Auto-return/Auto-shut off

# Technics
## by Panasonic

**FREQUENCY GENERATOR SERVO TURNTABLE**

# SL-23

**OPERATING INSTRUCTIONS**

Simulated metal base

Read these instructions completely before operating this unit.

Thank you for selecting the SL-23, FREQUENCY GENERATOR SERVO TURNTABLE.
To help you obtain the maximum performance from this unit, we recommend that you read these instructions carefully.

## PARTS IDENTIFICATION

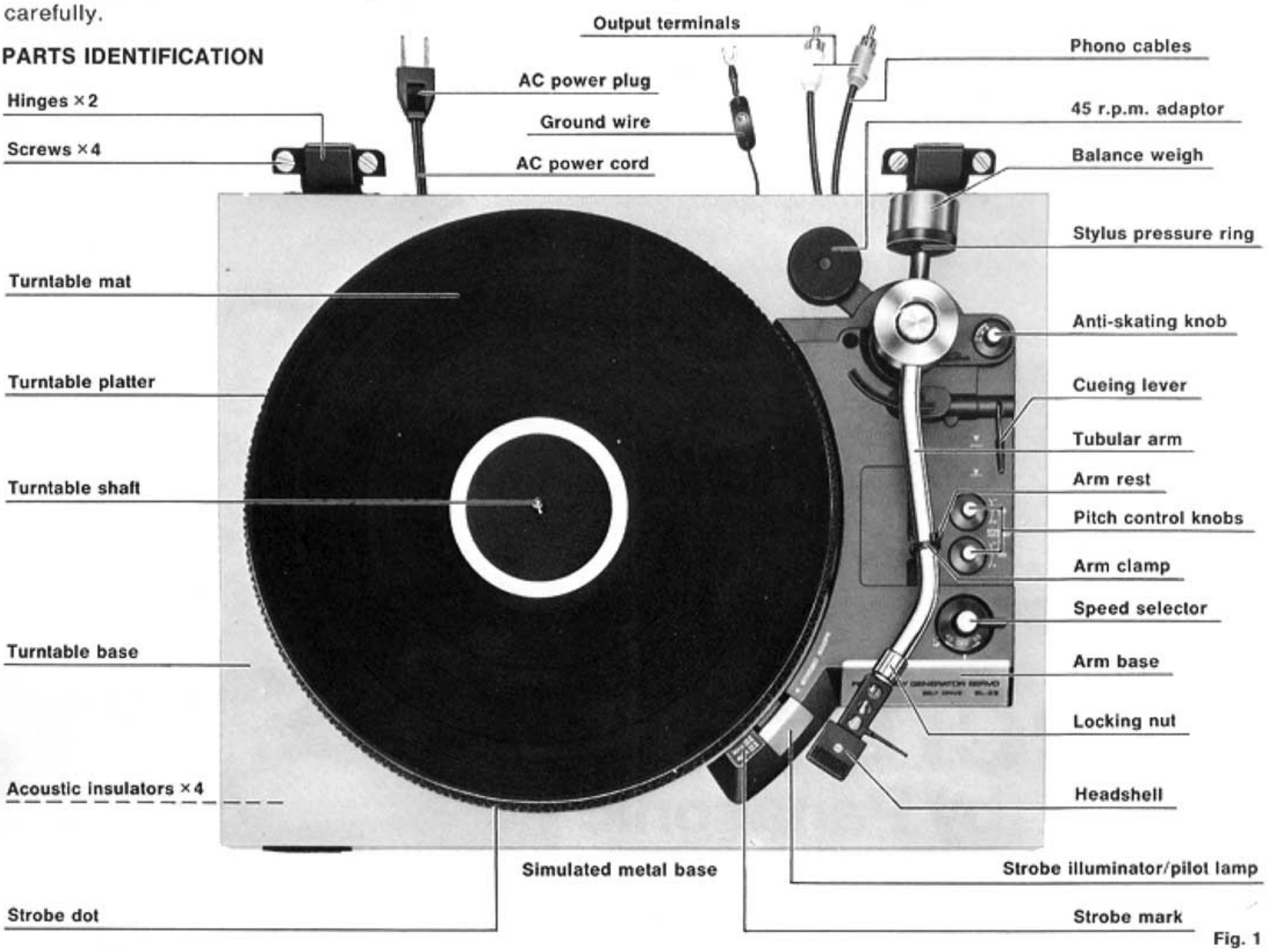


Fig. 1

## BEFORE USE

**❶CHECK TO MAKE SURE YOUR TURNTABLE IS PACKAGED AS PER THE LIST BELOW.**

| | | | |
|---|---|---|---|
| Turntable unit | 1 | Parts box | 1 |
| Dust cover | 1 | Headshell | 1 |
| Turntable platter | 1 | Balance weight | 1 |
| Turntable mat | 1 | 45 r.p.m. adaptor | 1 |
| | | Overhang gauge | 1 |

**❷REMOVE THE TRANSIT SCREWS, SPACERS AND PACKING MATERIAL**

*We recommend that you keep these items for future use, when the unit must again be transported (See Fig. 2)

**NOTE:**

**DO NOT CONNECT THE AC POWER PLUG UNTIL THE ASSEMBLY HAS BEEN COMPLETED!**

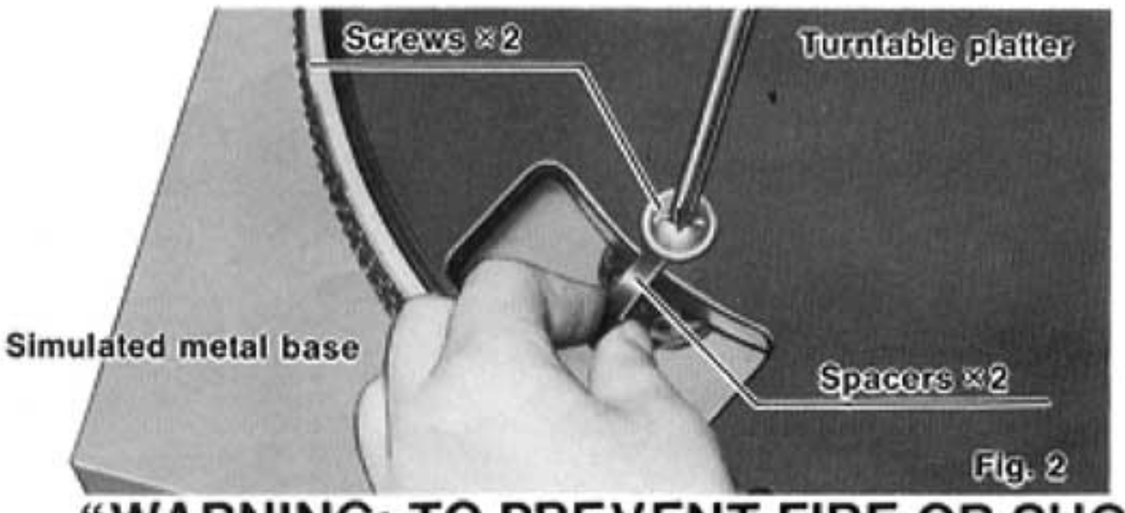


Fig. 2

## ASSEMBLY AND SET-UP

**❶PLACE THE TURNTABLE MAT ON THE PLATTER**

**NOTE:**

*In rare cases the automatic mechanism may have engaged the tonearm gear, or moved out of its normal position during transportation. In such a case we recommend that you move the tonearm toward the center of the platter (turntable shaft), rotate the turntable platter manually about 10 times to engage the return mechanism, and let the arm return to its rest position.

**❷INSTALLATION OF THE CARTRIDGE (CARTRIDGE NOT INCLUDED)**

*Connect the lead wires to the cartridge terminals.

| | |
|---|---|
| White (L +) | Left channel + |
| Blue (L −) | Left channel − |
| Red (R +) | Right channel + |
| Green (R −) | Right channel − |

*Install the cartridge to the spacer, and tighten it with screws provided with the cartridge. (See Fig. 3)

**"WARNING: TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE."**

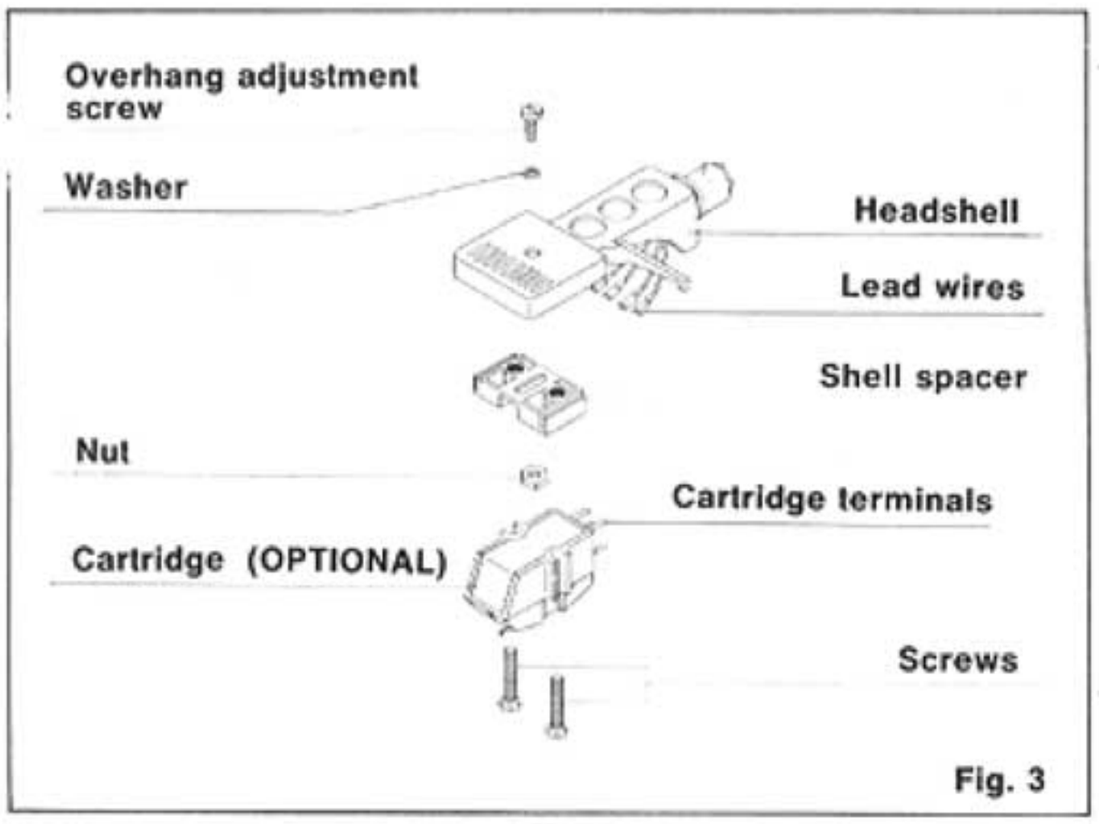

Fig. 3

*Insert the headshell into the gauge. (See Fig. 4)
*Loosen overhang adjustment screw and move the cartridge forward or backward until the stylus tip lines up with the edge of the gauge.
*Tighten adjustment screw without moving the cartridge.

**NOTE:**

*Your cartridge is now adjusted for lowest tracking error and minimum distortion.
*This gauge is exclusively designed for this tonearm.

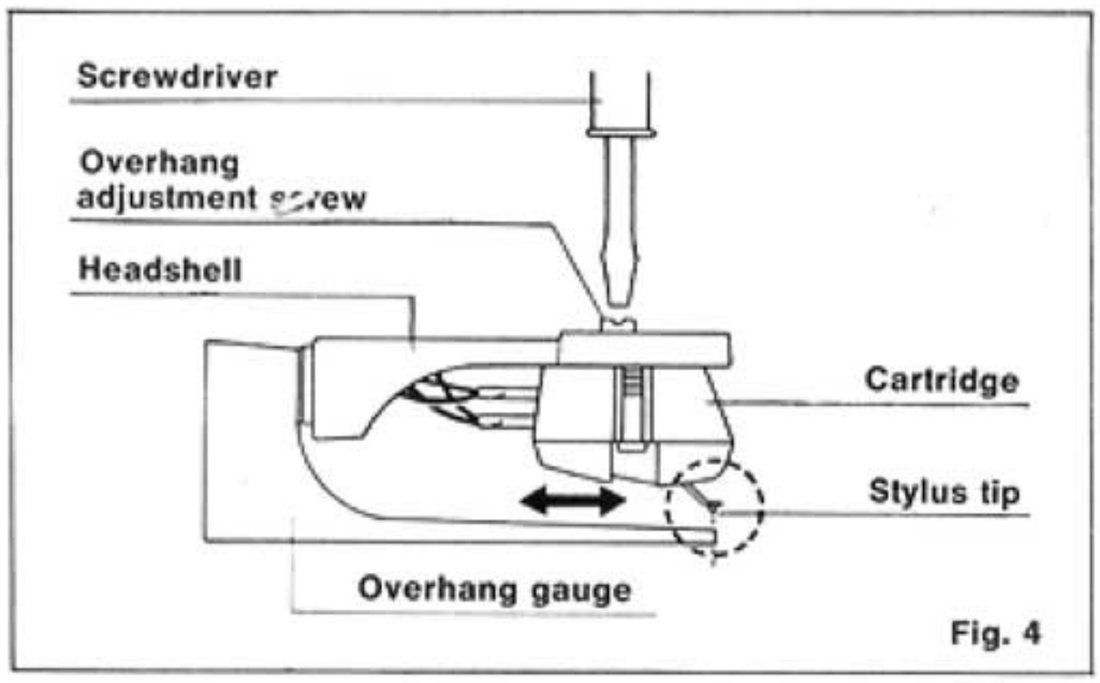

Fig. 4

### ❸INSTALLATION OF THE HEADSHELL

*Insert the headshell in the end of the tubular arm, and tighten it by turning the locking nut. (See Fig. 5)

Fig. 5

### ❹ADJUSTMENT OF THE HORIZONTAL "0" BALANCE

*Insert the balance weight on the rear shaft of the tonearm, with the numbers facing the front of the turntable. (See Fig. 7)
*Lower the cueing lever. (See Fig. 7)
Remove the stylus cover.
*Release the arm clamp (Fig. 6), and turn the entire balance weight forward or backward until the tonearm is approximately balanced (floats freely). In this condition, stylus pressure is "0". (See Fig. 7)
*After the arm is horizontally balanced, gently rotate the stylus pressure ring, so that the "0" lines up with the center line of the rear shaft. (See Fig. 8)
*Do not move the balance weight during this adjustment.

**NOTE:**

*Before adjustment of the "0" balance, make sure the anti-skating knob is set at the "0" position. (See Fig. 8)
*The stylus pressure ring moves in step with the balance weight so that, if you turn the balance weight, the stylus pressure ring moves with it.

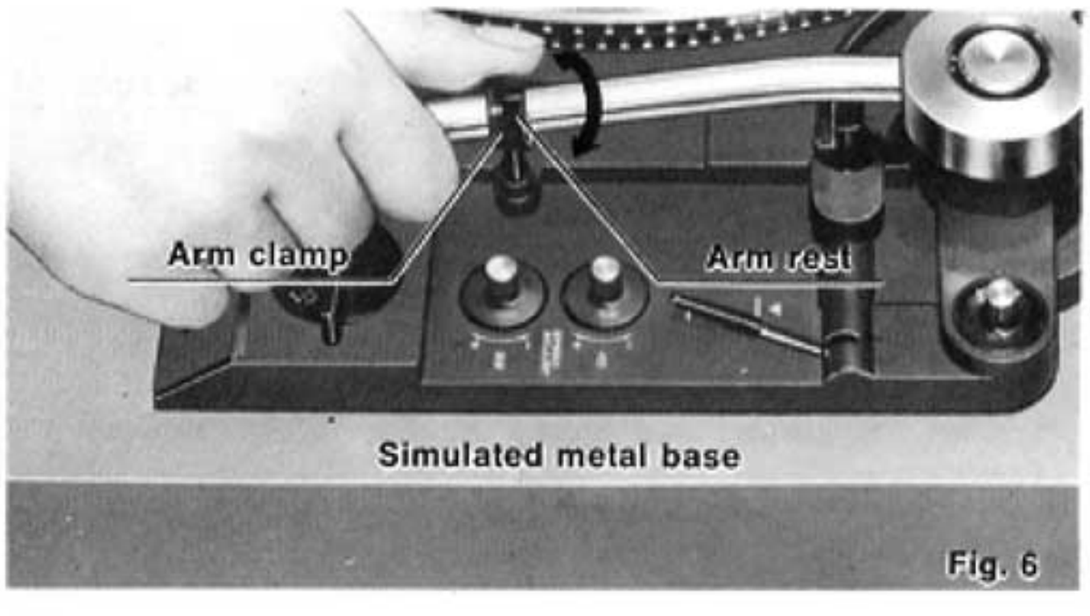

Fig. 6

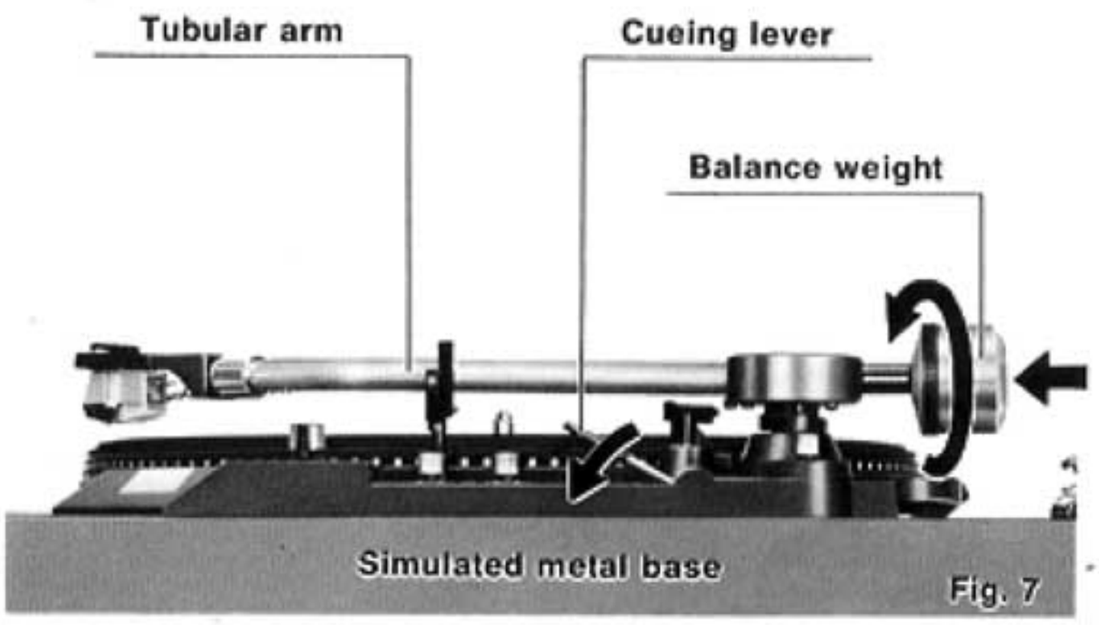

Fig. 7

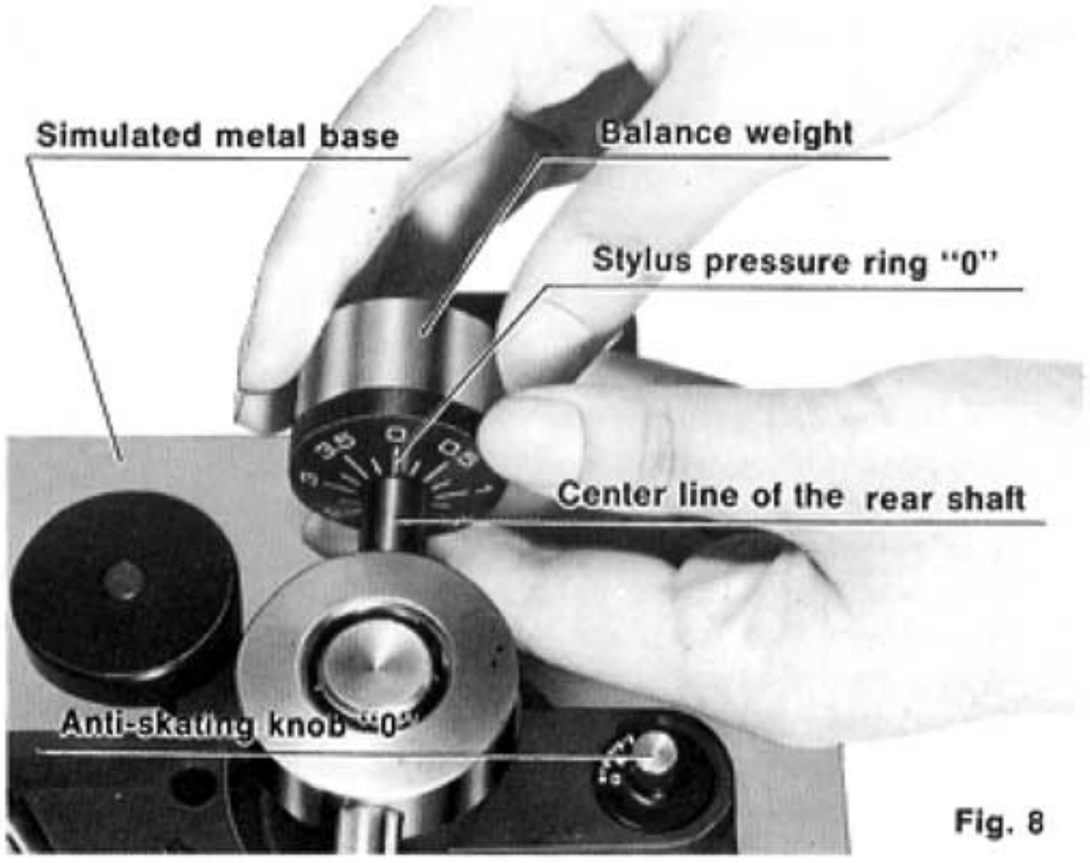

Fig. 8

### ❺ADD THE STYLUS PRESSURE AND THE ANTI-SKATING FORCE VALUE

*Turn the balance weight in the direction of the arrow (See Fig. 7) to the correct stylus pressure. (Follow the Cartridge Manufacturer's recommendation.)

*Turn the anti-skating knob to the same value as the stylus pressure ring. (See Fig. 9)

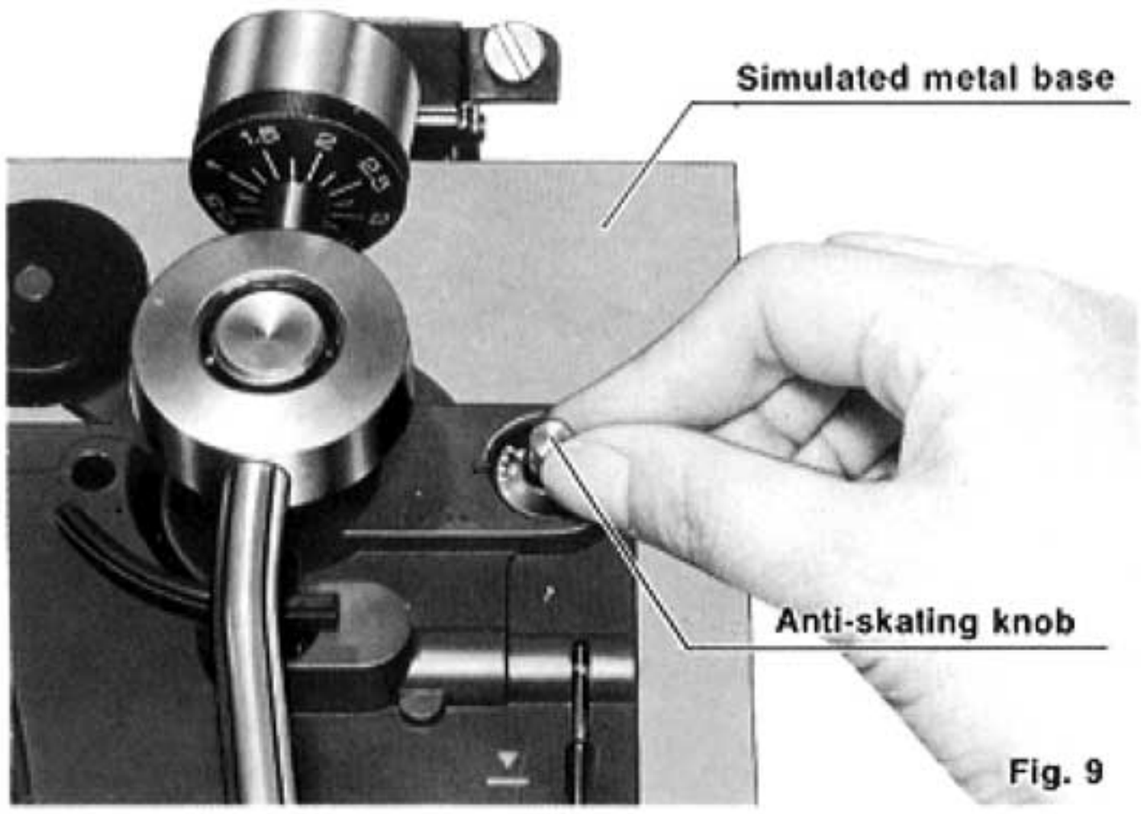


Fig. 9

### ❻INSTALLATION OF THE DUST COVER

*Loosen the screws and install the dust cover between the screws and hinges.

*Re-tighten the screws securely. (See Fig. 10)

**NOTE:**

In rare cases the dust cover may become the cause of **"HOWLING"** from speaker vibrations. In such a case we recommend that you remove the dust cover during playing.

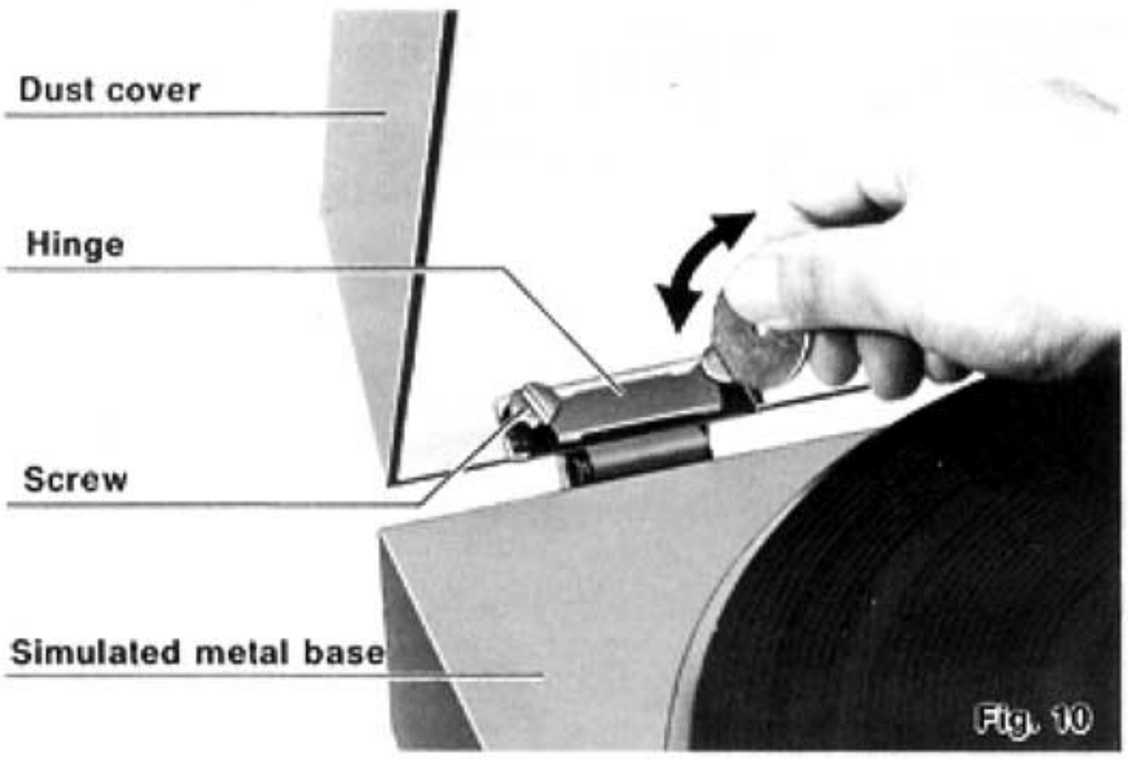


Fig. 10

### ❼PLACEMENT

1. Use the unit in a stable and horizontal position, where there is little or no vibration.
2. Use the unit as far away from the speakers as possible and isolate the unit from sound radiation from them. This unit is equipped with acoustic insulators but if the speakers are placed too near the unit, vibrations may be transmitted directly to the tonearm, resulting in "HOWLING" or "FEEDBACK".
   If for any reason, the speakers are placed near the unit, we recommend that you place felt under the speaker or the unit to reduce the sound vibrations.
3. Do not place the unit where it is exposed to direct sun, dust or moisture.
   Also keep it away from heating equipment in order to protect the dust cover and turntable base.

## CONNECTIONS

### 1. CONNECT THE AC POWER PLUG

**CAUTION**

*Connect the AC power plug to the AC wall socket or AC outlet of your amplifier.

*Make sure that the AC line voltage corresponds to the turntable's requirements before connecting the AC power plug. (120V AC 50 or 60 Hz)

*Never connect to a DC power socket.

### 2. CONNECT THE OUTPUT TERMINALS

*Connect the output terminals to the corresponding channels of your amplifier.

| Output terminal | | | Amplifier |
|---|---|---|---|
| L (White) | → | L | Channel |
| R (Red) | → | R | Channel |
| E (Spade lug) | → | GND | or Chassis |

**NOTE:**

*Be sure to connect the turntable ground wire to the ground terminal of your receiver or amplifier, to eliminate possible "HUM".

## HOW TO PLAY

❶Set the speed selector to the desired record speed and release the arm clamp.

❷Remove the stylus cover.

❸Raise the cueing lever to the ▼ position and place the tonearm over the lead-in groove or over any other groove, and then lower the cueing lever to the ▼ position.

❹The tonearm will descend slowly on the record and begin playing.
When playing has finished, the tonearm returns to its rest automatically and the unit will shut off automatically, too.

**NOTE:**

If you play 45 r.p.m. records with a large center hole, use the 45 r.p.m. adaptor.

## ADJUSTMENTS

### ❶ARM LIFT HEIGHT (CUEING LEVER)

*The space between the stylus tip and record surface, when the cueing lever is raised, should be from 5 to 10 mm (3/16" to 25/64").

*If, for any reason, it is not correct, turn the adjusting screw clockwise or counterclockwise while pushing down on the arm lift. (See Figs. 11 and 12)

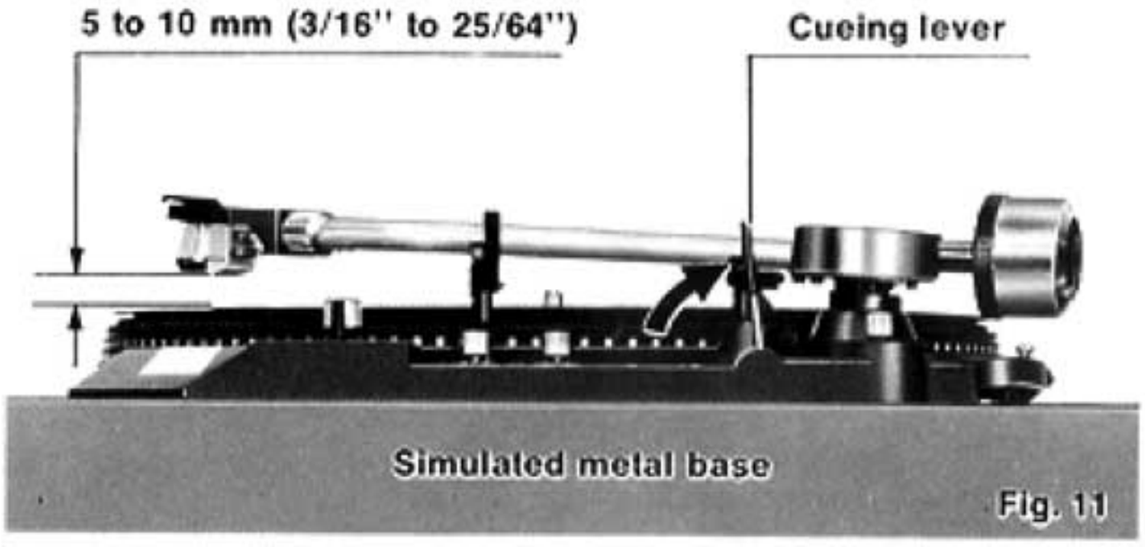


Fig. 11

**NOTE:**

*Be sure to push down on the arm lift when you turn this screw.

**Clockwise** .....to lower the arm.

**Counterclockwise** .....to raise the arm.

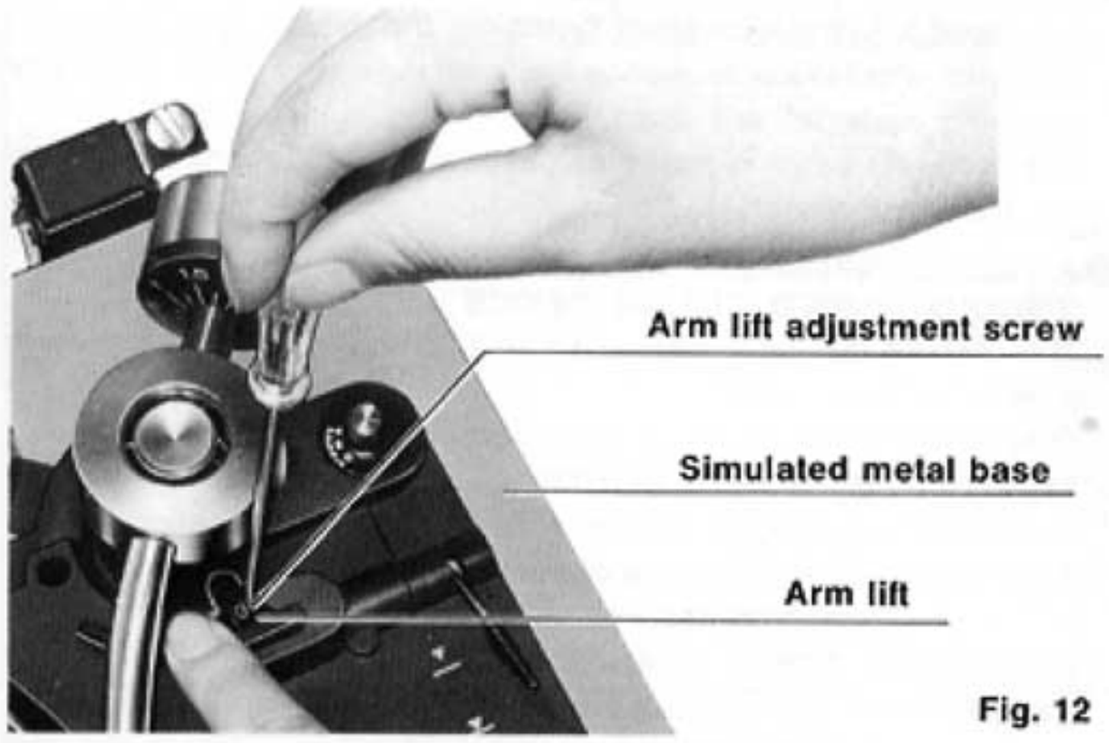


Fig. 12

**❷TURNTABLE SPEEDS (PITCH CONTROLS)**

If you wish to adjust the turntable speeds, turn these control knobs to the "+" (increase) or "−" (decrease) direction. (See Fig. 13)

**"+" direction** .....This increases the speed of the turntable platter.
Turn the knob to "+" direction if the strobe dots seem to be "falling back"; i.e., seem to be moving counterclockwise. When the strobe dots appear to be stationary, the speed is accurate.

**"−" direction** .....This decreases the speed of the turntable platter.
Turn the knob to "−" direction if the strobe dots seem to be "running ahead"; i.e., seem to be moving clockwise, until they appear stationary.

*Each of the two turntable speeds (33-1/3 and 45 r.p.m.) can be adjusted within a range of 6%.

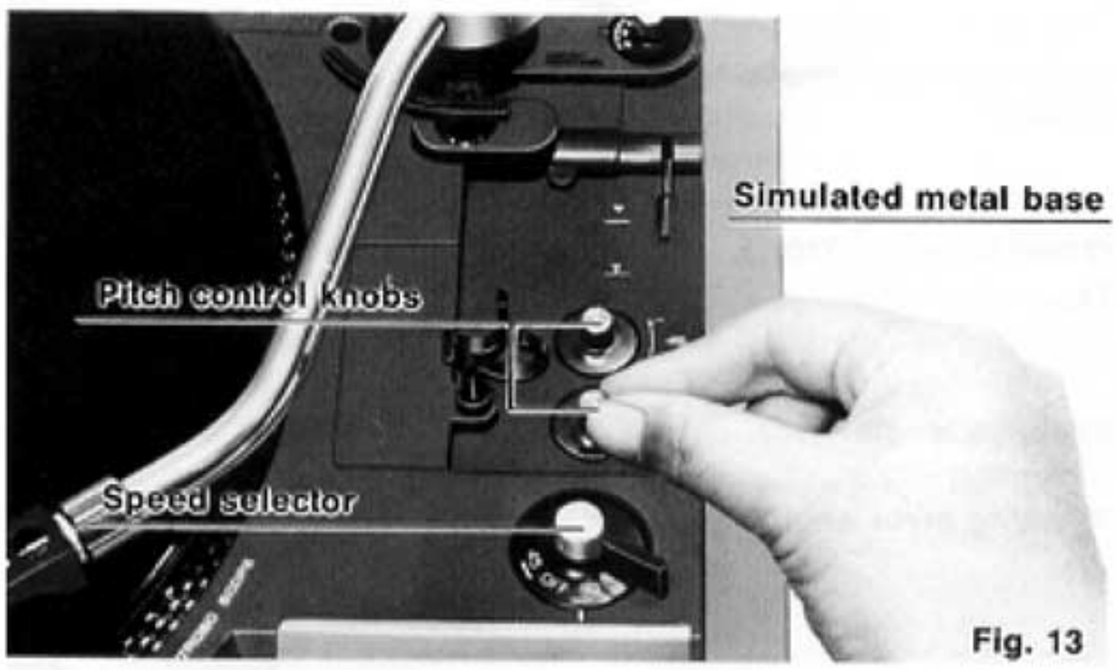


Fig. 13

**NOTE:**

Any change in powerline frequency will cause a change of the fluctuation rate of the neon or fluorescent lamp used for the illumination of the strobe dots. In such a case the strobe dots will start to move very slightly.

Under normal conditions the powerline frequency from Electric Utility Companies is extremely stable. Under certain abnormal conditions, however, changes in line frequency have been observed, averaging to about 0.2% when measured over a period of time.

Such change in line frequency will in no way affect the quality of the sound reproduction, as a change of line frequency does not change the rotational speed of the turntable.

**❸TONEARM RETURN POINT**

*In some cases, the tonearm will tend to return to its rest position before playing has finished. In other cases, it may fail to return to the rest position even after playing the last groove of the record.

*Rotate this screw to correct for either condition. (See Fig. 14)
If the tonearm returns its rest too soon.—Turn this screw counterclockwise.

*If the tonearm does not return its rest even after playing the last groove.—Turn this screw clockwise.

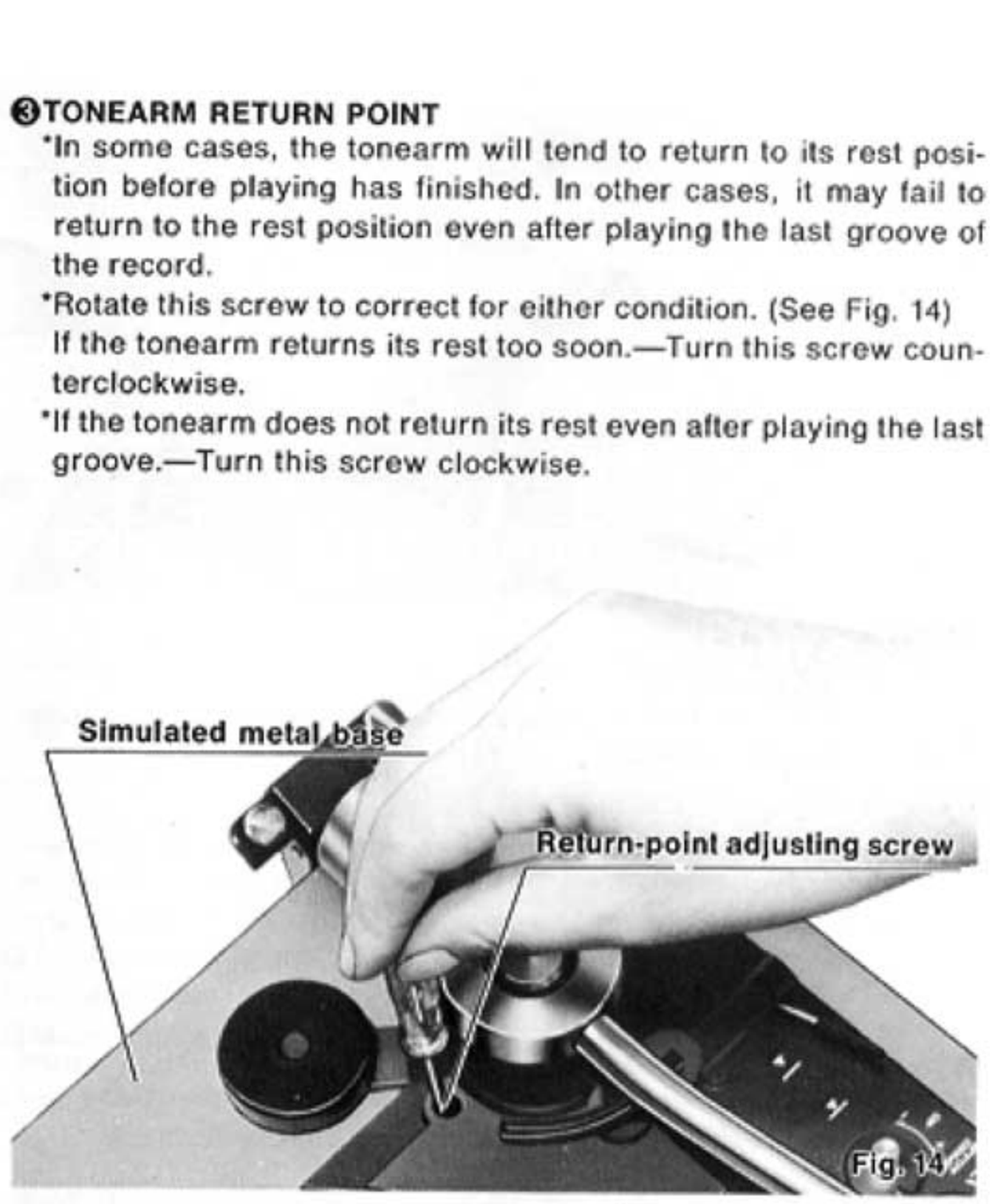


Fig. 14

## MAINTENANCE

**■KEEP THE STYLUS AND YOUR RECORDS CLEAN**

*If the stylus is not kept clean, it will not contact the record groove properly, nor track perfectly, resulting in sound deterioration as well as damage to both the record and the stylus tip.

*Be especially careful to clean away all dust and dirt from the stylus tip with a soft brush or blower. DO NOT USE YOUR FINGER. YOU MAY DAMAGE THE STYLUS. We recommend having your stylus checked periodically by your Hi-Fi Dealer. Remember, a worn or damaged stylus can permanently damage your record collection.

**■WIPE THE DUST COVER AND ARM BASE WITH A SOFT, DRY CLOTH**

*Never use any cleaners containing alcohol, benzine or thinner.

*To remove stubborn finger prints or grease spots, first disconnect the AC power plug and use a soft cloth dampened with a mild soap and water solution.

**■THE PRECISION FREQUENCY GENERATOR MOTOR USED IN THIS UNIT DOES NOT NEED LUBRICATION**

It is designed to provide long maintenance-free service.

**■HOW TO REMOVE AND INSTALL THE TURNTABLE PLATTER**

*The belt is connected to the capstan and the inner drive rim of the turntable platter.
Before removing the turntable platter, release the belt from the capstan. (See Fig. 15)

*When reinstalling the turntable platter, lower it over the turntable shaft and then put the belt onto the capstan.

**NOTE:**

*Be careful not to let oil or grease contact the belt.

*If grease inadvertently contacts the belt, disconnect the AC power plug and wipe the belt clean with alcohol.

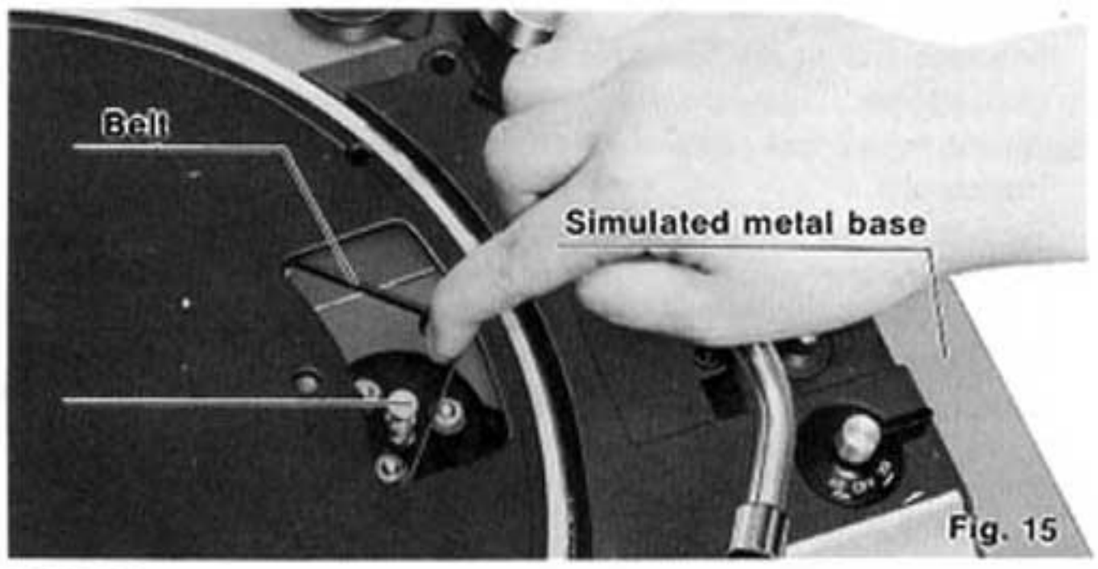

Fig. 15

## NOTES

❶Do not grasp or hold the tonearm during operation of the automatic-return mechanism.

❷The speed selector only controls the motor and the main power switch is dependent upon the tonearm movement. Therefore, with the speed selector at the off position, the unit will not be shut off unless the tonearm returns to its rest.

❸Clamp the tonearm with the arm clamp when not using the turntable.
Use the stylus cover to protect the stylus tip from damage.

## FEATURES

**The SL-23 employs a high-performance frequency generator, servo motor, auto-return mechanism and precise speed control. These features, and fine workmanship, account for its ultra-sensitive performance.**

**❶NEW DESIGN FREQUENCY GENERATOR SERVO CONTROLLED DC MOTOR (See Figs. 16 and 17)**
Motor power consumption is only 0.5 W and total turntable power consumption is 3 W. (Conventional AC phono motors typically consume 10 to 20 W.)
This new motor design, coupled with belt drive, enabled Technics engineers to develop a reasonably priced automatic-return turntable with many of the high-performance specs of our Direct Drive line, such as high starting torque, low power consumption and extremely good Wow, Flutter and Rumble figures.

**❷SPEED IS INDEPENDENT FROM POWER LINE FREQUENCY**
Since this unit uses a DC motor and the FREQUENCY GENERATOR SERVO SYSTEM, the turntable speed is independent of power line frequency variations.

**❸NEW-DESIGN ACOUSTIC INSULATORS**
To prevent vibrations from reaching the platter and tonearm, acoustic insulators composed of springs and high viscosity damping material are used.
The compact base is made of particle board, an inherently resonance-free material.

**❹A FULL COMPLEMENT OF FUNCTIONAL CONTROLS**
**VISCOUSDAMPED CUEING DEVICE**
This device is viscous-damped so that you lower the tonearm slowly on the record.
This protects the stylus tip from damage during descent.

**·ANTI-SKATING FORCE CONTROL**
No threads or weights, simply turn the knob to correspond with the tracking force setting, to obtain perfect compensation of tonearm side-thrust (anti-skating).

**·ELECTRONIC SPEED CHANGE**
Many belt-drive designs use a stepped capstan pulley and lever arrangement to change the speed.
The Technics Frequency Generator Servo Motor design allows for easy electronic speed change, eliminating a possible source of mechanical trouble.

**·LOW CAPACITANCE PHONO CABLES**
To avoid high frequency loss, low capacitance phono cables are used. They are ideal for conversion to CD-4, too.

**·VARIABLE PITCH CONTROLS**
Separate pitch control knobs are provided for 45 and 33-1/3 r.p.m.

**·STURDY, YET LOW-MASS HEADHELL OF DIECAST ALUMINUM**
The diecast aluminum headshell is designed to minimize resonances in the tonearm.
Installation of the cartridge and adjustment of stylus overhang are easy and foolproof.

## SPECIFICATIONS

**(TURNTABLE SECTION)**

| | |
|---|---|
| **Type** | FREQUENCY GENERATOR SERVO TURNTABLE. Automatic-return |
| **Driving method** | Belt drive |
| **Motor** | DC motor with FREQUENCY GENERATOR SERVO |
| **Turntable platter** | Aluminum diecast, 30 cm (12") diameter |
| **Turntable speeds** | 33-1/3 and 45 r.p.m. |
| **Speed change method** | Electronic change |
| **Pitch controls** | Individual adjustment controls, 6% adjustment range |
| **Wow and flutter** | 0.05% W.R.M.S. (JIS C5521)<br>±0.08% W. zero to peak (DIN 45507) |
| **Rumble** | −55 dB (IEC 179B)<br>−40 dB (DIN 45539A)<br>−65 dB (DIN 45539B) |

**(GENERAL SECTION)**

| | |
|---|---|
| **Power supply** | 120 V, AC 50 or 60 Hz |
| **Power consumption** | 3 W |
| **Dimensions** | 13.5 × 42.8 × 34.8 cm (H × W × D)<br>5-5/16 × 16-55/64 × 13-45/64 inches (H × W × D) |
| **Weight** | 6.5 kg (14.3 lb.) |

**(TONEARM SECTION)**

| | |
|---|---|
| **Type** | Universal "S" shaped tubular arm, Static-balanced type, Direct reading stylus pressure adjustment. |
| **Effective length** | 220 mm (8-21/32") |
| **Overhang** | 14 mm (35/64") |
| **Tracking error angle** | Within +3° (at the point 145 mm (5-45/64") from the center)<br>Within −0.2° at the point 55 mm (2-3/16") from the center) |
| **Offset angle** | 22° |
| **Adjustable stylus pressure range** | 0 to 4 g |
| **Cartridge weight range** | 3 to 8.5 g |
| **Headshell weight** | 9.5 g |

## OPERATING PRINCIPLES OF FREQUENCY GENERATOR SERVO MOTOR (FIG. 16)

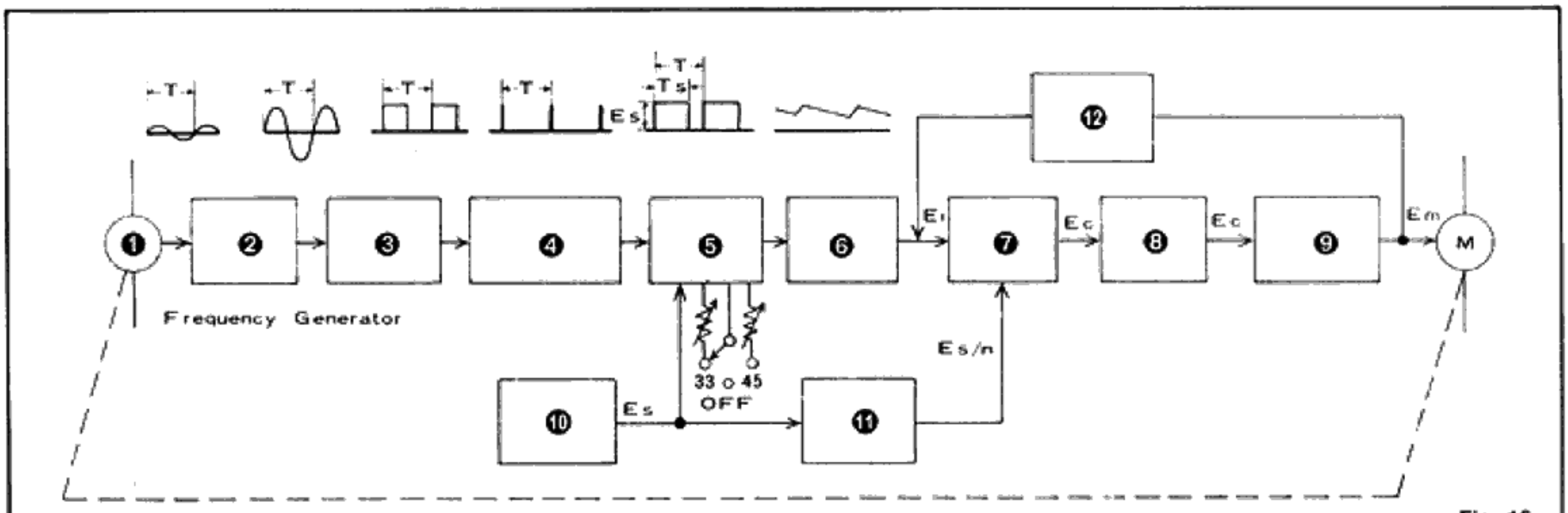


Fig. 16

❶Frequency generator
❷Amplifier
❸Pulse shaper circuit
❹Trigger pulse circuit
❺Constant time base generator
❻Integrated circuit
❼Voltage comparator
❽DC amplifier
❾Motor driving circuit
❿Reference voltage booster circuit
⓫Divider
⓬Phase compensator circuit

*A Frequency Generator is mechanically coupled to the motor shaft,its output is in direct proportion to motor speed. The signal produced by the Frequency Generator is amplified and converted to a square wave by the pulse shaper circuit.
*The square wave is then converted into a trigger pulse.
*A square wave of fixed amplitude (ES) and width (TS) is generated using the trigger pulse to determine the square wave frequency. Therefore, this square wave has a frequency (T) which is directly related to the speed of the motor.
*An integrated circuit converts this square wave into a ramp wave which is used as the motor control voltage (Ei). If the motor speed is too fast, the output of the Frequency Generator will be higher than normal causing a decrease in the period (T) of the square wave signal. This results in an increase in the motor control voltage (Ei). Thus the motor control voltage (Ei) is also in direct proportion to the motor speed.
*In the voltage comparator stage, the motor control voltage (Ei) is compared with the reference control voltage(Es/n)which is supplied from the reference voltage supply and divider circuits.
*The output of the comparator (Ec) is the actual motor control voltage which will adjust the motor speed based on the signal supplied by the Frequency Generator.
*A phase compensator is used to feed back the AC component of the motor drive voltage to the voltage comparator, to improve speed stability.

### ■SPEED SELECTION

The two playing speeds are selected by varying the square wave pulse width (Ts) with two variable resistors.

### ■LOAD CHARACTERISTICS (Fig. 17)

*This chart indicates the fluctuation of the rotational speed of the turntable in relation to the stylus pressure.
*This unit employs a DC motor with a FREQUENCY GENERATOR SERVO circuit so that the load characteristics are extremely good.

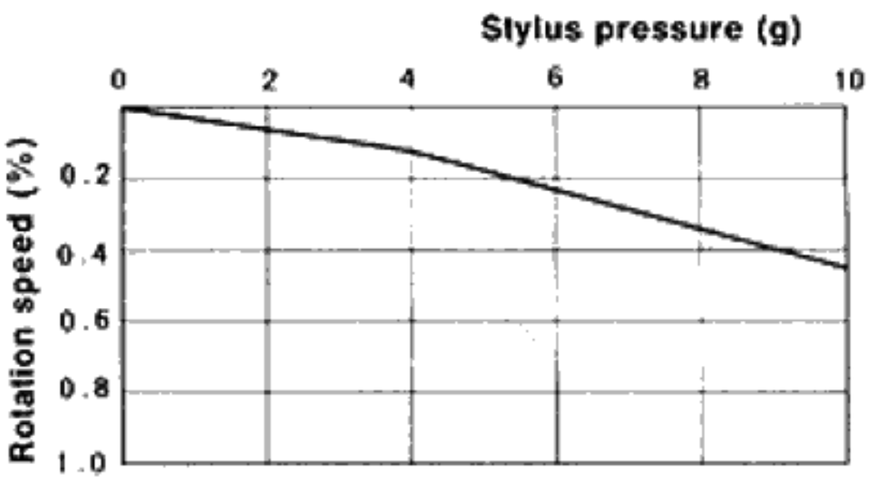


Fig. 17

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