

# Service Manual

QUARTZ Direct Drive Turntable  
SP-10MK3



## Specifications

Specifications are subject to change without notice for further improvement.  
Weight and dimensions shown are approximate.

### ■ General

<b>Power supply:</b>	~ 110/120/220/240V, 50 or 60Hz
<b>Power consumption:</b>	32.5 W
<b>Dimensions</b>	(Turntable unit)
<b>(H×W×D):</b>	11.3×36.9×36.9 cm 4-7/16×14-17/32×14-17/32 inches
	(Control unit)
	9.6×16.6×41 cm 3-3/4×6-17/32×16-1/8 inches
<b>Weight:</b>	18 kg (40 lb) (Turntable unit) 6 kg (13 lb) (Control unit)

### ■ Turntable section

<b>Type:</b>	Direct drive turntable with quartz synthesizer pitch control
<b>Turntable platter:</b>	Copper alloy and die-cast aluminum diameter 32 cm (12-19/32"), weight 10 kg (22 lb)
<b>Moment of inertia:</b>	1.1 ton•cm <sup>2</sup> (1,100 kg•cm <sup>2</sup> )
<b>Motor:</b>	Quartz-phase-locked, ultra-low speed, brushless DC motor

<b>Turntable speeds:</b>	33-1/3, 45 and 78.26 rpm
<b>Turntable speed fine adjustment:</b>	Quartz locked, pitch adjustable in 0.1% steps up to ±9.9%
<b>Starting torque:</b>	16 kg•cm
<b>Start-up time:</b>	0.25 s. (33-1/3 rpm)
<b>Braking time:</b>	0.3 s. (33-1/3 rpm)
<b>Speed fluctuation due to load torque:</b>	0% within 10 kg•cm
<b>Speed drift:</b>	Within ±0.001%
<b>Wow and flutter:</b>	0.015% WRMS (JIS C5521) ±0.021% weighted zero to peak (DIN 45500, IEC 98A weighted) (System tested: SP-10MK3 + SH-10B5+EPA-250+ EPC-100CMK3)
<b>Rumble:</b>	-92 dB DIN B (IEC 98A weighted) -60 dB DIN A (IEC 98A unweighted)

## Technics

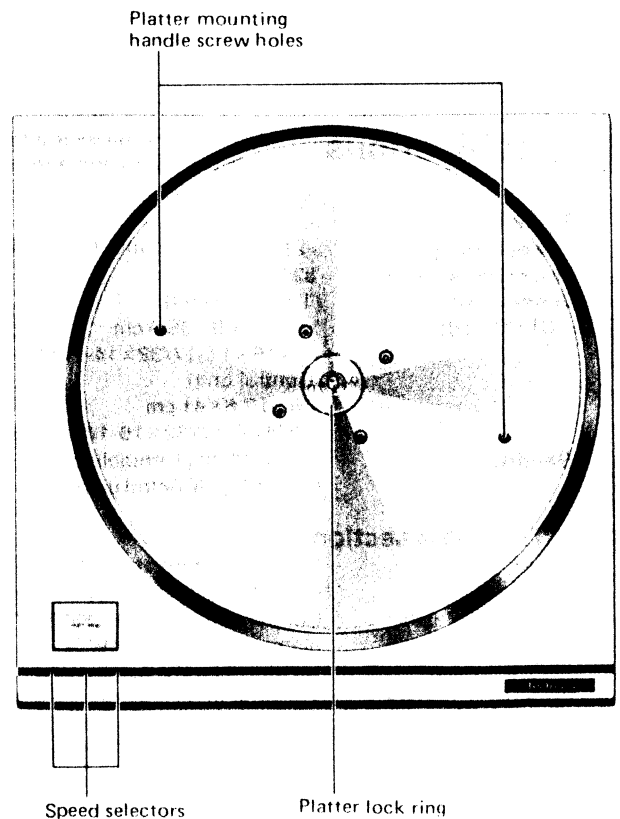
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## LOCATION OF CONTROLS

- Turntable unit



DEUTSCH

**■ TECHNISCHE DATEN**

Alle Angaben sind nominell, wenn nicht anders angegeben.  
 Die Angaben beziehen sich auf die Nennspannung und -leistung bei 230V.


<p><b>■ Allgemeine Daten</b></p> <p><b>Stromversorgung:</b> ~ 110-120V / 220-240V 50/60 Hz Wechselstrom 32,5 W</p> <p><b>Leistungsaufnahme:</b> 32,5 W</p> <p><b>Abmessungen (H x B x T):</b> (Plattenspielerereinheit) 11,3 x 38,9 x 26,9 cm (Steuereinheit) 9,6 x 16,6 x 41 cm</p> <p><b>Gewicht:</b> 13 kg (Plattenspielerereinheit) / 6 kg (Steuereinheit)</p> <p><b>■ Plattenspieler</b></p> <p><b>Typ:</b> Direktantriebs-Plattenspieler mit Quarz-Synthesizer-Drehzahlregelung</p> <p><b>Plattenteller:</b> Kupferlegierung und Aluminium-Spritzguß; Durchmesser 32 cm, Gewicht 10 kg</p> <p><b>Trägheitsmoment:</b> 1,1 Tonnen·cm<sup>2</sup></p> <p><b>Motor:</b> Quarzphasen-gesteuerter, ultralangsam- kollektorloser Gleichstrommotor</p> <p><b>Plattenteller-Drehzahlen:</b> 33-1/3 45 und U/min 78,26 U/min</p>	<p><b>Drehzahl-Feinregulierung:</b> 2,4 bis 25,0 Hz (Drehzahl regelbar in 200 Hz-Schritten) 0,1 Hz bis 25,0 Hz</p> <p><b>Anlaufdrehmoment:</b> 16 kg·cm</p> <p><b>Hochlaufzeit:</b> 0,25 s (30-1/3 U/min)</p> <p><b>Bremszeit:</b> 0,3 s (33-1/3 U/min)</p> <p><b>Drehzahlschwankungen aufgrund von Lastdrehmoment:</b> 0% (innerhalb 10 kg·cm)</p> <p><b>Drehzahlabweichung:</b> Innerhalb ±0,001%</p> <p><b>Gleichlaufschwankungen:</b> 0,015% WRMS (JIS C5521) ±0,021% bewertet Null-Zu-Spitze (DIN 45 500 IEC 98A bewertet) (getestetes System) SP-10MK3 + SH-10B5 + EPA-250 + EPD-100CMK3</p> <p><b>Rumpel-Fremdspannungsabstand:</b> -92 dB DIN B (IEC 98A bewertet)</p> <p><b>Rumpel-Geräuschspannungsabstand:</b> -60 dB DIN A (IEC 98A un bewertet)</p>
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**■ JUSTIERUNGEN**

**● Zu verwendende Instrumente und Einstellungen**

1. Gleichstrom-Voltmeter
2. Oszilloskop
3. Gleichstromversorgung
4. Den Drehzahlregler auf 0% einstellen.

Gegenstand	Vorbereitungen	Zu justierende Teile	Justiermethode
Konstantspannungs-Stromversorgung	1. Die Anschlüsse CN1, CN2 und CN3 herausziehen. 2. Das Gleichstrom-Voltmeter entweder an den CN1-Anschluß ③ (+) und BT1-Anschluß ③ (-) oder die negative Seite von C3 anschließen. 3. Den Netzschalter einschalten.	VR1	1. VR1 auf einen Ausgang von 31,8V abgleichen.
	1. Die Anschlüsse CN1, CN2 und CN3 herausziehen. 2. Das Gleichstrom-Voltmeter entweder an den CN1-Anschluß ③ (+) und BT1-Anschluß ③ (-) oder die negative Seite von C3. 3. Den Netzschalter einschalten.	VR2	1. VR2 auf einen Ausgang von -31,8V abgleichen.
Kristalloszillation	1. Das Oszilloskop an C202 Stift 7 und den Erdungsanschluß anschließen. 2. Den Netzschalter einschalten.	Q211	1. Q211 so justieren, daß der Zyklus 0,31 µsec (262,98 kHz) beträgt.

Gegenstand	Vorbereitungen	Zu justierende Teile	Justiermethode						
<b>VS-Spannung</b>	<ol style="list-style-type: none"> <li>Das Gleichstrom-Voltmeter an CN206 Anschluß 3 (+) und CN206 Anschluß 1 (-) anschließen.</li> <li>Den Netzschalter einschalten und den Drehzahl-Wahlschalter auf "33 U/min." einstellen.</li> </ol>	VR201	<ol style="list-style-type: none"> <li>VR201 so justieren, daß die Ausgangsspannung 2,1V beträgt.</li> </ol>						
<b>RS-Strom</b>	<ol style="list-style-type: none"> <li>Das Gleichstrom-Voltmeter an CN206 Anschluß ⑤ (+) und CN206 Anschluß ④ (-) anschließen.</li> <li>Den Netzschalter einschalten und den Drehzahl-Wahlschalter auf "33 U/min." einstellen.</li> <li>Die Start-Taste drücken.</li> </ol>	VR206	<ol style="list-style-type: none"> <li>VR206 so justieren, daß die Ausgangsspannung 0V beträgt.</li> </ol>						
<b>Synchronisierungs-Position</b>	<ol style="list-style-type: none"> <li>Das Oszilloskop an CN206 Anschluß ② (+) und CN206 Anschluß 1 (-) anschließen.</li> <li>Den Netzschalter einschalten und die Start-Taste drücken.</li> </ol>	VR200 33 U/min VR204 45 U/min VR205 99 U/min	<p>Den Drehzahl-Wahlschalter nacheinander auf "33", "45" und "99" umschalten und VR203, VR204 und VR205 so justieren, daß die Zeiten gemäß nachstehender Tabelle sind:</p> <table border="1"> <tr> <td>33</td> <td>3,5ms</td> </tr> <tr> <td>45</td> <td>5,5ms</td> </tr> <tr> <td>99</td> <td>10,5ms</td> </tr> </table> 	33	3,5ms	45	5,5ms	99	10,5ms
33	3,5ms								
45	5,5ms								
99	10,5ms								
<b>Bremse (elektrisch)</b>	<ol style="list-style-type: none"> <li>Den Anschluß CN202 herausziehen. (Bei gelöster mechanischer Bremse!)</li> <li>Den Netzschalter einschalten und den Drehzahl-Wahlschalter auf "33 U/min." einstellen.</li> <li>Die Start-Taste drücken.</li> </ol>	VR202	<ol style="list-style-type: none"> <li>Die Stoptaste drücken.</li> <li>VR202 so justieren, daß der Bereich des Winkels um den Stopp der Drehung <math>90^\circ \sim 180^\circ</math> beträgt.</li> </ol>						
<b>Offset-Spannung</b>	<ol style="list-style-type: none"> <li>40mV zwischen CN203 Anschlüsse ② und ③ mit der Gleichspannungsversorgung anlegen.</li> <li>Das Gleichstrom-Voltmeter zwischen CN102 Anschlüsse ③ und ④ anschließen.</li> <li>Den Netzschalter einschalten und die Start-Taste drücken.</li> </ol>	VR101	<ol style="list-style-type: none"> <li>VR101 so justieren, daß die Ausgangsspannung 10mV beträgt.</li> </ol>						
<b>Mittelspannung</b>	<ol style="list-style-type: none"> <li>Das Gleichstrom-Voltmeter zwischen CN102 Anschlüsse ① und ② anschließen.</li> <li>Den Netzschalter einschalten und die Start-Taste drücken.</li> </ol>	VR102	<ol style="list-style-type: none"> <li>VR102 so justieren, daß die Ausgangsspannung 0V beträgt.</li> </ol>						

**\* Justiermethode ohne Gleichstromversorgung für die Offsetspannungs-Justierung**

- 3 Widerstände an die Antriebsschaltungs-Platine anlöten. (Siehe Abb. 21)
- Den CN203-Stecker herausziehen. (Steuerschaltungs-Platine).
- CN203 Anschluß ⑤ an BT102 Anschluß ⑤, und CN203 Anschluß ④ an BT102 Anschluß ④ über Anschlußdrähte mit Klemmen anschließen.
- Das Gleichstrom-Voltmeter zwischen CN102 Anschlüsse ③ und ④ anschließen.
- Den Netzschalter einschalten und die Start-Taste drücken.
- VR101 so justieren, daß das Gleichstrom-Voltmeter 10mV anzeigt.
- Die 3 Widerstände und die Anschlußdrähte entfernen.

**• Justierung der mechanischen Bremse**

**1. Justierung der Hebelbremse**

- Den Plattenteller abnehmen.
- Die Hebelbremse-Justierschraube lösen.
- Das Solenoid nach links und rechts bewegen, so daß ein Abstand von ca. 2mm zwischen dem Solenoid und dem Stoppergummi entsteht.

- Die Hebelbremse-Justierschraube anziehen.

- Den Plattenteller aufsetzen und überprüfen, daß der Plattenteller sich nicht bewegt, wenn der Netzschalter ausgeschaltet ist.

**2. Justierung der Bandbremse**

**\* Überprüfung der Bandposition**

- Den Plattenteller abnehmen.
- Die innere Peripherie des Bandes sollte mit der inneren Peripherie des Gehäuses übereinstimmen.
- Falls sie voneinander abweichen, durch Lösen der Justierschrauben an zwei Stellen justieren.

**\* Überprüfung des Bremswinkels**

- Den Plattenteller drehen.
- Die Stoptaste drücken und überprüfen, daß der Bereich des Winkels zum Stoppen der Drehung  $40^\circ$  oder weniger beträgt.
- Falls der Stoppwinkel über  $40^\circ$  beträgt, zuerst die elektrische Bremse justieren.
- Anschließend die Justierungsplatten-Einstellschraube lösen und den Justierknopf so drehen, daß der Winkel  $40^\circ$  oder weniger wird.

## FRANÇAIS

## ■ CARACTERISTIQUES

Les spécifications sont susceptibles d'être modifiées sans préavis.  
Le poids et les dimensions donnés sont approximatifs.

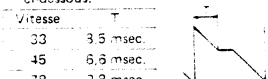
<b>■ Généralités</b> <b>Alimentation:</b> Alternatif 110-120/220-240V, 50 ou 60 Hz <b>Consommation:</b> 32,5 W <b>Dimensions:</b> (H x L x P) (Unité du tourne-disque): 11,2 x 36,0 x 36,9 cm 47,16 x 14,17/32 x 14,17/32 cm (Unité de contrôle): 9,5 x 18,3 x 11,7 cm 3,74 x 7,31/32 x 4,61/8 pouces <b>Poids:</b> 18,3/40 livres (Unité du tourne-disque): 6 kg/13 livres (Unité de contrôle)		<b>Vitesses de rotation:</b> 33-1/3, 45 et 78,26 t/p.m. <b>Réglage précis de la vitesse de la platine:</b> Blocage par quartz, écart réglable par étapes de 0,1% jusqu'à ±0,3%, 1,6 kg/cm <b>Couple de démarrage:</b> 0,25 s (33-1/3 t/p.m.) <b>Durée de démarrage:</b> 0,2 s (33-1/3 t/p.m.) <b>Durée de freinage:</b> 0,2 s (33-1/3 t/p.m.) <b>Variation de la vitesse due au couple de charge:</b> 1% en sera de 10 kg/cm <b>Déviations du nombre de tours:</b> En sera de ±0,001% <b>Pleurage et scintillement:</b> 0,015% de valeur efficace (JIS C3521) <b>Ronflement:</b> ±0,021% de zéro pondéré à la norme (DIN 45 500, IEC 98A pondéré) (Dispositif essayé: SP-10MK3 + SH-10B5 + EPA-250 + EPC-100CMK3) -92 dB DIN B (IEC 98A pondéré) -60 dB DIN A (IEC 98A non-pondéré)
<b>■ Platine de lecture</b> <b>Type:</b> Platine à entraînement direct avec réglage d'écart à synthétiseur à quartz. <b>Plateau de la platine:</b> Alliage en cuivre et aluminium moulé sous pression. Diamètre de 32 cm; poids de 10 kg, 1,1 tonne.cm <sup>2</sup> (1,100 kg.cm <sup>2</sup> ). <b>Moment d'inertie:</b> Moteur à C.C. sans palai, à vitesse ultra-faible et à accrochage de phase par quartz.		

## ■ RÉGLAGES

## ● Instruments utilisés et réglages

1. Voltmètre à C.C.
2. Oscilloscope
3. Alimentation en courant C.C.
4. Régler la commande d'écart sur 0%.

Article	Préparatifs	Éléments de réglage	Méthode de réglage
Alimentation en tension constante	1. Retirer les connecteurs CN1, CN2 et CN3. 2. Brancher le voltmètre à C.C. soit à la borne ③ (+) de CN1 et à la borne ④ (-) de BT1 soit au côté négatif de C3. 3. Tourner l'interrupteur d'alimentation sur "on" (marche).	VR1	1. Ajuster VR1 de façon à ce que la tension de sortie soit de 31,8V.
	1. Retirer les connecteurs CN1, CN2 et CN3. 2. Brancher le voltmètre à C.C. soit à la borne ① (-) de CN1 et à la borne ③ (-) de BT1 soit au côté négatif de C3. 3. Tourner l'interrupteur d'alimentation sur "on" (marche).	VR2	1. Ajuster VR2 de façon à ce que la tension de sortie soit de -31,8V.
Oscillateur à cristal	1. Brancher l'oscilloscope à l'ergot 7 de IC202 et à la borne de mise à la terre. 2. Tourner l'interrupteur d'alimentation sur "on" (marche).	C211	1. Ajuster C211 de façon à ce que le cycle soit de 3,81 μsec. (262,08 kHz).

Article	Préparatifs	Éléments de réglage	Méthode de réglage								
Tension VS	1. Brancher le voltmètre à C.C. à la borne ③ (+) de CN206 et à la borne ① (-) de CN206. 2. Tourner l'interrupteur d'alimentation sur "on" (marche) et régler le sélecteur de vitesse sur "33 r.p.m." (t/p.m.).	VR201	1. Ajuster VR201 de façon à ce que la tension de sortie soit de 2,1V.								
Courant RS	1. Brancher le voltmètre à C.C. à la borne ⑤ (+) de CN206 et à la borne ④ (-) de CN206. 2. Tourner l'interrupteur d'alimentation sur "on" (marche) et régler le sélecteur de vitesse sur "33 r.p.m." (t/p.m.). 3. Appuyer sur la touche de démarrage.	VR206	1. Ajuster VR206 de façon à ce que la tension de sortie soit de 0V.								
Position de synchronisation	1. Brancher l'oscilloscope à la borne ② (+) de CN206 et à la borne ① (-) de CN206. 2. Tourner l'interrupteur d'alimentation sur "on" (marche) et appuyer sur la touche de démarrage.	VR203 33 t/p.m. VR204 45 t/p.m. VR205 78 t/p.m.	1. Commuter le sélecteur de vitesse sur "33", "45" et "78" et ajuster VR203, VR204 et VR205 de façon à ce que la durée de T soit telle que dans la table ci-dessous.  <table border="1"> <thead> <tr> <th>Vitesse</th> <th>T</th> </tr> </thead> <tbody> <tr> <td>33</td> <td>3,5 msec.</td> </tr> <tr> <td>45</td> <td>6,6 msec.</td> </tr> <tr> <td>78</td> <td>3,8 msec.</td> </tr> </tbody> </table>	Vitesse	T	33	3,5 msec.	45	6,6 msec.	78	3,8 msec.
Vitesse	T										
33	3,5 msec.										
45	6,6 msec.										
78	3,8 msec.										
Frein (électrique)	1. Retirer le connecteur CN202 (avec le frein mécanique libéré). 2. Tourner l'interrupteur d'alimentation sur "on" (marche) et régler le sélecteur de vitesse sur "33 r.p.m." (t/p.m.) 3. Appuyer sur la touche de démarrage.	VR202	1. Appuyer sur la touche d'arrêt. 2. Ajuster VR202 de façon à ce que la plage de l'angle pour l'arrêt de la rotation soit de 90° ~ 180°.								
Tension de suppression	1. Appliquer 40mV entre les bornes ② et ③ de CN203 avec l'alimentation en courant C.C. 2. Brancher le voltmètre à C.C. entre les bornes ③ et ④ de CN102. 3. Tourner l'interrupteur d'alimentation sur "on" (marche) et appuyer sur la touche de démarrage.	VR101	1. Ajuster VR101 de façon à ce que la tension de sortie soit de 10mV.								
Tension intermédiaire	1. Brancher le voltmètre à C.C. entre les bornes ① et ② de CN102. 2. Tourner l'interrupteur d'alimentation sur "on" (marche) et appuyer sur la touche de démarrage.	VR102	1. Ajuster VR102 de façon à ce que la tension de sortie soit de 0V.								

## \* Méthode de mise au point sans alimentation en courant C.C. pour le réglage de la tension de suppression.

1. Souder 3 résistances à la plaquette à circuits imprimés du circuit d'attaque. (Se référer à la Fig. 21.)
2. Retirer le connecteur CN203. (Plaquette à circuits imprimés du circuit de commande.)
3. Connecter la borne ⑤ de CN203 à la borne ⑤ de BT102 et la borne ④ de CN203 à la borne ④ de BT102, en utilisant un fil de jonction avec pince, etc.
4. Brancher le voltmètre à C.C. entre les bornes ③ et ④ de CN102.
5. Tourner l'interrupteur d'alimentation sur "on" (marche) et appuyer sur la touche de démarrage.
6. Ajuster VR101 de façon à ce que la lecture du voltmètre à C.C. soit de 10mV.
7. Retirer les trois résistances et le fil de jonction.

3. Déplacer le solénoïde de droite à gauche de façon à ce que l'intervalle entre le solénoïde et le caoutchouc de la pièce d'arrêt soit d'à peu près 2 mm.
4. Serrer la vis de réglage du frein à levier.
5. Monter la platine et vérifier qu'elle ne bouge pas avec l'interrupteur d'alimentation réglé sur "off" (hors circuit).

## 2. Ajustement du frein du ruban

## \* Vérifier la position de la bande.

1. Retirer la platine.
2. La périphérie interne de la bande devra coïncider avec la périphérie interne du logement.
3. Si elles sont déviées, ajuster en desserrant les vis de réglage aux deux endroits.

## \* Vérifier l'angle de freinage

1. Faire tourner la platine.
2. Appuyer sur la touche d'arrêt et vérifier que la plage de l'angle pour l'arrêt de la rotation soit de 40° ou moins.
3. Si l'angle d'arrêt est au-dessus de 40°, régler préalablement le frein électrique.
4. Ensuite, desserrer la vis de réglage de la plaque d'ajustage et tourner le bouton de réglage de façon à ce que l'angle soit de 40° ou moins.

## ● Réglage du frein mécanique

## 1. Ajustement du frein du levier

1. Retirer la platine.
2. Desserrer la vis de réglage du frein à levier.

# ESPAÑOL

## ■ ESPECIFICACIONES

Las especificaciones quedan sujetas a cambios sin aviso previo. El peso y las dimensiones indicados son aproximados.

<b>■ En general</b> <b>Alimentación de corriente:</b> ~ 110-120/220-240 V, 50/60 Hz <b>Consumo de corriente:</b> 32,5 W <b>Dimensiones:</b> (Alto x Ancho x Prof.) (Equipo del plato giratorio) 11,3 x 36,9 x 36,9 cm (Unidad de control) 9,6 x 16,6 x 41 cm <b>Peso:</b> 18 kg (Equipo del plato giratorio) 5 kg (Unidad de control)		<b>Ajuste exacto de la velocidad del plato giratorio:</b> Ajuste de la altura de sonido en pasos de 0,1% hasta aproximadamente 9,9%, con bloqueo por cuarzo 16 kg/cm <b>Par motor de arranque:</b> 0,25 a 1,00 kg/cm <b>Tiempo de puesta en marcha:</b> 0,2 a 1,00 s (0,16 a 0,2 s) <b>Tiempo de frenado:</b> 0,2 a 1,00 s (0,16 a 0,2 s) <b>Variación de velocidad debido al par de carga:</b> 0% dentro de 10 kg/cm <b>Desplazamiento de velocidad:</b> Menos de ±0,001% <b>Ululaciones y trémolo:</b> ±0,015% WRMS (UIS C5621) ±0,021% Ponderado cero a cresta (DIN 45 500, IEC98A Ponderado) (Probado por sistemas: SP-10MK3 + SH-10B5 + EPA-250 + EPC-100CMK3) <b>Ruido de rodadura:</b> -92 dB DIN B (IEC 98A Ponderado) -60 dB DIN A (IEC 98A No ponderado)	
<b>■ Sección del plato giratorio</b> <b>Tipo:</b> Plato giratorio de accionamiento directo con control de altura de sonido por sintetizador de cuarzo <b>Platillo del plato giratorio:</b> Aleación de cobre y aluminio fundido Diámetro de 32 cm (12-19/32") Peso: 10 kg (22 lbs.) 1,1 t·cm <sup>2</sup> (1,100 kg·cm <sup>2</sup> ) <b>Momento de inercia:</b> Motor de corriente continua sin escobillas con velocidad ultrarápida, de enganche de fase por cuarzo <b>Motor:</b> <b>Velocidades del plato giratorio:</b> 33-1/3, 45 y 78,26 rpm			

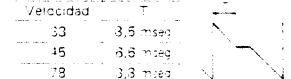
## ■ AJUSTES

### ● Instrumentos usados y puestas

1. Voltímetro DV
2. Osciloscopio
3. Fuente de alimentación CC

4. Ponga el control de altura en 0%

Item	Preparaciones	Piezas de ajuste	Método de ajuste
Fuente de alimentación de voltaje constante	1. Saque los conectores CN1, CN2 y CN3. 2. Conecte el voltímetro CC ya al terminal ③ (+) CN1 y terminal ④ (-) BT1 o ya al lado negativo de C3. 3. Ponga el interruptor de corriente en "on".	VR1	1. Ajustar VR1 de manera que el voltaje de salida sea 31,8V.
	1. Saque los conectores CN1, CN2 y CN3. 2. Conecte el voltímetro CC ya al terminal ① (+) CN1 y terminal ③ (-) BT1 o ya al lado negativo de C3. 3. Ponga el interruptor de corriente en "on".	VR2	1. Ajustar VR2 de manera que el voltaje de salida sea -31,8V.
Oscilación de cristal	1. Conecte el osciloscopio a púa ⑦ de IC202 y terminal de tierra. 2. Ponga el interruptor de corriente en "on".	C211	1. Ajustar C211 de manera que el ciclo sea 3,81 μseg. (262,08 kHz).

Item	Preparaciones	Piezas de ajuste	Método de ajuste
Voltaje VS	1. Conecte el voltímetro CC a terminal ③ (+) CN206 y terminal ① (-) CN206. 2. Ponga el interruptor de corriente en "on" y fije el selector de velocidad a "33 r.p.m.".	VR201	1. Ajustar VR201 de manera que el voltaje de salida sea 2,1V.
Corriente RS	1. Conecte el voltímetro CC a terminal ⑤ (+) CN206 y terminal ④ (-) CN206. 2. Ponga el interruptor de corriente en "on" y fije el selector de velocidad a "33 r.p.m.".	VR206	1. Ajustar VR206 de manera que el voltaje de salida sea 0V.
Posición de sincronización	1. Conecte el osciloscopio a terminal ② (+) CN206 y terminal ① (-) CN206. 2. Ponga el interruptor de corriente en "on" y apriete el botón de arranque.	VR203 (33 rpm) VR204 (45 rpm) VR205 (78 rpm)	1. Conmutar el selector de velocidad a "33", "45" y "78" y ajustar VR203, VR204 y VR205 de manera que el tiempo T este como en la tabla de abajo. 
Freno (eléctrico)	1. Saque el conector CN202. (Con el freno mecánico soltado). 2. Ponga el interruptor de corriente en "on" y fije el selector de velocidad a "33 r.p.m.".	VR202	1. Apriete el botón de arranque. 2. Ajustar VR202 de manera que el ángulo para parada de rotación sea 90° ~ 130°.
Contravoltaje	1. Aplique 40mV entre terminales ② y ③ CN203 mediante la fuente de alimentación CC. 2. Conecte el voltímetro CC entre terminales ③ y ④ CN102. 3. Ponga el interruptor de corriente en "on" y apriete el botón de arranque.	VR101	1. Ajustar VR101 de manera que el voltaje de salida sea 10mV.
Voltaje medio	1. Conecte el voltímetro CC entre terminales ① y ② CN102. 2. Ponga el interruptor de corriente en "on" y apriete el botón de arranque.	VR102	1. Ajustar VR102 de manera que el voltaje de salida sea 0V.

### \* Método de ajuste sin fuente de alimentación CC para ajuste de contravoltaje

1. Suelde 3 resistores al circuito excitador p.c.B. (Refiera a la Fig. 21)
2. Saque el tornillo de CN203. (Circuito de control p.c.B.)
3. Conecte el terminal ⑤ de CN203 al terminal ⑤ de BT102 y el terminal ④ de CN203 al terminal ④ de BT102, usando un hilo conductor con presilla, etc.
4. Conecte el voltímetro de CC entre terminales ③ y ④ de CN102.
5. Ponga el interruptor de la corriente en "on" (conectado) y apriete el botón de arranque.
6. Ajuste VR101 de manera que la lectura del voltímetro de CC sea 10mV.
7. Remueva los 3 resistores y el hilo conductor.

### ● Ajuste del Freno Mecánico

#### 1. Ajuste del freno de palanca

1. Remueva el plato giradiscos.
2. Afloje el tornillo de ajuste de freno de palanca.
3. Mueva el solenoide de derecha a izquierda de manera que la separación entre el solenoide y el caucho de retenedor sea unos 2 mm.
4. Apriete el tornillo de ajuste de freno de palanca.
5. Monte el plato giradiscos y compruebe para ver que el plato giradiscos no se mueva con el interruptor de la corriente puesto en "off" (desconectado).

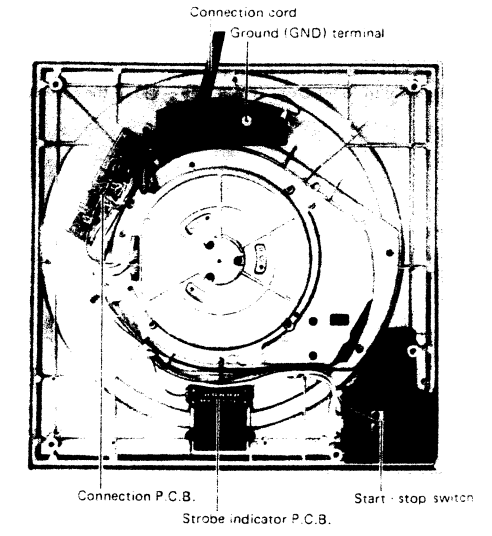
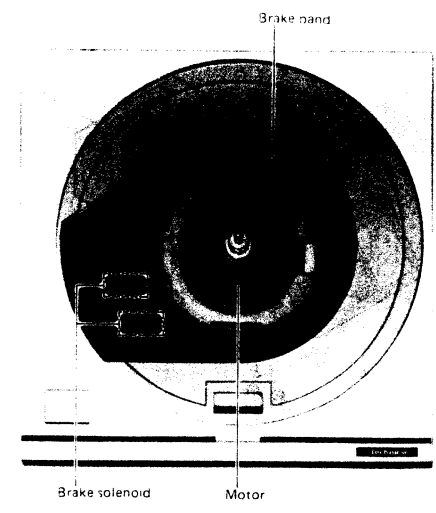
### 2. Ajuste del freno de banda

#### \* Comprobación de la posición de banda

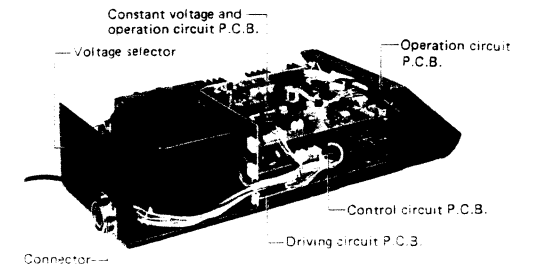
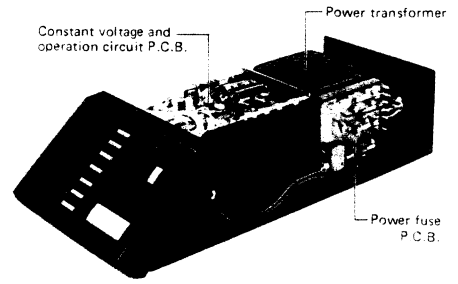
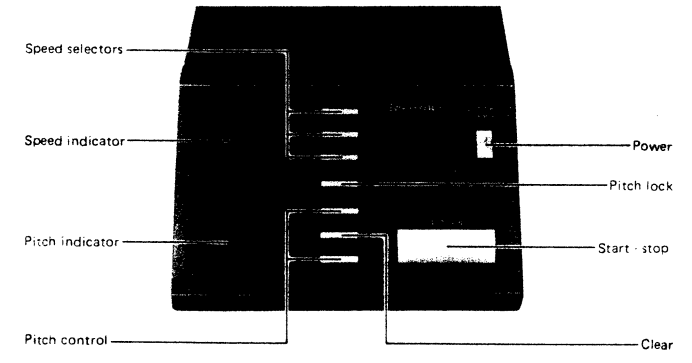
1. Remueva el plato giradiscos.
2. La periferia interna de la banda debería coincidir con la periferia interna de la caja.
3. Si ellas están desviadas, ajústelo aflojando los tornillos de ajuste en 2 posiciones.

#### \* Comprobación del ángulo de freno

1. Gire el plato giradiscos.
2. Apriete el botón de arranque y compruebe para ver que el ángulo para parada de la rotación sea 40° o menos.
3. Si el ángulo de parada es más de 40°, ajuste, de antemano, el freno eléctrico.
4. A continuación, afloje el tornillo de sujeción de placa de ajuste y gire la perilla de ajuste de manera que el ángulo sea 40° o menos.



• Control unit



**DISASSEMBLY INSTRUCTIONS**

**1. Control unit**

**• How to remove the cabinet**

1. Remove the 8 setscrews (Fig. 1 : ① ~ ⑧) of the cabinet.

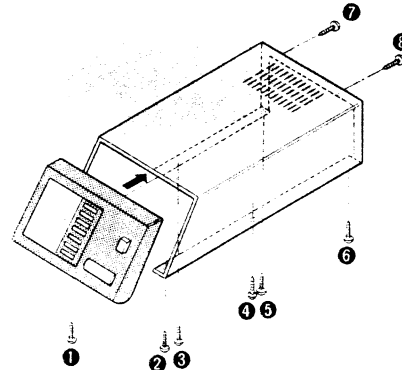


Fig. 1

**• How to remove the front panel**

1. Remove the cabinet.
2. Remove the 4 setscrews (Fig. 2 : ⑨ ~ ⑫) of the front panel.
3. Pull out the connectors CN2 and CN403 of the constant voltage and operation circuit P.C.B. and remove the panel in the direction of the arrow. (Fig. 2)

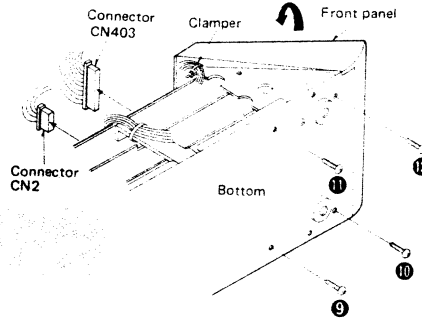


Fig. 2

**• When removing the front panel**

1. Remove the 4 setscrews (Fig. 3 : ⑬ ~ ⑯) of the bracket.
2. Remove the 4 setscrews (Fig. 4 : ⑰ ~ ⑳) of the front panel to remove the panel.

**• How to remove the operation circuit P.C.B.**

1. Remove the cabinet and front panel.
2. Remove the bracket.
3. Remove the 3 setscrews (Fig. 3 : ⑰ ~ ⑳) of the printed circuit board.
4. Loosen 2 claws upward to remove them from the printed board. (Fig. 3)
5. Remove the printed circuit board in the direction of the arrow A. (Fig. 3)

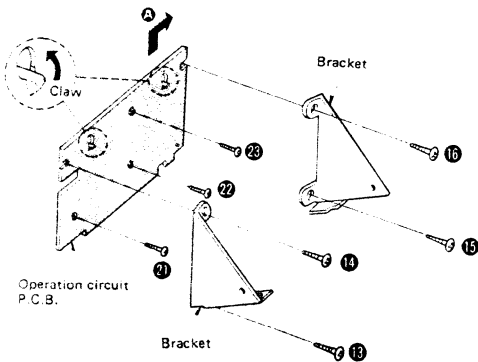


Fig. 3

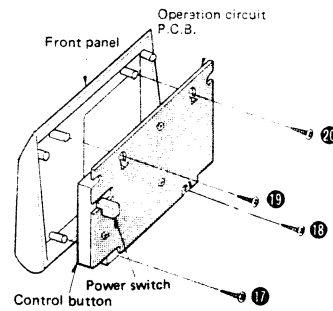


Fig. 4

**• How to remove the control buttons (Start/stop, speed selector/pitch control) and the power switch.**

1. Remove the cabinet and front panel.
2. Remove the operation circuit P.C.B.
3. Remove the setscrews ⑳ and ㉑ in Fig. 5 to remove the power switch.
4. Remove the setscrews ㉒ ~ ㉔ in Fig. 5 to remove the speed selector/pitch control button.
5. Remove the setscrews ㉕ in Fig. 5 to remove the start/stop button.

**Note:** The setscrews of the start/stop button and the speed selector/pitch control button are adjusted so that the screw tips slightly touch the buttons (to attain smooth switching). If further adjustment is needed, refer to Fig. 5 (A) and (B).

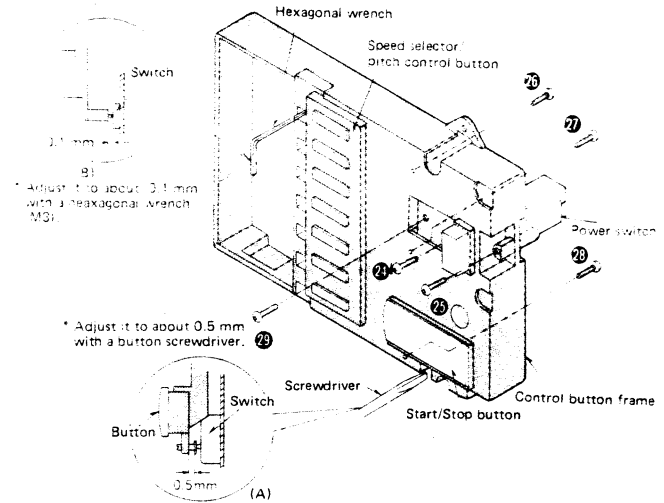


Fig. 5

**• How to remove the constant voltage and operation circuit P.C.B.**

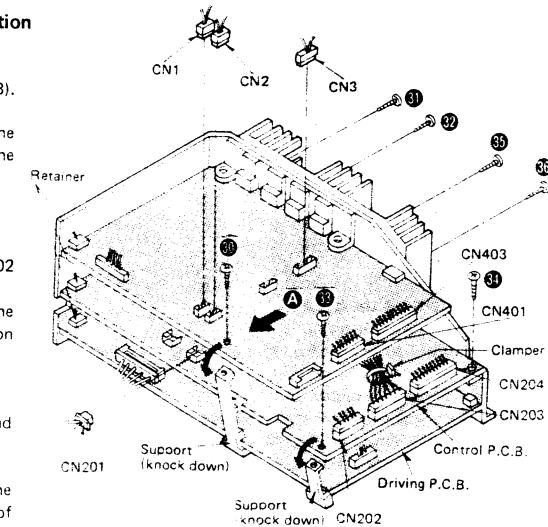
1. Remove the cabinet and front panel.
2. Pull out 4 connectors (CN2, CN3, CN202 and CN403). (Fig. 6)
3. Remove the 3 setscrews (Fig. 6 : ㉖ ~ ㉘) of the printed circuit board and remove the board in the direction of the arrow A.

**• How to remove the control circuit P.C.B.**

1. Remove the cabinet and front panel.
2. Pull out 6 connectors (CN1, CN2, CN3, CN401, CN202 and CN204). (Fig. 6)
3. Remove the 3 setscrews (Fig. 6 : ㉙, ㉚, ㉛) of the printed board and remove the board in the direction of the arrow A.

**• How to remove the driving circuit P.C.B.**

1. Remove the cabinet and front panel.
2. Pull out 5 connectors (CN1, CN2, CN401, CN202 and CN201). (Fig. 6)
3. Cut off the lead wire clammer of CN203.
4. Remove the 4 setscrews (Fig. 6 : ㉜, ㉝, ㉞, ㉟) of the printed board and remove the board in the direction of the arrow A.



\* To mount each P.C.B., fit it in the P.C.B. retainer and support rod groove.

Fig. 6



• How to remove the power fuse P.C.B.

1. Remove the cabinet.
2. Remove the 2 setscrews (Fig. 7 : 47, 48) of the printed circuit board.

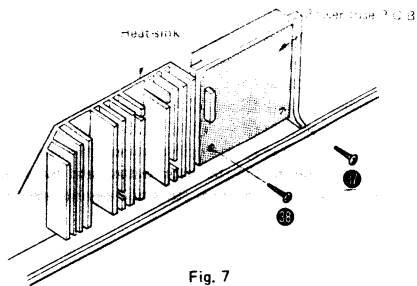


Fig. 7

2. Turntable unit

• How to remove the turntable platter

1. Turn off the power switch. (Check that the brake solenoid is "OFF".)
2. Turn the platter lock ring counterclockwise by using the wrench (attached) to remove the ring. (Fig. 8)
3. Completely fasten the platter mounting handle (attached) into the screw holes (2 portions). (Fig. 8)
4. Slowly lift up the turntable platter, holding the platter mounting handle.

Note: The platter weighs 10 kg. Take care not to drop it when lifting.

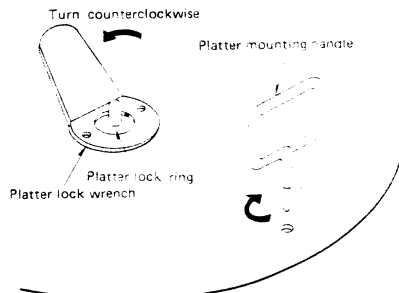


Fig. 8

• How to remove the bottom cover

1. Remove the turntable platter.
2. Place a proper base under the panel on either side so that external forces will not be applied to the center spindle. (Fig. 9)
3. Remove the 15 setscrews (Fig. 10 : 39) of the bottom cover.

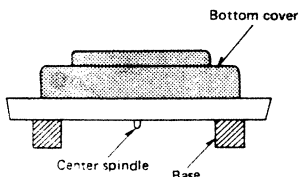


Fig. 9

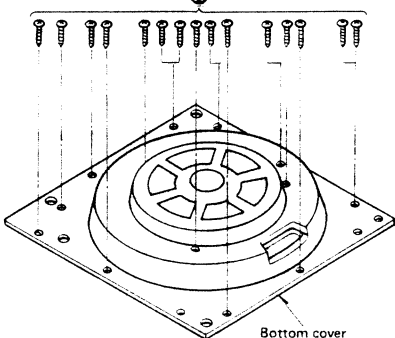


Fig. 10

• How to remove the brake

1. Remove the turntable platter.
2. Remove the 7 setscrews (Fig. 11 : 40 ~ 46) of the panel cover.
3. Remove the housing rubber.
4. Pull out the lead connector of the solenoid. (Fig. 12)
5. Remove the 4 setscrews (Fig. 12 : 47 ~ 50) of the brake and lift up the brake.
6. When removing the brake band, remove 2 setscrews (Fig. 12 : 51, 52).

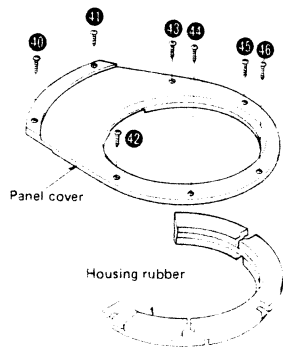


Fig. 11

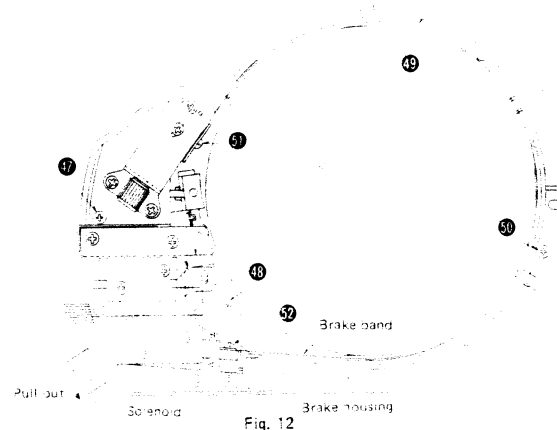


Fig. 12

• How to remove the motor

1. Remove the brake.
2. Remove the 4 setscrews (Fig. 13 : 53 ~ 56) of the stator frame. (Use the hexagonal wrench (M4)).
3. Pull out the connector and lift it up to remove the motor.

Notes: 1. When inserting the connector, remove the bottom cover beforehand. (See Fig. 14)

2. The DC resistance of armature drive coil is about 22Ω. (There are 3 coils - 1st (Green), 2nd (Red), and 3rd (Blue). The difference in resistance between the layers is less than 1Ω.)

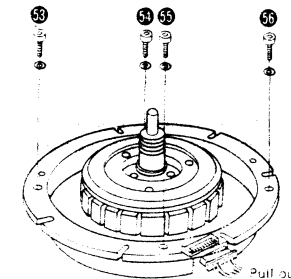


Fig. 13

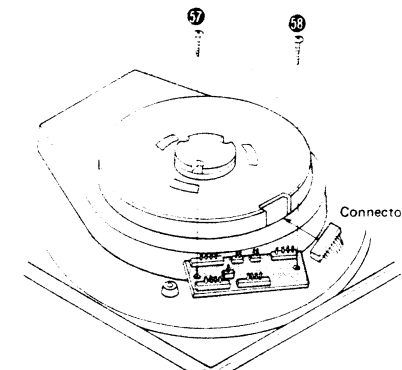


Fig. 14

• How to remove the connection P.C.B.

1. Remove the bottom cover.
2. Remove the 2 setscrews (Fig. 14 : 57, 58) of the printed board to remove the board.

• How to remove the strobe LED P.C.B.

1. Remove the bottom cover.
2. Shift the claws which fasten the printed circuit board in the direction of the arrow to remove the board. (Fig. 15)

• How to remove the speed selector P.C.B.

1. Remove the bottom cover.
2. Remove the 5 setscrews (Fig. 15 : 59 ~ 63) of the speed selector P.C.B.
3. Remove the setscrews 64, 65 in Fig. 15 to remove the start/stop switch.
4. Remove the 2 setscrews (Fig. 16 : 66, 67) of the start/stop button.
5. Remove the 3 setscrews (Fig. 16 : 68 ~ 70) of the speed selector button.
6. Shift the claws (2 portions) in the direction of the arrow to remove the board.

\* For the speed selector and start/stop button screw adjustment refer to Fig. 5 on page 5.

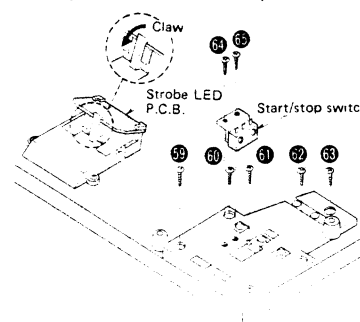


Fig. 15

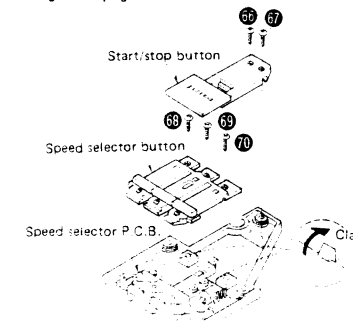


Fig. 16

■ HOW TO CHECK THE PRINTED CIRCUIT BOARD

● Operation circuit P.C.B.

1. Remove the cabinet.
2. Remove the 4 setscrews (Fig. 17 : ㉗ ~ ㉙) of the front panel.
3. Cut off the clumper, remove the front panel in the direction of the arrow and check the printed board from the back side.
4. When replacing the parts of the P.C.B., remove the P.C.B. (Refer to "How to remove the operation circuit P.C.B.")

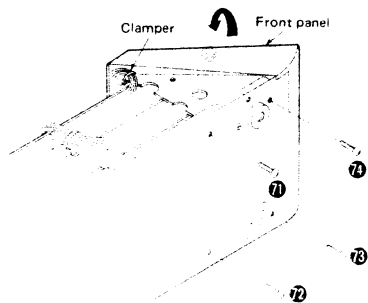


Fig. 17

● Constant voltage and operation circuit P.C.B.

1. Remove the cabinet and front panel.
2. Check from above the printed circuit board.
3. When replacing the parts of the printed circuit board, remove the P.C.B. (Refer to "How to remove the constant voltage and operation circuit P.C.B.")

Note: Do not check the conduction of the printed board with the heat-sink removed. (Keeping it energized for a long period of time may damage the parts.)

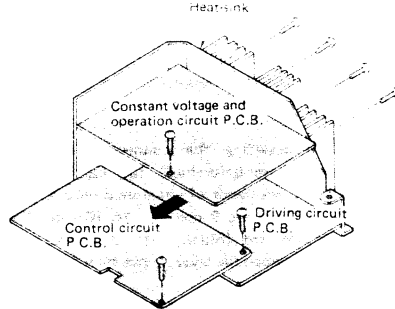


Fig. 18

● Control circuit P.C.B.

1. Remove the cabinet and front panel.
2. Remove the printed circuit board. (Refer to "How to remove the control circuit P.C.B.")
3. Connect the connector and check the conduction.

● Driving circuit P.C.B.

1. Remove the cabinet and front panel.
2. Remove the 3 setscrews (Fig. 19 : ㉚ ~ ㉜) of the heat-sink and 2 setscrews (Fig. 19 : ㉝, ㉞) of the printed board support, shift down the board in the direction of the arrow and check it from the back side. (Fig. 20)
3. When replacing the parts of the printed board, remove either the driving circuit P.C.B. (Refer to "How to remove the driving circuit P.C.B.") or the control circuit P.C.B. (Refer to "How to remove the control circuit P.C.B.")

Note: Do not check the conduction of the driving circuit P.C.B. with the heat-sink removed. (If it is energized for a long period of time, the protection circuit will operate to stop the turntable. It may also damage the parts.)

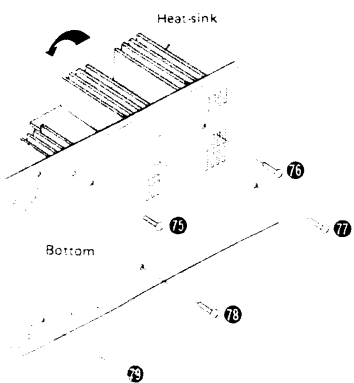


Fig. 19

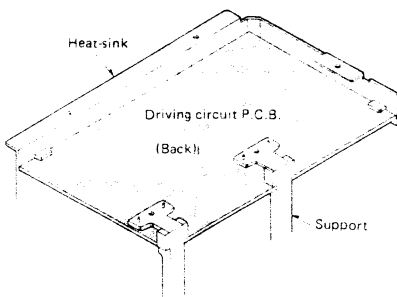


Fig. 20

■ MEASUREMENTS AND ADJUSTMENT

● Instruments used and settings

1. DC voltmeter
2. Oscilloscope
3. DC Power Supply.
4. Set the pitch control to 0%.

Item	Preparations	Adjusting Parts	Adjusting Method								
Constant Voltage	<ol style="list-style-type: none"> <li>1. Pull out the connectors CN1, CN2 and CN3.</li> <li>2. Connect the DC voltmeter to either CN1 terminal ㉓ (+) and BT1 terminal ㉑ (-) or the negative side of C3.</li> <li>3. Turn the power switch "on".</li> </ol>	VR1	1. Adjust VR1 so that the output voltage is 31.8V.								
	<ol style="list-style-type: none"> <li>1. Pull out the connectors CN1, CN2 and CN3.</li> <li>2. Connect the DC voltmeter to either CN1 terminal 1 (+) and BT1 terminal 3 (-) or the negative side of C3.</li> <li>3. Turn the power switch "on".</li> </ol>	VR2	1. Adjust VR2 so that the output voltage is -31.8V								
Crystal Oscillation	<ol style="list-style-type: none"> <li>1. Connect the oscilloscope to IC202 pin 7 and ground terminal.</li> <li>2. Turn the power switch "on".</li> </ol>	C211	1. Adjust C211 so that the cycle is 3.81 μsec. (262.08 kHz).								
VS Voltage	<ol style="list-style-type: none"> <li>1. Connect the DC voltmeter to CN206 terminal ㉒ (+) and CN206 terminal ㉑ (-).</li> <li>2. Turn the power switch "on" and set the speed selector to "33 r.p.m."</li> </ol>	VR201	1. Adjust VR201 so that the output voltage is 2.1V.								
RS Current	<ol style="list-style-type: none"> <li>1. Connect the DC voltmeter to CN206 terminal ㉓ (+) and CN206 terminal ㉒ (-).</li> <li>2. Turn the power switch "on" and set the speed selector to "33 r.p.m."</li> <li>3. Press the start button.</li> </ol>	VR206	1. Adjust VR206 so that the output voltage is 0V.								
Synchronizing position	<ol style="list-style-type: none"> <li>1. Connect the oscilloscope to CN206 terminal ㉒ (+) and CN206 terminal ㉑ (-).</li> <li>2. Turn the power switch "on" and press the start button.</li> </ol>	VR203 (33 r.p.m.) VR204 (45 r.p.m.) VR205 (78 r.p.m.)	<ol style="list-style-type: none"> <li>1. Switch over the speed selector to "33", "45" and "78" and adjust VR203, VR204 and VR205 so that the time T is as in the table below:</li> </ol> <table border="1"> <thead> <tr> <th>Speed</th> <th>T</th> </tr> </thead> <tbody> <tr> <td>33</td> <td>8.5msec.</td> </tr> <tr> <td>45</td> <td>6.6msec.</td> </tr> <tr> <td>78</td> <td>3.8msec.</td> </tr> </tbody> </table>	Speed	T	33	8.5msec.	45	6.6msec.	78	3.8msec.
Speed	T										
33	8.5msec.										
45	6.6msec.										
78	3.8msec.										
Brake (electric)	<ol style="list-style-type: none"> <li>1. Pull out CN202 connector. (With mechanical brake released)</li> <li>2. Turn the power switch "on" and set the speed selector to "33 r.p.m."</li> <li>3. Press the start button.</li> </ol>	VR202	<ol style="list-style-type: none"> <li>1. Press the stop button.</li> <li>2. Adjust VR202 so that the range of angle for stop of the rotation is 90° ~ 180°.</li> </ol>								
Offset voltage	<ol style="list-style-type: none"> <li>1. Apply 40mV between CN203 terminals 2. and 3. by the DC power supply.</li> <li>2. Connect the DC voltmeter between CN102 terminals ㉑ and 4.</li> <li>3. Turn the power switch "on" and press the start button.</li> </ol>	VR101	1. Adjust VR101 so that the output voltage is 10mV.								
Middle voltage	<ol style="list-style-type: none"> <li>1. Connect the DC voltmeter between CN102 terminals ㉑ and 2.</li> <li>2. Turn the power switch "on" and press the start button.</li> </ol>	VR102	1. Adjust VR102 so that the output voltage is 0V.								

• Adjusting method without DC power supply for offset voltage adjustment

1. Solder 3 resistors to the driving circuit P.C.B. (Refer to Fig. 21)
2. Pull out CN203 connector. (Control circuit P.C.B.)
3. Connect CN203 terminal ⑤ to BT102 terminal ⑤ and CN203 terminal ④ to BT102 terminal ④, using lead wire with clip, etc.
4. Connect the DC voltmeter between CN102 terminals ③ and ④.
5. Turn the power switch "on" and press the start button.
6. Adjust VR101 so that the DC voltmeter reading is 10mV.
7. Remove the 3 resistors and lead wire.

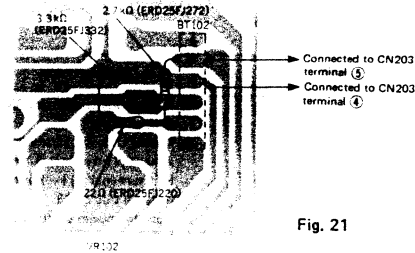


Fig. 21

• Adjustment of the mechanical brake

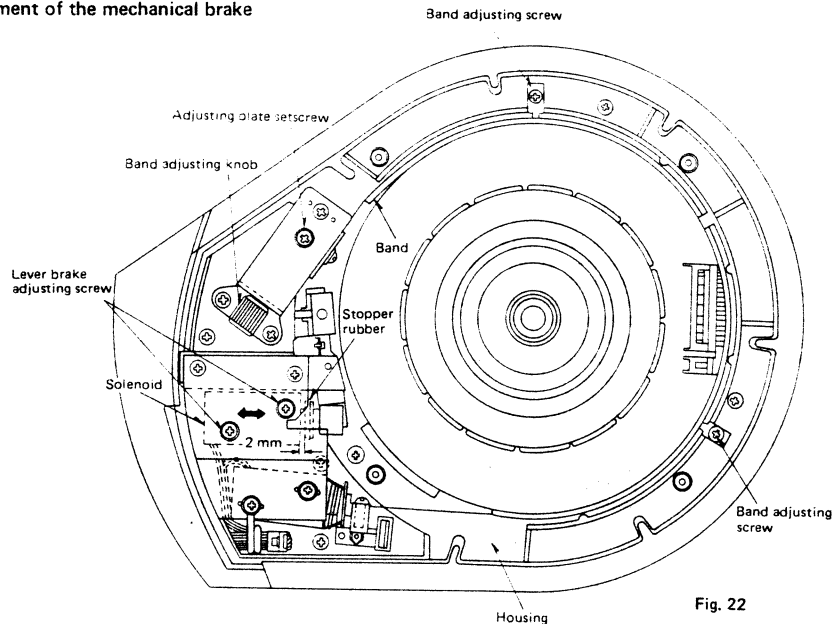


Fig. 22

1. Adjustment of the lever brake

1. Remove the turntable platter.
2. Loosen the lever brake adjusting screw.
3. Shift the solenoid right and left so that the clearance between the solenoid and stopper rubber is about 2 mm.
4. Tighten the lever brake adjusting screw.
5. Mount the turntable and check to see that the turntable does not move with the power switch set to "off".

2. Adjustment of the band brake

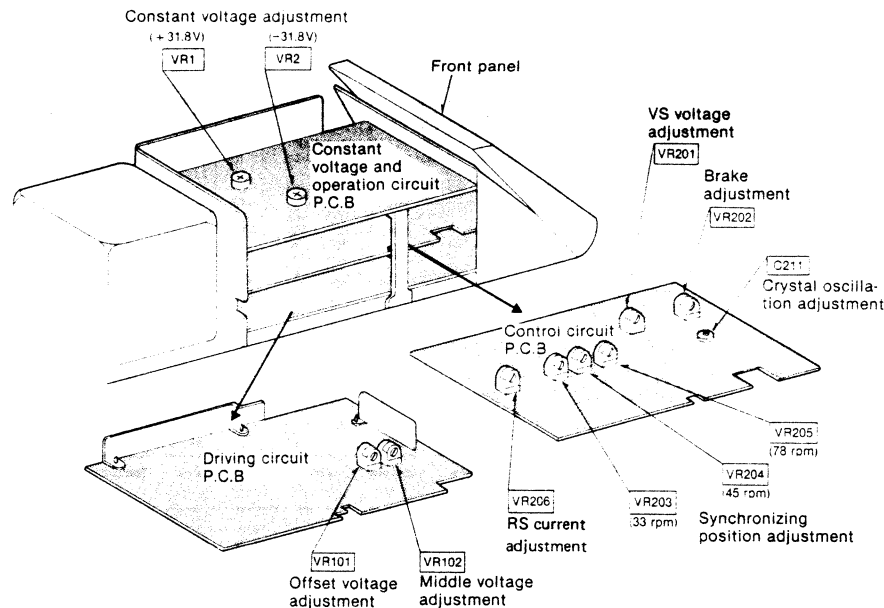
• Check of the band position

1. Remove the turntable.
2. The inner periphery of the band should match the inner periphery of the housing.
3. If they are deflected, adjust it by loosening the adjusting screws at two portions.

• Check of the brake angle

1. Turn the turntable.
2. Press the stop button and check to see that the range of angle for stop of the rotation is 40° or less.
3. If the stopping angle is over 40°, adjust the electric brake beforehand. (Refer to page 9.)
4. Next, loosen the adjusting plate setscrew and turn the adjusting knob so that the angle is 40° or less.

• Adjustment points



■ RESISTORS & CAPACITORS

- Notes:**
1. Part numbers are indicated on most mechanical parts. Please use this part number for parts orders.
  2. Important safety notice: Components identified by  $\Delta$  mark have special characteristics important for safety. When replacing any of these components use only, manufacturer's specified parts.
  3. Bracketed indications in Ref. No. columns specify the area. Parts without these indications can be used for all areas.
  4. The "S" mark is service standard parts and may differ from production parts.
  5. Unless otherwise specified. All resistors are in OHMS ( $\Omega$ ) K = 100 $\Omega$ , M = 1000k $\Omega$  All capacitors are in MICROFARADS ( $\mu$ F) P =  $\mu$ MF

Numbering System of Resistor

Example

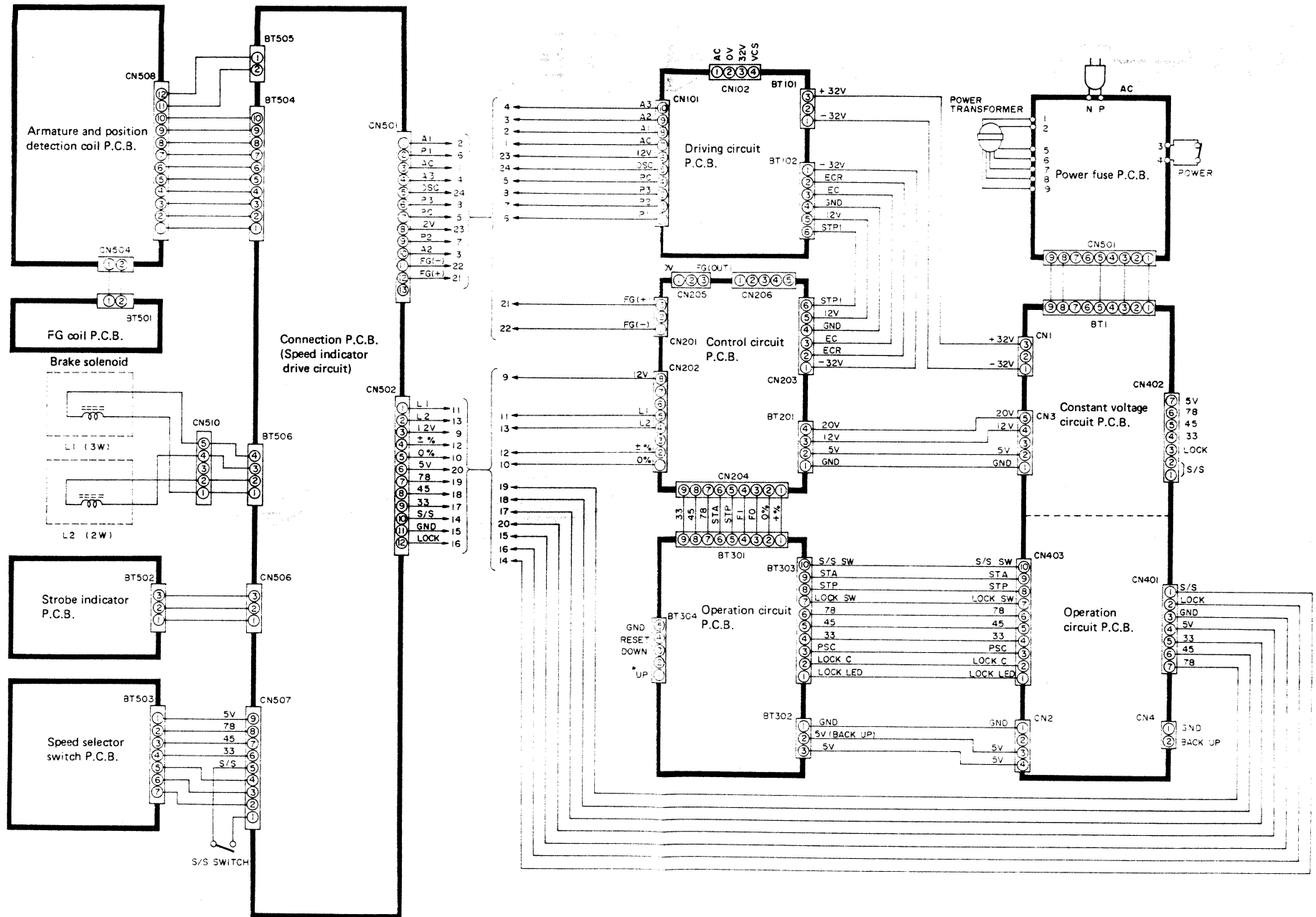
ERD	25	F	J	101
Type	Wattage	Shape	Tolerance	Value

Resistor Type	Wattage	Tolerance
ERD : Carbon	25	1/4W J : $\pm$ 5%
ERG : Metal Oxide	50	1/2W
ERX : Metal Film	1	1W
	2	2W

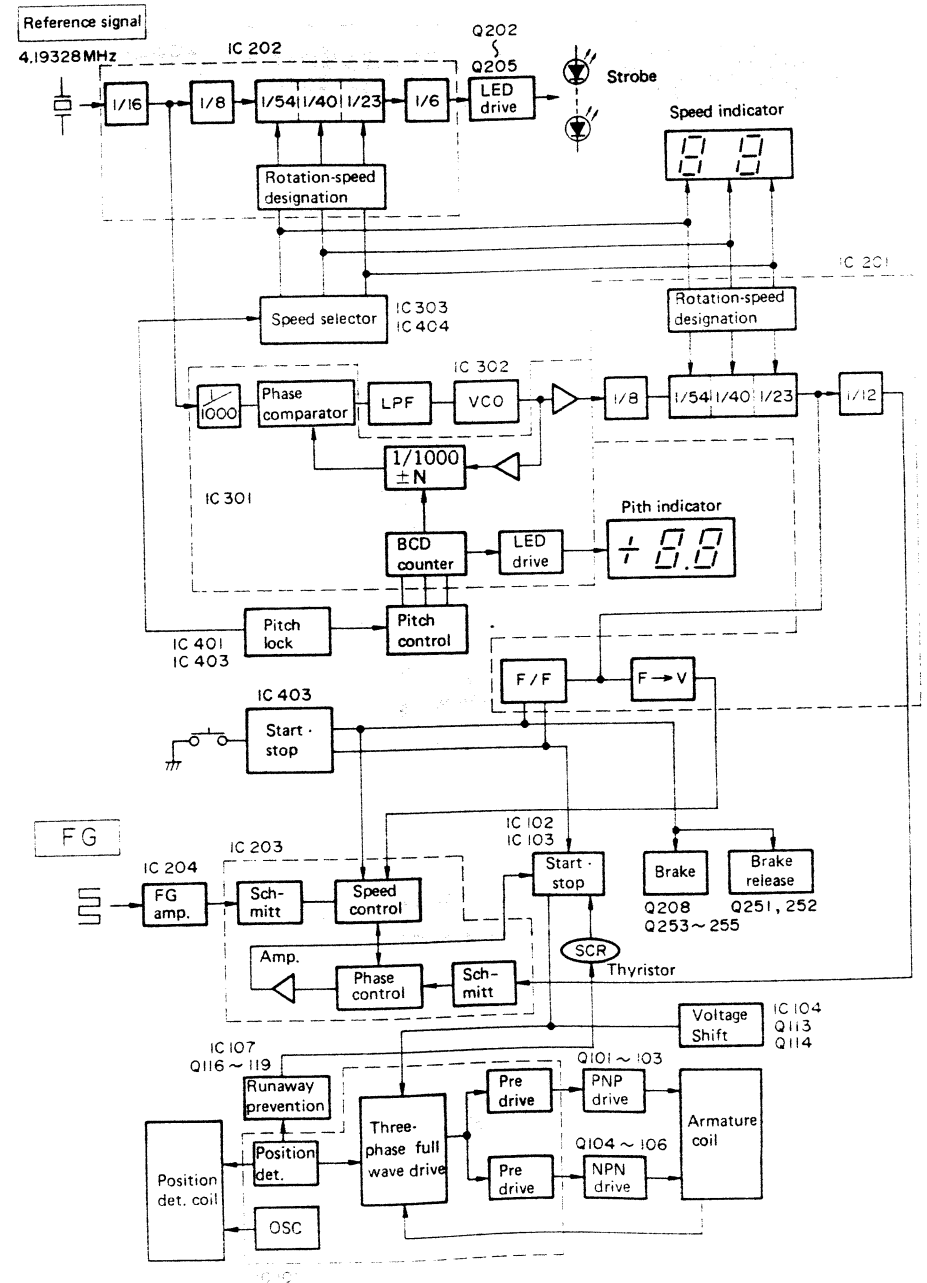
Ref. No.	Part No.	Value	Ref. No.	Part No.	Value	Ref. No.	Part No.	Value	Ref. No.	Part No.	Value
<b>RESISTORS</b>											
R1	S ERD25FJ102	1k	R109	S ERD25TJ393	39k	R135	S ERD25FJ103	10k	R164	S ERD25FJ332	3.3k
R2	S ERD25FJ332	3.3k	R110	S ERD25TJ223	22k	R137	S ERG2ANJ150	15	R201	S ERD25FJ472	4.7k
R3	S ERD25FJ152	1.5k	R111	S ERD25FJ562	5.6k	R139	S ERG2ANJ150	15	R202	S ERD25FJ471	470
R4	S ERD25FJ332	3.3k	R113	S ERD25FJ332	3.3k	R140	$\Delta$ ERD2FCG101	100	R203	S ERD25FJ222	2.2k
R5	S ERD25TJ273	27k	R114	S ERD25TJ183	18k	R141	S ERD25FJ151	150	R204	S ERD25FJ563	56k
R6	S ERD25FJ682	6.8k	R115	S ERD25FJ471	47k	R143	S ERD25FJ151	150	R205	S ERD25TJ123	12k
R10	S ERD25FJ103	10k	R116	S ERD25FJ102	1k	R145	S ERD25FJ151	150	R206	S ERD25TJ123	12k
R11	S ERD25FJ102	1k	R117	S ERD25FJ562	5.6k	R147	S ERX2ANJR47	0.47	R207	S ERD25TJ473	47k
R12, 13	S ERD25FJ332	3.3k	R118	S ERD25FJ471	470	R148	S ERG2ANJ271	270	R209	S ERD25FJ103	10k
R17	S ERD25FJ103	10k	R119	S ERD25FJ220	22	R149	S ERD25FJ103	10k	R210	S ERD25TJ223	22k
R18	S ERD25FJ560	56	R120	S ERD25FJ472	4.7k	R150	S ERD25TJ393	39k	R211	S ERD25FJ332	3.3k
R19	S ERD25FJ182	1.8k	R121	S ERD25FJ103	10k	R152	S ERD25TJ474	47k	R212	S ERD25TJ223	22k
R20	S ERD25FJ122	1.2k	R122	S ERD25FJ222	2.2k	R153	S ERD25TJ104	100k	R213	S ERD25FJ822	8.2k
R21	S ERX2ANJR68	0.68	R123	S ERD25FJ470	47	R154	S ERD25FJ101	100	R214	S ERD25TJ153	15k
R103	S ERD25FJ102	1k	R124, 125	S ERD25FJ472	4.7k	R155	S ERD25FJ102	1k	R215	S ERD25FJ472	4.7k
R104	S ERD25TJ474	47k	R126	S ERD25FJ222	2.2k	R156	S ERD25TJ473	47k	R216	S ERD25TJ183	18k
R105	S ERD25FJ472	4.7k	R127, 128	S ERD25FJ103	10k	R157	S ERD25FJ103	10k	R217	S ERD25TJ333	33k
R106	S ERD25TJ563	56k	R129	S ERD25TJ153	15k	R158	S ERD25TJ564	56k	R218	S ERD25TJ333	33k
R107	S ERD25FJ101	100	R130	S ERD25FJ102	1k	R159, 160	S ERD25FJ113	11k	R219	S ERD25TJ333	33k
R108	S ERD25TJ473	47k	R132, 133	S ERD25FJ103	10k	R161	S ERD25FJ472	4.7k	R220, 221	S ERD25TJ123	12k
			R134, 135	S ERD25FJ103	10k	R162	S ERD25FJ471	47k	R222	S ERD25TJ123	12k
						R163	S ERD25FJ102	1k	R223	S ERD25TJ123	12k



**PRINTED CIRCUIT BOARD WIRING CONNECTION DIAGRAM**

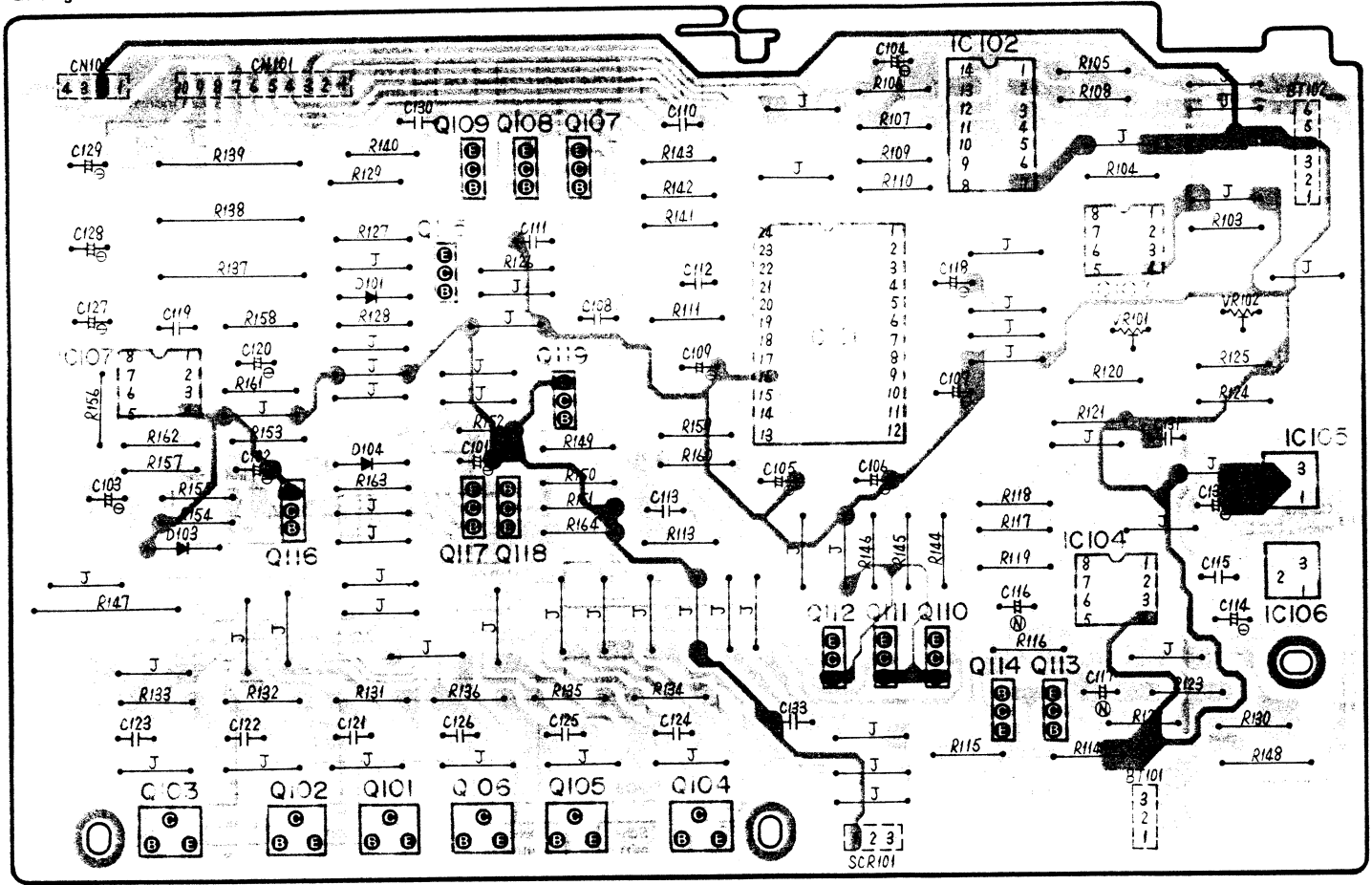


■ BLOCK DIAGRAM



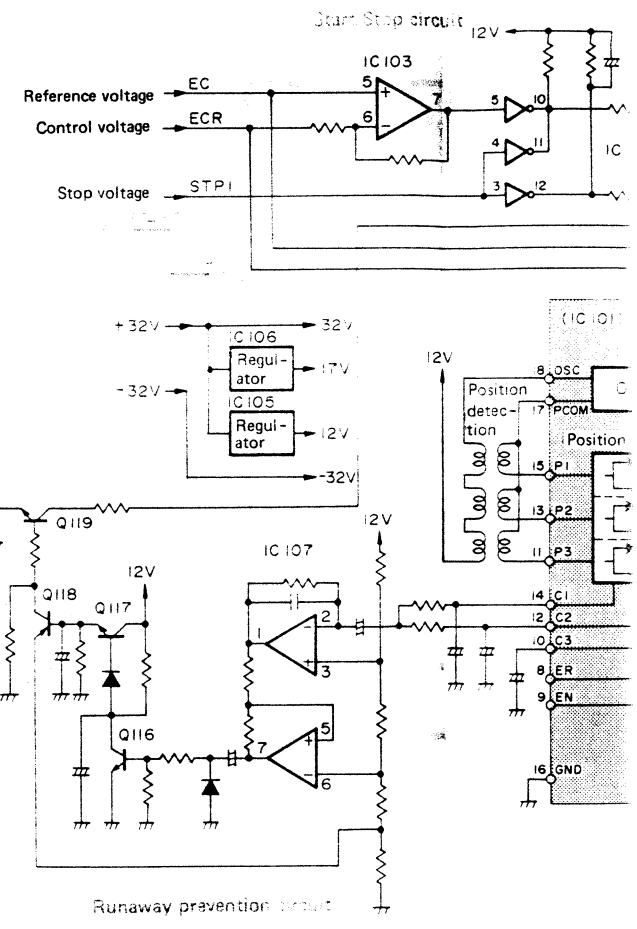
■ **PRINTED CIRCUIT BOARDS**

● **Driving circuit**

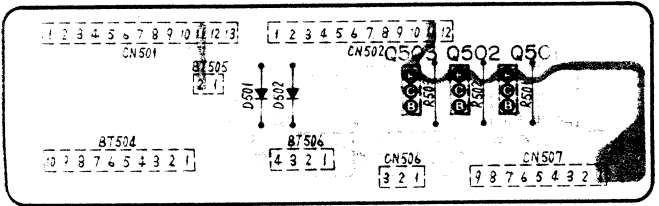


Ground (Earth) lines

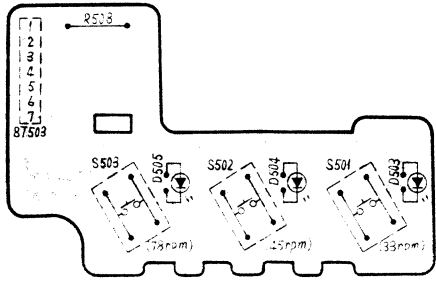
● **Block diagram of driving circuit**



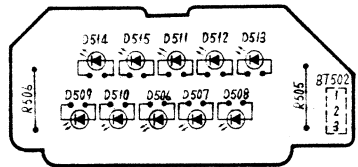
● **Connection board (Speed indicator drive circuit)**



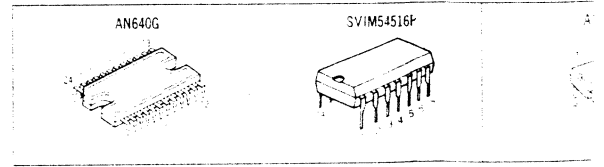
● **Speed selector switch circuit**



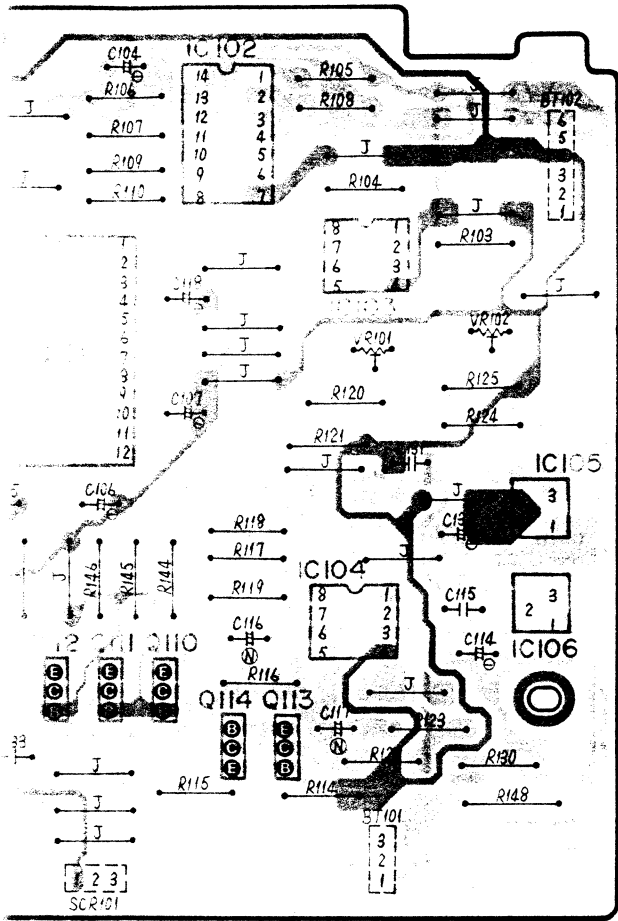
● **Strobe indicator circuit**



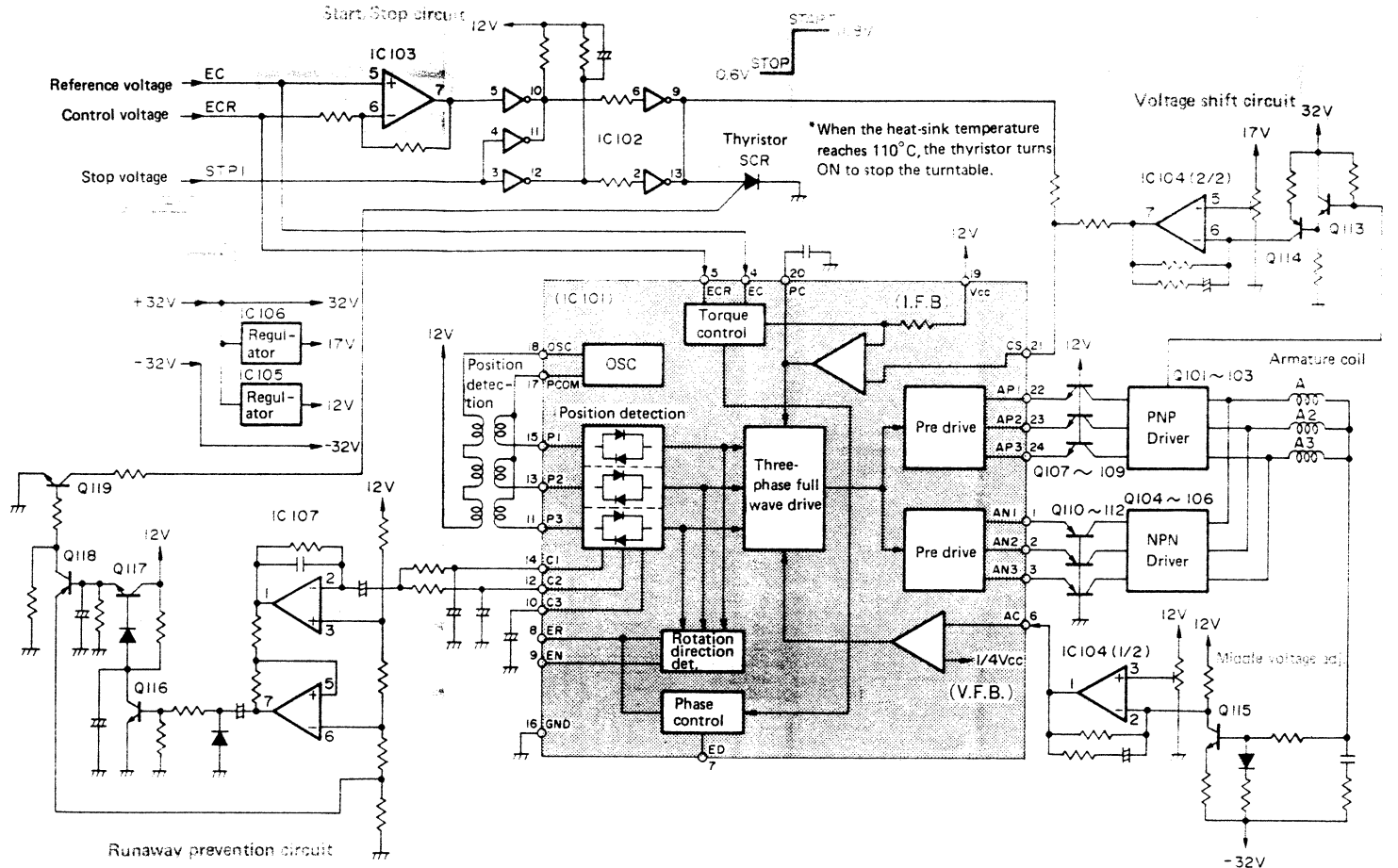
● **Terminal guide of IC and transistors**



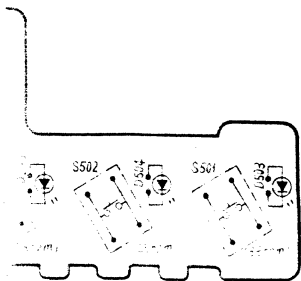
Earth) lines



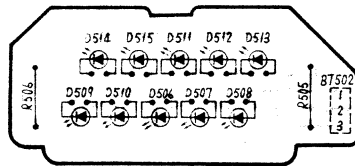
• Block diagram of driving circuit



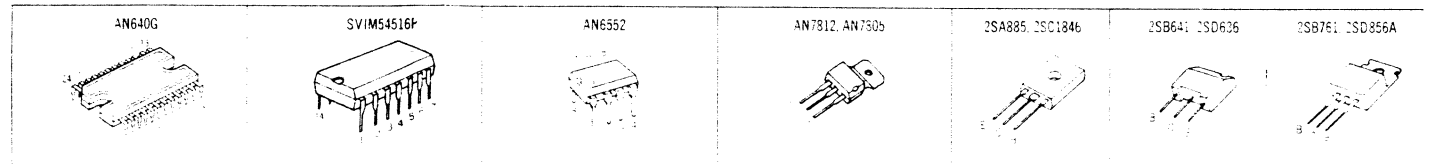
Switch circuit



• Strobe indicator circuit



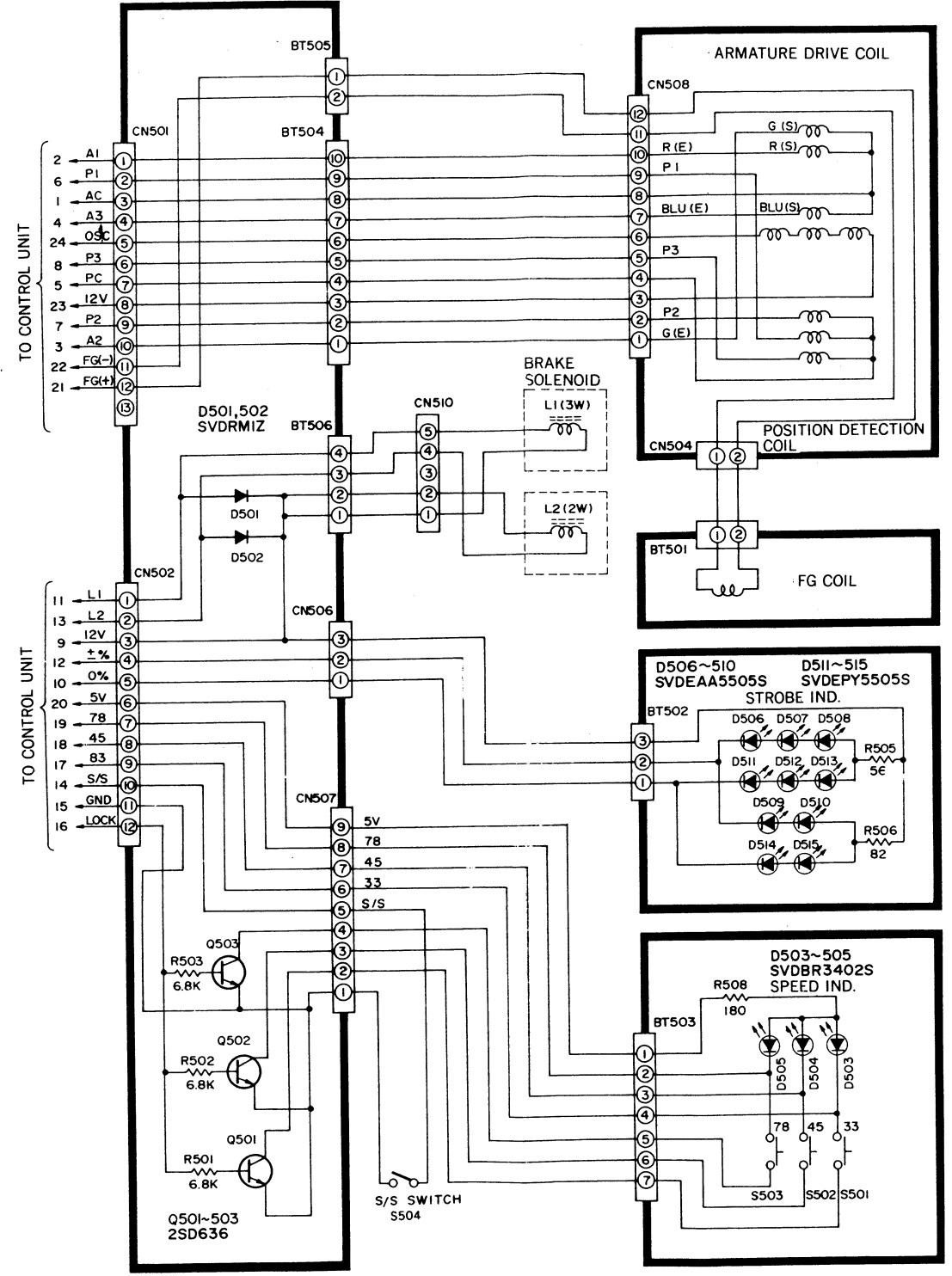
• Terminal guide of IC and transistors





• Turntable unit (Speed selector, strobe indicator and motor coil circuit)

A  
E  
C  
D  
E  
F

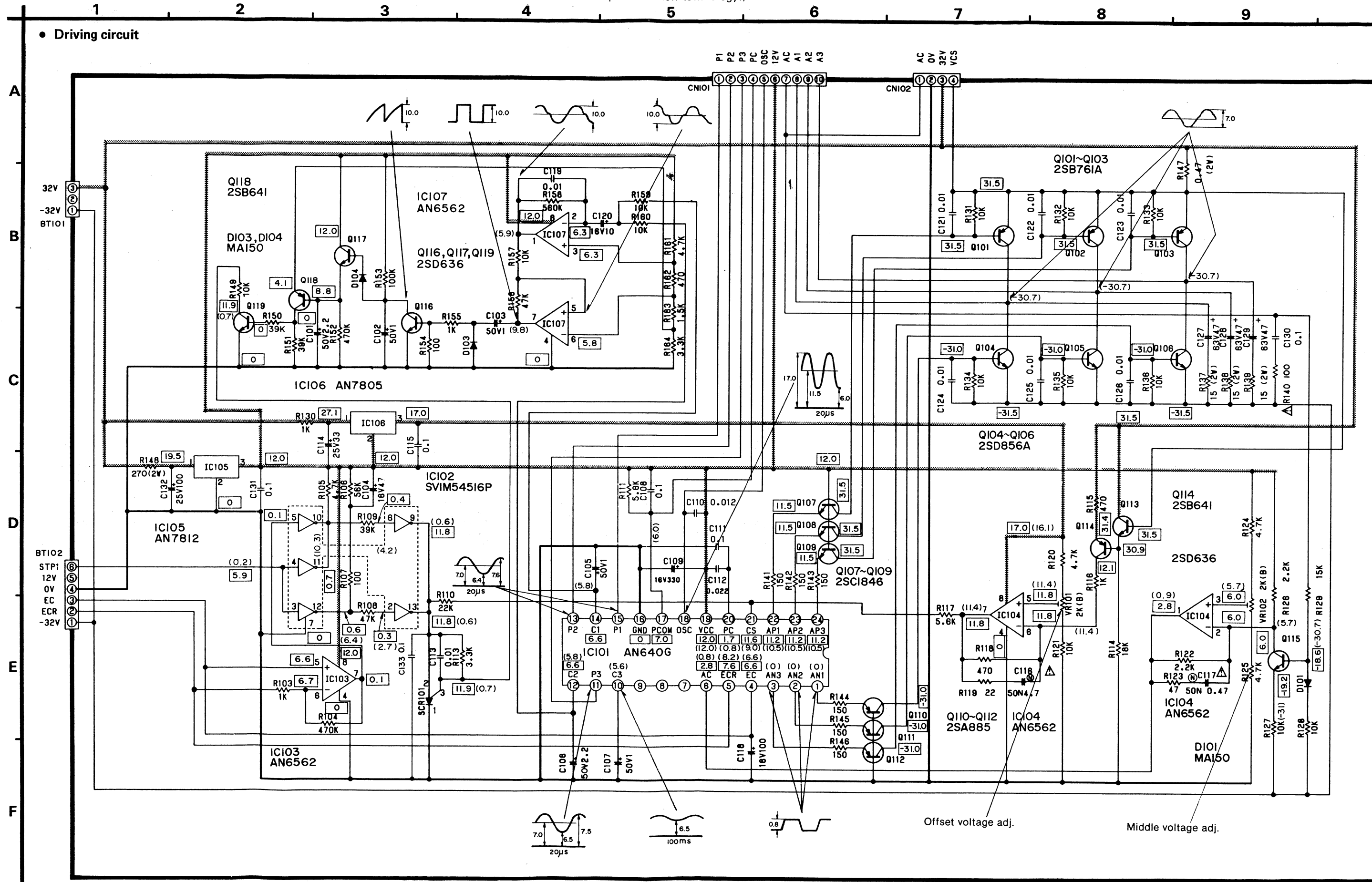


Notes:

1. The voltage value and waveform are the standard values of this measured by DC electronic voltmeter (high impedance) and oscilloscope on the basis of chassis. Therefore, the voltage value and waveform may include some error due to the internal impedance of the tester or the measuring set.
  - \* Those in ( ) are voltage in stop.
  - \* Those in [ ] are voltage in rotation.
2. ----- positive voltage lines.
3. Important safety notice: Components identifier by  $\Delta$  make have special characteristics important for safety. When replacing any of these components, use only manufacturer's specified parts.
4. **S501** : Speed selector (33 rpm) switch.
5. **S502** : Speed selector (45 rpm) switch.
6. **S503** : Speed selector (78 rpm) switch.
7. **S504** : Start/stop switch.

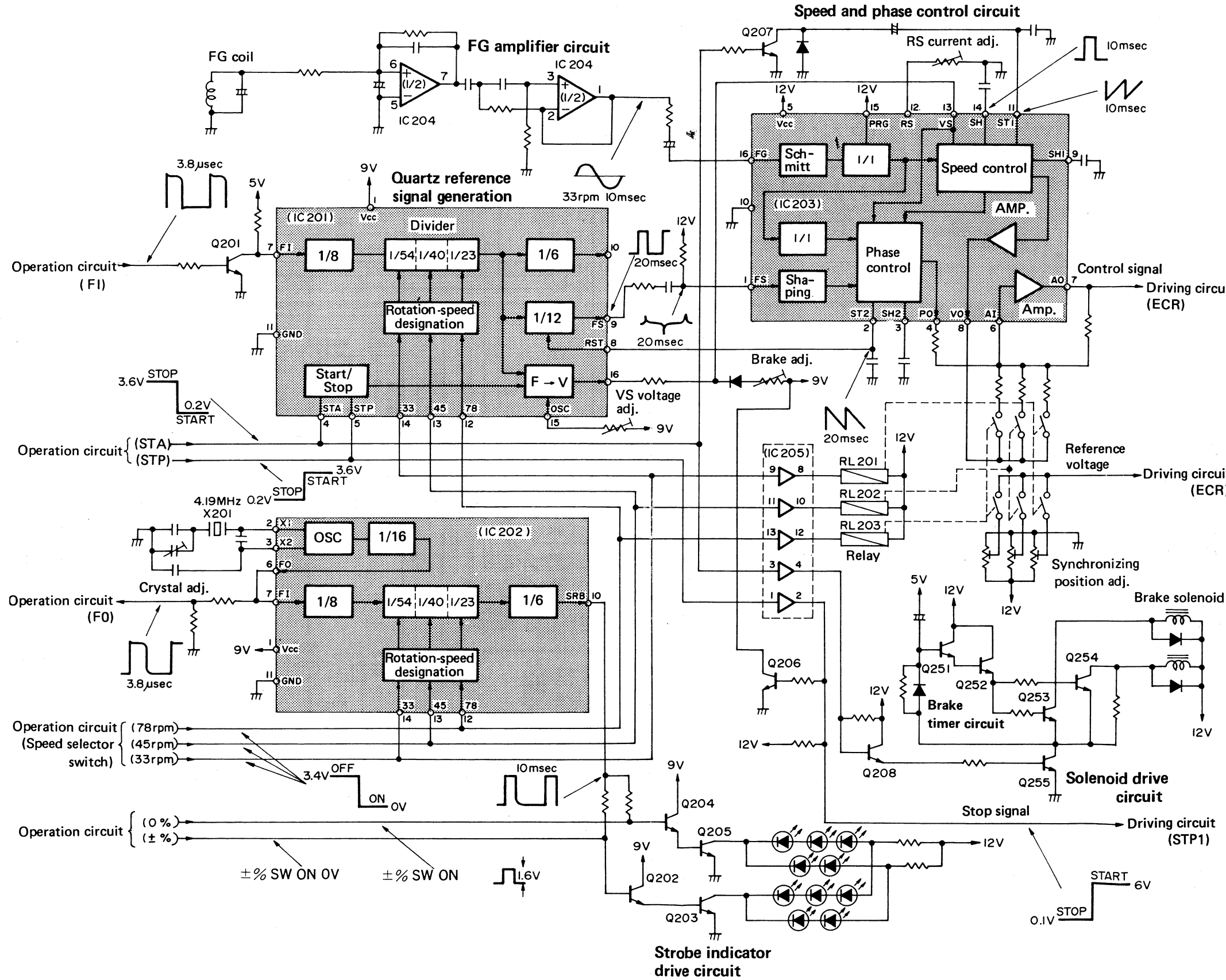
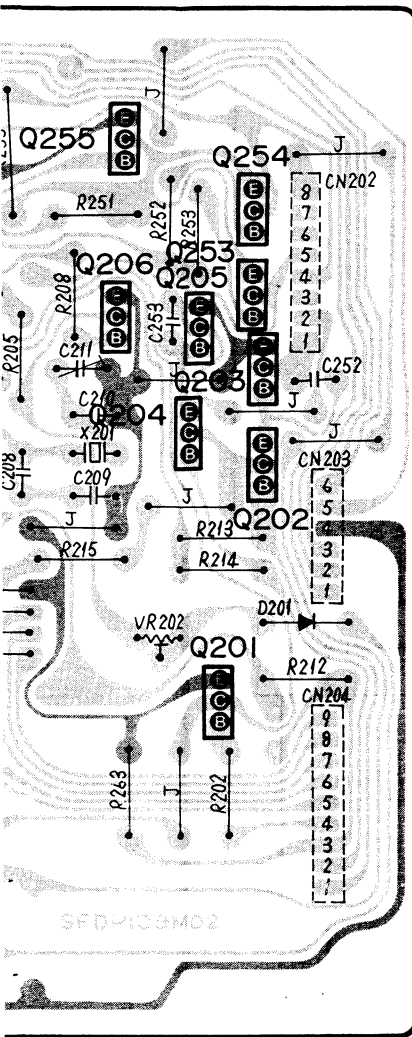
**SCHEMATIC DIAGRAM** (This schematic diagram may be modified at any time with the development of new technology.)

• Driving circuit

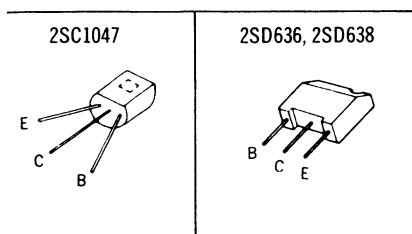


• Block diagram of control circuit

• Reference voltage and waveform at each IC pin



IC201 DN860		IC203 AN660	
No	STOP ROTATION(START)	No	STOP ROTATION(START)
1	9.0 9.0	1	11.8
4	3.6 0.2	2	0
5	0.2 3.6	3	6.0 5.0
7		4	6.2 6.2
8	0	5	12.0 12.0
9	4.2	6	6.4 6.4
11	0 0	7	8.2 6.7
12	33,45rpm 3.6 78rpm 0.2	8	5.2 6.4
13	33,78 " 3.6 45 " 0.2	9	7.6 6.4
14	45,78 " 3.6 33 " 0.2	10	0 0
15		11	7.8
16	0.2	12	2.6
		13	2.6
		14	7.5
		15	12.0 12.0
		16	5.8

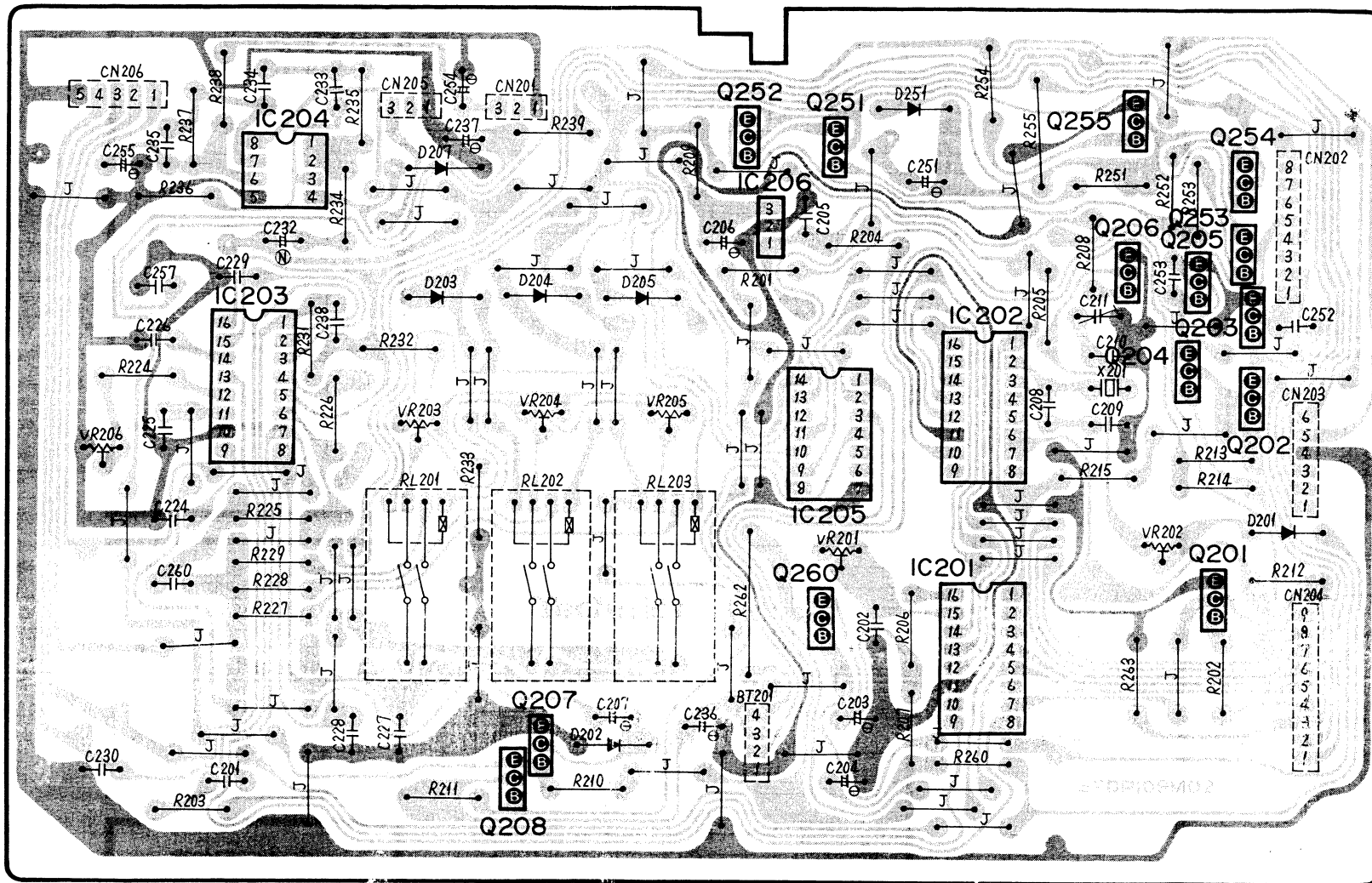


PRINTED CIRCUIT BOARD

Ground (Earth) lines

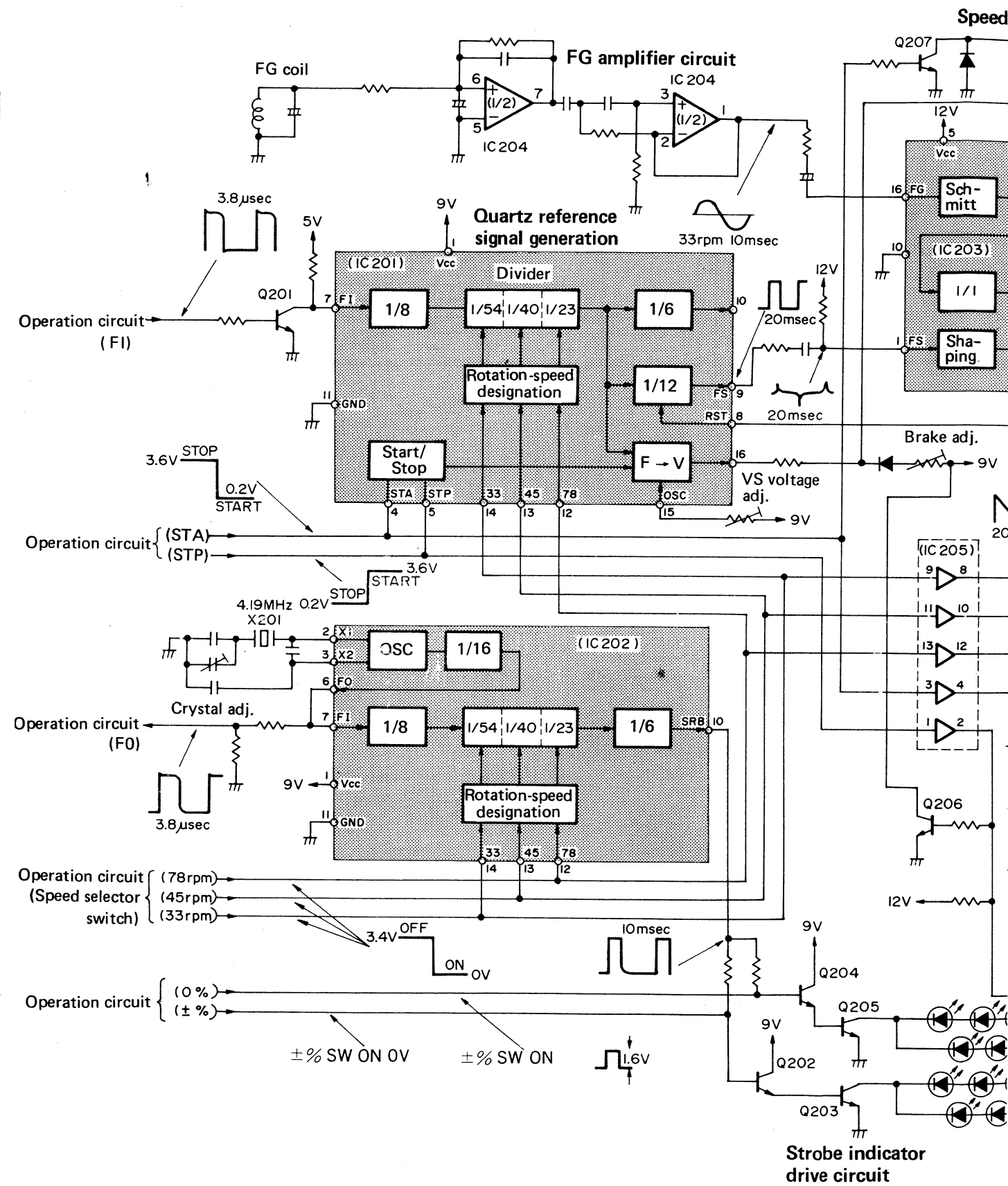
Block diagram of control circuit

Control circuit



Terminal guide of IC and transistors

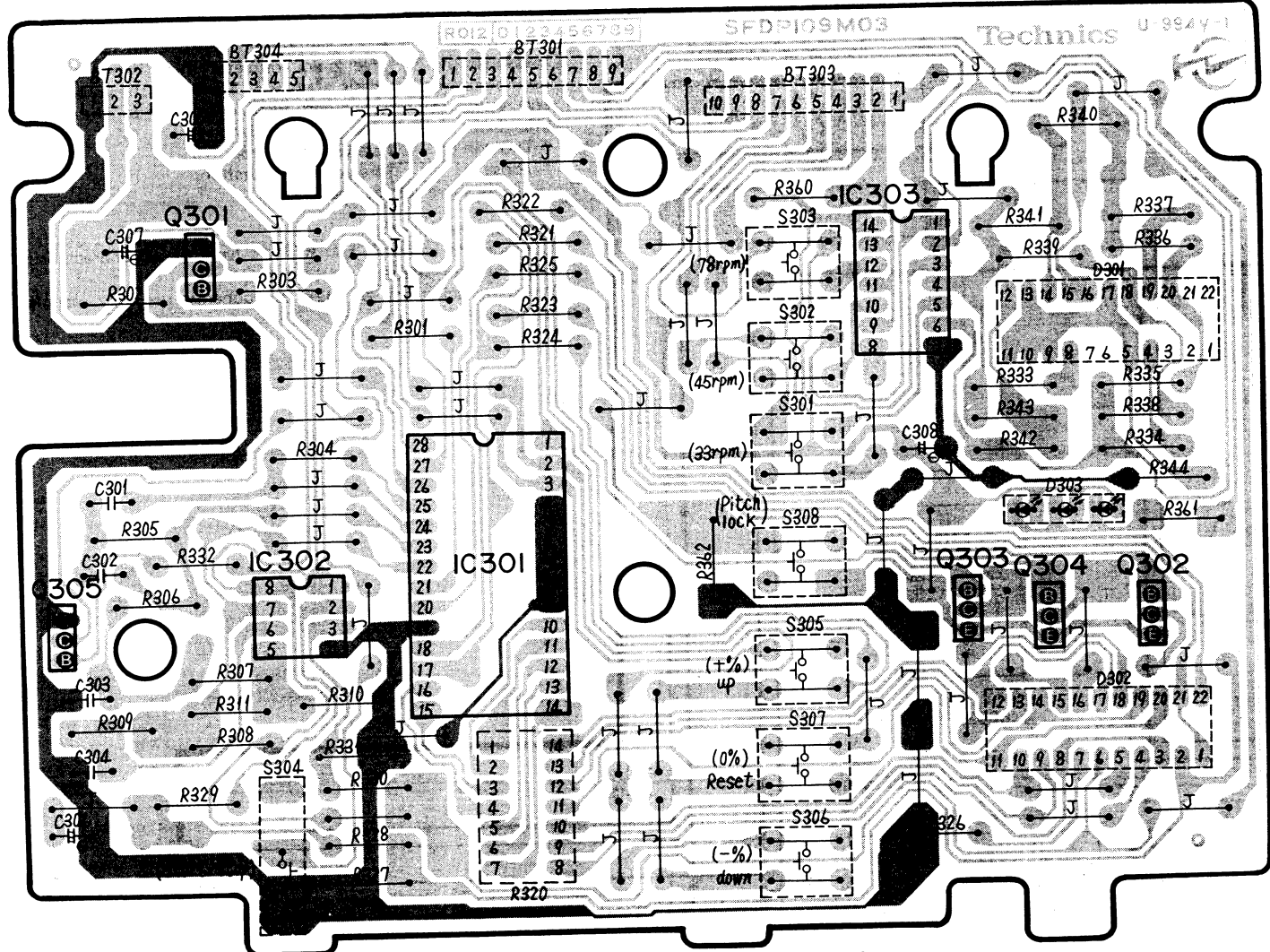
<p>DN860, AN660</p>	<p>AN6552F</p>	<p>SVIM53217P</p>	<p>SVITA78L009</p>	<p>2SC1846</p>	<p>2SC1047</p>	<p>2SD636, 2SD638</p>
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# SP-10MK3 SP-10MK3

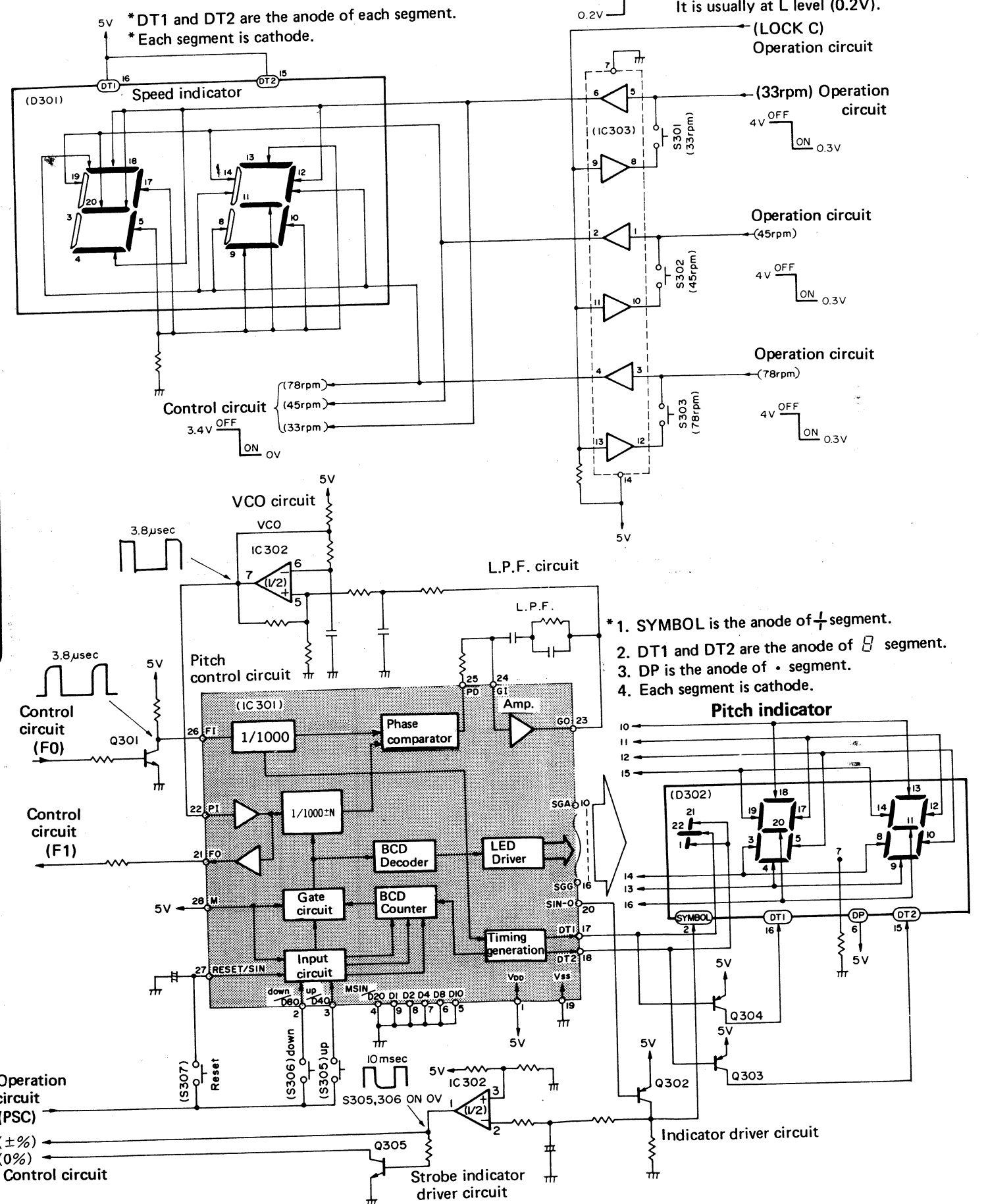
## PRINTED CIRCUIT BOARD

● Operation circuit

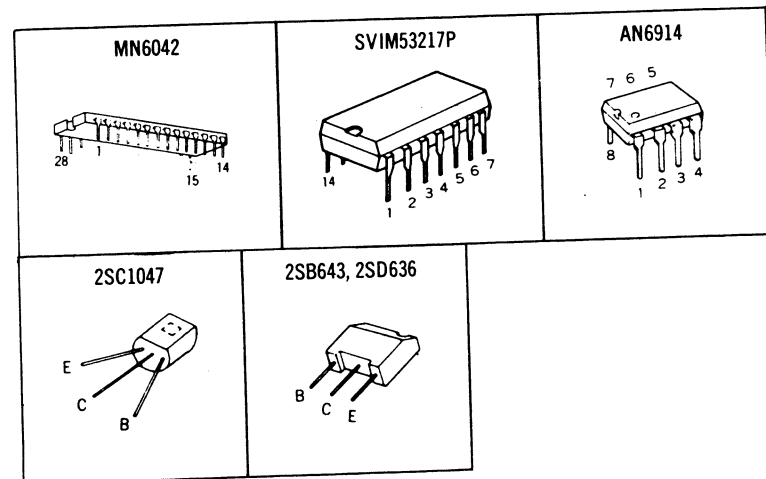


■ Ground (Earth) lines

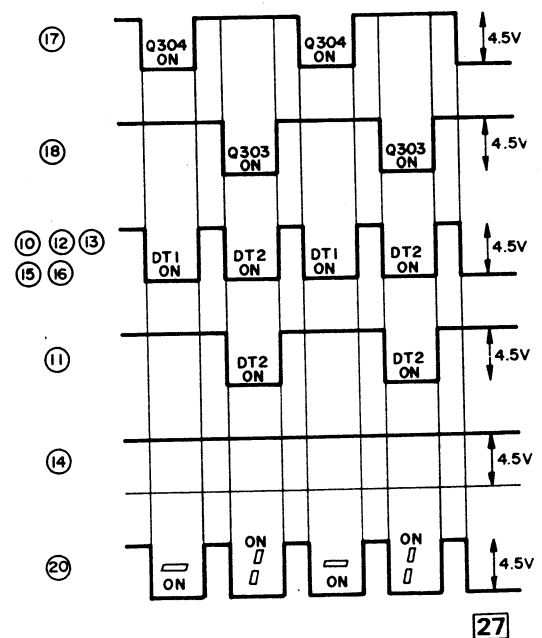
● Block diagram of operation circuit



● Terminal guide of IC and transistors



● Timing chart (When the pitch has been set to +5.9%)  
IC301 pin number

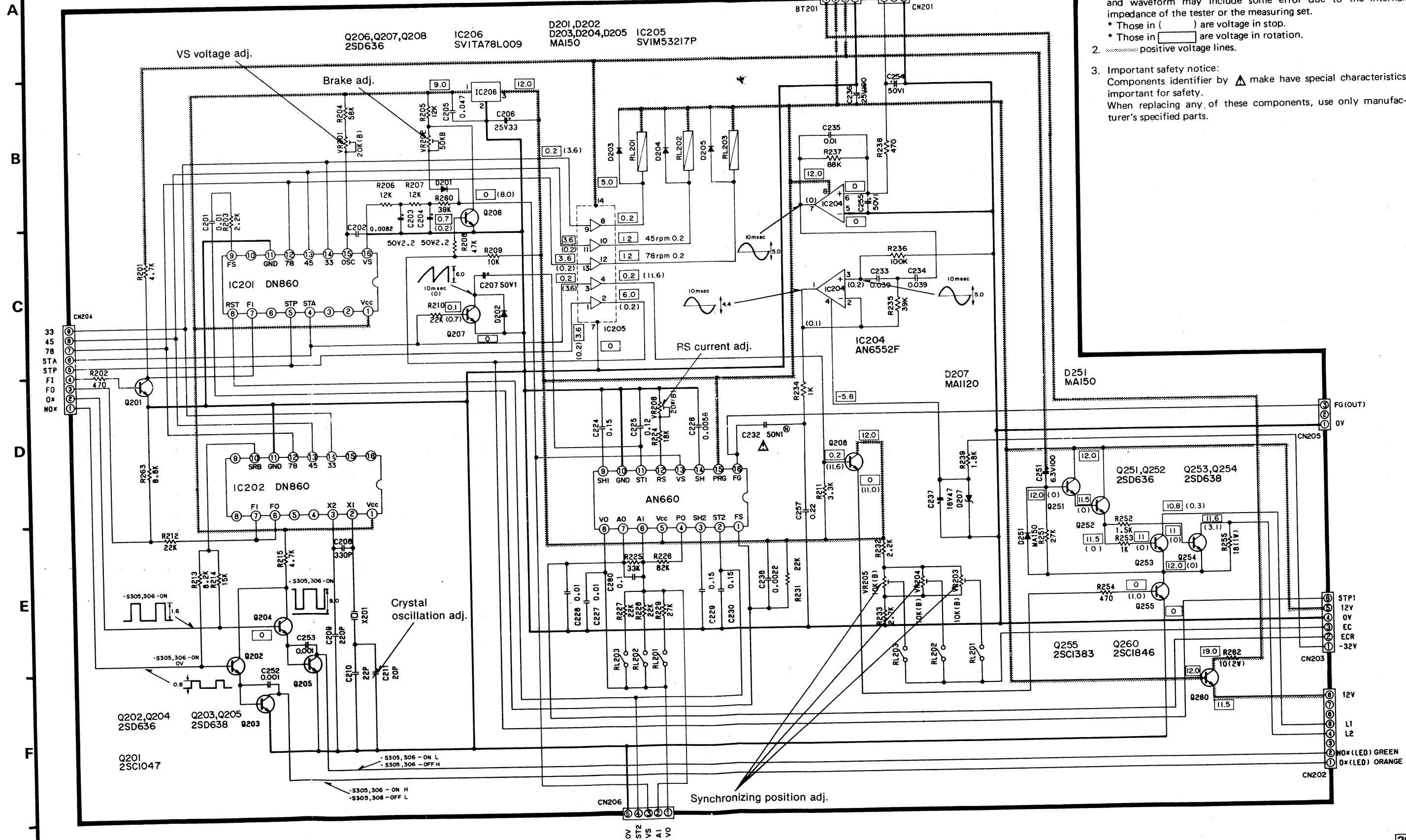


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**SCHEMATIC DIAGRAM** (This schematic diagram may be modified at any time with the development of new technology.)

• Control circuit



**Notes:**

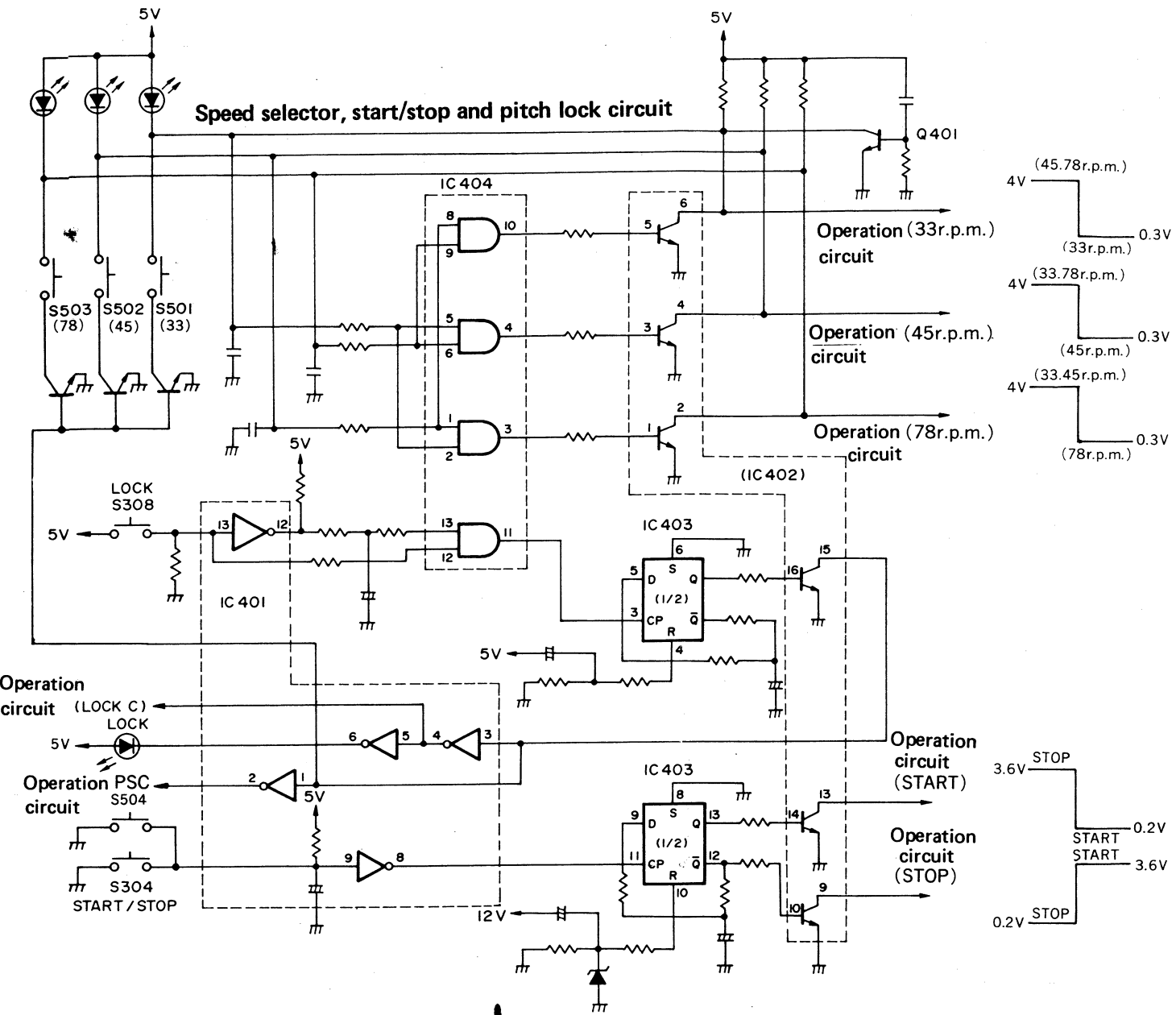
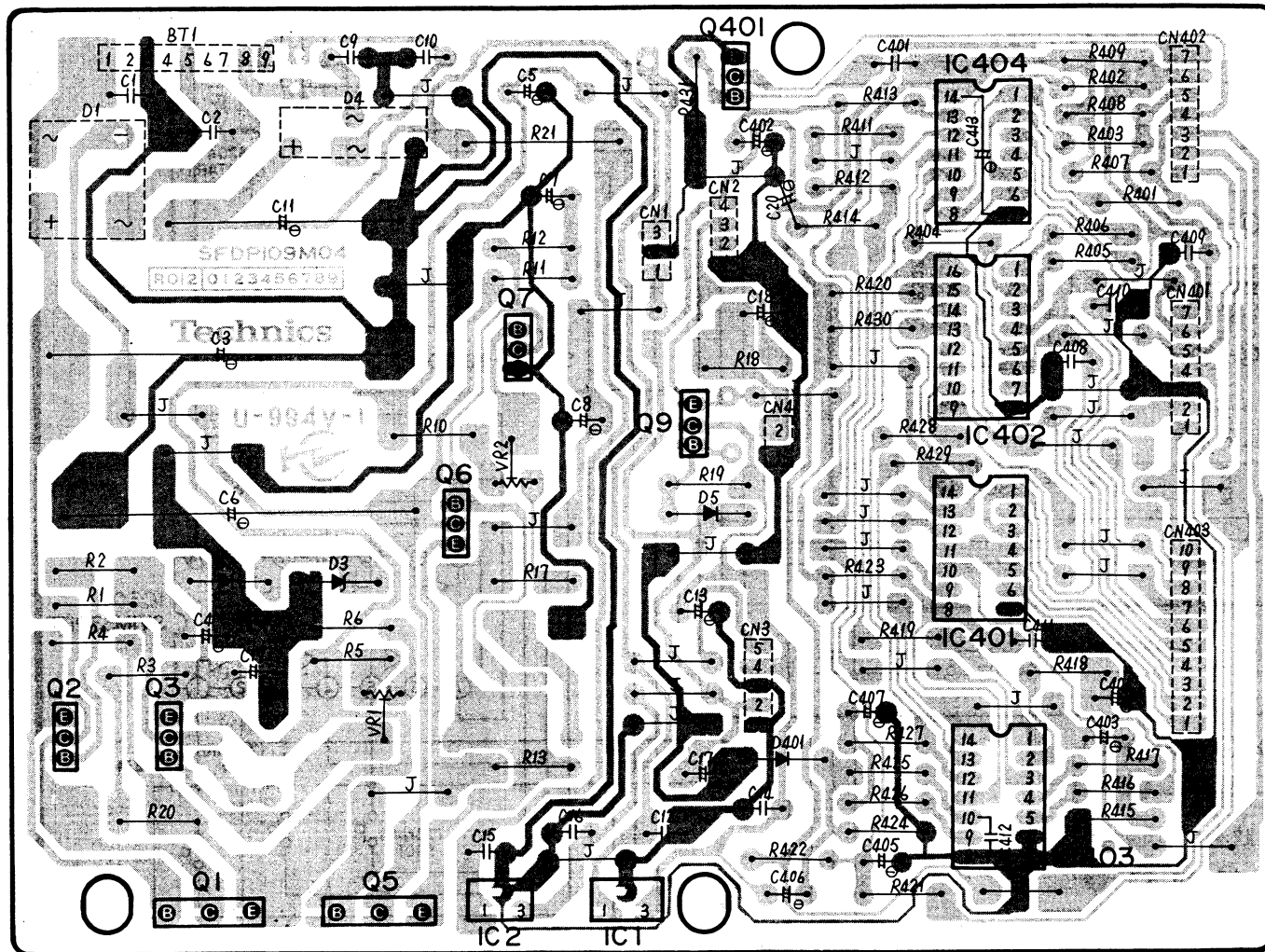
- The voltage value and waveform are the standard values of this measured by DC electronic voltmeter (high impedance) and oscilloscope on the basis of chassis. Therefore, the voltage value and waveform may include some error due to the internal impedance of the tester or the measuring set.  
 \* Those in ( ) are voltage in stop.  
 \* Those in [ ] are voltage in rotation.
- Positive voltage lines.
- Important safety notice: Components identifier by  $\Delta$  make have special characteristics important for safety. When replacing any of these components, use only manufacturer's specified parts.

PRINTED CIRCUIT BOARD

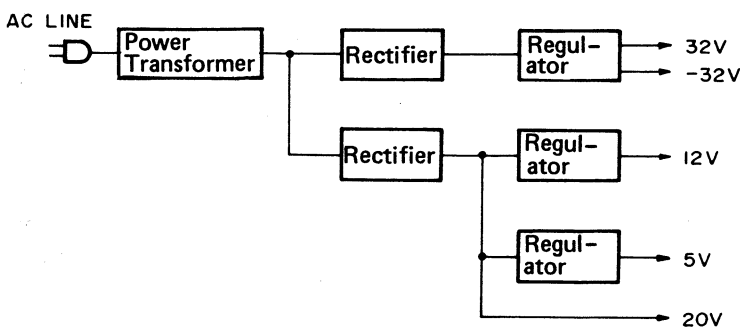
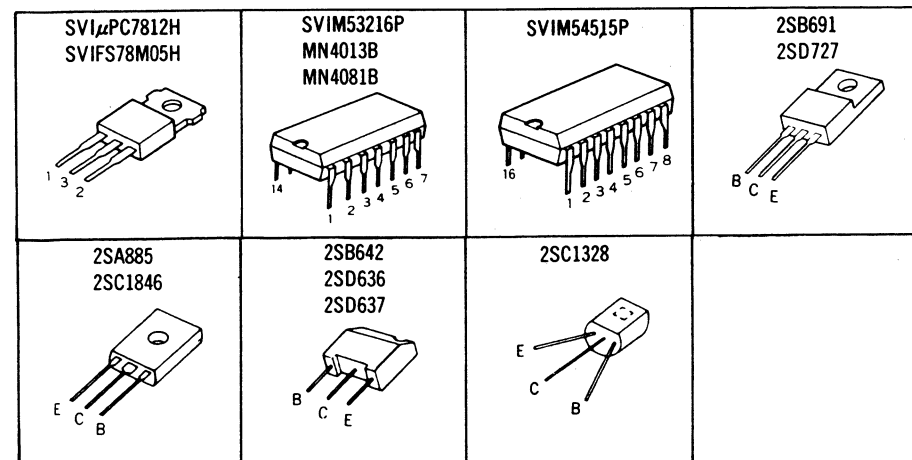
Ground (Earth) lines

Block diagram of constant voltage and operation circuit

Constant voltage and operation circuit



Terminal guide of IC and transistors



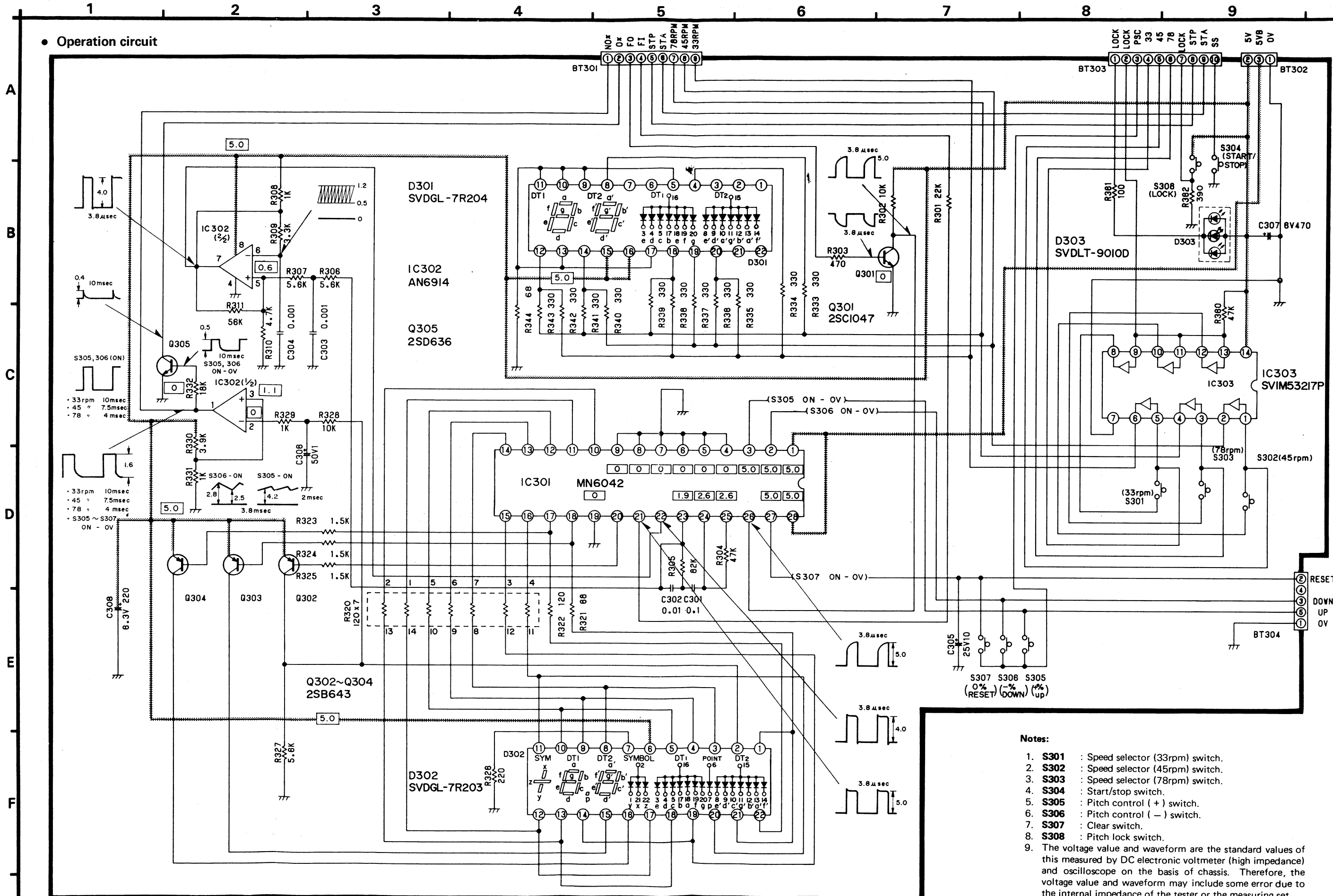
Reference voltage at each IC pin

IC404 MN4081B				
No	STOP	33rpm	45rpm	78rpm
1	4.0	4.0	0.3	4.0
2	0.3	0.3	4.0	4.0
3	0	0	0	5.0
4	0	0	5.0	0
5	0.3	0.3	4.0	4.0
6	4.0	4.0	4.0	0.3
7	0	0	0	0
8	4.0	4.0	0.3	4.0
9	4.0	4.0	4.0	0.3
10	5.0	5.0	0	0
11	0	0	0	0
12	0.1	0.1	0.1	0.1
13	5.0	5.0	5.0	5.0
14	5.0	5.0	5.0	5.0

IC402 SVIM54515P				
No	STOP	33rpm	45rpm	78rpm
1	0	0	0	0.8
2	4.0	4.0	4.0	0.3
3	0	0	0.8	0
4	4.0	4.0	0.3	4.0
5	0	0.8	0	0
6	4.0	0.3	4.0	4.0
7	0	0	0	0
8	0	0	0	0
9	0.2	3.6	3.6	3.6
10	0.8	0	0	0
11	0	0	0	0
12	0	0	0	0
13	3.6	0.2	0.2	0.2
14	0	0.8	0.8	0.8
15	3.2	3.2	3.2	3.2
16	0	0	0	0

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

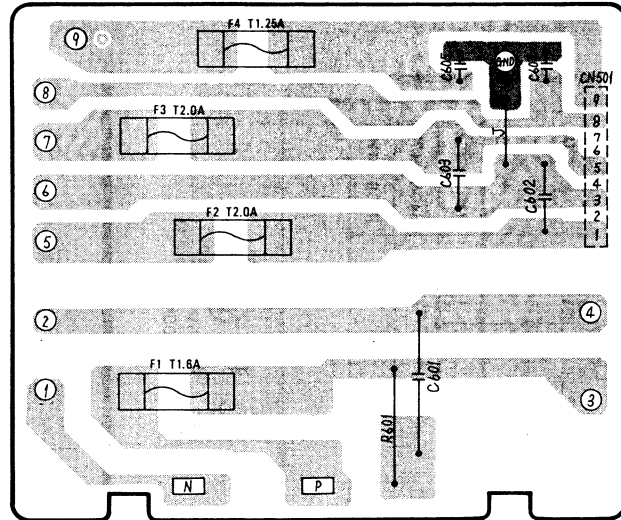
● Operation circuit



- Notes:**
1. **S301** : Speed selector (33rpm) switch.
  2. **S302** : Speed selector (45rpm) switch.
  3. **S303** : Speed selector (78rpm) switch.
  4. **S304** : Start/stop switch.
  5. **S305** : Pitch control (+) switch.
  6. **S306** : Pitch control (-) switch.
  7. **S307** : Clear switch.
  8. **S308** : Pitch lock switch.
  9. The voltage value and waveform are the standard values of this measured by DC electronic voltmeter (high impedance) and oscilloscope on the basis of chassis. Therefore, the voltage value and waveform may include some error due to the internal impedance of the tester or the measuring set.
  10. Positive voltage lines.



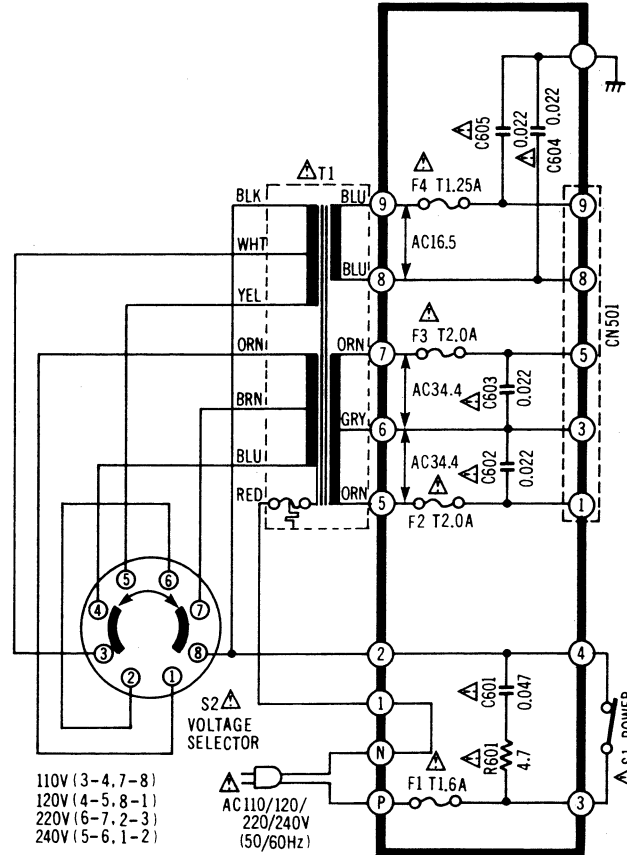
- Power fuse
- Ground (Earth) lines



**Note:**

1. S1 : Power switch in "on" position.
2. S2 : Voltage selector switch in "110V" position.
3. Important safety notice:  
Components identifier by  $\Delta$  make have special characteristics important for safety.  
When replacing any of these components, use only manufacturer's specified parts.

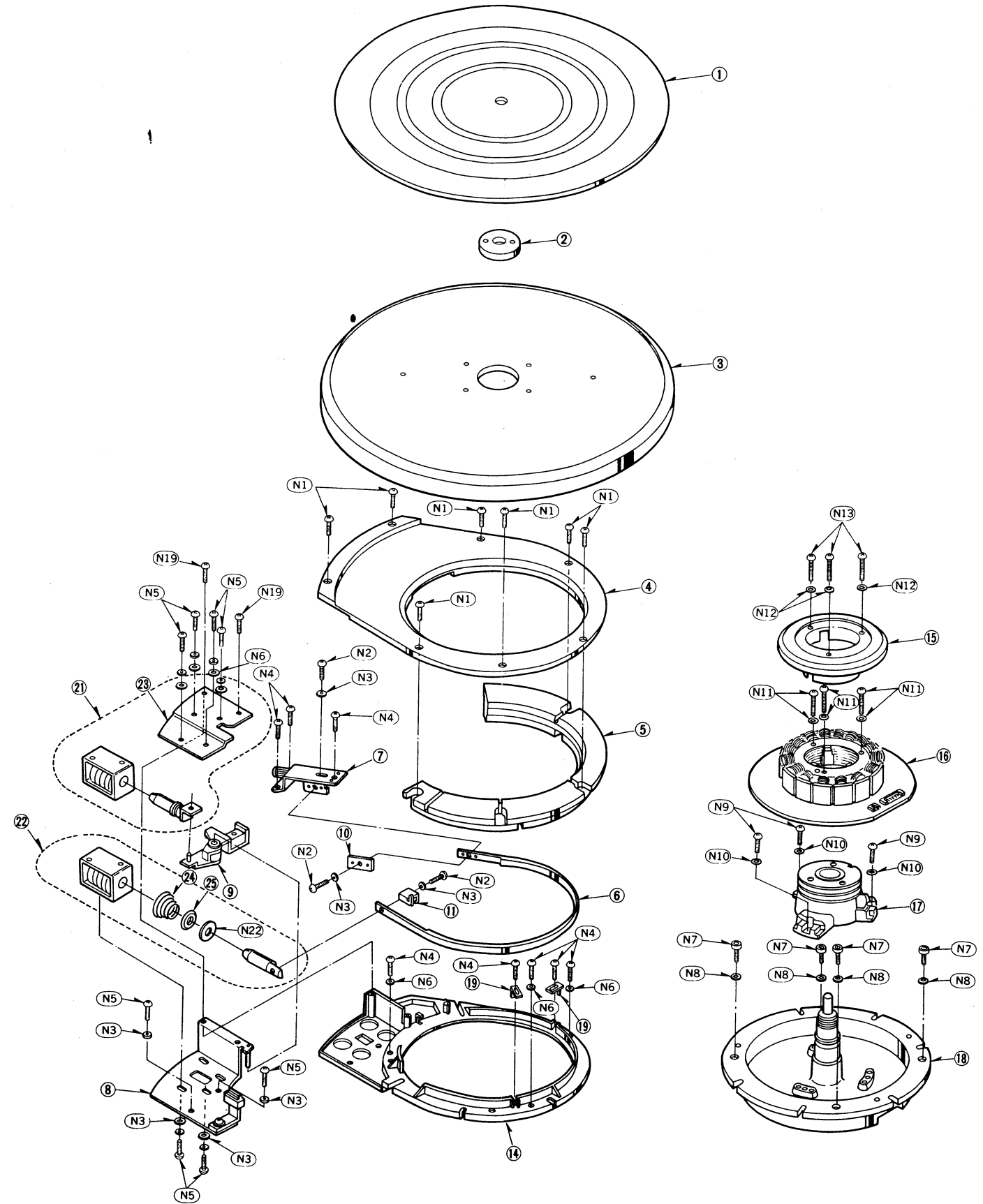
- Power supply circuit



110V (3-4, 7-8)  
120V (4-5, 8-1)  
220V (6-7, 2-3)  
240V (5-6, 1-2)

■ EXPLODED VIEWS

- Turntable platter and motor

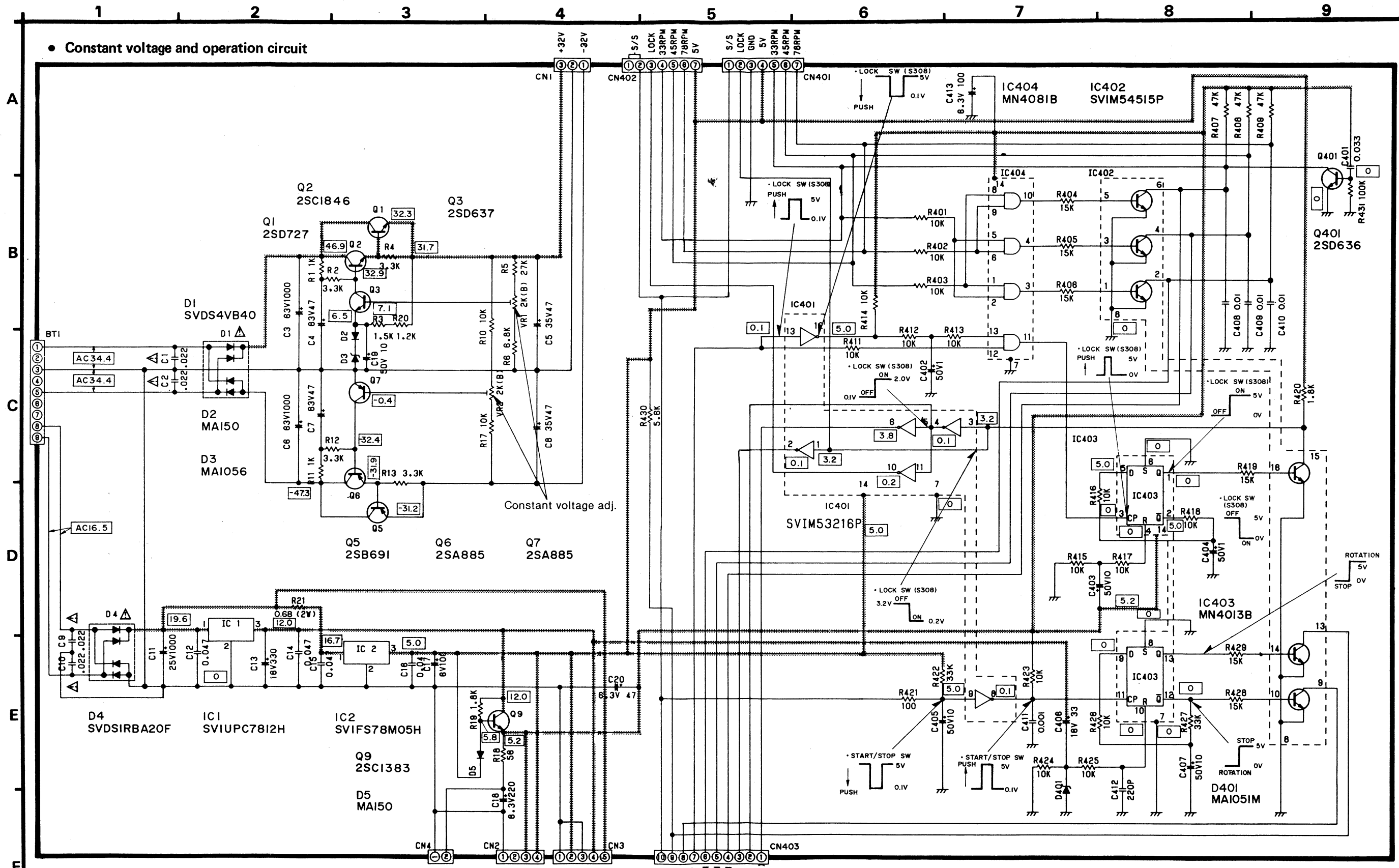


■ REPLACEMENT PARTS LIST...Electric Parts

- Notes:**
1. Part numbers are indicated on most mechanical parts. Please use this part number for parts orders.
  2. Important safety notice:  
Components identified by  $\Delta$  mark have special characteristics important for safety.  
When replacing any of these components, use only manufacturer's specified parts.
  3. Bracketed indications in Ref. No. columns specify the area. Parts without these indications can be used for all areas.
  4. The "S" mark is service standard parts and may differ from production parts.

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
<b>INTEGRATED CIRCUITS</b>			Q113	2SD636	Voltage Shift	D501, 502	SVDRM1Z	Switching
IC1, 105	SVIUPC7812H	Regulator	Q114	2SB641	Voltage Shift	D503 ~ 505	SVDEBR3402S	Speed Indicator
IC2, 106	SVIFS78M05H	Regulator	Q115 ~ 117	2SD636	Runaway Prevent	D506 ~ 510	SVDEAA5505S	Strobe Indicator
IC101	AN640G	Turntable Drive	Q118	2SB641	Runaway Prevent	D511 ~ 515	SVDEPY5505S	Strobe Indicator
IC102	SVIM54516P	Inverter	Q119	2SD636	Runaway Prevent	<b>SWITCHES</b>		
IC103, 104, 107	AN6562	Operation Amp.	Q201	2SC1047-D	Buffer	S1	$\Delta$ ESB90619S	Power
IC201, 202	DN860	Control	Q202, 204	2SD636	Strobe Drive	S2	$\Delta$ ESE37200	Voltage Selector
IC203	AN660	Control	Q203, 205	2SD638	Strobe Drive	S301 ~ 303	EVQQR02K	Speed Selector
IC204	AN6552F	FG Amplifier	Q206 ~ 208	2SD636	Switching	S304	SFSS01	Start/Stop
IC205	SVIM53217P	Relay Drive	Q251, 252	2SD636	Brake Timer	S305 ~ 308	EVQQR02K	(Control Unit)
IC206	SVITA78L009	Regulator	Q253, 254	2SD638	Solenoid Drive	S501 ~ 503	EVQQR02K	Pitch Control
IC301	MN6042	Synthesizer/Pitch Control	Q255	$\Delta$ 2SC1383Q	Solenoid Drive	S504	SFSS01	Start/Stop
IC302	AN6914	Control	Q260	2SC1846	Regulator	<b>VARIABLE RESISTORS</b>		
IC303	SVIM53217P	Strobe Drive	Q301	2SC1047-D	Regulator	VR1, 2	EVMH1GA00B23	Constant Voltage
IC401	SVIM53216P	Speed Selector	Q302 ~ 304	2SD643	Buffer	VR101, 102	EVMJ1GA01B23	Adj., 2k $\Omega$ (B)
IC402	SVIM54515P	Inverter	Q305, 401	2SD636	Pitch Indicator Drive	VR201, 206	EVMJ1GA01B24	Offset Voltage and Middle Voltage Adj., 2k $\Omega$ (B)
IC403	MN4013B	D-Type Fli-Flop	Q501 ~ 503	2SD636	Speed Indicator Drive	VR202	EVMJ1GA01B54	VS Voltage and RS Current Adj., 20k $\Omega$ (B)
IC404	MN4081B	2-Input AND Gate				VR203 ~ 205	EVMJ1GA01B14	Brake Adj., 50k $\Omega$ (B)
<b>TRANSISTORS</b>			<b>DIODES</b>					
Q1	2SD727	Regulator	D1	$\Delta$ SVDS4VB40	Rectifier			
Q2	2SC1846	Regulator	D2, 5	S MA162A	Rectifier			
Q3	2SD637	Regulator	D3	S MA1056	5.6V Zener			
Q5	2SB691	Regulator	D4	$\Delta$ SVDS1RBA20F	Rectifier			
Q6	2SA885	Regulator	D101, 103, 104	S MA162A	Rectifier			
Q7	2SA886	Regulator	201 ~ 205	S RVDRD12FB	12V Zener			
Q9	$\Delta$ 2SC1383Q	Regulator	D207	S MA162A	Rectifier			
Q101 ~ 103	2SB761A	Driver	D251	S MA162A	Rectifier			
Q104 ~ 106	2SD856A	Driver	D301	SVDGL-7R204	Speed Indicator			
Q107 ~ 109	2SC1846	Buffer	D302	SVDGL-7R203	Pitch Indicator			
Q110 ~ 112	2SA885	Buffer	D303	SVDLT9010D	Pitch Lock Indicator			
			D401	MA1051A	5.1V Zener			

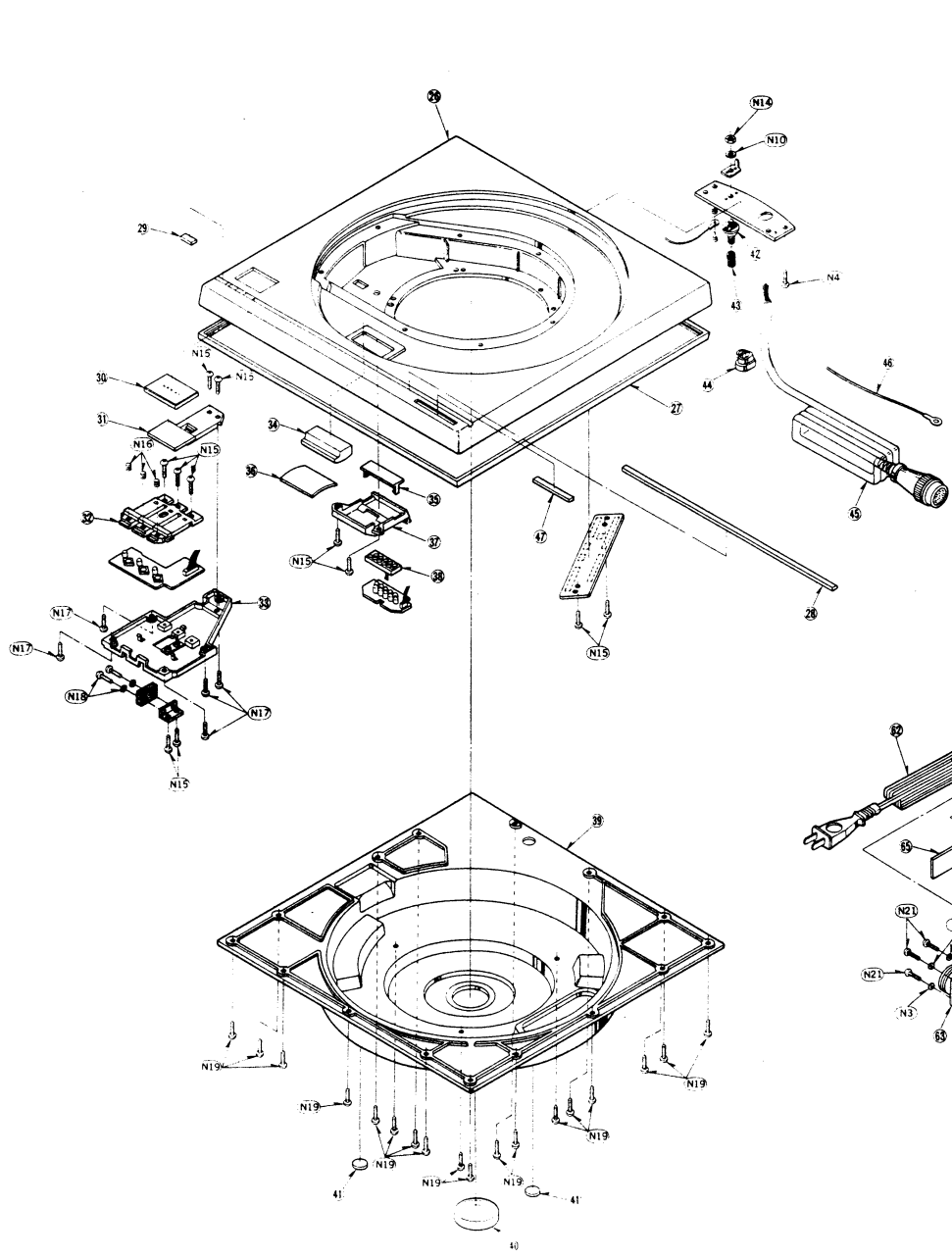
SCHEMATIC DIAGRAM (This schematic diagram may be modified at any time with the development of new technology.)



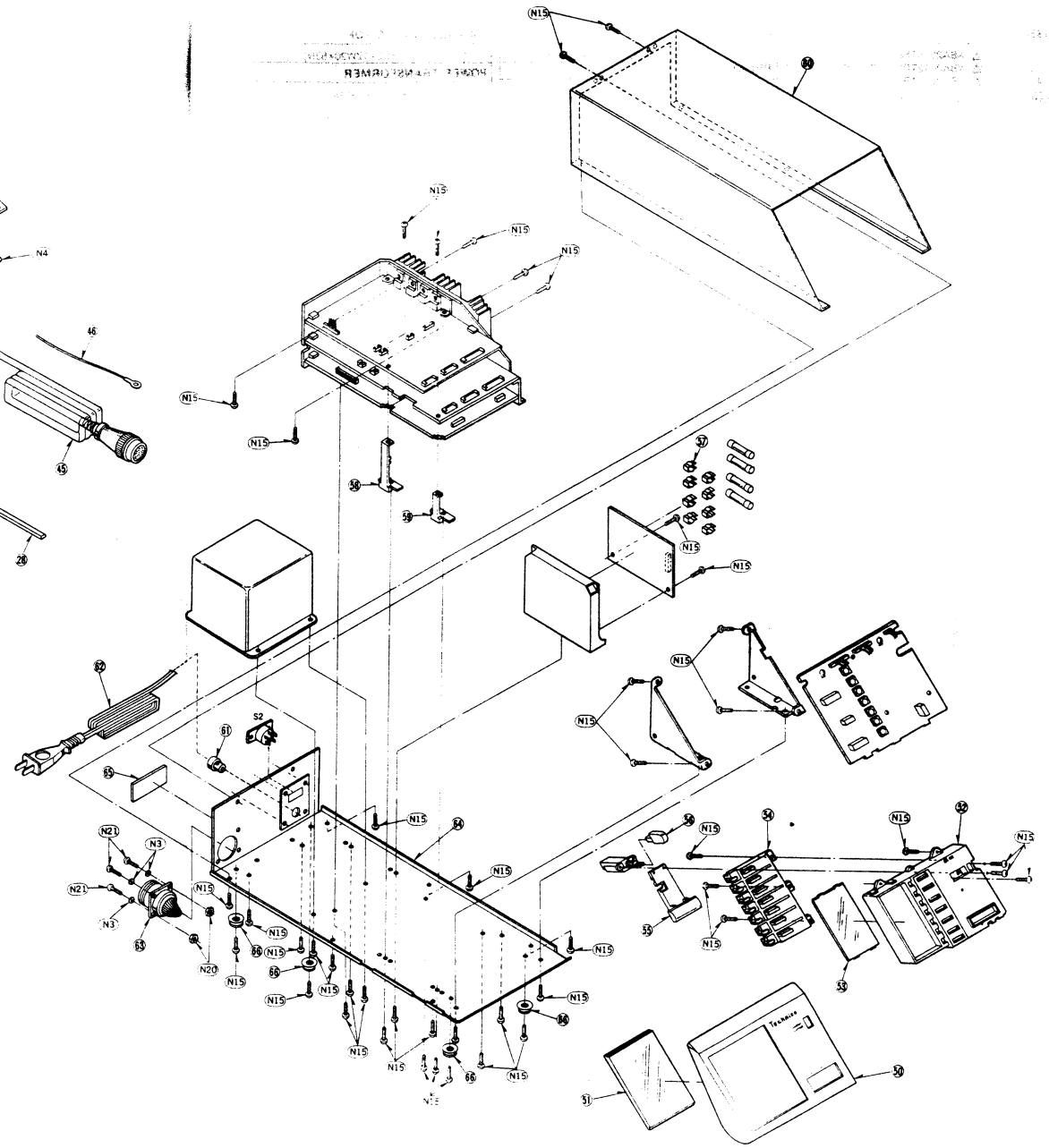
**Notes:**

- The voltage value and waveform are the standard values of this measured by DC electronic voltmeter (high impedance) and oscilloscope on the basis of chassis. Therefore, the voltage value and waveform may include some error due to the internal impedance of the tester or the measuring set.
  - \* Those in ( ) are voltage in stop.
  - \* Those in [ ] are voltage in rotation.
- ..... positive voltage lines.
- Important safety notice: Components identifier by  $\Delta$  make have special characteristics important for safety. When replacing any of these components, use only manufacturer's specified parts.

• Cabinet



• Control unit



Continued from page 35

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
<b>FUSES</b>			<b>CRYSTAL</b>			<b>VARIABLE CAPACITOR</b>		
11	Δ XBA2C10T1R0	T 1.6A	12	SVQ0306115	419320110	13	ECV12W20X53N	
12	Δ XBA2C12T1R0	T 1.25A	<b>RELAY</b>			<b>POWER TRANSFORMER</b>		
13, 4	Δ XBA2C20T1R0	T 2.0A	RL201 ~ 203	SFDYC10-01		T1	Δ SLT85HE14E	Power Source
<b>COMPONENT COMBINATION</b>			<b>THYRISTOR</b>					
R320	EXBRB7121M	120Ω x 7	SCR101	SVTTT201-110				

**REPLACEMENT PARTS LIST... Cabinet and Chassis Parts**

- Notes:**
- Part numbers are indicated on most mechanical parts. Please use this part number for parts orders.
  - Important safety notice. Components identified by Δ mark have special characteristics important for safety. When replacing any of these components, use only manufacturer's specified parts.
  - Bracketed indications in Ref. No. columns specify the area. Parts without these indications can be used for all areas.
  - The "S" mark is service standard parts and may differ from production parts.
  - The parenthetical numbers in the columns of description stand for the quantity per set.

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
<b>CABINET and CHASSIS PARTS</b>			<b>Control Unit Section</b>		
<b>• Turntable and Motor Section</b>			50	SFAC109N03	Panel, Front (1)
1	SFTG109N01	Turntable Motor (1)	51	SFAM109N17	Glass, Front Panel (1)
2	SFTM109N01	Ring, Turntable (1)	52	SFJM109N15	Frame, Control Section (1)
3	SFTS109N01A	Submotor (1)	53	SFUM109N19	Filter, Control Section (1)
4	SFLM109N06	Cover, Cabinet Panel (1)	54	SFUM109N19E	Button, Control (1)
5	SFGH109N01	Cushion Rubber (1)	55	SFUM109N20E	Button, Start, Stop (1)
6	SFLP109N05E	Jacquet Panel (1)	56	SFKT109N05	Button, Power Switch (1)
7	SFLP109N06E	Brake Belt Ass'y (1)	57	SJT347	Terminal, Fuse (8)
8	SFLP109N06E	Rack, Support (1)	58	SFUM109N21	Shaft, Support (2)
9	SFLP109N03E	Plate, Solenoid (1)	59	SFUM109N22	Shaft, Support (2)
10	SFLM109N13E	Lever Ass'y, Brake (1)	60	SFUP10914E	Cabinet (1)
11	SFLP109N08	Bracket, Brake Belt (1)	61 [EK] Δ	SJA139	AC Cord (1)
12	SFLP109N16	Plate, Brake Belt (1)	61 [KLI] Δ	SJAG23	AC Cord (1)
13	SFLM109N12	Case, Brake Belt (1)	61 [Other] Δ	SJA137	AC Cord (1)
14	SFLM109N06	Cover, Stator Coil (1)	<b>62 [EK]</b> SFSR5N-4 Bushing, AC Cord (1)		
15	SFGP109N11A	Motor Coil Ass'y (1)	<b>62 [Other Areas]</b> SFSR4N-4 Bushing, AC Cord (1)		
16	SFMG109N01A	FG Base Ass'y (1)	63	SFDJ109N04E	Socket, (24P) (1)
17	SFMJ109N02A	Turntable Shaft Ass'y (1)	64	SFUP109N01	Bottom Cover (1)
18	SFLP109N15	Plate, Belt Control (1)	<b>65 [E, EC]</b> SFNN109S01 Name Plate (1)		
19	SFDQ109N02E	Solenoid Ass'y (1)	<b>65 [EK, XLI]</b> SFNN109G01 Name Plate (1)		
20	SFDQ109N03E	Solenoid Ass'y (1)	<b>65 [XA, XM]</b> SFNN109X01 Name Plate (1)		
21	SFLP109N19	Plate, Solenoid Ass'y (1)	<b>65 [Other Areas]</b> SFNN109R01 Name Plate (1)		
22	SFDQ109N02	Spring, Solenoid (1)	66	SKL261	Foot, Set (6)
23	SFGH109N03	Rubber, Solenoid (1)	<b>SCREWS, WASHERS AND NUTS</b>		
<b>• Main Cabinet Section</b>			N1	S XTN3+10BFZ	Screw, φ 3 x 10 (5)
24	SFAJ109N01	Cabinet (1)	N2	S XSN3+6S	Screw, φ 3 x 6 (2)
25	SFGR109N02	Speaker, Cabinet (1)	N3	S XWA3B	Washer, φ 3 (6)
26	SFLM109N01	Ornament Plate (1)	N4	S XTV3+8BFN	Screw, φ 3 x 8 (9)
27	SFLM109N02	Ornament Plate (1)	N5	S XSN3+5S	Screw, φ 3 x 5 (8)
28	SFKT109N01	Ornament, Start, Stop Button (1)	N6	S XWE3	Washer, φ 3 (7)
29	SFLM109N06E	Button, Start, Stop (1)	N7	KVE4A12FN	Screw, φ 4 x 12 (4)
30	SFLM109N09E	Button, Speed Selector (1)	N8	S XWA4B	Washer, φ 4 (4)
31	SFLM109N07	Guide, Start, Stop Button (1)	N9	S XSN4+10S	Screw, φ 4 x 10 (3)
32	SFLM109N03	Cover, Stripe (1)	N10	S XWA4B	Washer, φ 4 (3)
33	SFLP109N22	Filter, Stripe (1)	N11	KXN3+C10S	Screw, φ 3 x 40 (2)
34	SFLM109N01	Speaker, Stripe Case (1)	N12	SFX0109N01	Washer, φ 3 (2)
35	SFLM109N04	Case, Stripe (1)	N13	SXSB3+35FZS	Screw, φ 3 x 35 (3)
36	SFLM109N05	Speaker, Stripe (1)	N14	S XNG4ES	Nut, φ 4 (1)
37	SFLM109N01	Cover, Buttons (1)	N15	S XTV3+8BFZ	Screw, φ 3 x 8 (39)
38	SFLM109N01	Supplemental Cover (1)	N16	KXE26D5FP	Screw (3)
39	SFLM109N08	Foot, Bottom Cover (1)	N17	S XTN3+8BFZ	Screw, φ 3 x 8 (5)
40	SNEZ118	Terminal, Ground (8)	N18	KXN23+C10	Screw, φ 2.3 x 10 (2)
41	SNEZ13-1	Knob, Ground Terminal (1)	N19	KXN3+10TFZ	Screw, φ 3 x 10 (29)
42	SFGR1P-2	Bushing, AC Cord (1)	N20	S XN03ES	Nut, φ 3 (4)
43	SFEZ109N01A	DC Cord (1)	N21	SXN04S	Screw, φ 3 x 3 (4)
44	SFEZ109N04E	Ground Wire (1)			
45	SFLB109N01	Base, Terminal (1)			