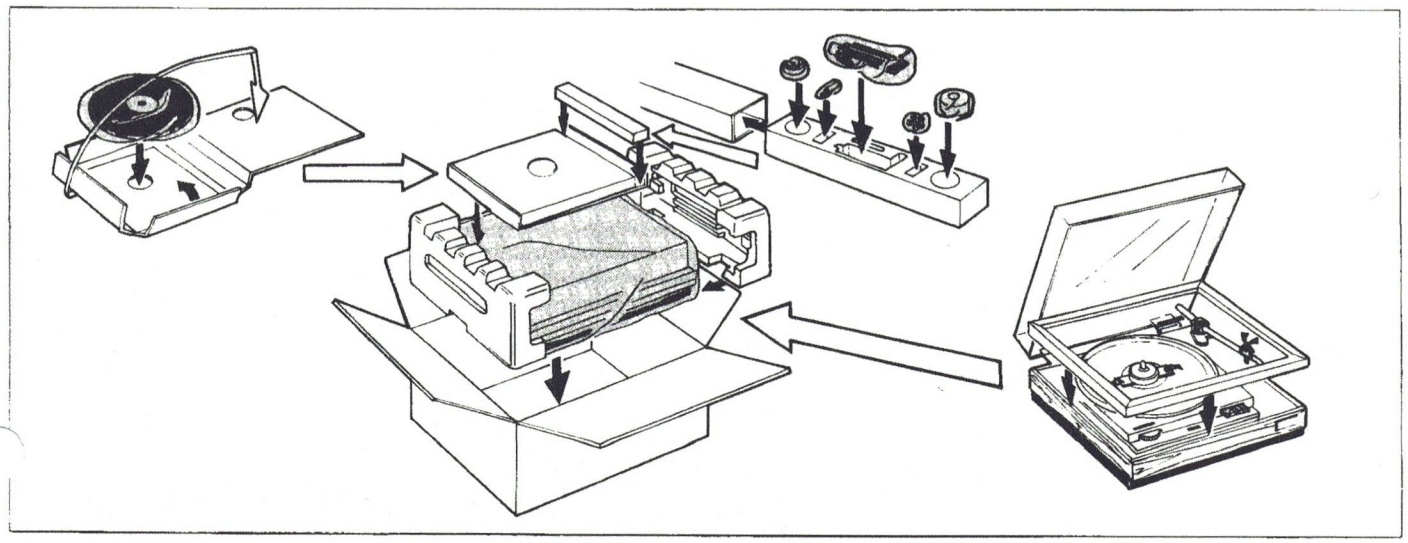
To lubricate the spindle retainer, remove the center spindle by turning counterclockwise. Apply two or three drops of oil to the spindle hole. Do not lubricate excessively.



REPACKING FOR SHIPMENT

The PS-2251 original shipping carton and packing material (which we asked you to save) is the ideal container for use in shipping the PS-2251 for repair work, or simply to another location. However, to secure the maximum protection, the PS-2251 must be repacked in this material precisely as before. The proper repacking procedure is as shown in the illustration.

1. Turn the three mounting-board Transit Screws (painted black) fully counterclockwise to fasten the turntable to the cabinet.
2. Replace and fasten the three Transit Screws (painted red) to secure the transformer to the motor board.

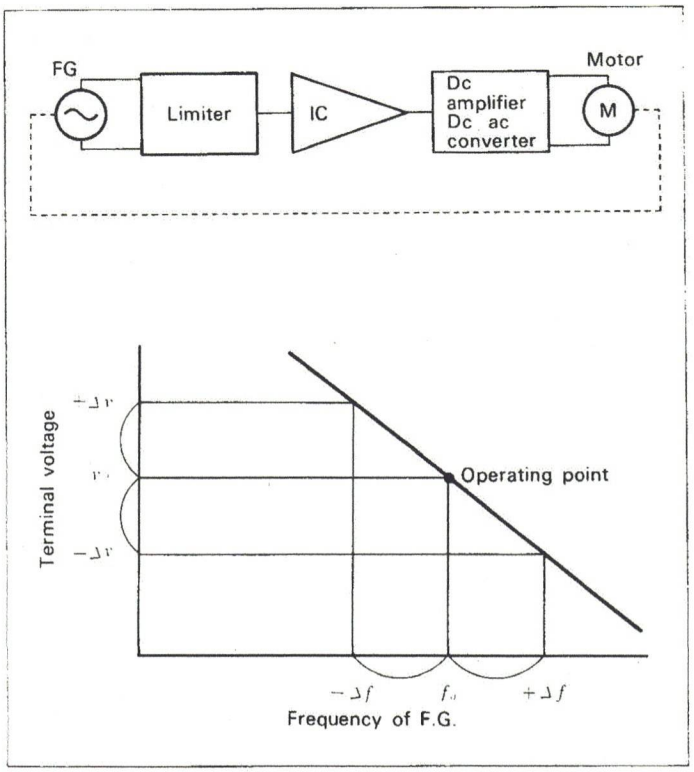


TECHNICAL DATA

"SERVO-CONTROLLED SYSTEM" PRINCIPLE

The servo motor used in the PS-2251 consists of an ac motor, a frequency generator (F.G.) and a servo amplifier. The F.G. output passes through a limiter to eliminate level differences, and goes to the IC where it is converted to a dc output proportional to input frequency. This output is amplified, and converted to ac for motor driving.

Frequency changes in the F.G. output—due to motor-speed changes—are detected by the IC which then changes the terminal voltage of the motor. Thus, motor speed is kept constant. The graph shows these relationships. If the motor accelerates (or slows down) due to external causes, the output frequency of the F.G. (f_0) moves by Δf to the right (or to the left). Terminal voltage (V_0) then decreases (or increases) by ΔV and the motor speed is decreased (or increased), and the frequency generated by the F.G. returns to f_0. Thus the servo-controlled system maintains equilibrium at f_0 and the motor operates at a constant speed.



SPECIFICATIONS

Turntable	
Platter	12 1/4", die-cast alminum alloy 3 lb 5 oz
Drive system	Ac servo-controlled motor, direct drive
Speeds	33 1/3 rpm, 45 rpm
Speed control range	±4%
Wow and flutter	Less than 0.04% weighted
Signal-to-noise ratio	Better than 58 dB
Tonearm	
Type	Static balanced, universal
Overall arm length	343 mm (13 1/2")
Pivot-to-stylus length	245 mm (9 5/8")
Overhang	14 mm (9/16")
Tracking error	+2°16', −1°12'
Cartridge offset angle	20° 40'
Tracking force adjustment range	0 – 3 g
Anti-skating adjustment range	0 – 3 g
Tonearm height adjustment range	7 mm (9/32")
Shell weight	10.5 g
Cartridge weight range	4 – 17 g (8 g – 21 g with extra weight supplied)
General	
Power requirements	120 volts, 50 Hz/60 Hz, ac
Power consumption	15 watts
Dimensions	19 5/16 (w) × 7 5/16 (h) × 16 1/8 (d)" (with cover opened 20 1/8" (h), 18 1/2" (d)
Weight	33 lb 1 oz (net) 38 lb 6 oz (in shipping carton)

Supplied accessories	
Adaptor for 45-rpm discs	(1)
Sony Oil OL-2K	(1)
Polishing cloth	(1)
Alignment protractor	(1)
Connecting cord	(1)
Screws (for installing a cartridge)	(3 pairs)
Screwdriver	(1)

Optional accessory

Standard shell SH-150

Design and specifications subject to change without notice.

INSTRUCTIONS MODEL 3009 SERIES II IMPROVED

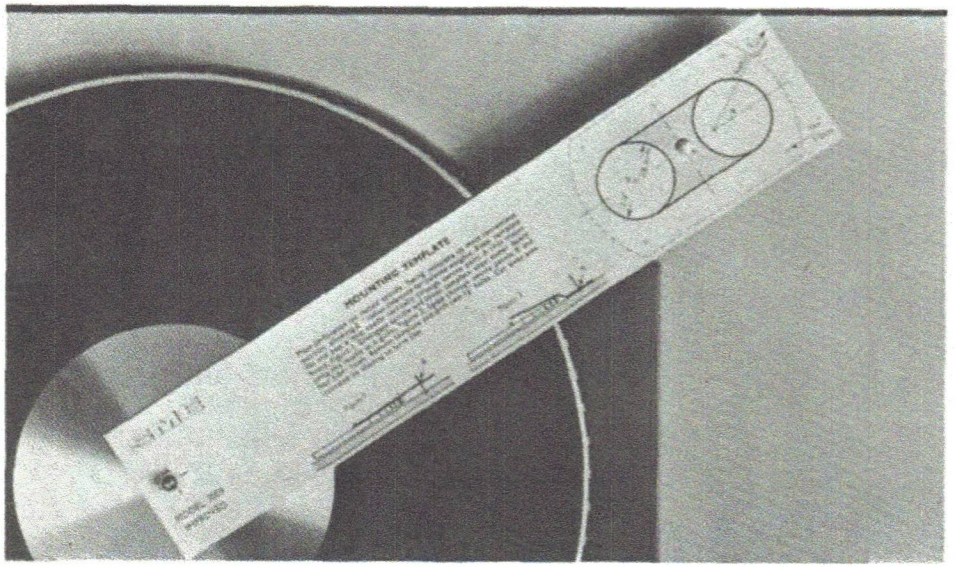
SME

SME Model 3009 Series II Improved precision pick-up arms combine latest design features with the same high quality engineering and finish that made their predecessors famous for more than a decade.

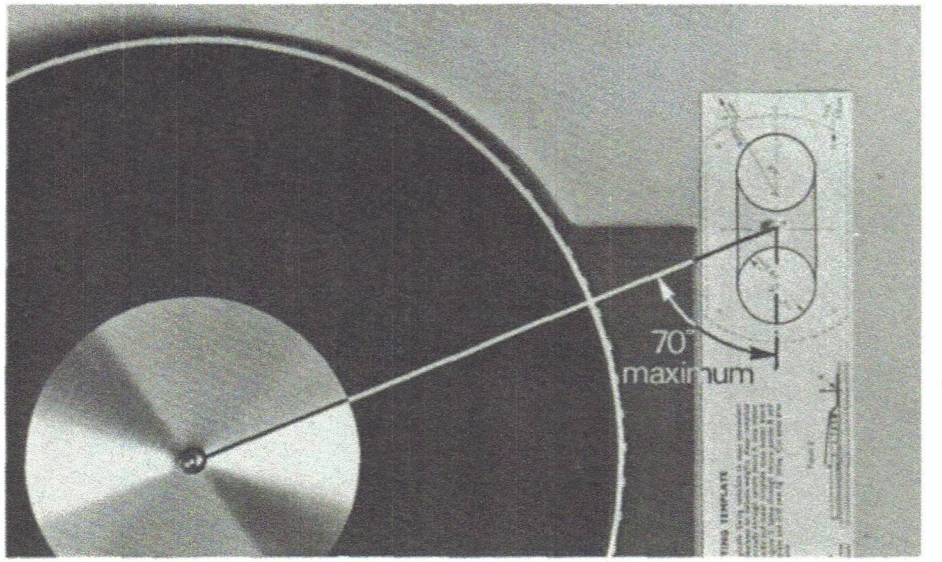
Each arm is meticulously built and tested and will meet its specification reliably through many years of service. Skilful design and choice of materials combine high mechanical strength with low inertia and friction ensuring full suitability for professional as well as domestic application.

Technically correct and aesthetically satisfying the SME has been called "The best pick-up arm in the world" and we believe you will find this to be true.

CONTENTS



101

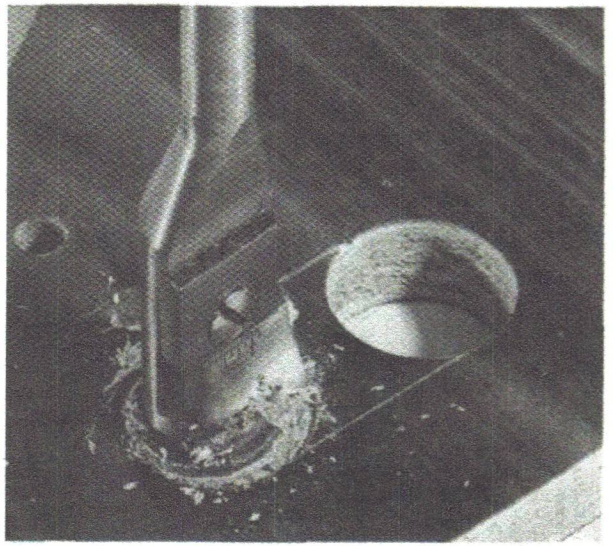


102

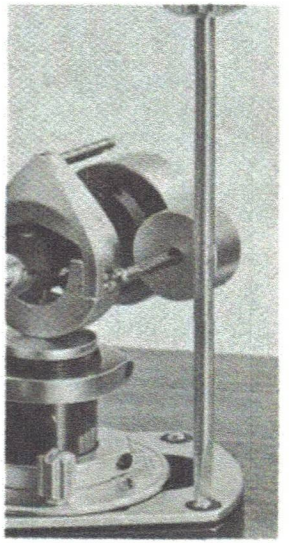
Setting out

101 Establish the position for the bedplate with the mounting template.

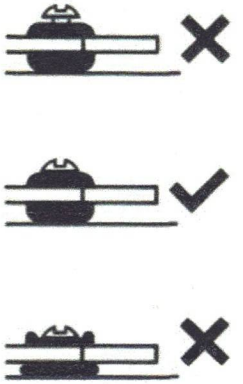
102 Where space is restricted the template may be rotated up to 70° off the radial position.



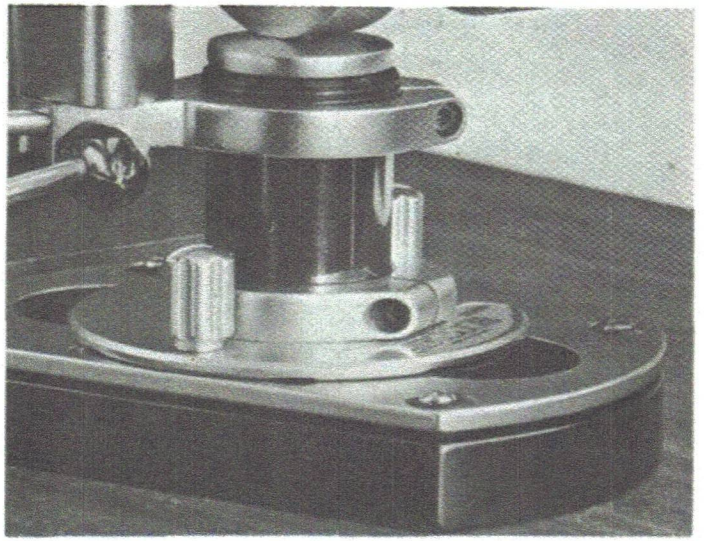
103



104



105



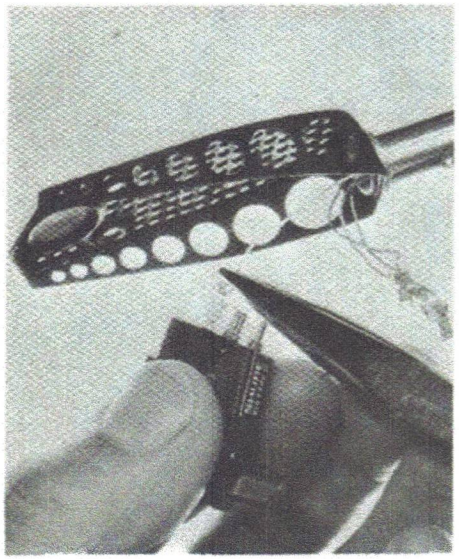
106

103 Drill and form the cut-out in accordance with the template. Ensure that it is large enough to clear the screening can completely. Drill the four 1.2 mm. pilot holes for the wood-screws.

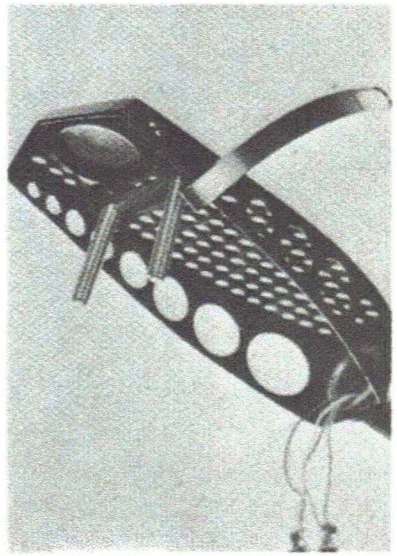
104 Screw down the bedplate with the four wood-screws.

105 Adjust the screws as shown.

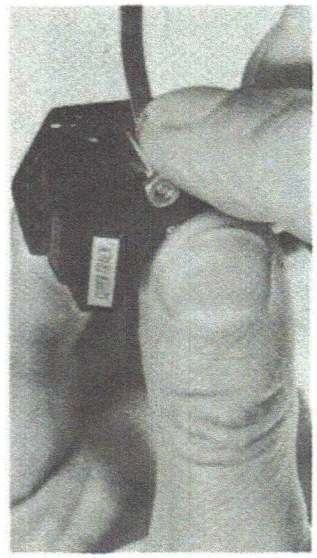
106 When the surface of the turntable is more than 41 mm. above that on which the bedplate is mounted a spacer SME Accessory P.1 is required.



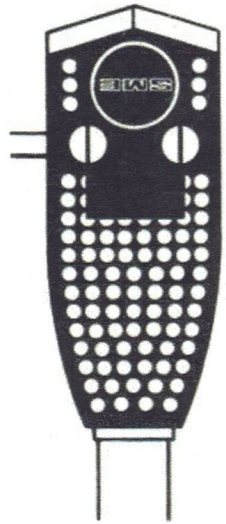
107



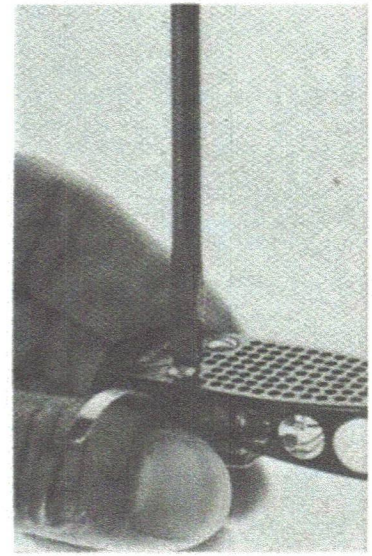
108



109



110



111

Fitting the cartridge

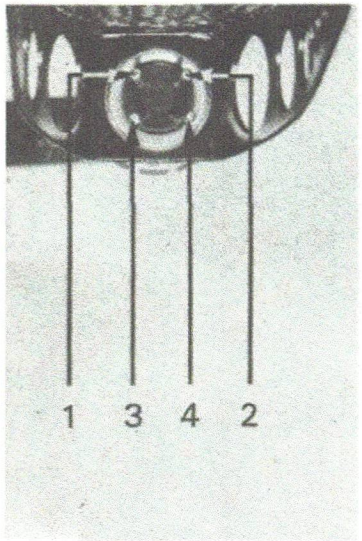
107 Fit the pin jacks to the cartridge terminals: White to left channel: Red to right channel: Blue to left ground: Green to right ground. Tails must never be soldered direct to the cartridge terminals.

108 Select screws of appropriate length. The top of the cartridge should lie snugly against the shell or as close to it as possible. The use of the finger lift is optional. Use spacers only if cartridge contours make it essential.

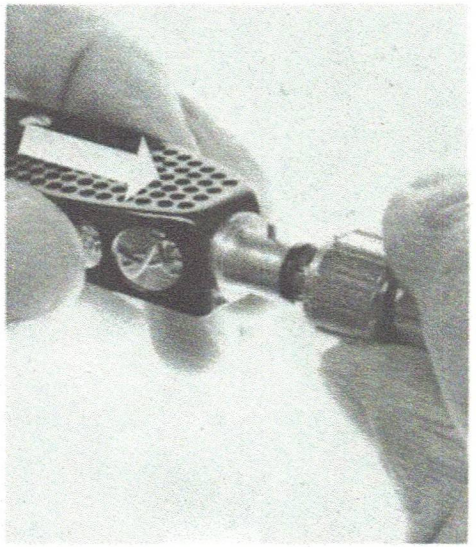
109 Fit the nuts.

110 Check that the cartridge lies symmetrically in the shell. This is important.

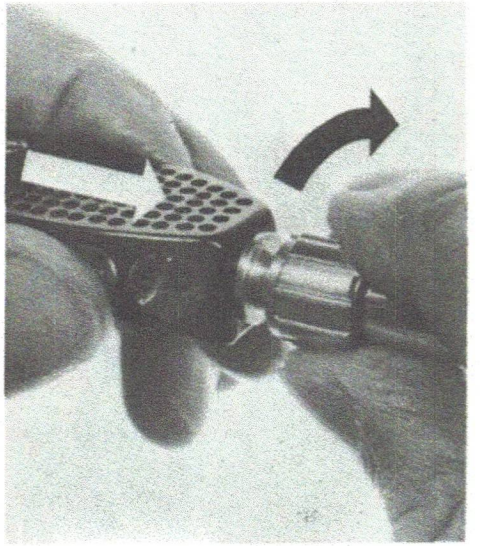
111 Tighten the screws taking care to preserve (110)



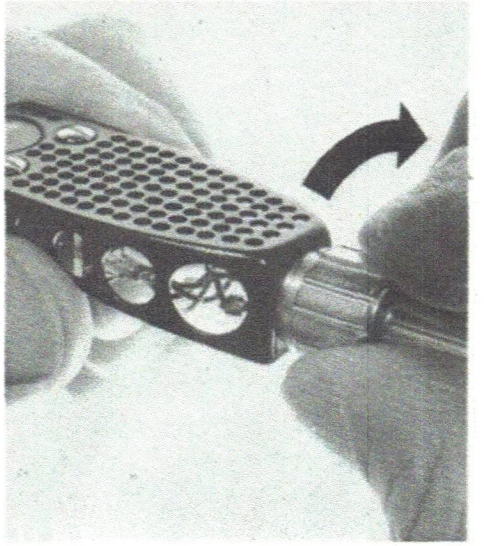
112



113



114



115

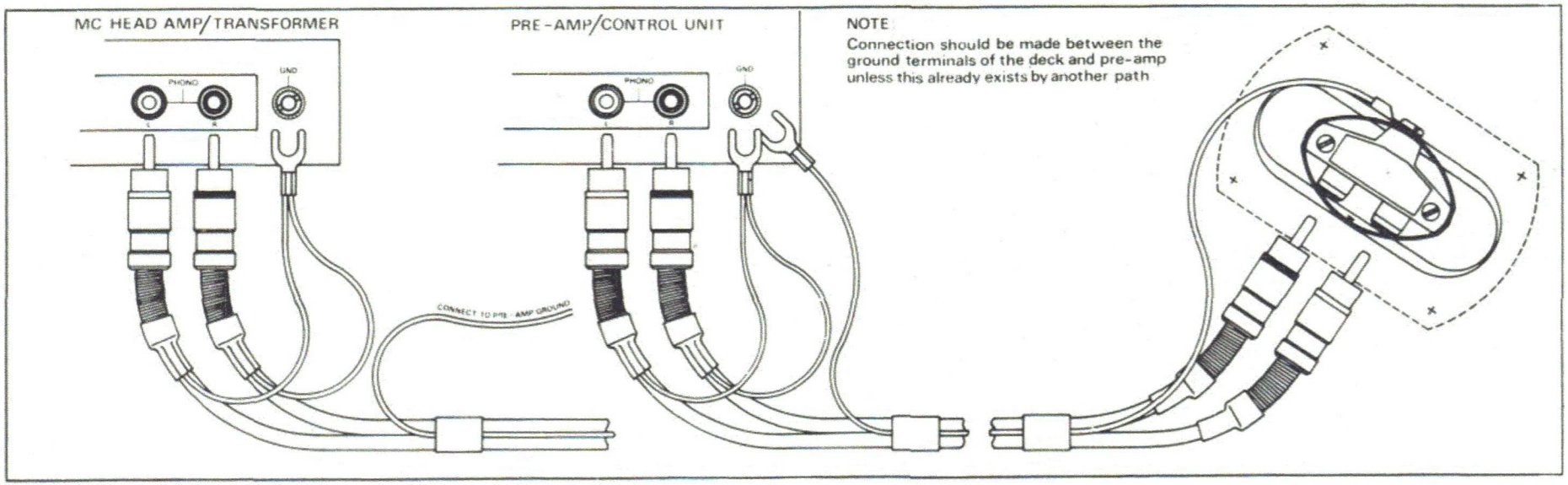
Model 3009/S2 Improved (detachable shell)

112 Fit the tails to the shell terminals: White (1) to left channel: Red (2) to right channel: Blue (3) to left ground: Green (4) to right ground. Fit the cartridge as detailed on Page 6.

113 Insert the shell in the arm socket.

114 Press in to contact the thread.

115 Maintaining pressure, rotate the socket nut to draw the shell firmly home. Do not over-tighten.



116

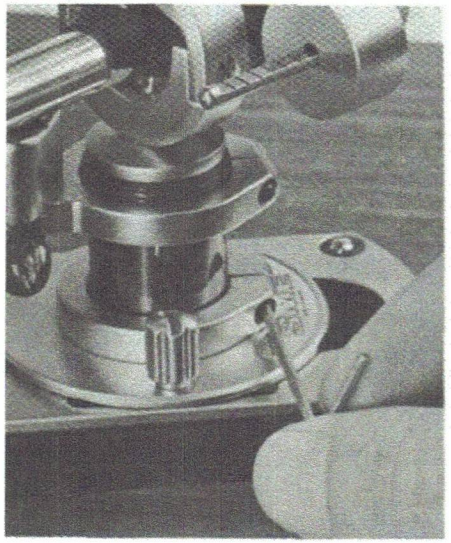
LCOFC Audio Lead

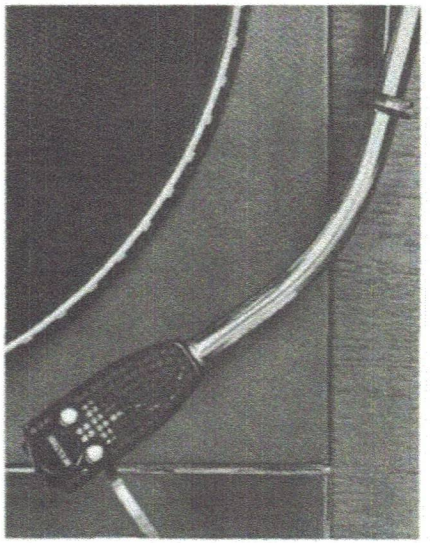
116 The illustration shows use with and without a mc head amp/transformer and phono plug connections should be made accordingly.

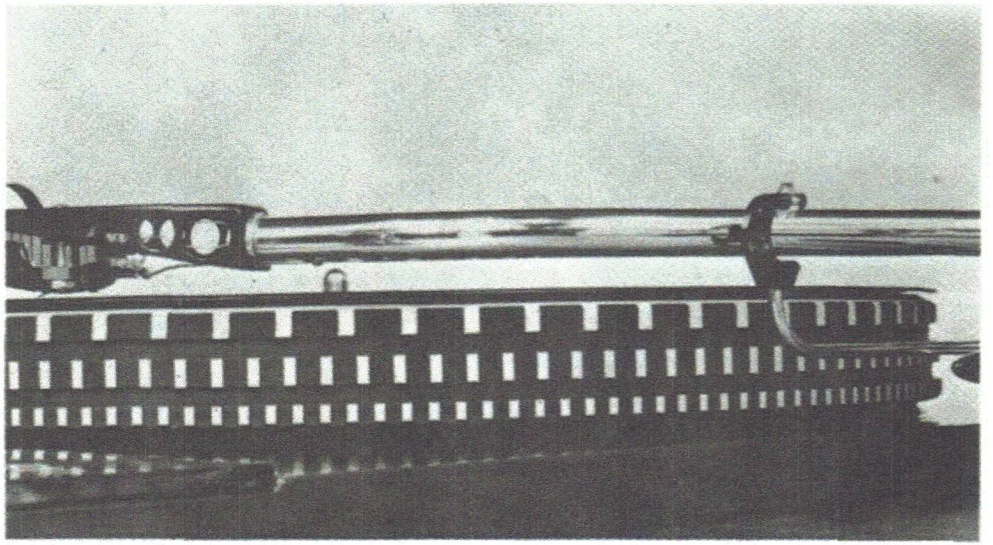
Connect the ground lead serving the arm to the pre-amp ground, and those from the rear of the phono plugs to the ground terminal on the piece of equipment to which these plugs are connected.

If the turntable has a ground terminal, it too should be connected to the pre-amp ground, provided it is not already grounded by another path.

The system has been designed for a high S/N ratio and if this is not achieved multiple ground paths or the over proximity of mains equipment will be likely causes. Some cartridges have an external foil tag connecting the right channel ground terminal to the cartridge body. For use in a metal shell it will be necessary to remove this with a small pair of tweezers or the point of a blade, lifting the tag off over the terminal pin. If this is not done a ground loop may be formed, causing hum on the right channel.





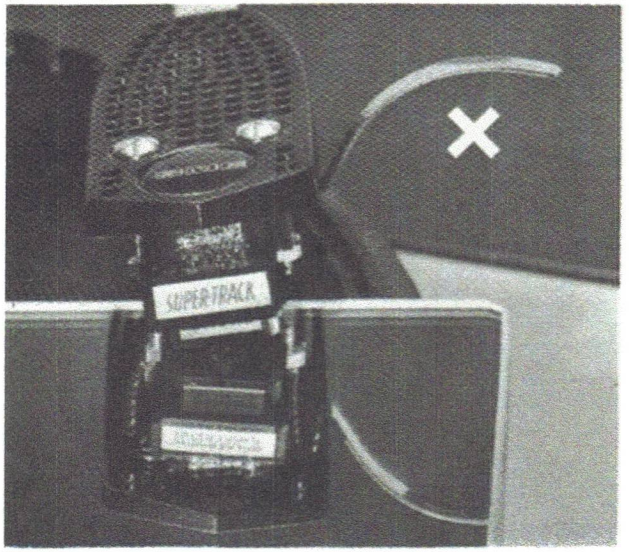


119 **120** **121**

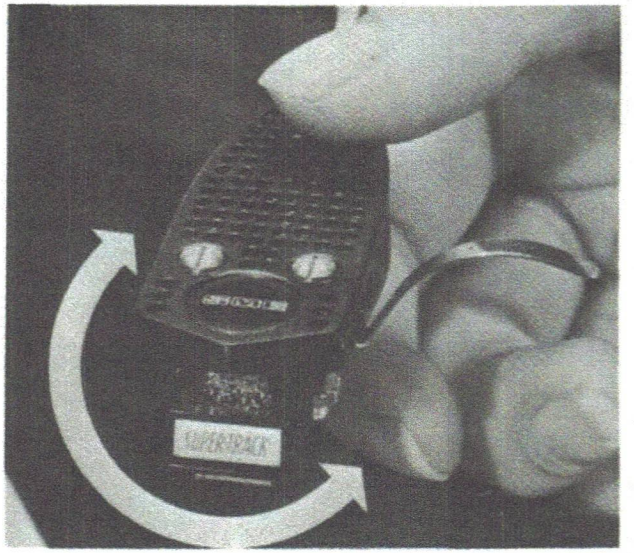
119 Release the cap screw in the base to unlock the pillar.

120 Rotate the pillar to position the arm-rest in a convenient position relative to the turntable.

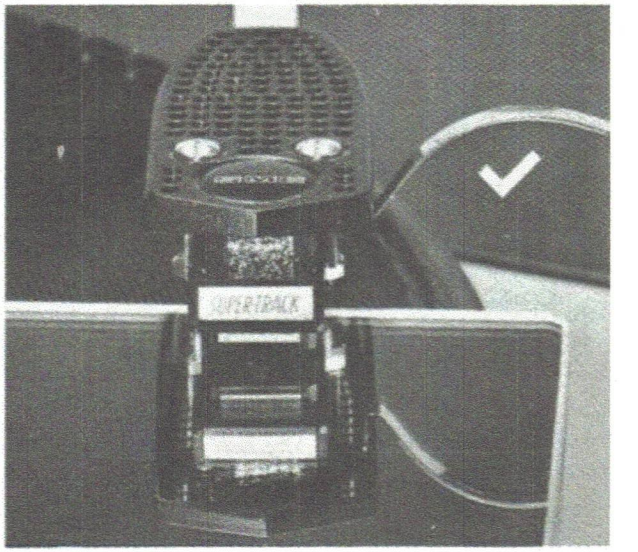
121 Set the pillar height so that the arm is parallel with the record surface when playing. Check that there is clearance between the tone-arm and the rubber surface of the lowering and raising control when the lever is in the down position. If one does not clear the other, the pillar is set too high. Relock the cap screw.



122



123



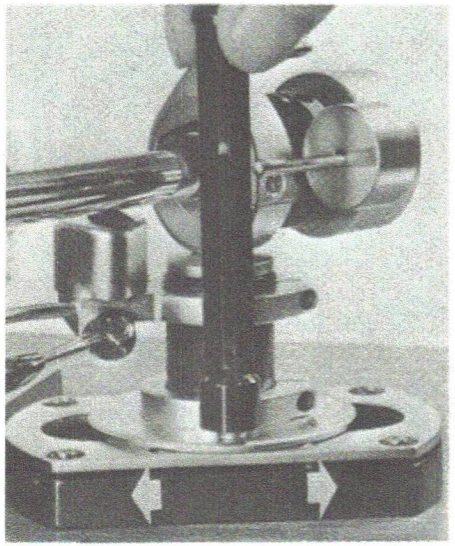
124

Shell adjustment

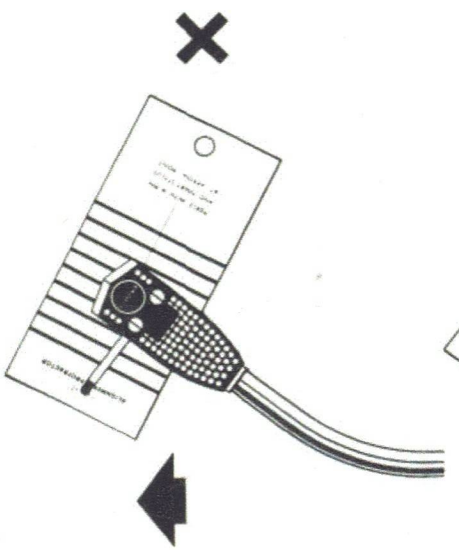
122 Place a small flat mirror on the turntable and rest the stylus on it.

123 If necessary hold the shell firmly close to the tone-arm and twist in the required direction with one hand whilst holding the arm firmly with the other. *The stylus must be clear of the mirror whilst this is done.* Movement of the socket in the end of the tone-arm is limited by a detent screw.

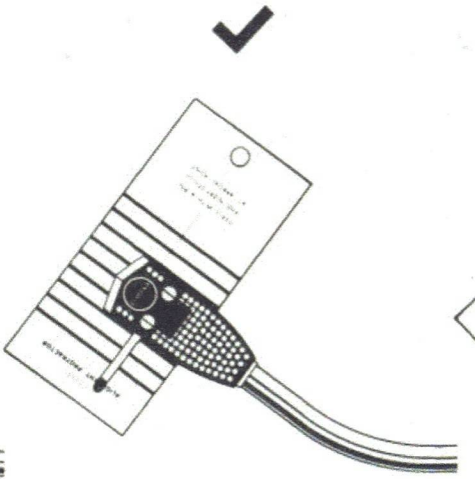
124 Recheck with the mirror.



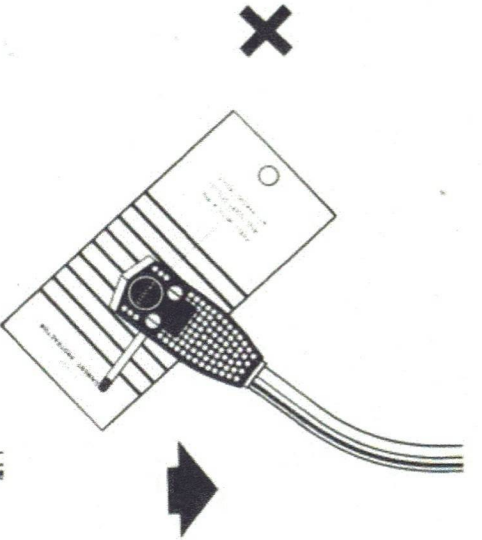
125



126



127

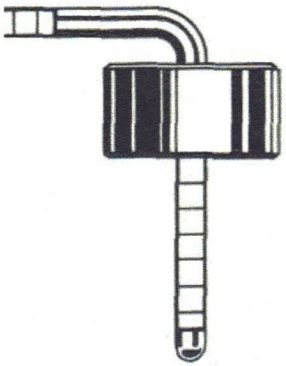


128

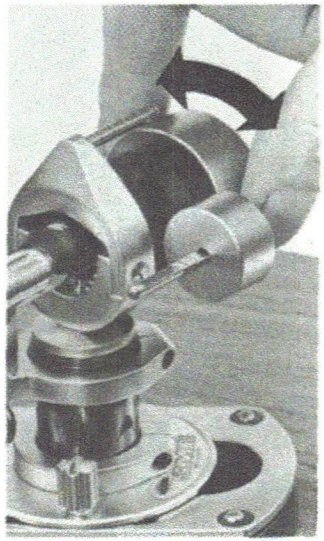
Tracking adjustment

125 Release the base clamp nuts with the plastic box spanner.

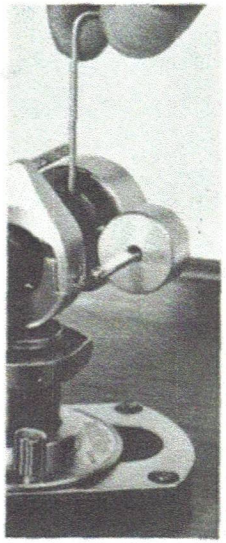
126 Place a record on the turntable
127 with the alignment protractor on
128 top of it. The large hole engages the record spindle with the stylus in the small one. Move the base on the bedplate until the cartridge and shell appear symmetrical with the protractor. Relock the base clamp nuts.



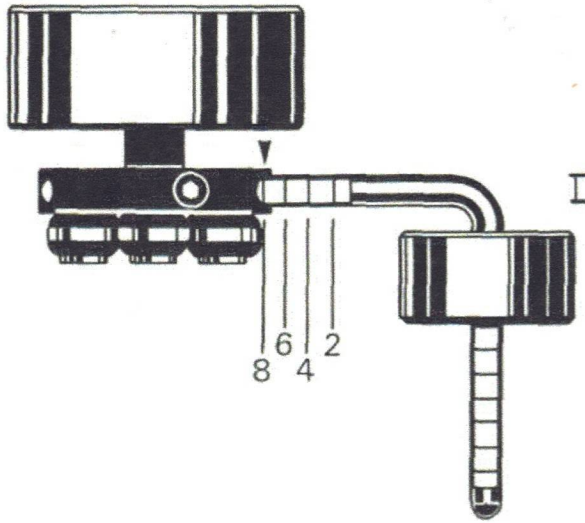
129



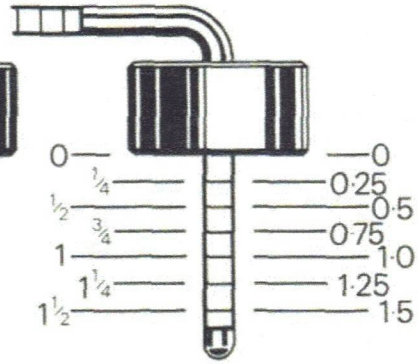
130



131



132



133

Balance adjustment

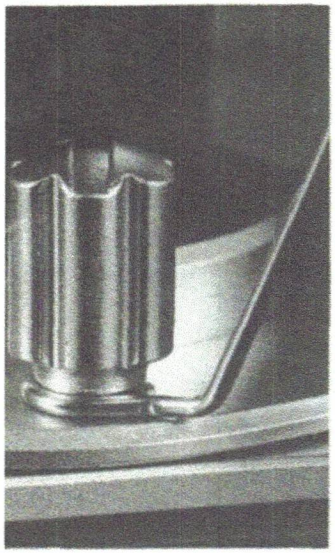
129 Position the rider weight so that its front coincides with the first division of the wayrod.

130 Place the arm in a state of *equilibrium by rotating the balance* weight in the required direction.

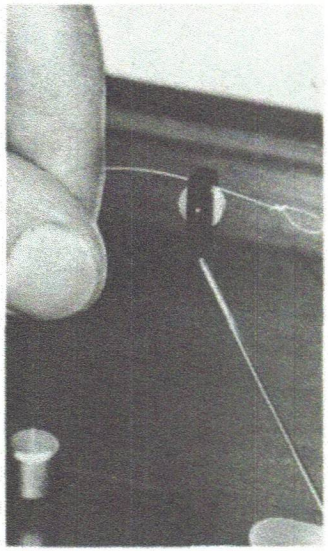
131 Release the set screw in the wayrod housing.

132 Divisions correspond to cartridge weights in grams. Adjust as required for your cartridge. The setting shown is for 8 grams.
Relock the set screw.

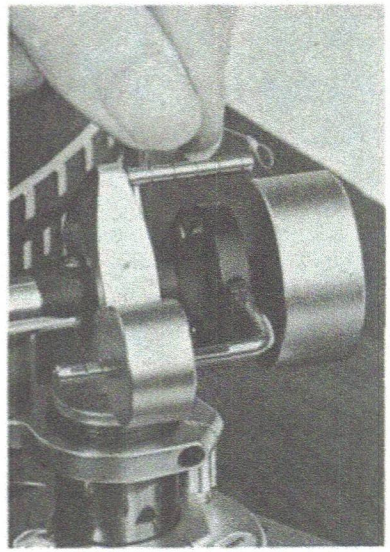
133 Apply tracking force by advancing *the rider weight along the wayrod.* Each division travelled applies ·25 *gram tracking force at the stylus.*



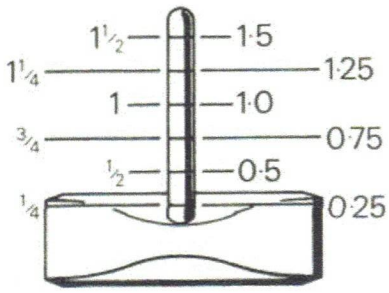
134



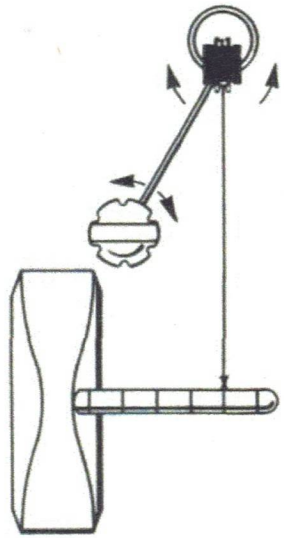
135



136



137



138

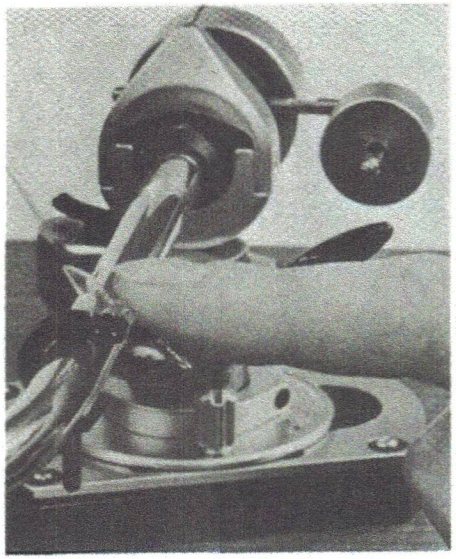
Bias adjustment

134 Fit the eye of the bias guide under the base clamp nut nearest to the turntable.

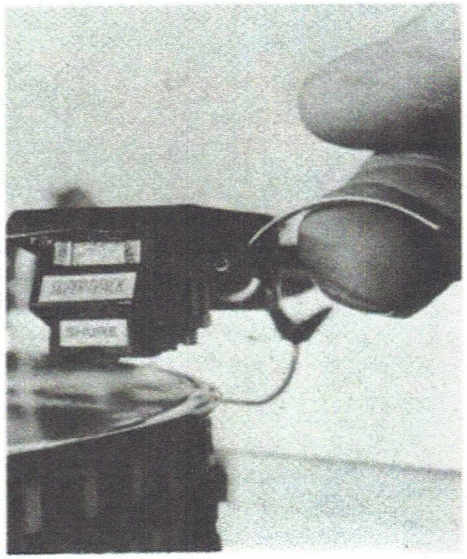
135 Thread the nylon through the
136 guide pulley housing and pass the loop over the bias lever.

137 Place the nylon loop in the groove corresponding to the tracking force being used.

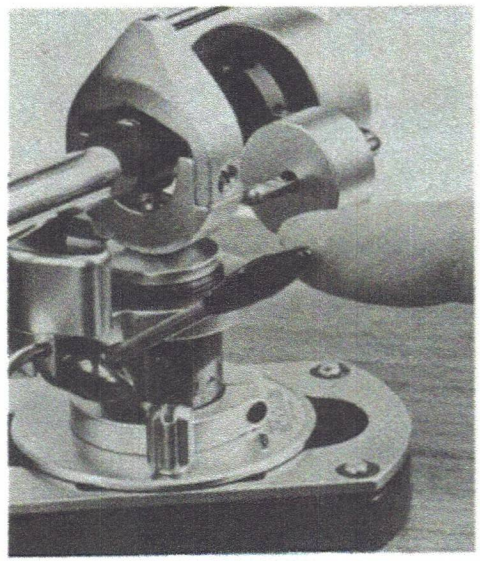
138 Position the bias guide so that the thread is at approximately 90° to the bias lever when the stylus is over the outer groove of a 12" record. Rotate the guide pulley housing to align it with the thread which must lie in the groove of the pulley.



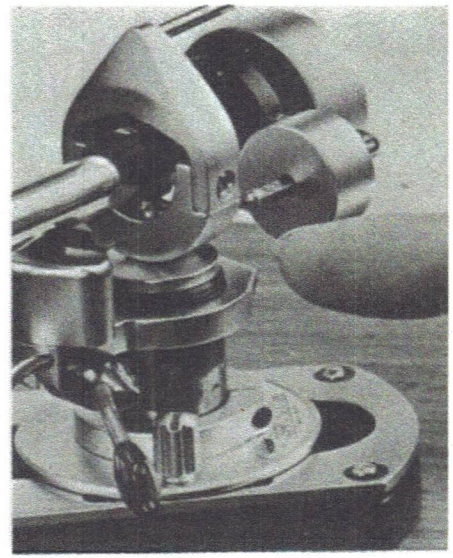
139



140



141



142

Operation

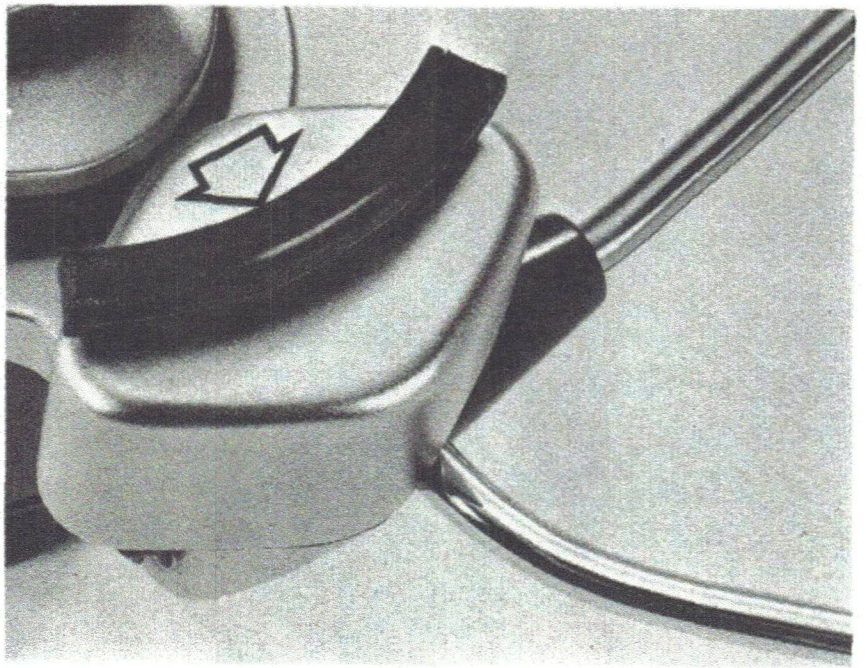
139 With the control lever raised release the tone-arm from its rest.

140 Place the stylus over selected band on the record.

141 Move the control lever forward

142 allowing it to fall freely.

After playing, raise the control lever to lift the stylus from the record. Return the arm to its rest.



We hope these instructions have made installation of your SME precision pick-up arm simple and straightforward. Care for it as you would a camera. Do not attempt to take it to pieces. Do not apply oil or other lubricants to any part of it.

If the arm drifts outwards during lowering and raising it usually indicates the presence of contaminant on the rubber insert in the arm lift. To restore positive working proceed as follows:-

a) Wipe the insert with a damp cloth.

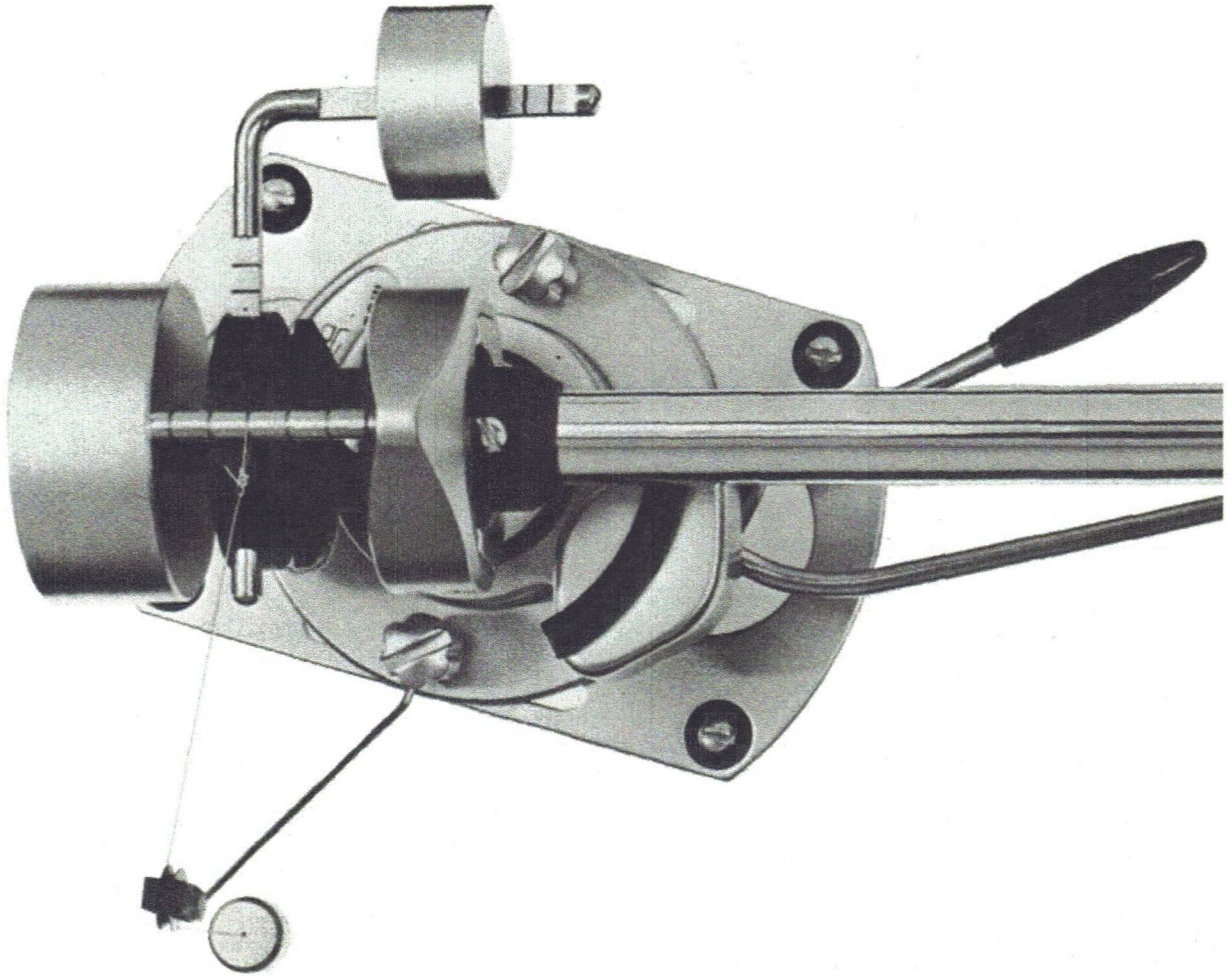
b) Repeat with a paper tissue until it is quite dry.

c) Clean the underside of the tone-arm where it contacts the rubber insert in the same way.

If you have a problem concerning the operation or repair of your pick-up arm, write to the address overleaf. We provide quick and efficient service direct from the factory to any part of the world. In the first instance please quote the model, type and serial number. Do not send the arm to us unless requested to do so.

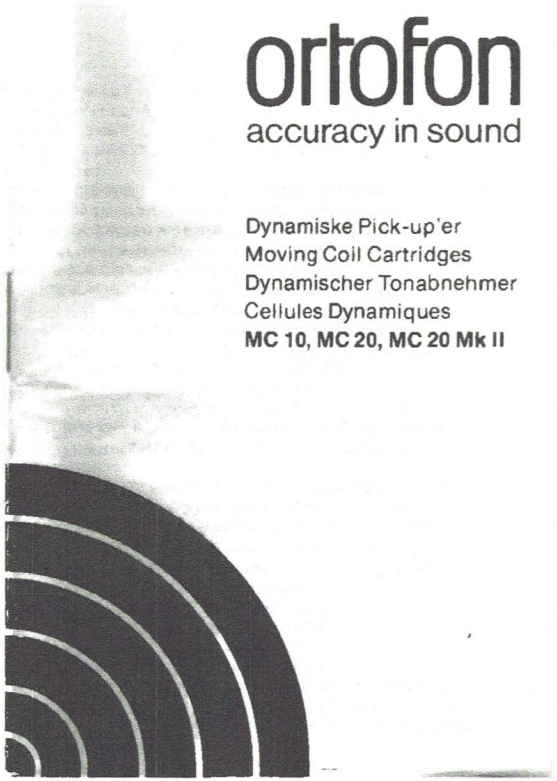
SME

PRECISION GRAMOPHONE EQUIPMENT



Manufactured in England by **SME LIMITED · STEYNING · SUSSEX · BN44 3GY** ☎ **01903 814321** Fx **01903 814269**

ORTOFON MANUFACTURING A/S
11 B, Mosedalvej,
DK-2500 Copenhagen - Valby, Denmark



ortofon

accuracy in sound

Dynamiske Pick-up'er
Moving Coil Cartridges
Dynamischer Tonabnehmer
Cellules Dynamiques
MC 10, MC 20, MC 20 Mk II

Til lykke med Deres nye Ortofon dynamiske stereo pick-up. Ortofons dynamiske pick-up'er er og har været anerkendt over hele verden for deres uovertrufne lydgengivelse, siden Ortofons introduktion af verdens første dynamiske pick-up i 1948.

Vi beder Dem følge monteringsinstruktionen og ønsker Dem god fornøjelse med Deres nye Ortofon pick-up.

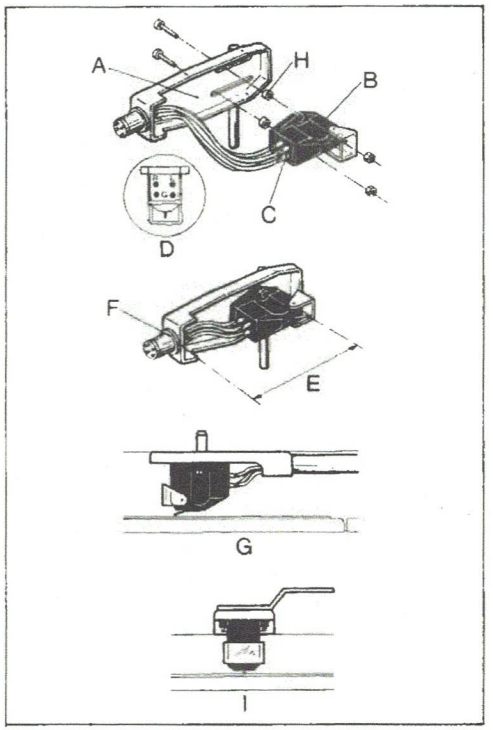
You are now the owner of a new Ortofon Moving Coil Stereo Cartridge.

Ortofon introduced the world's first moving coil cartridge in 1948 and ever since, our moving coil models have been universally acknowledged because of their superb sound reproduction. We request you to follow the mounting instructions carefully, and wish you every enjoyment with your new Ortofon cartridge.

Herzlichen Glückwunsch mit Ihrem neuen ORTOFON dynamischen Stereo Tonabnehmer. Die dynamischen Tonabnehmer von Ortofon sind seit ihrer Introduktion im Jahre 1948 als die ersten dynamischen Tonabnehmer, anerkannt und geschätzt in der ganzen Welt.

Wir bitten Sie der Montierungsanleitung zu folgen und wünschen Ihnen viel Vergnügen mit Ihrem neuen Ortofon Tonabnehmer.

Nous vous félicitions de votre nouvelle cellule dynamique stéréo Ortofon.
Les cellules dynamiques Ortofon ont toujours été appréciées par le monde entier pour leur reproduction de son irréprochable, depuis l'introduction par Ortofon, en 1948, de la première cellule dynamique du monde.
Nous vous prions de suivre l'instruction de montage et vous souhaitons beaucoup de plaisir de votre nouvelle cellule Ortofon.



Technical data	MC 10	MC 20
Weight	7 g	7 g
Output voltage per channel at 1000 Hz, 5 cm/s	0.1 mV	0.07 mV
Output voltage per channel at 1000 Hz, 5 cm/s with STM 72 or MCA 76	5.0 mV	3.5 mV
Internal impedance DC resistance per channel	3 ohm	2,5 ohm
Vertical tracking angle	20°	20°
Frequency range	10-50,000 Hz	5-60,000 Hz
Frequency response	10-20,000 Hz +3 dB -2 dB	20-20,000 Hz ±1 dB
Channel separation at 1000 Hz	>22 dB	25 dB
Channel balance	<2 dB	2 dB
Compliance: Horizontal	15 μm/mN	25 μm/mN
Vertical	15 μm/mN	15μm/mN
Tracking ability at 300 Hz at recommended tracking force	>50 μm	60 μm
FIM distortion at recommended tracking force	≤1%	≤1%
Type of stylus	Elliptical	Fine-line
Stylus tip radius	18/8 μm	8 μm
Equivalent stylus tip mass	0.5 mg	0.5 mg
Tracking force range	17-23 mN (1.7-2.3 gm)	15-20 mN (1.5-2.0 gm)
Recommended tracking force	20 mN (2.0 gm)	17 mN (1.7 gm)

Technical data	MC 20 Mk II
Sensitivity:	0,09 m V at 1 kHz, 5 cm/sec., 45°
Channel balance:	<1,5 dB at 1 kHz
Channel separation:	min. 25 dB at 1 kHz min. 15 dB at 15 kHz
Frequency response:	20-20.000 Hz ± 1 dB
FIM-distortion:	<1% 300+3000 Hz (4:1) DIN 45542, -6 dB
Tracking ability:	>70 μm at 315 Hz
Dynamic compliance:	12/12 μm/mN at 10 Hz
Vertical tracking angle:	20°
Stylus:	Nude, oriented diamond 0.14 × 0.07 mm Fine-line 8 μm × 40 μm
Equivalent tip mass:	0.5 mg
Recommended tracking force:	17 mN (1.7 g)
Weight:	7 g
DC-resistance	3 ohm
Load impedance:	>10 ohm

ortofon

accuracy in sound

Dynamiske Pick-up'er
Moving Coil Cartridges
Dynamischer Tonabnehmer
Cellules Dynamiques
MC 10, MC 20, MC 20 Mk II

Til lykke med Deres nye Ortofon dynamiske stereo pick-up. Ortofons dynamiske pick-up'er er og har været anerkendt over hele verden for deres uovertrufne lydgengivelse, siden Ortofons introduktion af verdens første dynamiske pick-up i 1948.

Vi beder Dem følge monteringsinstruktionen og ønsker Dem god fornøjelse med Deres nye Ortofon pick-up.

You are now the owner of a new Ortofon Moving Coil Stereo Cartridge.

Ortofon introduced the world's first moving coil cartridge in 1948 and ever since, our moving coil models have been universally acknowledged because of their superb sound reproduction. We request you to follow the mounting instructions carefully, and wish you every enjoyment with your new Ortofon cartridge.

Herzlichen Glückwunsch mit Ihrem neuen ORTOFON dynamischen Stereo Tonabnehmer. Die dynamischen Tonabnehmer von Ortofon sind seit ihrer Introduktion im Jahre 1948 als die ersten dynamischen Tonabnehmer, anerkannt und geschätzt in der ganzen Welt.

Wir bitten Sie der Montierungsanleitung zu folgen und wünschen Ihnen viel Vergnügen mit Ihrem neuen Ortofon Tonabnehmer.

Nous vous félicitions de votre nouvelle cellule dynamique stéréo Ortofon.
Les cellules dynamiques Ortofon ont toujours été appréciées par le monde entier pour leur reproduction de son irréprochable, depuis l'introduction par Ortofon, en 1948, de la première cellule dynamique du monde.
Nous vous prions de suivre l'instruction de montage et vous souhaitons beaucoup de plaisir de votre nouvelle cellule Ortofon.

Mounting

1. The leads from the head shell (A) are connected to the cartridge's (B) terminal pins (C) by means of the clips attached to the leads. Follow the colour code (D) (Never solder directly onto the terminal pins!).

White: Left channel, signal (L)
Blue: Left channel, ground (LG)
Red: Right channel, signal (R)
Green: Right channel, ground (RG)

2. The cartridge is then fastened loosely in the head shell. In the turntable/tone arm instructions you will find the correct distance (E) from the diamond tip to the socket (F). When the correct distance has been adjusted the head shell screws are tightened to secure the cartridge.

3. The tone arm is balanced - in the majority of cases this is done by moving the counterweight back or forth. Follow the turntable/tone arm instructions. The recommended tracking force is then set

4. To ensure optimum tracking ability and channel separation, it is important that the cartridge is parallel with the record (G) when in the playing position. This can be achieved either by adjusting the height of the tone arm or by placing spacers (H) between the cartridge and the head shell.

5. If the cartridge is not parallel with the surface of the record when viewed from the front (I) this can be adjusted by twisting the head shell carefully in the required direction (see the turntable/tone arm instructions).

Some head shell models are produced in a way that may make it difficult for you to mount the cartridge yourself and in such cases, we recommend that you contact your Hi Fi dealer.

Connection to amplifier

Ortofon Moving Coil cartridges have a low inner resistance and small output voltage which necessitates the connection of a transformer or a special pre-preamplifier between the turntable and amplifier.

Some amplifiers and receivers are equipped with a special input for use with turntables mounted with a moving coil cartridge. In such cases the turntable is connected to the amplifier without the use of a transformer or pre-preamplifier.

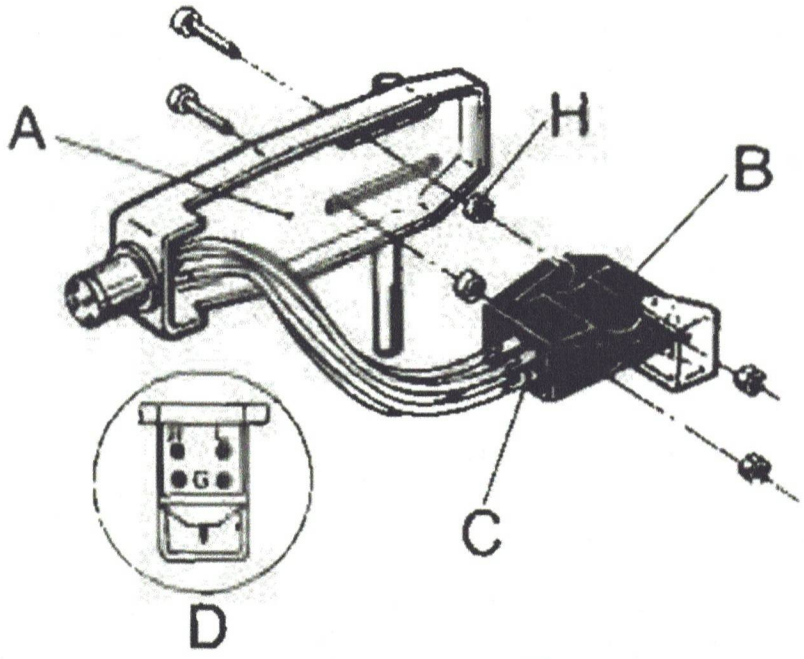
Advice

Remember to clean the diamond regularly by removing dust with a suitable small brush and a recommended cartridge cleaning agent. Let your dealer inspect the diamond at least once a year.

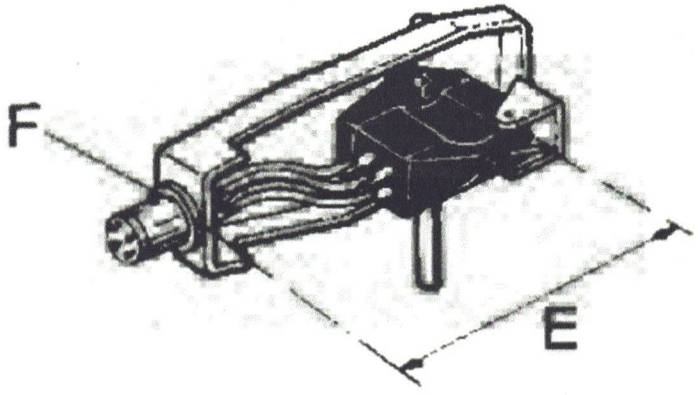
When the cartridge is not in use, the guard should always be snapped over the stylus to prevent damage to the diamond.

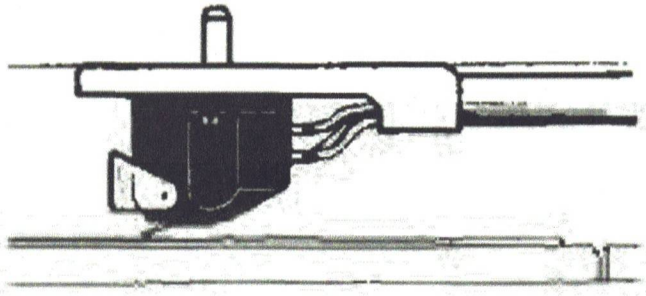
Ortofon's Exchange Service

Owing to the nature of the design of the Ortofon Moving Coil cartridges, the stylus is not part of a replaceable assembly and therefore, Ortofon offers, through its dealers, an exchange/repair service. If you should have need for this service please contact your local Ortofon dealer.

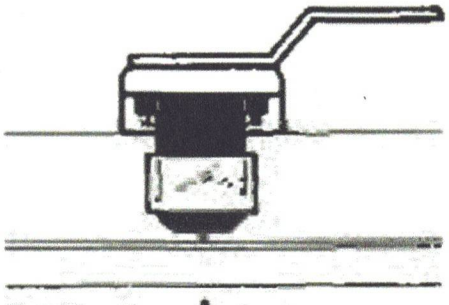


D





G



I

Technical data	MC 10	MC 20
Weight	7 g	7 g
Output voltage per channel at 1000 Hz, 5 cm/s	0.1 mV	0.07 mV
Output voltage per channel at 1000 Hz, 5 cm/s with STM 72 or MCA 76	5.0 mV	3.5 mV
Internal impedance DC resistance per channel	3 ohm	2,5 ohm
Vertical tracking angle	20°	20°
Frequency range	10-50,000 Hz	5-60,000 Hz
Frequency response	10-20.000 Hz +3 dB -2 dB	20-20,000 Hz ±1 dB
Channel separation at 1000 Hz	≥22 dB	25 dB
Channel balance	≤2 dB	2 dB
Compliance: Horizontal Vertical	15 µm/mN 15 µm/mN	25 µm/mN 15µm/mN
Tracking ability at 300 Hz at recommended tracking force	≥50 µm	60 µm
FIM distortion at recommended tracking force	≤1 %	≤1 %
Type of stylus	Elliptical	Fine-line
Stylus tip radius	18/8 µm	8 µm
Equivalent stylus tip mass	0.5 mg	0.5 mg
Tracking force range	17-23 mN (1.7-2.3 gm)	15-20 mN (1.5-2.0 gm)
Recommended tracking force	20 mN (2.0 gm)	17 mN (1.7 gm)

Technical data	MC 20 Mk II
Sensitivity:	0,09 m V at 1 kHz, 5 cm/sec., 45°
Channel balance:	<1,5 dB at 1 kHz
Channel separation:	min. 25 dB at 1 kHz min. 15 dB at 15 kHz
Frequency response:	20-20.000 Hz ± 1 dB
FIM-distortion:	<1% 300+3000 Hz (4:1) DIN 45542, -6 dB
Tracking ability:	>70 µm at 315 Hz
Dynamic compliance:	12/12 µm/mN at 10 Hz
Vertical tracking angle:	20°
Stylus:	Nude, oriented diamond 0.14 × 0.07 mm Fine-line 8 µm × 40 µm
Equivalent tip mass:	0.5 mg
Recommended tracking force:	17 mN (1.7 g)
Weight:	7 g
DC-resistance	3 ohm
Load impedance:	>10 ohm

ORTOFON MANUFACTURING A/S
11 B, Mosedalvej,
DK-2500 Copenhagen - Valby, Denmark

Printed in Denmark - Westergaard • Thompson