

# Service Manual

Direct Drive Automatic Turntable System

## SL-3200 (X), (XAL) / SL-3210 (E), (XG)

(XGE), (E)  
(XG), (XGF)

SL-3200/SL-3210



- The model SL-3200 (X) is available in Asia, Latin America, Middle East and Africa only.
- The model SL-3200 (XAL) is available in Australia only.
- The model SL-3200 (XGE) is available in United Kingdom only.
- The model SL-3200 (E) is available in Scandinavia only.
- The model SL-3200 (XG) is available in European only.
- The model SL-3200 (XGF) is available in France only.
- The model SL-3210 (E) is available in Scandinavia only.
- The model SL-3210 (XG) is available in European only.

- SL-3200 is of silver finish.
- SL-3210 is of black finish.

### Specifications (Specifications are subject to change without notice for further improvement.)

#### General

**Power supply:** ~110-120/220-240V, 50/60Hz  
**Power consumption:** 4.5W  
**Dimensions:** 43.0 x 13.0 x 37.5 cm  
 (W x H x D) (16-59/64x5-7/64x14-49/46 inches)  
**Weight:** 6.9 kg (15.2 lb.)

#### Turntable section

**Type:** Direct Drive Automatic Turntable System (Auto-return, Auto-stop)  
**Drive method:** Direct Drive  
**Motor:** Brushless DC motor  
**Turntable platter:** Aluminum die-cast, 30.4 cm (12")  
**Turntable speeds:** 33-1/3 and 45 rpm  
**Pitch controls:** Individual adjustment controls, 10% adjustment range  
**Wow and flutter:** 0.03% WRMS (JIS C5521)  
 $\pm 0.042$ /peak (IEC 98A Weighted)  
**Rumble:** -73 dB (IEC 98A Weighted)

#### Tonearm section

**Type:** Universal tubular arm, staticbalanced type  
**Effective length:** 230 mm (9-1/16")  
**Overhang:** 15 mm (19/32")  
**Friction:** Within 7 mg (horizontally and vertically)  
**Effective mass:** 12 g (without cartridge)

**Tracking error angle:** Within  $2^{\circ}32'$  (at the outer groove of 30 cm (12") record)  
 Within  $0^{\circ}32'$  (at the inner groove of 30 cm (12") record)  
**Offset angle:**  $22^{\circ}$   
**Adjustable stylus pressure range:** 0 to 2.5 g (stylus pressure direct reading type)  
**Cartridge weight range:** 6 to 9.5 g (13.5 ~ 17 including headshell)  
**Headshell weight:** 7.5 g  
**Cartridge section (for set with cartridge)**  
**Model No.:** EPC-270C  
**Type:** Moving magnet  
**Frequency response:** 20 Hz to 25 kHz  $-3$  dB  
 20 Hz to 15 kHz  $\pm 2$  dB  
**Output voltage:** 3.2 mV at 1 kHz  
 5 cm/sec. zero to peak lateral velocity  
 (6.4 mV at 1 kHz, 10 cm/sec. zero to peak lateral velocity [DIN 45500])  
**Channel separation:** 25 dB at 1 kHz  
**Channel balance:** Within 2 dB at 1 kHz  
**Compliance (dynamic):**  $10 \times 10^{-6}$  cm/dyne at 100 Hz (CBS STR-100)  
**Stylus pressure:**  $1.75 \pm 0.25$  g ( $17.5 \pm 2.5$  mN)  
**Load impedance:** 47 k $\Omega$  to 100 k $\Omega$   
**Weight:** 6.0 g (cartridge only)  
**Replacement stylus:** EPS-270SD

Specifications subject to change without notice.

# Technics

Matsushita Electric Trading Co., Ltd.  
 P.O. Box 288, Central Osaka Japan

## TECHNISCHE DATEN

## Allgemeine Daten

**Netzspannung:** ~110-120/220-240 V, 50/60 Hz  
Wechselstrom  
**Leistungsaufnahme:** 4,5 W  
**Abmessungen:** 43,0 x 13,0 x 37,5 cm  
(B x H x T)  
**Gewicht:** 6,9 kg

## Plattenspielererteil

**Typ:** Automatisches Plattenspieleresystem mit Direktantrieb, (Rückföhrautomatik, stopautomatik)

**Antrieb:** Direktantrieb  
**Motor:** Kollektorloser Gleichstrommotor  
**Plattenteller:** Aluminium-Spritzguß  
30,4 cm  $\phi$

**Plattenteller-Drehzahlen:** 33-1/3 und 45 U/min

**Geschwindigkeits-Feineinstellung:** Für jede Geschwindigkeit gesondert, mittels Einsteller, 10% Einstellbereich

**Gleichlaufschwankungen:** 0,03% WRMS (JIS C5521)  
 $\pm 0,043\%$  bewertet Null-zu-Spitze (IEC 98A bewertet)

**Rumpel-Geräuschspannungsabstand:** -53 dB (IEC 98A unbewertet)  
-75 dB (IEC 98A bewertet)

## Tonarmteil

**Typ:** Universal-Röhrtonarm statisch ausbalanciert

**Effektive Länge:** 230 mm  
**Überhang:** 15 mm

**Mechanischer Widerstand:** Weniger als 7 mg (horizontal, vertikal)  
**Spurfehlwinkel:** Innerhalb 2° 32' (bei der äußeren Rille einer 30 cm-Schallplatte)  
Innerhalb 0° 32' (bei der inneren Rille einer 30 cm-Schallplatte)

**Kröpfungswinkel:** 22°  
**Effektive Masse:** 12 g (ohne Tonabnehmer)  
**Auflagedruck-Einstellbereich:** 0-2,5 g (direkt ablesbare Einstellung)  
**Zulässiger Tonabnehmer Gewichtsbereich:** 6-9,5 g  
13,5-17 g (einschließlich Tonarmkopf)  
**(mit Tonarmkopf-Gewicht):** 3-9,5 g  
10,5-17 g (einschließlich Tonarmkopf)  
**Tonarmkopf-Gewicht:** 7,5 g

## Tonabnehmererteil

**Modell-Nummer:** EPC-270C  
**Typ:** Magnetischer Tonabnehmer  
**Frequenzgang:** 20 Hz to 25 kHz -3 dB  
20 Hz to 15 kHz  $\pm 2$  dB  
3,2 mV bei 1 kHz  
**Ausgangsspannung:** 5 cm/sec Null-zu Spitze, lateral (6,4 mV bei 1 kHz 10 cm/sec Null-zu Spitze, lateral, [DIN 45500])  
25 dB bei 1 kHz  
Innerhalb 2 dB bei 1 kHz  
**Kanaltrennung:** 10 x 10<sup>-6</sup> cm/dyn bei 100 Hz (CBS STR-100)  
**Kanalabweichung:** 1,75  $\pm$  0,25 g 17,5  $\pm$  2,5 mN)  
**Nachgiebigkeit (dynamisch):** 47 k $\Omega$  bis 100 k $\Omega$   
**Auflagekraft:** 6,0 g (ohne Tonarmkopf)  
**Impedanz:** EPS-270SD  
**Gewicht:**  
**Ersatznadel:**

Änderungen der technischen Daten vorbehalten.

## CARACTERISTIQUES TECHNIQUES

## Généralités

**Alimentation:** Alternatif 110-120/220-240 V, 50 ou 60 Hz  
**Consommation:** 4,5 W  
**Dimensions:** 43,0 X 13,0 X 37,5 cm  
(L x H x P)  
**Poids:** 6,9 kg

## Platine de lecture

**Typ:** Système de platine automatique à entraînement direct (retour automatique, arrêt automatique)

**Système d'entraînement:** Entraînement par courroie

**Moteur:** Moteur C.C. sans balais

**Plateau de lecture:** Aluminium moulé sous pression  
Diamètre 30,4 cm

**Vitesses de rotation:** 33-1/3 et 45 t/p.m.

**Commandes de précision de la vitesse:** Commandes de réglage individuelles; plage de réglage 10%

**Pleurage et scintillement:** 0,03% de valeur efficace (JIS C5521)  
 $\pm 0,042\%$  de crête (IEC 98A Pondéré)

**Ronflement:** -53 dB (IEC 98A Non-pondéré)  
-75 dB (IEC 98A Pondéré)

## Bras de lecture

**Typ:** Bras tubulaire universel, de type à équilibrage statique

**Longueur effective:** 230 mm

**Porte-à-faux:** 15 mm

**Frottement:** Moins de 7 mg (horizontal et vertical)

**Masse réelle:** 12 g (sans la cellule pick-up)

**Angle d'erreur de piste:** En deçà de 2° 32' (au sillon extérieur d'un disque de 30 cm)  
En deçà de 0° 32' (au sillon intérieur d'un disque de 30 cm)

**Angle de décalage:** 22°

**Plage de réglage de la pression d'appui:** 0 à 2,5 g (type à lecture directe de la pression d'appui de la pointe)

## Gamme de poids de la cellule pick-up utilisable:

6 à 9,5 g  
13,5 à 17 g (y compris la coque porte-cellule)

## (avec contrepois de la cellule):

3 à 6,5 g  
10,5 à 14 g (y compris la coque porte-cellule)

## Poids de la coquille porte-cellule:

7,5 g

## Cellule pick-up (pour appareil avec cellule pick-up).

**No. du modèle:** EPC-270C

**Type:** Aimant mobile

**Réponse en fréquence:** 20 Hz à 25 kHz -3 dB

20 Hz à 15 kHz  $\pm 2$  dB

3,2 mV à 1 kHz

**Tension de sortie:** 5 cm/sec., zéro à vitesse latérale de crête (6,4 mV à 1 kHz, 10 cm/sec., zéro à vitesse latérale de crête [DIN 45500])

**Séparation de canal:** 25 dB à 1 kHz

**Équilibrage des canaux:** En deçà de 2 dB à 1 kHz

**Elasticité (dynamique):** 10 x 10<sup>-6</sup> cm/dyne à 100 Hz (CBS STR-100)

## Pression de la pointe de lecture:

1,75  $\pm$  0,25 gramme (17,5  $\pm$  2,5 mN)

**Impédance de charge:** 47 k $\Omega$  à 100 k $\Omega$

**Poids:** 6,0 grammes (cellule seule)

**Pointe de lecture de remplacement:** EPS-270SD

Les spécifications sont susceptibles d'être modifiées sans préavis.

**■ PARTS IDENTIFICATION**

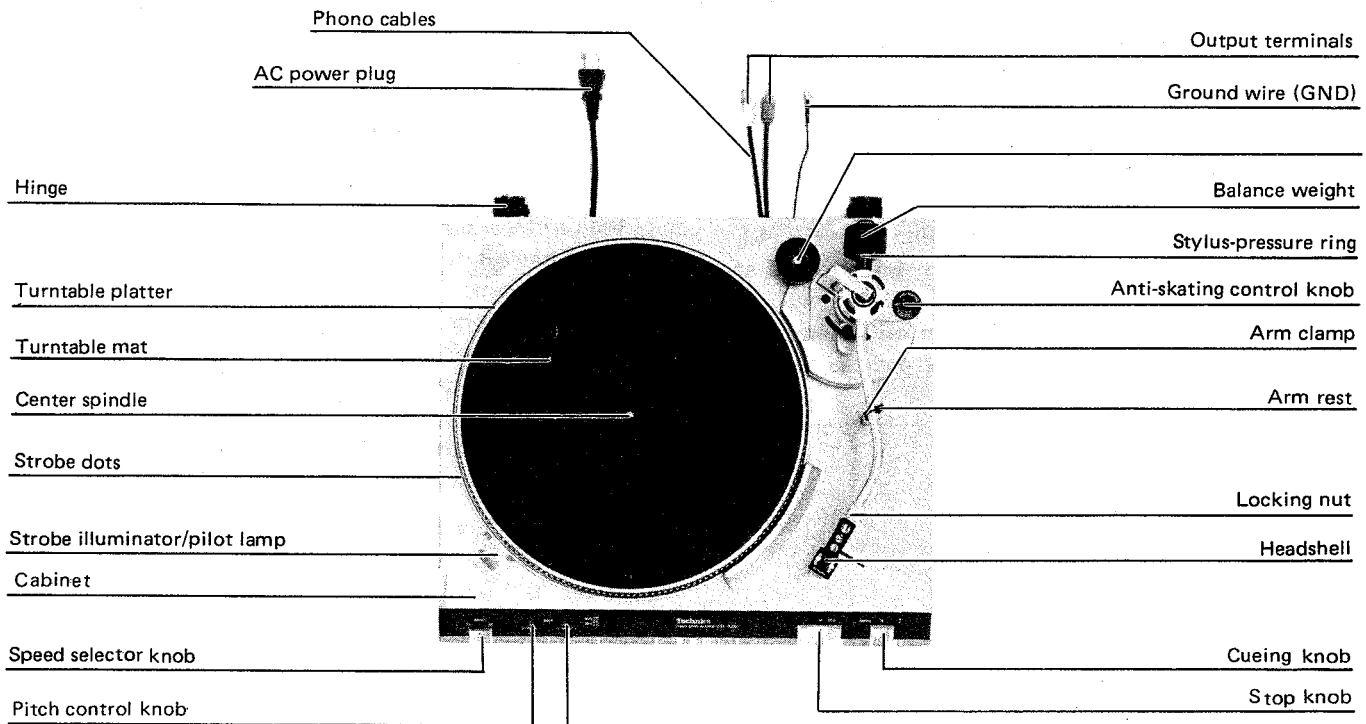


Fig. 1

**■ FEATURES**

**Ultra-Low-Speed Direct Drive Motor**

The direct-drive of the SL-3200 eliminates the belts, wheels, and other drive elements required by conventional systems. These same belts and so on are notorious sources of vibration, resonance, and cyclical variations in speed. With only one moving part, the D.D. system does away with these sources of disturbance, to provide superbly smooth, constant platter rotation.

**Integral Rotor-Platter Structure**

To further simplify the turntable design, the platter and rotor are formed into a single, continuous unit. By eliminating a linkage point, this prevents the potentially disturbing effects of looseness or maladjustment between platter and rotor.

**All Front-Panel Controls**

The advancement to complete front-panel control marks a big step forward in turntable operation, not only because of the greater convenience, but also because of the greater protection from dust, as the dust cover can stay closed.

**Tonearm Cueing Controlled from Front Panel**

The tonearm is raised and lowered softly by a viscous-damped cueing lifter. Even with the dust cover closed, a cueing can be easily performed as the control is located on the front panel.

**High Sensitive Gimbal Suspension**

The recently developed high sensitivity tonearm bearings featured in this unit achieve a very high degree of performance. In addition, the universal-type detachable headshell features all gold-plated pin connections to ensure unwavering reliability through many years of use.

**Independent Pitch Controls**

Permits record speed (at both 33-1/3 and 45 rpm) to be varied by up to 10%.

**Precision Strobe Illuminator/Pilot Lamp**

With the built-in strobe illuminator/pilot lamp, accurate speed adjustments can be made rapidly and easily.

**Anti-Skating Force Mechanism**

The well-designed anti-skating force mechanism ensures minimum side thrust with different cartridges and guarantees accurate center-of-the-groove tracking.

**Automatic Tonearm Return**

For greater operational convenience, the tonearm returns to the arm rest automatically.

**Detachable Dust Cover**

## ■ HOW TO OPERATE

1. Place a record on the turntable mat.
2. Set the speed select knob to the desired record speed. (See Fig. 2.)
3. Remove the stylus protector.
4. Release the arm clamp.
5. Set the cueing knob to the "▼" position. (See Fig. 3.)
6. Move the tonearm over the desired groove.

When you move the tonearm towards the center spindle, the turntable platter will rotate.

7. Set the cueing knob to the "▼" position. (See Fig. 4.)  
The tonearm will descend slowly onto the record and play will begin.
8. When play has finished, the tonearm will automatically return to the arm rest (auto-return) and the turntable platter will stop rotation.

(The turntable platter will continue to rotate briefly due to its own inertia.)

### Note:

- After play is completed, fasten the tonearm with the arm clamp and set the speed select knob to the "•" position.
- Attach the stylus protector again, if you have one, to protect the stylus tip from damage.

### When you play a 45-rpm record with a large center hole

Place the 45-rpm adaptor on the center spindle. Set the speed select knob to the "45" position.

### How to suspend play

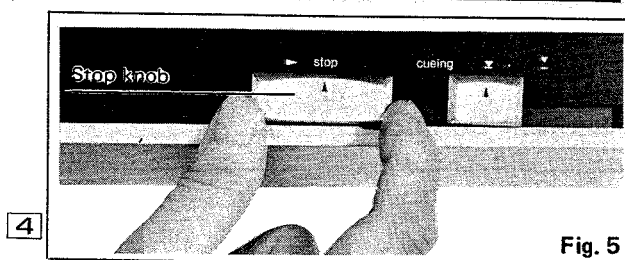
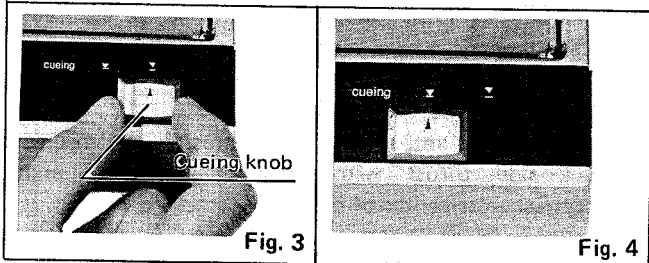
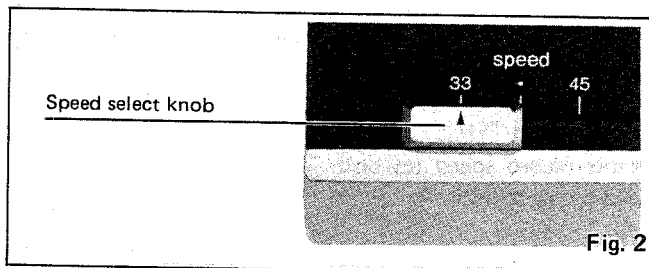
Set the cueing knob to the "▼" position.

The stylus tip of the cartridge will be lifted from the record.

### How to stop play

Set the stop knob to the "stop" position. (See Fig. 5.)

The tonearm will automatically return to the arm rest and the turntable will stop rotating.



## ■ ADJUSTMENTS

### Adjustments of horizontal "0" balance and stylus pressure

1. Remove the stylus protector. Be careful not to touch your fingers to the stylus tip.
2. Release the arm clamp and lift the tonearm from the arm rest to free it.

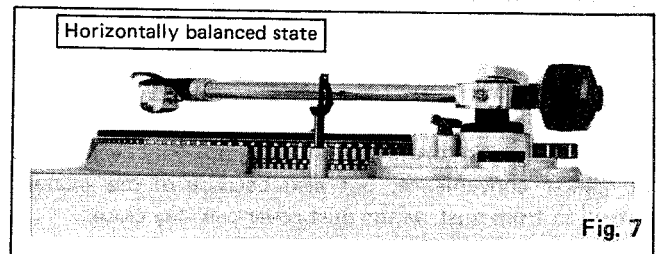
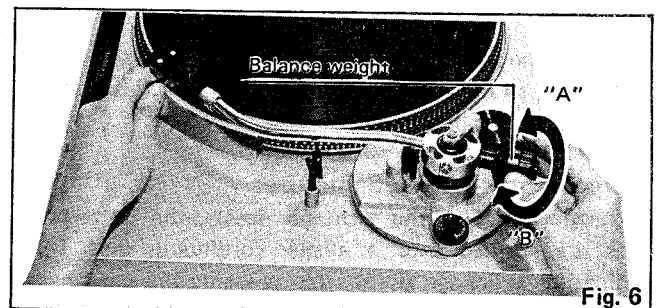
### Note:

- When you move the tonearm toward the center spindle, the turntable platter will move slightly, even if the speed select knob is at the "•" position, but this movement is not significant.
- If the tonearm pulls toward the arm rest when the tonearm is held in a free state as shown in the picture (See Fig. 6), rotate the turntable platter clockwise about 10 times. This will disengage the automatic mechanism from the tonearm gear, which in rare cases may have moved out of its normal position during transportation.

3. Turn the entire balance weight clockwise (indicated by the arrow "A") or counterclockwise (indicated by the arrow "B") until the tonearm is approximately balanced horizontally (floats freely). (See Figs. 6 and 7.)

### Note:

- During the adjustment of the horizontal "0" balance, be careful that the stylus tip of the cartridge does not contact the turntable mat or turntable base.
4. After the tonearm is horizontally "0" balanced, temporarily fasten the tonearm with the arm clamp.
  5. Hold the balance weight stationary with one hand, as shown in the picture, and rotate only the stylus-pressure ring to bring the numeral "0" of the ring into alignment with the center line of the tonearm rear shaft. The adjustment of the horizontal "0" balance is now completed. (See Fig. 8.)



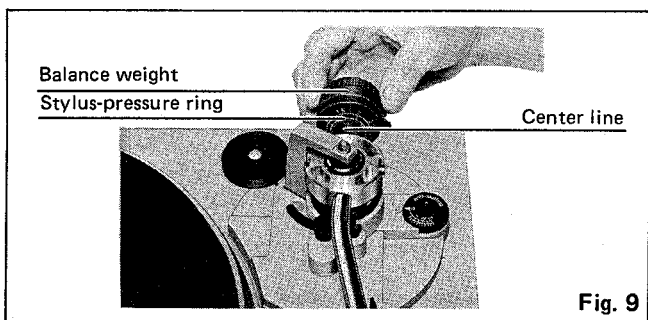
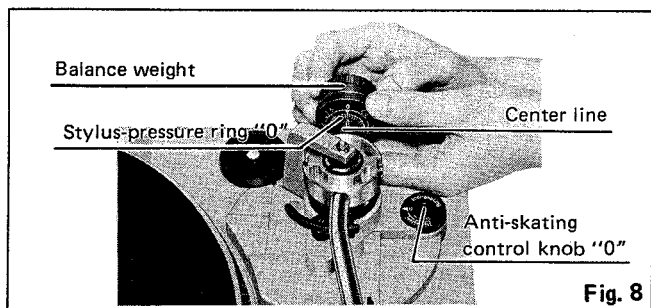
6. After adjusting the horizontal "0" balance, turn the balance weight clockwise in the direction of the arrow and align to the correct stylus pressure. (The stylus pressure of this unite is 1.75g.) (See Fig. 9.)

### Note:

- As the stylus-pressure ring moves in step with the

balance weight, proper stylus pressure can be selected by directly reading the graduated ring.

- Set the stylus pressure to the maximum recommended value for your cartridge in cases where the record has an extremely high recording level, or where the unit is operated in a room at low temperature or in places in which the unit is subjected to vibrations.

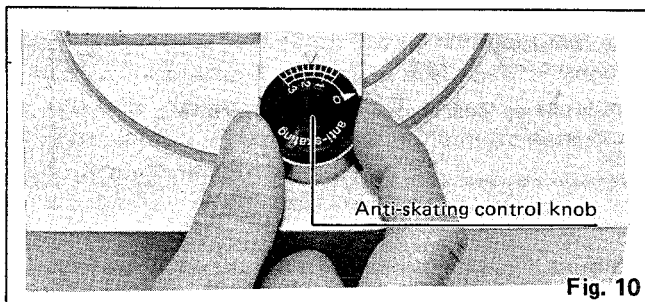


### Adjustment of the anti-skating control

Set the anti-skating control knob to the same value as the stylus pressure. (See Fig. 10.)

**Note:**

- When a cartridge with integral dust brush is used, follow the cartridge manufacturer's recommendation for adjusting both stylus pressure and anti-skating force.



### Adjustment of arm-lift height (See Fig. 11.)

- The arm-lift height distance between the stylus tip and record surface when cueing knob is at "▼" has been adjusted at the factory before shipping to approximately 5 to 10 mm.
- For using different cartridges available on the market or when further adjustments are particularly necessary, make adjustment as follows:
  1. Put on the stylus protector to protect the stylus tip from damage.
  2. Set the speed select knob to the "•" position to prevent the turntable platter from rotation.
  3. Move the tonearm towards the center spindle.

4. Turn the adjustment screw clockwise or counterclockwise, while pushing the arm lift down. (See Fig. 11.)

**Clockwise rotation**

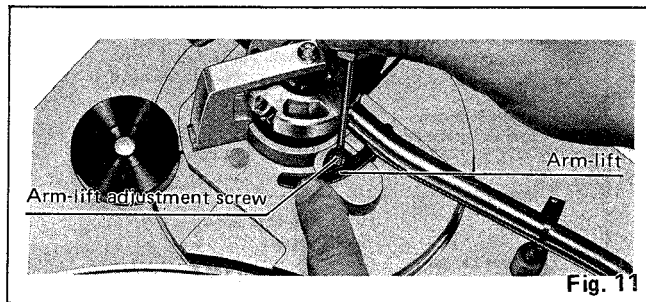
– distance between the record and stylus tip is reduced.

**Counterclockwise rotation**

– distance between the record and stylus tip is increased.

**Note:**

- As the adjusting screw has a hexagonal head, be sure to make the adjustment while depressing the arm lift, or the screw will not move freely. Also be sure that the hexagonal head retracts correctly into the arm lift when the latter is released.



### Speed adjustment (with pitch control knobs)

Strobe dots are set on the rim of the turntable platter according to the power-line frequency and the speed of the records. Make adjustment, referring to strobe-dot indication.

1. Place a record on the turntable mat.
2. Set the speed select knob to the speed to be adjusted.
3. Adjust the speed while playing a record.
 

The strobe-illuminator/pilot lamp will be lit for illuminating the strobe dots.
4. While turning the pitch control knobs either to "+" side or "-" side, adjust so that the strobe dots of the turntable platter look as if they were stationary. The state under which the strobe dots seem to be stationary represents the correct number of revolutions.

**"+" direction**

This increases the speed of the turntable rotation, and the strobe dot pattern seems to flow in the same direction as the rotational direction of the turntable platter.

**"-" direction**

This decreases the speed of the turntable rotation, resulting in a state opposite to that in the "+" direction.

**Note:**

**Strobe dot pattern**

The strobe-illuminator/pilot lamp of this unit employs the commercially available power source. The frequency of such power source, when actually measured, has a fluctuation of about 0.2%. As such a fluctuation of the power source affects the strobe illuminator, the strobe dot pattern also seems to fluctuate to a certain extent.

But the unit is not affected by these fluctuations of the power source, since a DC motor is employed. In other words, rotation of the platter will be constant, and slight shifts in the movement of the dots simply reflect normal drift in the power-source frequency.

## Adjustment for automatic return position (See Fig. 12.)

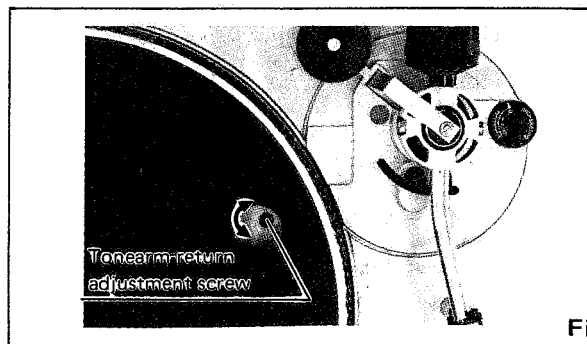
(Remove the turntable mat.)

In cases where the tonearm tends to return before playing has finished.

— Rotate clockwise.

In cases where the tonearm fails to return after the last groove of the record.

— Rotate counterclockwise.



## ■ OPERATION PRINCIPLES OF THE SL-3200/3210

This unit, like the SL-1300 has a rational motor structure, and its drive control circuit is the B.F.G. type (Back TECHNICAL EXPLANATION electromotive force frequency generator) which is constructed on a single integrated Circuit (IC) chip(AN630). The following is a block diagram of the IC (AN630) for which the operating principle will be briefly explained.

### ■ OPERATING PRINCIPLE

The back electromotive force, which is generated by the drive coil winding according to the rotation of the motor, is detected and converted to a frequency signal that is proportional to the number of revolutions.

Conversion is performed by a wave-shaping circuit and a logic circuit (This is referred to as the B.F.G. method).

This frequency signal is compared with a standard signal by means of a frequency-voltage conversion circuit which converts it to a voltage signal in order to maintain a constant number of revolutions.

After removing unnecessary frequency components with the operational-amplifier active filter, from a voltage signal, it controls the current flow in differential switching circuits. As a result, the frequency current in the drive coil winding is always controlled, maintaining the correct rotational speed. Control of the rotational speed can be performed by means of adjusting the standard signal generator circuit according to the rotational speed adjustment circuit.

### ■ EXPLANATION OF EACH PART

#### 1. B.F.G. METHOD (BACK ELECTROMOTIVE FORCE FREQUENCY GENERATOR)

Making use of the back electromotive force that is generated in the drive coil winding of the motor as a frequency generator, the frequency of the frequency generator is converted to the number of revolutions for the turntable.

After shaping the wave form of this back electromotive force, it is composed logically, and a frequency is generated that is proportional to the number of revolutions. This is the use of the B.F.G. Making use of the drive coil winding, frequency generator coil windings and magnets are not necessary, yielding a motor structure that is very compact.

#### 2. FREQUENCY-VOLTAGE CONVERSION CIRCUIT

Being composed of a trapezoidal wave generating circuit, a pulse generating circuit and a sampling integration circuit, the B.F.G. output frequency is converted to a voltage, and control output voltage is generated in order to maintain the rotational speed of the turntable at a constant level.

#### 3. OPERATION CONTROL CIRCUIT

The operation control circuit functions as a control output voltage control keeping the rotational speed of the turntable constant with regard to the start of turntable operation and the operation of the mechanism. With this circuit, transient response characteristic starting characteristics are very good.

#### 4. OPERATIONAL AMPLIFIER (OP AMP) AC FILTER

Because of using an operational amplifier in the filter, an ideal filter operation is possible. As a result, such high performance as a signal-to-noise (SN) ratio of 60 dB (IEC-B) and a wow-and-flutter of 0.03% (WRMS) have been achieved.

#### 5. DRIVE CIRCUIT

By incorporating a large capacity power transistor integrated circuit, a starting torque of 1 kg-cm can be obtained. By means of this large starting torque, precise starts have been realized.

#### 6. THREE DIFFERENTIAL SWITCHING CIRCUIT

By means of the signal from the position signal control starting circuit power transistor selector operation, obtaining smooth rotation.

## ■ JUSTIERUNGEN

### Justierung des Antiskating-Einstellers

Stellen Sie den Antiskating-Einstellknopf auf den gleichen Wert ein, wie den Auflagedruck. (Vgl. Abb. 10)

#### Anmerkung:

- Wenn Sie einen Tonabnehmer mit einem daran befestigten Pinselchen benutzen, halten Sie sich bei der Einstellung der Auflagekraft und des Antiskatingwertes an die Empfehlungen des Tonabnehmer-Herstellers.

### Einstellung des Tonarmlifts (Vgl. Abb. 11)

- Die Tonarmlifthöhe, d.h. der Abstand zwischen der Schallplattenoberfläche und der Nadelspitze, wenn der Lift-Schieber in der "▼"-Position ist, wurde vor der Auslieferung auf ungefähr 5–10 mm eingestellt.
- Für die Benutzung anderer Tonabnehmer, die auf dem Markt erhältlich sind, oder, falls eine weitere Justierung unbedingt erforderlich ist, nehmen Sie die Justierung auf folgende Weise vor:

1. Stellen Sie den Geschwindigkeits-Wahlschalter in die "•"-Position, damit sich der Plattenteller nicht dreht.
2. Führen Sie den Tonarm gegen die Plattentellerachse.
3. Drehen Sie die Justierschraube im Uhrzeigersinn oder Gegenuhrzeigersinn, währenddem Sie die Tonarmliftführung nach unten drücken. (Vgl. Abb. 11)

#### Im Uhrzeigersinn

—Der Abstand wird kleiner.

#### Im Gegenuhrzeigersinn

—Der Abstand wird größer

#### Anmerkung:

- Da die Justierschraube einen Sechskantkopf hat, muß die Tonarmliftführung während dem Justieren unbedingt gedrückt gehalten werden. Vergewissern Sie sich, daß der Sechskantkopf in die Tonarmliftführung zurückkehrt, wenn diese losgelassen wird.

### Einstellen des Abschaltpunktes der Automatik (Vgl. Abb. 12)

(Die Plattentellerauflage abnehmen.)

Falls der Tonarm zu früh zurückkehrt.

—Im Uhrzeigersinn drehen.

Falls der Tonarm nach Erreichen der Auslaufrille nicht zurückkehrt.

—Im Gegenuhrzeigersinn drehen.

### Geschwindigkeits-Feineinstellung (mittels der Feineinsteller)

Die Stroboskoppunkte sind auf dem Plattentellerrand entsprechend der Stromfrequenz und der Drehzahl der Schallplatten angebracht. Richten Sie sich bei der Drehzahl-Feineinstellung nach dem Stroboskopbild.

1. Legen Sie eine Schallplatte auf den Plattenteller.
2. Stellen Sie den Geschwindigkeits-Wahlschieber auf die zu regulierende Geschwindigkeit ein.

3. Regulieren Sie die Geschwindigkeit während dem Abspielen der Platte.

Die Stroboskoplampe/Einschaltkontrolllampe leuchtet zur Beleuchtung der Stroboskoppunkte.

4. Regulieren Sie durch Drehen der Einstellknöpfe in "+" oder "-" Richtung, solange, bis die Stroboskoppunkte den Anschein vermitteln, daß sie stillstehen. Der Zustand, in dem die Stroboskoppunkte scheinbar stationär verbleiben, stellt die korrekte Drehgeschwindigkeit dar.

#### "+" Richtung

Die Drehgeschwindigkeit des Plattentellers erhöht sich und die Stroboskoppunkte scheinen in der gleichen Richtung zu laufen, wie der Plattenteller.

#### "-" Richtung

Die Drehgeschwindigkeit des Plattentellers verringert sich, und die Stroboskoppunkte laufen in der, der Drehrichtung des Plattentellers entgegengesetzten Richtung.

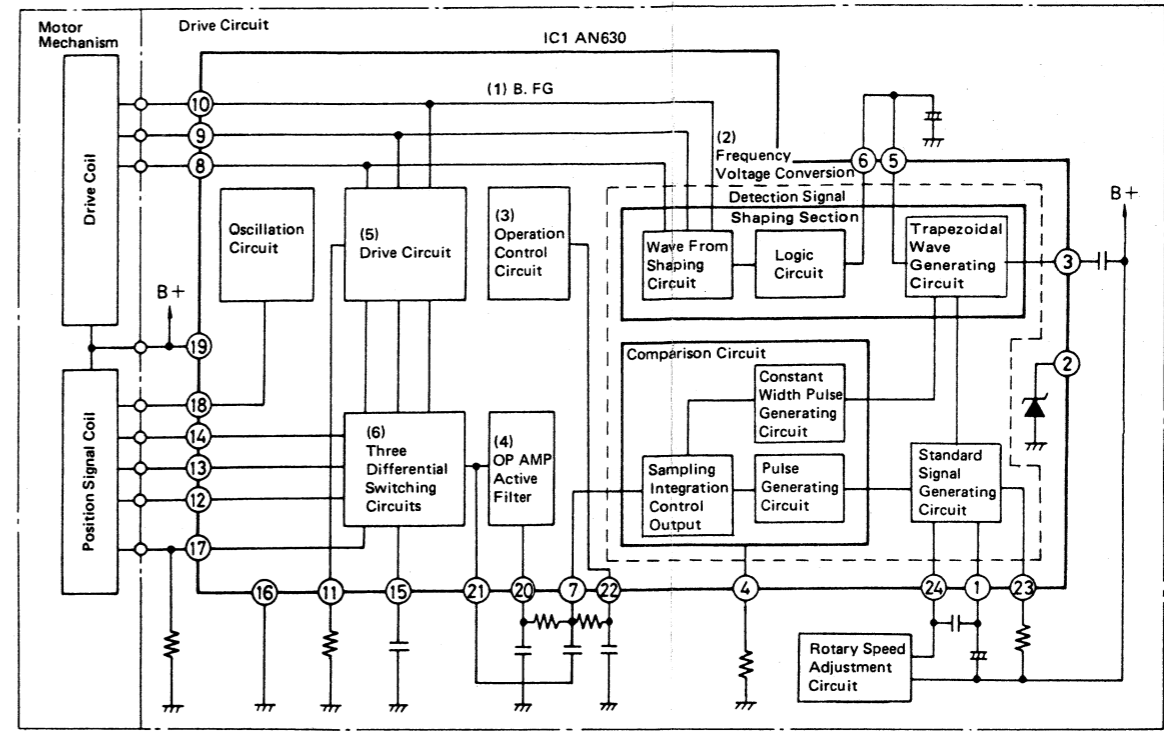
#### Anmerkung:

##### Stroboskoppunktemuster

- Die Stroboskoplampe/Kontrolllampe dieses Gerätes arbeitet mit normalem Netzstrom. Die Frequenz dieser Stromquelle besitzt einen Schwankungsbereich von 0,2%. Da eine solche Schwankung der Stromquelle die Stroboskoplampe beeinflußt, scheint das Punktemuster auch zu einem gewissen Grad zu fließen. Die Drehzahl des Plattentellers wird jedoch durch diese Schwankung nicht beeinflußt, da ein Gleichstrommotor den Plattenteller antreibt. Anders ausgedrückt, die Umdrehungsgeschwindigkeit des Plattentellers bleibt konstant, und die geringfügige Bewegung des Stroboskoppunktemusters entspricht lediglich der normalen Schwankung der Netzfrequenz.

Anders ausgedrückt, die Umdrehungsgeschwindigkeit des Plattentellers bleibt konstant, und die geringfügige Bewegung des Stroboskoppunktemusters entspricht lediglich der normalen Schwankung der Netzfrequenz.

## ■ BLOCK DIAGRAM



## ■ REPLACEMENT PARTS LIST

- Notes:**
1. Part numbers are indicated on most mechanical parts. Please use this part number for parts orders.
  2. **S** indicates that only parts specified by the manufacturer be used for safety.

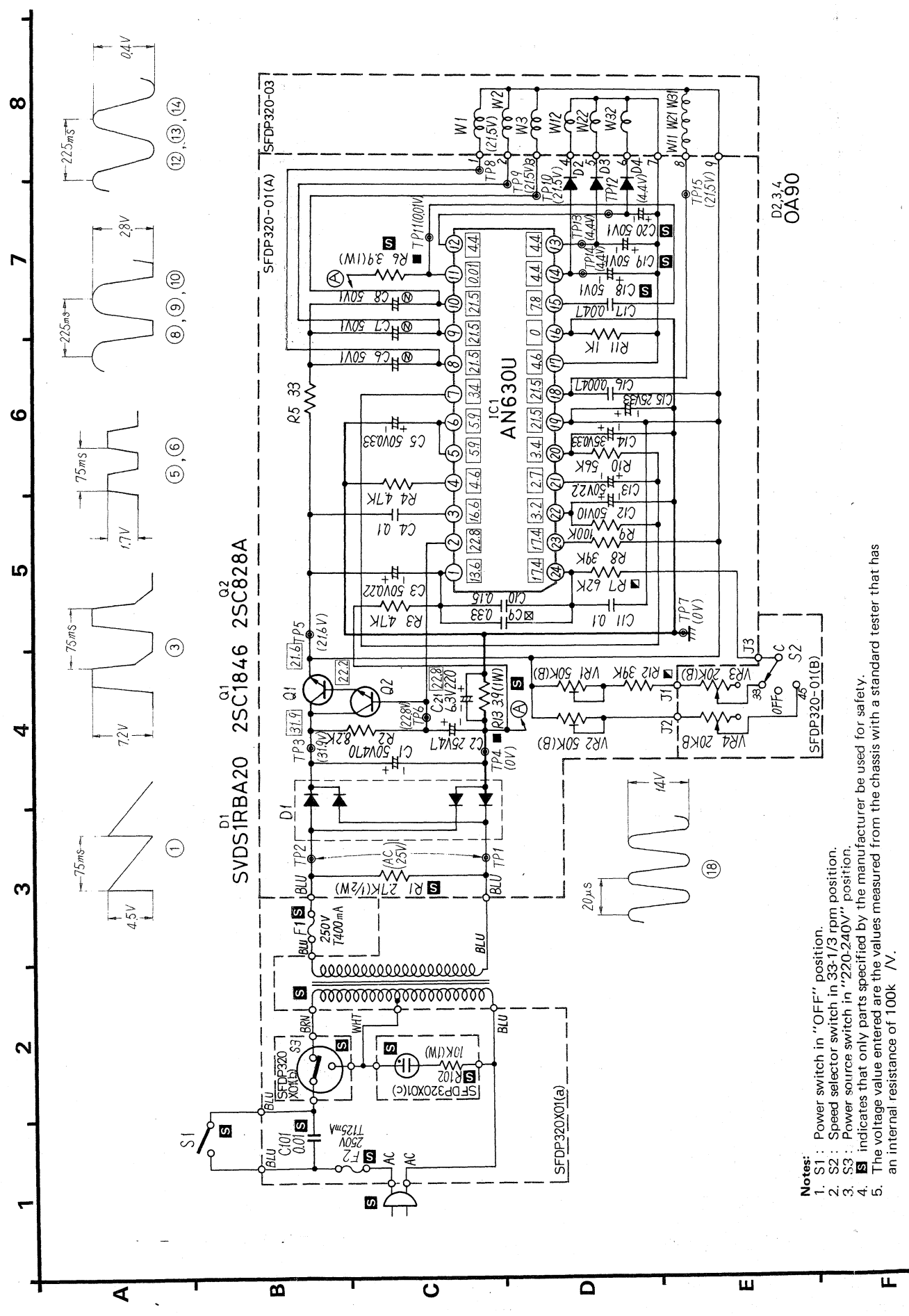
3. SL-3200 (X) → [X]      SL-3200 [XG] → [XG]      SL-3200 (XGE) → [XGE]      SL-3210 [E] → [10E]  
 SL-3200 (XAL) → [XAL]      SL-3200 [XGF] → [XGF]      SL-3200 (E) → [E]      SL-3210 [XG] → [10XG]

Ref. No.	Part No.	Part Name & Description	Ref. No.	Part No.	Part Name & Description
<b>INTEGRATED CIRCUIT</b>			<b>RESISTORS</b>		
IC1	AN630U	Integrated Circuit	R1	<b>S</b> ERD50TJ272	Carbon, 2.7kΩ, 1/2W, ± 5%
<b>TRANSISTORS</b>			R2	ERD25TJ822	Carbon, 8.2kΩ, 1/4W, ± 5%
Q1	<b>2SC1846-Q</b>	Transistor	R3, 4	ERD25TJ472	Carbon, 4.7kΩ, 1/4W, ± 5%
Q2	<b>2SC1328-T</b>	Transistor	R5	ERD25TJ330	Carbon, 33Ω, 1/4W, ± 5%
<b>DIODES</b>			R6	<b>S</b> ERX1ANJ3R9	Metallic, 3.9Ω, 1W, ± 5%
D1	<b>S</b> SVDS1RBA20	Rectifier	R7	ERO25CKF6202	Metallic, 62kΩ, 1/4W, ± 1%
D2, 3, 4	OA90	Diodes	R8	ERD25TJ393	Carbon, 39kΩ, 1/4W, ± 5%
<b>TRANSFORMER</b>			R9	ERD25TJ104	Carbon, 100kΩ, 1/4W, ± 5%
T1	<b>S</b> SLTF5352A	Power Transformer	R10	ERD25TJ563	Carbon, 56kΩ, 1/4W, ± 5%
<b>LAMP</b>			R11	ERD25TJ102	Carbon, 1kΩ, 1/4W, ± 5%
NL1	<b>S</b> SFDNE2HU	Neon Lamp	R12	ERO25CKF3902	Metallic, 39kΩ, 1/4W, ± 1%
<b>SWITCHES</b>			R13	<b>S</b> ERX1ANJ3R9	Metallic, 3.9Ω, 1W, ± 5%
S1	<b>S</b> SFDSA764039	Switch, Power	R102	<b>S</b> ERG1ANJ103	Metallic, 10kΩ, 1W, ± 5%
S2	EVAL06SBBAAF	Switch, Speed Selector	<b>CAPACITORS</b>		
S3	<b>S</b> SFDHXW13312	Switch, Power Source Selector	C1	ECEB1HS471	Electrolytic, 470µF, 50V
<b>FUSE</b>			C2	ECEA1JS4R7	Electrolytic, 4.7µF, 63V
F1	XBA2C04TRO	400mA, Fuse	C3	ECEA50ZR22	Electrolytic, 0.22µF, 50V
F2	XBA2C012TRO	125mA, Fuse	C4	ECQM1H104KZ	Polyester, 0.1µF, 50V, ±10%
<b>VARIABLE RESISTORS</b>			C5	ECEA50ZR33	Electrolytic, 0.33µF, 50V
VR1, 2	EVLS3AA00B54	50kΩ, Pitch Control	C6, 7, 8	ECEA50N1	Electrolytic, 1µF, 50V
VR3, 4	EVHX8AF15B54	50kΩ, Speed Control	C9	ECQF2334KZ	Polyester, 0.33µF, 200V, ±10%
			C10	ECQM1H154KZ	Polyester, 0.15µF, 50V, ±10%
			C11	ECQM1H104KZ	Polyester, 0.1µF, 50V, ±10%
			C12	ECEA25M10R	Electrolytic, 10µF, 25V
			C13	ECEA50M2R2R	Electrolytic, 2.2µF, 50V
			C14	ECSZ35EFR33E	Electrolytic, 0.33µF, 35V
			C15	ECEA1VS330	Electrolytic, 33µF, 35V
			C16	ECEM1H472KZ	Polyester, 0.0047µF, 50V, ±10%
			C17	ECQM1H473KZ	Polyester, 0.047µF, 50V, ±10%
			C18, 19, 20	<b>S</b> ECEA2A 010	Electrolytic, 1µF, 100V
			<b>C101</b> [X, XAL, XGE, XG, XGF, 10XG]	<b>S</b> ECQE2A103MZ	Polyester, 0.01µF, 250V, ±20%
			<b>C101</b> [E, 10E]	<b>S</b> ECKDHS103SE2	Polyester, 0.01µF, 400V, ±20%

■ SCHEMATIC DIAGRAM (This schematic diagram may be at any time with the development of new technology.)

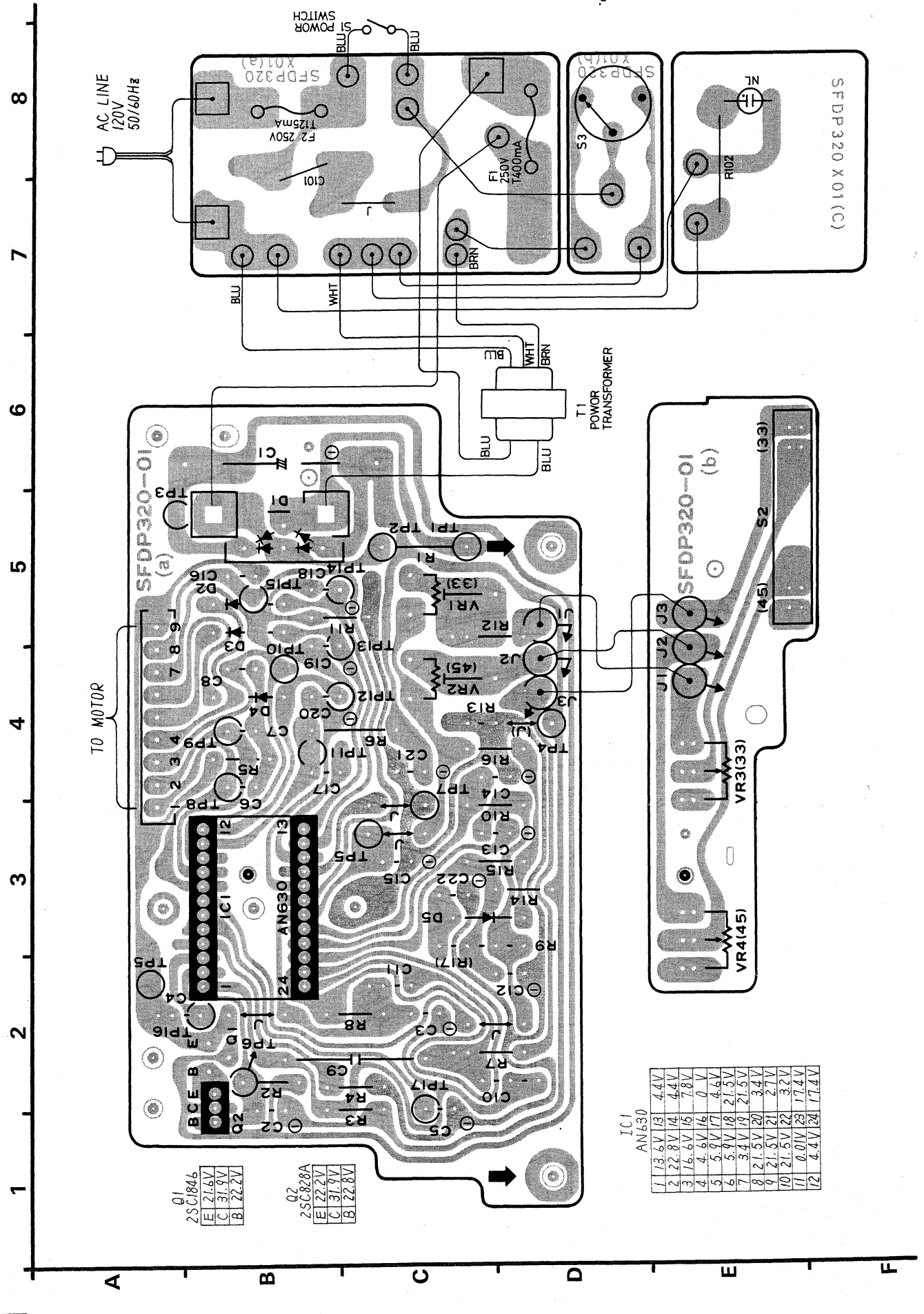
Part Name & Description	Quantity	Value	Tolerance
2.7kΩ	1/2W	± 5%	
8.2kΩ	1/4W	± 5%	
4.7kΩ	1/4W	± 5%	
33Ω	1/4W	± 5%	
3.9Ω	1W	± 5%	
62kΩ	1/4W	± 1%	
39kΩ	1/4W	± 5%	
100kΩ	1/4W	± 5%	
56kΩ	1/4W	± 5%	
1kΩ	1/4W	± 5%	
39kΩ	1/4W	± 1%	
3.9Ω	1W	± 5%	
10kΩ	1W	± 5%	
470μF	50V		
4.7μF	63V		
0.22μF	50V		
0.1μF	50V	±10%	
0.33μF	50V		
1μF	50V		
0.33μF	200V	±10%	
0.15μF	50V	±10%	
0.1μF	50V	±10%	
10μF	25V		
2.2μF	50V		
0.33μF	35V		
33μF	35V		
0.0047μF	50V	±10%	
0.047μF	50V	±10%	
1μF	100V		
0.01μF	250V	±20%	
0.01μF	400V	±20%	

**SCHEMATIC DIAGRAM** (This schematic diagram may be at any time with the development of new technology.)



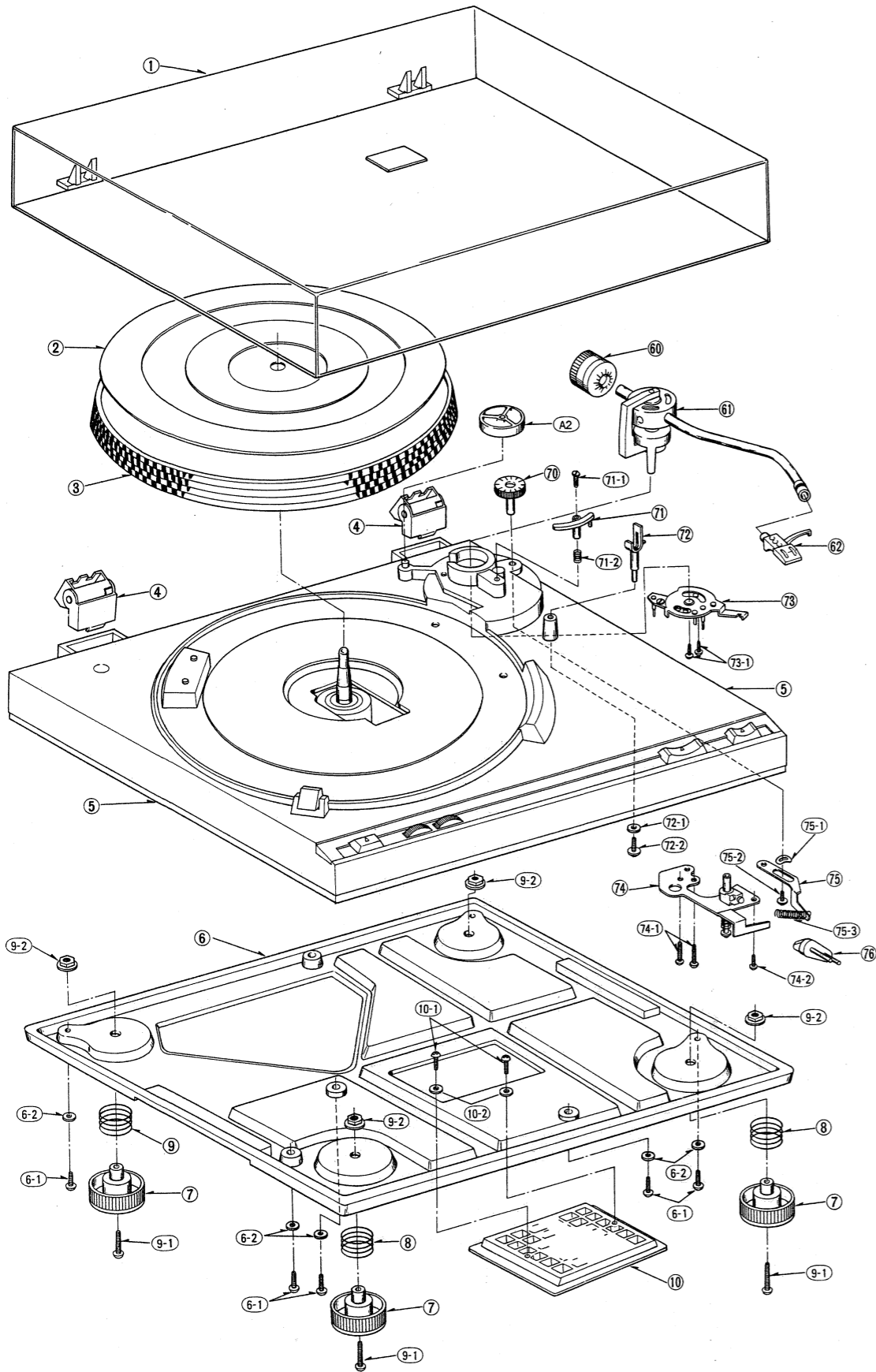
- Notes:**
- S1 : Power switch in "OFF" position.
  - S2 : Speed selector switch in 33-1/3 rpm position.
  - S3 : Power source switch in "220-240V" position.
  - S indicates that only parts specified by the manufacturer be used for safety.
  - The voltage value entered are the values measured from the chassis with a standard tester that has an internal resistance of 100k Ω.

**CIRCUIT BOARD WIRING VIEW**





EXPLODED VIEWS



REPLACEMENT PARTS LIST

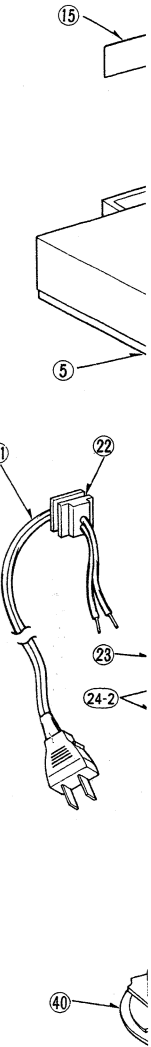
- Notes: 1. Part numbers are indicated on most mechanical parts. Please use this part number for parts orders.  
 2. **S** indicates that only parts specified by the manufacturer be used for safety.

3. SL-3200 (X) → [X] SL-3200 (XAL) → [XAL] SL-3200 (XG) → [XG] SL-3200 (XGF) → [XGF] SL-3200 (XGE) → [XGE] SL-3200 (E) → [E] SL3210 (E) → [10E] SL-3210 (XG) → [10XG]

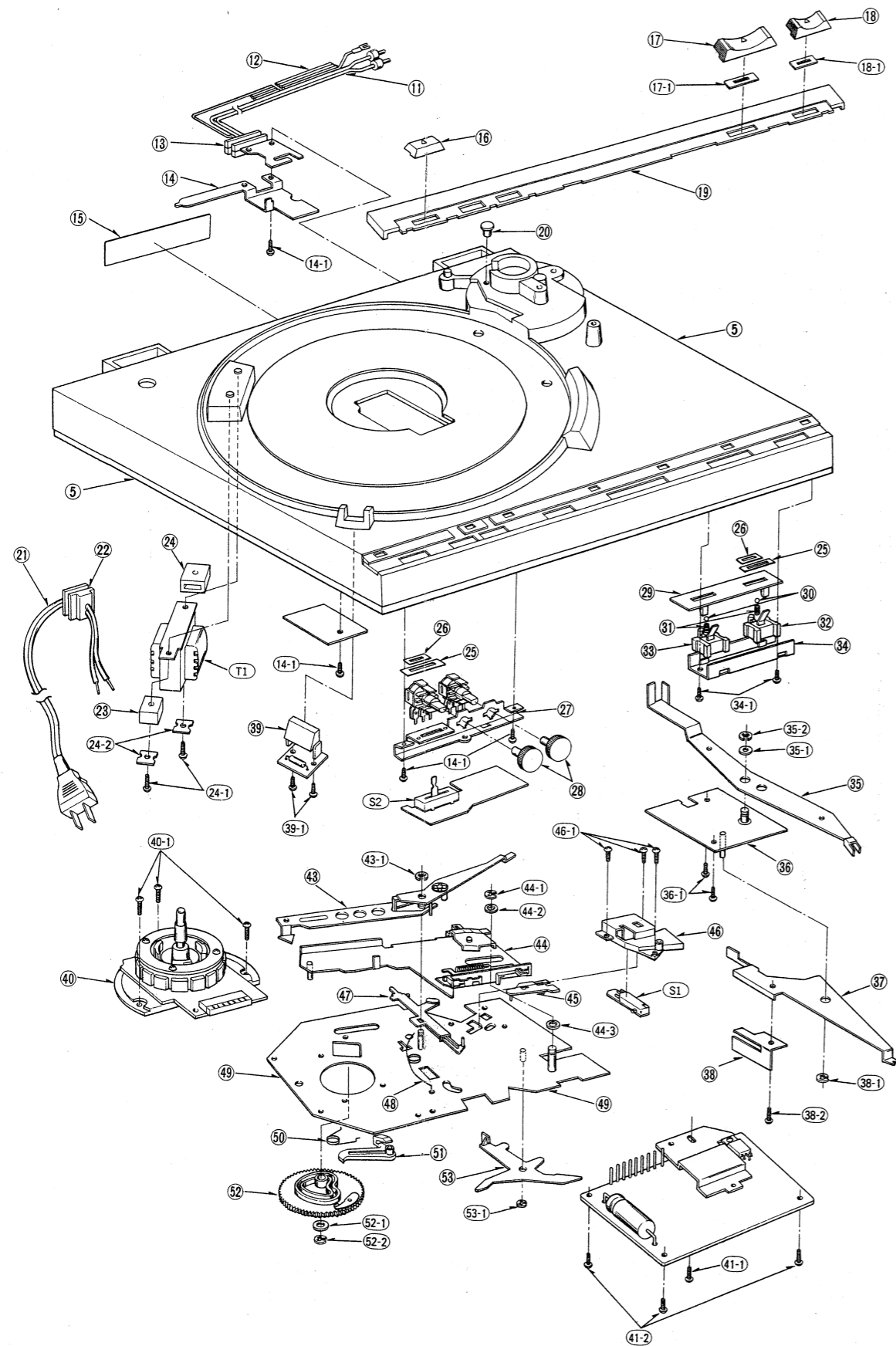
Ref. No.	Part No.	Part Name & Description
<b>CABINET and CHASSIS PARTS</b>		
1	SFAD019-01E	Dust Cover
2	SFTG320-01	Turntable Mat
3	SFTE320-01A	Turntable
4	SFAT301-01A	Hinge Ass'y
5	SFAC320-01	Cabinet
5 [X, XAL, XGE, E, XG, XGF]	SFAC321P01	Cabinet
5 [10E, 10XG]	SFAU320-01	Bottom Board
6	XTN3+20B	Screw, Bottom Board
6-1	XWG3	Washer, Bottom Board
6-2	XWG3	Washer, Bottom Board
7	SFGA212-01	Audio Insulator
8	SFQC200-01	Spring, Audio Insulator
9	SFQC200-02	Spring, Audio Insulator
9-1	XSN3+14S	Screw, Audio Insulator
9-2	SFXN212-01	Nut, Audio Insulator
10	SFUM320-02	Cover, Bottom Board
10-1	XTN3+8B	Screw, Cover
10-2	XWG3	Washer, Cover
11	SFDH212-01	Phono Cord
12	SFEL028-01E	Ground Wire
13	SFUM212-08	Clamper, Phono Cord
14	SFUP320-01	Plate, Shield
14-1	XTV3+10C	Screw
15 [X, XG, XGF]	SFNN320X01	Name Plate
15 [10XG]	SFNN321X01	Name Plate
15 [E]	SFNN320S01	Name Plate
15 [XAL, XGE]	SFNN320G01	Name Plate
15 [10E]	SFNN321S01	Name Plate
16	SFKT320-03	Knob, Speed Select
17	SFKT320-01	Knob, Stop
17-1	SFXW212-02	Washer, Stop Knob
18	SFKT320-02	Knob, Cueing
18-1	SFXW212-01	Washer, Cueing Knob
19 [X, XAL, XGE, E, XG, XGF]	SFKK320-01	Panel
19 [10E, 10XG]	SFKK321P01	Panel
20 [X, XAL, XGE, E, XG, XGF]	SFGK170-01	Cap, Rubber
20 [10E, 10XG]	SFGK171F01	Cap, Rubber
21 [X, E, XG, XGF, 10E, 10XG]	RJA232C	AC Cord
21 [XAL]	QFC1207M	AC Cord
21 [XGE]	RJA452C	AC Cord
22 [except XAL]	SFUM190-12	Bushing, AC Cord
22 [XAL]	SFUM190-11	Bushing, AC Cord
23	SFGC320-02	Supporter, Power Transformer (A)
24	SFGC320X01	Supporter, Power Transformer (B)
24-1	XTV3+10C	Screw, Power Transformer
24-2	SFUP320-04	Supporter, Power Transformer (C)
25	SFUP212-13	Shutter (A)
26	SFUP212-07	Shutter (B)
27	SFUP212-11	Plate, Speed Adjustment
28	SFKT212-02	Knob, Pitch Control
29	SFUM212-02	Plate, Operation
30	SFYB5-32	Ball, Slider Ass'y
31	SFQA130-11	Spring, Slider Ass'y
32	SFUP212-20E	Slider Ass'y
33	SFUP212-03E	Slider Ass'y
34	SFUP212-06	Case, Operation
34-1	XTN3+20B	Screw, Slider Ass'y
35	SFUP212-04	Lever, Cueing
35-1	SFXW190-22	Washer, Cueing Lever

Ref. No.	Part No.	Part Name & Description
35-2	<b>XUC5FT</b>	Circlip, Cueing Lever
36	SFUK230-02E	Plate, Cueing Lever
36-1	XTV3+10C	Screw, Cueing Lever Plate
37	SFUP222-01	Lever, Start
38	SFQP230-01	Supporter, Start Lever
38-1	<b>XUC3FT</b>	Circlip, Start Lever
38-2	XTN3+5B	Screw, Start Lever
39	SFUM320-01	Cover, Neon
39-1	XTN3+10B	Screw, Neon Cover
40	SFMZ320-01Z	Stator Frame Ass'y
40-1	XTN3+10B	Screw
41-1	XTN3+8B	Screw, Heat Sink
41-2	XTV3+10C	Screw, P.C.B.
43	SFUC222-11E	Actuating Plate Ass'y
43-1	<b>XUC3FT</b>	Circlip, Actuating Plate Ass'y
44	SFUB222-11A	Operating Plate Ass'y
44-1	<b>XUC5FT</b>	Circlip, Operating Plate Ass'y
44-2	SFXW623-02	Washer, Operating Plate Ass'y
44-3	SFXW130-13	Washer, Operating Plate Ass'y
45	SFUM222-15	Plate, Switch
46	SFUM222-14	Cover, Switch
46-1	XTN3+8B	Screw, Switch Cover
47	SFUM222-13	Plate, Stop
48	SFQS222-12	Spring, Stop Plate
49	SFUK320-11E	Automatic Mechanism Ass'y
50	SFQS222-11	Spring, Supporter
51	SFUM222-11	Supporter, Gear Setting
52	SFUG190-22E	Main Gear Ass'y
52-1	SFXW890B01	Washer, Main Gear Ass'y
52-2	<b>XUC5FT</b>	Circlip, Main Gear Ass'y
53	SFUM222-16	Lever, Switch
53-1	<b>XUC3FT</b>	Circlip, Switch Lever
<b>TONE ARM</b>		
60	SFPWG21001K	Balance Weight Ass'y
61	SFPAM31001K	Tone Arm Ass'y
62	SFPCC31002K	Head Shell
63 [except XGF]	EPC270C2K-X	Cartridge
64 [except XGF]	EPS270ED	Stylus
64-1 [except XGF]	SFPEV9801	Screw, Cartridge
64-2 [except XGF]	SFPEV9801	Nut, Cartridge
64-3 [except XGF]	SFPEW9601	Washer, Cartridge
<b>ARM BASE</b>		
70	SFPJK19004	Knob, Anti-skate Force Control
71	SFPRT13004K	Lift Ass'y
71-1	SFXG829-1	Screw, Tone Arm Lift Adjustment
71-2	SFQA829-03	Spring, Lift Ass'y
72	SFKU212-01E	Arm Rest
72-1	XWG3	Washer, Arm Rest
72-2	XTN3+14BFZ	Screw, Arm Rest
73	SFUP320-05A	Tone Arm Fixing Plate Ass'y
73-1	SFPEV13204	Screw, Tone Arm Fixing Plate Ass'y
74	SFUP320-03A	Bracket, Lift Ass'y
74-1	XTN4+12B	Screw, Lift Ass'y Bracket
74-2	XTN3+10B	Screw, Lift Ass'y Bracket
75	SFUP212-02	Plate, Anti-skate Force Control
75-1	SFQP212-02	Washer, Plate
75-2	SFXG212-04	Screw, Plate
75-3	SFSP19004	Spring, Anti-skate Force Control
76	SFUM212-01	Cam, Cueing

EXPLODED



## ■ EXPLODED VIEWS



## ■ REGLAGES

### Mise au point de la hauteur de l'élevateur du bras. (Voir Figs. 11.)

- La hauteur du bras élévateur (distance entre l'extrémité de la pointe de lecture et la surface du disque lorsque la manette de pose et de relevage est sur "▼") a été mise au point en usine avant d'être expédiée, sur une hauteur approximative de 5 à 10 mm.
- Lorsqu'on utilise une des diverses cellules pick-up disponibles sur le marché ou lorsqu'une mise au point ultérieure est particulièrement nécessaire, faire le réglage de la façon suivante:
  1. Régler la manette sélectrice de vitesse sur la position "•", pour empêcher la rotation du plateau de lecture.
  2. Placer le dispositif protecteur de la pointe de lecture, s'il y en a un, pour protéger la tête de la pointe d'une éventuelle détérioration.
  3. Tourner la vis de réglage dans le sens des aiguilles d'une montre ou dans le sens inverse, tout en abaissant l'élevateur du bras. (Voir Fig. 11.)

### Rotation dans le sens des aiguilles d'une montre.

— La distance entre la surface du disque et l'extrémité de la pointe de lecture diminue.

### Rotation dans le sens contraire des aiguilles d'une montre.

— La distance entre la surface du disque et l'extrémité de la pointe de lecture augmente.

### Nota:

- Comme la vis de réglage possède une tête hexagonale, s'assurer d'effectuer la mise au point tout en abaissant l'élevateur du bras, sinon la vis ne bougera pas librement. Vérifier aussi que la tête hexagonale se retire correctement dans l'élevateur du bras quand ce dernier est libéré.

### Réglage de la vitesse (avec les boutons de réglage de vitesse).

Les points du stroboscope se trouvent disposés sur le bord du plateau du tourne-disque en fonction de la fréquence de réseau et de la vitesse des disques. Effectuer la mise au point, en se référant aux indications des points stroboscopiques.

1. Disposer la manette sélectrice de vitesse sur la vitesse devant être mise au point.
2. Libérer le dispositif de fixation du bras et déplacer le bras de lecture vers le disque. La lampe-témoin/éclairage du stroboscope s'allumera et le plateau commencera à tourner.
3. Il faut tourner les boutons de réglage de vitesse suffisamment, soit dans le sens "+" soit dans le sens "-", pour que les points du stroboscope du plateau de lecture paraissent stationnaires. L'état dans lequel les points du stroboscope paraissent immobiles représente le nombre correct de révolutions.

### Sens "+"

La vitesse du plateau augmentera. Tourner le bouton dans cette direction si les points stroboscopiques semblent "reculer", c'-à-d. se déplacer dans le sens inverse des aiguilles d'une montre. Lorsque les points paraissent immobiles, la vitesse du plateau est exacte.

### Sens "-"

Ce sens diminue la vitesse de rotation du plateau. Tourner le bouton dans cette direction si les points stroboscopiques semblent "s'écouler vers l'avant", c'-à-d. se déplacer dans le sens des aiguilles d'une montre jusqu'à ce qu'ils paraissent stationnaires.

### Nota:

#### Image des points stroboscopiques

- La lampe témoin/éclairage du stroboscope de cet appareil utilise une alimentation disponible commercialement. S'il se produit une vibration de la fréquence du courant d'alimentation de l'appareil, il se peut que l'on observe un léger déplacement des points du stroboscope. Bien que le courant du secteur soit en général très stable en ce qui concerne la fréquence, si l'on procède à des mesures précises sur une durée suffisamment longue, il est possible d'observer une variation qui, en moyenne, est de l'ordre de 0,2%. Ce sont ces variations qui provoquent le déplacement des points du stroboscope. Mais l'appareil n'est pas affecté par ces variations, étant donné qu'un moteur à courant continu est utilisé. En d'autres mots, la rotation du plateau restera constante, et les légères variations dans le mouvement des points ne reflètent simplement qu'une déviation normale dans la fréquence de la source d'énergie.

### Mise au point pour une position de retour automatique. (Voir Fig. 12.)

(Retirer le tapis du plateau de lecture.)

Dans le cas où le bras de lecture tend à revenir avant que l'audition ne soit terminée.

—Tourner dans le sens des aiguilles d'une montre.

Dans le cas où le bras de lecture ne peut revenir en arrière après le dernier sillon du disque.

—Tourner dans le sens contraire des aiguilles d'une montre.

## ■ REPLACEMENT PARTS LIST

Notes: SL-3200(X) → [X]      SL3200 (XG) → [XG]  
 SL-3200 (XAL) → [XAL]      SL-3200 (XGF) → [XGF]  
 SL-3200 (XGE) → [XGE]      SL-3210 (E) → [10E]  
 SL-3200 (E) → [E]      SL-3210 (XG) → [10XG]

Ref. No.	Part No.	Part Name & Description
<b>ACCESSORIES</b>		
A1	SFNU320X01	Instruction Book
A2	SFWE212-01	Adaptor, 45 r.p.m.
A3 [XGF]	SFPEN3302	Nut, Cartridge
A3-1 [XGF]	SFPEW9601	Washer, Head Shell
A3-2 [XGF]	SFCZV8801	Screw, Cartridge
A3-3 [XGF]	SFPEV9801	Screw, Cartridge
A3-4 [XGF]	SFYF05A06	Polyethylene Bag
A4 [XGF]	SFKO135M01E	Overhang Gauge
A5	SFPZB3501	Shell Weight
<b>PACKING PARTS</b>		
P1 [X, XAL, XGE, E, XG]	SFHP320X01	Carton
P1 [XGF]	SFHP320J01	Carton
P1 [10E, 10XG]	SFHP321S01	Carton
P2	SFHH320-01	Pad, Front
P3	SFHH320-02	Pad, Rear
P4	SFHD212-01	Pad, Top.
P5	SFHD212-02	Pad, Turntable
P6	SFHH212-03	Parts Box
P7	SFHD212-03	Pad, Top, Parts Box
P8	SFYC22A30	Polyethylene Cover, Parts Box
P9	SFYF60A60	Polyethylene Bag, Player Unit
P9-1	SFYH60X60	Polyethylene Bag, Dust Cover
P9-2	SFYH40X45	Polyethylene Bag, Turntable

## ■ PACKINGS

