

194

SERVICE MANUAL

STEREO TURNTABLE

SANSUI SR-929



SANSUI ELECTRIC CO., LTD.

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This service manual is designed for service engineers to repair, adjust, maintain and order the replacement parts of the SR-929 correctly. When ordering the parts, use the stock number and parts name specifically referring to the Parts Locations & Parts Lists. For general usage and maintenance of the unit, please refer to the Operating Instructions attached with the unit.

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1. SPECIFICATIONS

TYPE Two-speed direct-driven
SPEEDS 33-1/3, 45 rpm
FINE SPEED ADJUSTMENT
RANGE $\pm 3.5\%$
PLATTER Aluminum alloy die-cast
302 mm (11-15/16") diameter,
1.4 kg (3.1 lbs)
MOTOR 20-pole brushless DC servo-
type (Quartz-servo)
WOW AND FLUTTER ... less than 0.028% (W.R.M.S)
S/N better than 66dB (IEC-B)
RUMBLE better than 74dB (DIN-B)
TONEARM Statically-balanced
S-shaped tubular type
TONEARM LENGTH 240 mm (9-1/2")
OVERHANG 15.6 mm (5/8")
WEIGHT 2 to 11 g (11 to 21 g using
sub-weight)
DIMENSIONS 490 mm (19-15/16") W
173 mm (6-7/18") H
381 mm (15") D
WEIGHT 16.5 kg (36.4 lbs) net
18.5 kg (40.8 lbs) packed
POWER CONSUMPTION.. .8W (rated)
CARTRIDGE SV-27A Not Included in the
unit sold in U.S.A, Canada &
Europe.
STYLUS..... 0.5 mil, diamond spherical
(SN-27)
TYPE Moving magnet type
FREQUENCY RESPONSE .. 10 Hz to 23 kHz
OUTPUT VOLTAGE 3.5 mV per channel
(1,000 Hz, 50 mm/sec)
LOAD IMPEDANCE 47 kg
TRACKING FORCE..... 1.5 to 2.0 g

* Design and specifications subject to change without notice for improvements.

2. PARTS LOCATION AND PARTS LISTS

AS to U.L., C.S.A., B.S., EU and ※ marked in the Parts Lists, note the followings:

U.L., C.S.AParts used in the unit which is applicable to the U.S. and Canada under industrial standards.

B.S.Parts used in the unit which is applicable to British under industrial standards.

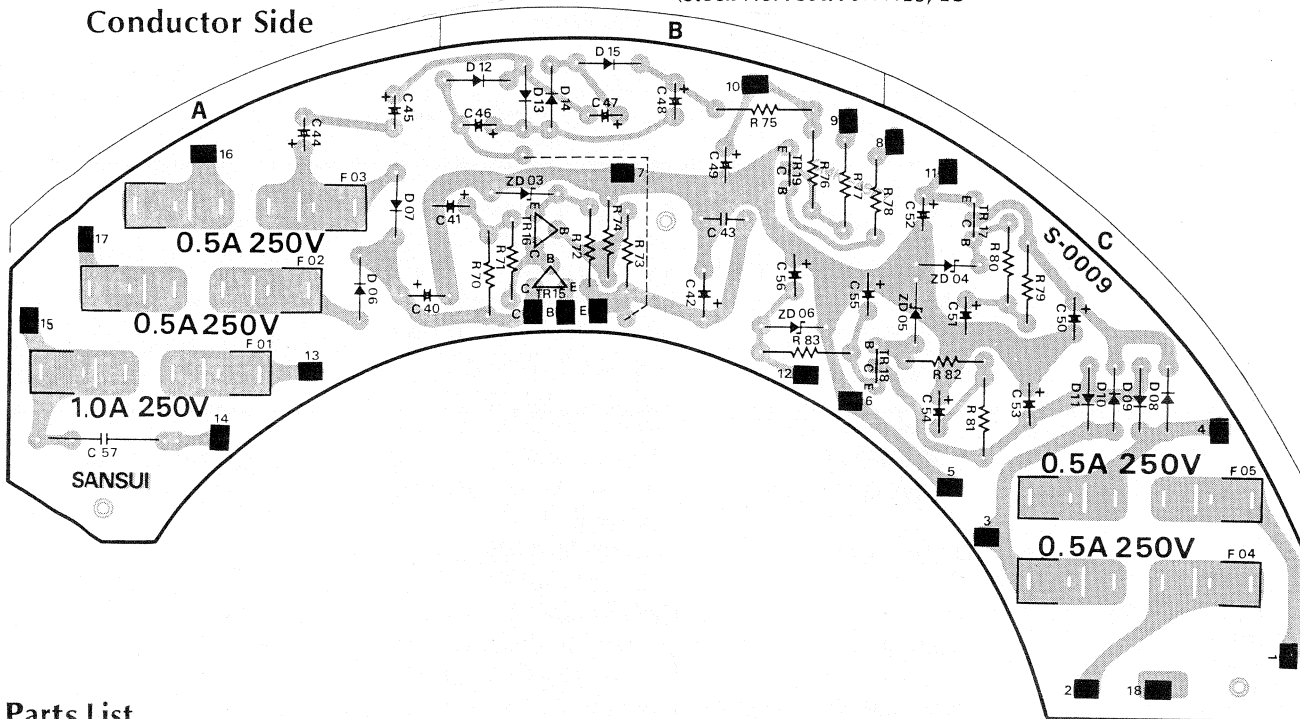
E.U.Parts used in the unit which is applicable to Sweden, Denmark, Norway, Finland, West Germany, and Switzerland under industrial standards.

※Parts used in the unit which is applicable to other countries excepting mentioned above.

2-1. S-0009 Power Supply Circuit Board

{ Stock No. 7501750※
 { Stock No. 7501760UL, C.S.A
 { Stock No. 7501770BS, EU

Conductor Side



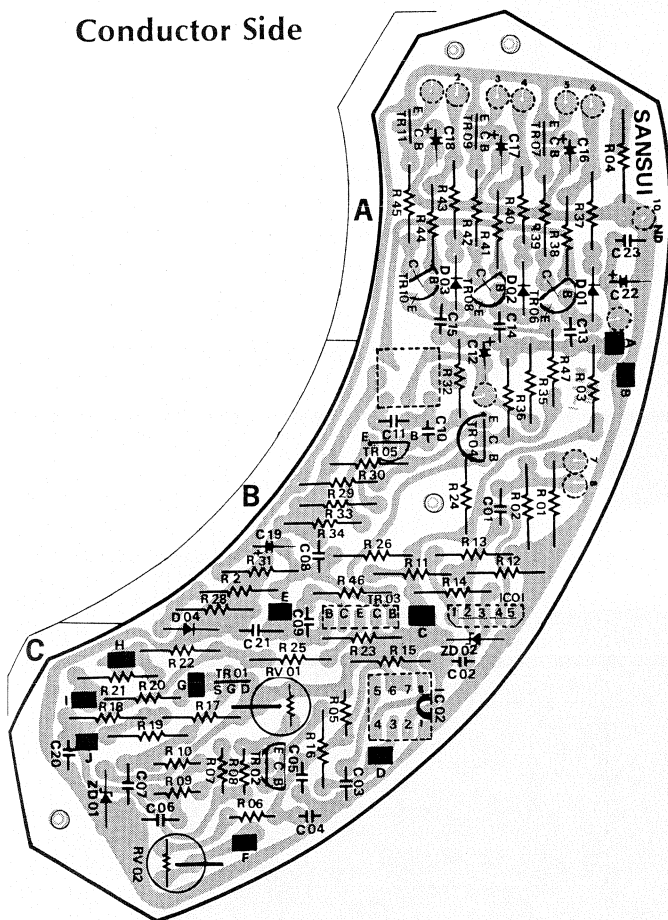
Parts List

Parts No.	Stock No.	Description	Position
TR15	0305951	2SC945	B
TR16	0306070	2SC1313	B
TR17	0305951	2SC945	C
TR18	0300510	2SA733	B
TR19	0306520	2SC1439	B
D06-11	0310340	10D1	A, C
D12-15	0310350	10D2	B
ZD03	0316630	RD5.1E, Zener Diode	B
ZD04	0315770	EQA01-06S, Zener Diode	C
ZD05	0315810	EQA01-07S, Zener Diode	C
ZD06	0316630	RD5.1E Zener Diode	B
C40	0515471	470µF 50V	A, B
C41	0515470	47µF 50V	B
C42	0513471	470µF 25V	B
C43	0656473	0.047µF 25V	B
C44	0518100	10µF 160V	A
C45	0518100	10µF 160V	A
C46	0518479	4.7µF 160V	B
C47	0518479	4.7µF 160V	B
C48	0518479	4.7µF 160V	B
C49	0518100	10µF 160V	B
C50	0512221	220µF 16V	C
C51	0511470	47µF 10V	C
C52	0511221	220µF 10V	C
C53	0512221	220µF 16V	C
C54	0511470	47µF 10V	C
C55	0511221	220µF 10V	B
C56	0511470	47µF 10V	B

Parts No.	Stock No.	Description	Position
C57	{ 0605227 0635227 0598227	{ 0.022µF 250V M.C.※ 0.022µF 125V M.C.UL, C.S.A 0.022µF 250V MP.C.BS, EU	A
R70	0107561	560Ω	B
R71	0107332	3.3kΩ	B
R72	0107152	1.5kΩ	B
R73	0107222	2.2kΩ	B
R74	0107102	1kΩ	B
R75	0103122	1.2kΩ	B
R76	0107564	560kΩ	B
R77	0103472	4.7kΩ	B
R78	0107223	22kΩ	B
R79	0107391	390Ω	C
R80	0107561	560Ω	C
R81	0107221	220Ω	C
R82	0107271	270Ω	C
R83	0103820	82Ω	B
F01	{ 0432220 0435090	{ 1A, 250V※, UL, C.S.A 0.8A, 250VBS, EU	A
F02	{ 0432210 0435070	{ 0.5A, 250VUL, C.S.A 0.5A, 250VBS, EU	A
F03	{ 0432210 0435070	{ 0.5A, 250V※, UL, C.S.A 0.5A, 250VBS, EU	A
F04	{ 0432210 0435070	{ 0.5A, 250V※, UL, C.S.A 0.5A, 250VBS, EU	C
F05	{ 0432210 0435070	{ 0.5A, 250V※, UL, C.S.A 0.5A, 250VBS, EU	C

2-2. Control Circuit Board (Stock No. 7502170)

Conductor Side



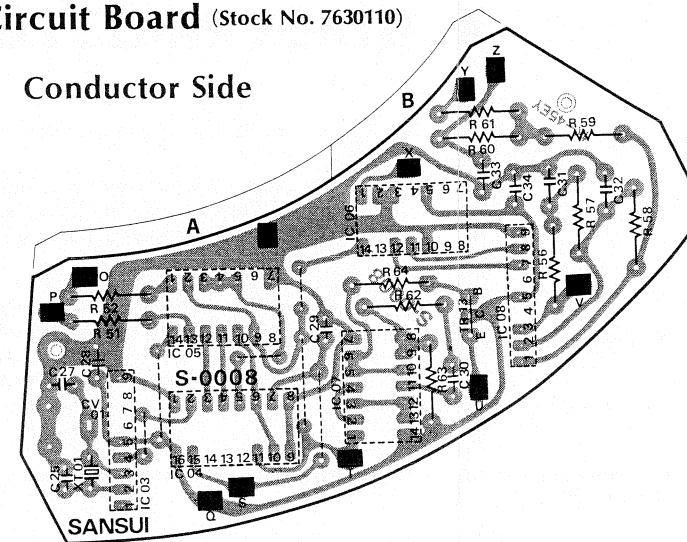
Parts List

Parts No.	Stock No.	Description	Position
TR01	0370102	2SK68L, FET	C
TR02	0300680	2SA733 (P, Q) Transistor	C
TR03	0360381	2SC1583 Dual Transistor	B
TR04	0305952	2SC945 (P, K) Transistor	B
TR05	0305952	2SC945 (P, K) Transistor	B
TR06	0300680	2SA733 (P, Q) Transistor	A
TR07	0308590	2SD471 Transistor	A
TR08	0300680	2SA733 (P, Q) Transistor	A
TR09	0308590	2SD471 Transistor	A
TR10	0300680	2SA733 (P, Q) Transistor	A
TR11	0308590	2SD471 Transistor	A
IC01	0360490	M51201 (L) IC	B, C
IC02	0360500	M51841 (P) IC	C
ZD01	0316630	RD5.1E, Zener Diode	C
D01-03	0311050	1S953, Silicon Diode	A
R01	0107272	2.7kΩ 1/4W C.R.	B
R02	0210122	1.2kΩ 1/2W M.R.	B
R03	0210681	680Ω	B
R04	0210229	2.2Ω	A
R05	0231104	100kΩ	C
R06	0231274	270kΩ 1/2W M.R.	C
R07	0231822	8.2kΩ	C
R08	0231682	6.8kΩ	C
R09	0231154	150kΩ	C

Parts No.	Stock No.	Description	Position
R10	0231154	150kΩ 1/2W C.R.	C
R11	0107184	180kΩ	B
R12	0107223	22kΩ	B
R13	0107821	820Ω	B
R14	0107472	4.7kΩ	B
R15	0107273	27kΩ	C
R16	0107223	22kΩ	C
R17	0107104	100kΩ	C
R18	0107823	82kΩ	C
R19	0107105	1MΩ	C
R20	0107820	82Ω	C
R21	0107151	150Ω	C
R22	0107472	4.7kΩ	C
R23	0107104	100kΩ	C
R24	0107103	10kΩ	B
R25	0107272	2.7kΩ	C
R26	0107183	18kΩ	B
R27	0107152	1.5kΩ	B
R28	0107821	820Ω	B
R29	0107820	82Ω 1/4W C.R.	B
R30	0107820	82Ω	B
R31	0107223	22kΩ	B
R32	0107823	82kΩ	B
R33	0107683	68kΩ	B
R34	0107121	120Ω	B
R35	0107471	470Ω	B
R36	0107152	1.5kΩ	B
R37	0107561	560Ω	A
R38	0107561	560Ω	A
R39	0107330	33Ω	A
R40	0107561	560Ω	A
R41	0107561	560Ω	A
R42	0107330	33Ω	A
R43	0107561	560Ω	A
R44	0107561	560Ω	A
R45	0107330	33Ω	A
R46	0107100	10Ω	A, B
R47	0107100	10Ω	A, B
RV01	1034210	1kΩ Semi-Variable resistor	C
RV02	1034310	47kΩ(B) Semi-Variable resistor	C
C01	0600477	0.047μF	B
C02	0600106	0.001μF	C
C03	0600107	0.01μF	C
C04	0600686	0.0068μF	C
C05	0600687	0.001μF	C
C06	0600687	0.068μF	C
C07	0600687	0.068μF	C
C08	0600477	0.047μF	B
C09	0656223	0.022μF 25V C.C.	B, C
C10	0600226	0.0022μF	B
C11	0600107	0.01μF	B
C12	0515109	1μF 50V E.C.	B
C13	0657472	0.0047μF	A, B
C14	0657471	0.0047μF	A, B
C15	0657472	0.0047μF	A
C16	0515229	2.2μF	A
C17	0515229	2.2μF	A
C18	0515229	2.2μF	A
C19	0519103	0.17μF	B
C20	0656223	0.022μF 25V C.C.	C
C21	0515229	2.2μF 50V E.C.	C
C22	0513330	33μF 25V E.C.	A
C23	0656223	0.022μF 25V C.C.	A
C24	0513100	10μF 25V E.C.	A

2-3. S-0008 PLL Circuit Board (Stock No. 7630110)

Conductor Side

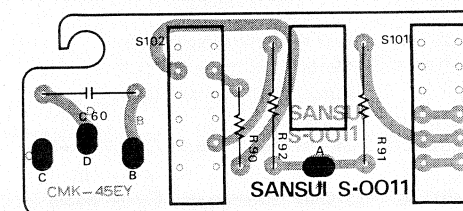


Parts List

Parts No.	Stock No.	Description	Position	Parts No.	Stock No.	Description	Position
TR13	0305951	2SC945	B	C31	0601687	0.068μF	B
IC03	0360470	TC5082P	A	C32	0601687	0.068μF 50V M.C.	B
IC04	0360440	MSM4520	A	C33	0513479	4.7μF 25V E.C.	B
	0360450	TC4520P		C34	0657103	0.01μF 25V C.C.	B
IC05	0360420	MSM4082	A	C35	0657470	47pF 50V C.C.	B
	0360430	TC4082		CV01	1230060	Trimmer Capacitor 20pF	A
IC06	0360480	MSM5538	B	R51	0107101	100Ω	A
	0360400	MSM4011		R52	0107101	100Ω	A
IC07	0360410	TC4011P	B	R56	0107474	470kΩ	B
	0360460	TC5081P		R57	0107474	470kΩ	B
IC08	0360460	TC5081P	B	R58	0107474	470kΩ	B
XT01	0930010	Quartz-element HC-18/U	A	R59	0107822	8.2kΩ 1/4W C.R.	B
C25	0657470	47pF	A	R60	0107273	27kΩ	B
C26	0657560	56pF	A	R61	0107472	4.7kΩ	B
C28	0513479	4.7μF 25V E.C.	A	R62	0107101	100Ω	B
C29	0657102	0.001μF	A	R63	0107393	39kΩ	B
C30	0601477	0.047μF	B	R64	0107223	22kΩ	B
				R65	0107273	27kΩ	B
				R93	0107473	47kΩ	B

2-4. S-0011 Power Supply Circuit Board (Stock No. 7501880...UL, C.S.A, BS / Stock No. 7501890...EU)

Conductor Side



Parts List

Parts No.	Stock No.	Description
R90	0107821	820Ω 1/4W C.R.
R91	0201820	82Ω
R92	0201820	22Ω
C60	0598227	{0.022μF 250V MP.C. BS, EU {Not included in UL & C.S.A model
S101a, 101b, 102c	1131240	Push switch (3-stage)

Abbreviations

C.R. : Carbon Resistor	BP.E.C. : Bi-Polar Electrolytic Capacitor
S.R. : Solid Resistor	C.C. : Ceramic capacitor
Ce.R. : Cement Resistor	Mi.C. : Mica Capacitor
M.R. : Metallized Film Resistor	O.C. : Oil Capacitor
M.C. : Mylar Capacitor	P.C. : Polystyrene Capacitor
E.C. : Electrolytic Capacitor	T.C. : Tantalum Capacitor

3. REPLACEMENT OF MAIN PARTS

3-1. Replacement of Tonearm and Motor

- 3-1-1. Remove Dust Cover Ass'y ①, Rubber Mat ② and Turntable (Platter) from the unit.
- 3-1-2. Unscrew 4 Insulators ③ (Turn them counter-clockwise).
- 3-1-3. Unscrew ④ (2 screws) and take off 2P Output Terminal ⑤.
- 3-1-4. Unscrew ⑥, ⑦ (4 screws) and take off Bracket for voltage selector.
- 3-1-5. Unscrew ⑧ (2 screws) & ⑨ (one screw), then remove Bottom Cover ⑩ for tonearm from the bottom side of motor board.
- 3-1-6. Unscrew ⑪ (one nut) and Tonearm ass'y ⑫ can be easily taken off.
- 3-1-7. Unscrew ⑬ (3 screws), ⑭ (2 screws), & ⑮ (3 screws) and Cabinet Ass'y ⑯ & Cabinet Base can be separated each other.
(During this procedure, be careful not to scratch on the surface of shining particleboard).
- 3-1-8. Unscrew ⑰ (3 screws) and Motor can be removed from the board.

When removing 2P-Output Terminal, unsolder wires at the two metal terminals. When resoldering the wires, refer to wiring sketch ⑰ on page 12.

3-2. Replacement of Power transformer

- 3-2-1. Same as above steps from 3-1-1 to 3-1-7 of Replacement of Tonearm ass'y & Motor aforementioned.
- 3-2-2. Then, unscrew ⑱ (2 screws), one nut ⑲, and Power transformer can be easily off.

3-3. Replacement of Neon Lamp

- 3-3-1. Same as above steps from 3-1-1 to 3-1-7 of Replacement of Tonearm ass'y & motor.
- 3-3-2. Then, unscrew ⑳ (one screw), and Neon Lamp can be pulled out of the holder.

3-4. Replacement of Illuminator

- 3-4-1. Same as above steps from 3-1-1 to 3-1-7 of Replacement of Tonearm ass'y and Motor.
- 3-4-2. Unscrew ㉑ (2 screws), then remove two holders at the both sides. The illuminator can be easily slid out.

4. OTHER PARTS LOCATION AND PARTS LISTS

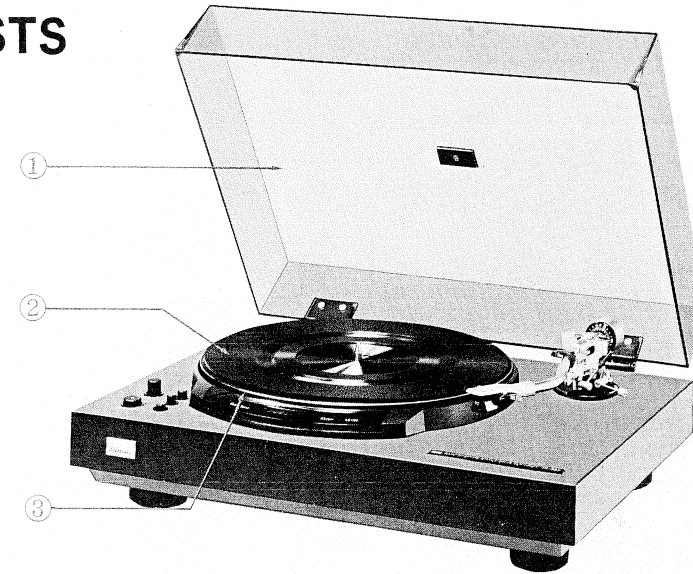
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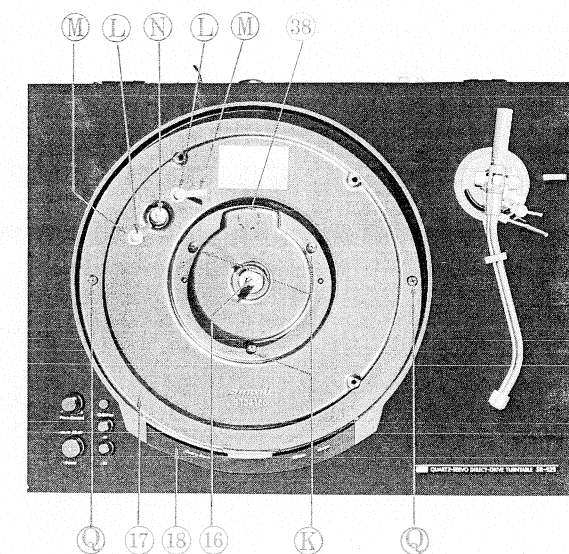
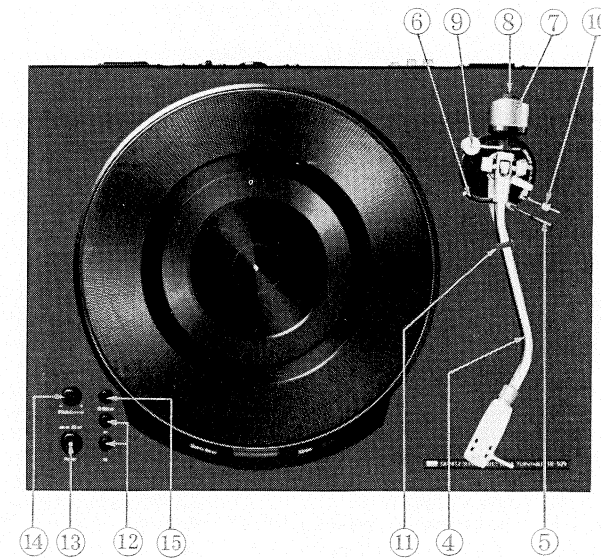
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Parts List

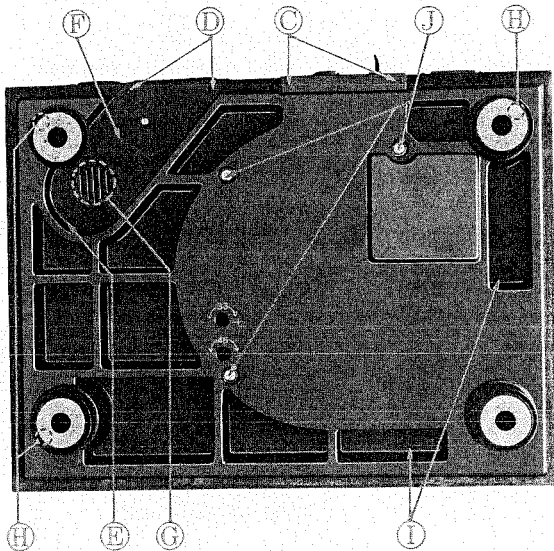
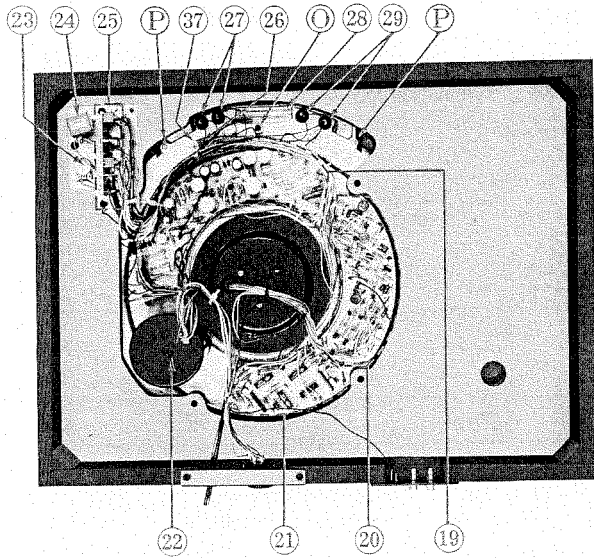
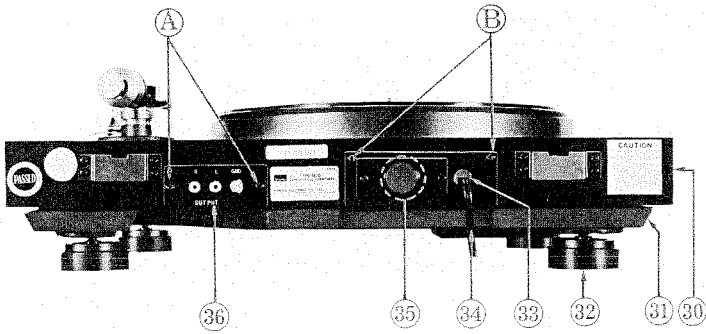
Parts No.	Stock No.	Description
1	7012120	Dust Cover Ass'y
	5362581	Name Plate, cover
	5502021	Rubber Cushion
	6922290	Auto Hinge
	6922320	Plate, auto hinge
	5101163	B Type Screw, M4 × 10
2	5502630	Rubber Mat, turntable
3	6112171	Turntable (Platter)
4	7092520	Tonearm Ass'y
	7082270	Lifter Base
5	7082260	Manual Lifter Ass'y
6	7082180	Lifter Plate
7	6912470	Main Weight
8	6912490	Sub Weight
9	6912480	Lateral Weight
10	6912500	I.F.C Weight
		Bottom Cover, tonearm (not be supplied)
11	6622220	Arm Rest
12	5322140	Push Knob, selector
13	5322100	Push Knob, power switch
14	5312260	Knob, pitch-control
15	5322140	Push Knob, Q servo switch
16	4320430	Motor
17		Motor Board (not be supplied)
18	5392170	Illuminator
	7501750	S-0009 Power Supply Circuit Board Ass'y※
19	7501760	S-0009 Power Supply Circuit Board Ass'yUL, CSA
	7501770	S-0009 Power Supply Circuit Board Ass'yBS, EU
20	7502170	Control Circuit Board Ass'y
21	7630110	S-0008 PLL (Phase Locked Loop) Circuit Board Ass'y

Parts No.	Stock No.	Description
22	{ 4002480	Power Transformer... ※, BS, EU
	{ 4002482	Power Transformer... UL, CSA
23	1005270	Pitch-Control Volume, 1kΩ(B)
24	{ 1131210	Power Switch... ※, UL, CSA
	{ 1131220	Power Switch... BS, EU
	7501880	S-0011 Power Supply Circuit Board Ass'y... ※, UL, CSA, BS
25	{ 7501890	S-0011 Power Supply Circuit Board Ass'y... EU
26	0308392	2SD313 (E) Transistor
27	0400340	7V, 100mA Pilot Lamp
	5262260	Holder, pilot Lamp
28	0410100	100V, 5mA Neon Lamp
		Holder, neon lamp (not be supplied)
29	0400340	7V, 100mA Pilot Lamp
30	7172200	Cabinet Ass'y
	5322110	Ring, push switch knob
	5322120	Ring, push switch knob
	5322130	Ring, power switch knob
	5332041	Sansui Badge
	6922300	Lock Plate (A)
	5362530	Name Plate, model name
31	5732500	Cabinet Base
32	5512150	Insulator
33	3910490	Cord Clip
	3800010	Power Cord... ※, UL, CSA
34	{ 3800320	Power Cord... EU
	{ 3800190	Power Cord... BS
	2410820	Voltage Selector, plug
35	{ 2410890	Voltage Selector, socket
		Not Included in UL & CSA model
36	2200440	2P Output Terminal
37	5106536	P Type Screw, M3 × 4 (Polycarbonate)
38	{ 0390010	PTR101 PH101, Photo Transistor
	{ 0319100	PD101 SE302A, LED



Screws

Parts No.	Stock No.	Description
A	5109905	WT Type Screw, M3 × 12
B	5109905	WT Type Screw, M3 × 12
C	5109905	WT Type Screw, M3 × 12
D	5109905	WT Type Screw, M3 × 12
E	5101143	B Type Screw, M3 × 6
H	5140452	RW Type Screw, M3.8 × 32
I	5140451	RW Type Screw, M3.8 × 25
J	5162530	B Type Screw, M6 × 65
	5121290	S Type Washer, 6φ
	5182850	P Type Washer, 6φ
K	5101364	BSB Type Screw, M4 × 12
L	5108646	PSB Type Screw, M4 × 12
M	5182340	Tug Washer
N	5110261	Hex. Nut, M4
	5120161	P Type Washer, 4φ
O	5101143	B Type Screw, M3 × 6
P	5107743	PSB Type Screw, M3 × 6
Q	5143848	FW Type Screw, M3.8 × 16



Abbreviations

1. Pan Head Tapping ScrewPT	9. Flat Countersunk Head Wood ScrewFW
2. Washer Head Tapping ScrewWT	10. Round Head Wood ScrewRW
3. Pan Head ScrewP	11. Hex. Socket Set ScrewSC
4. Pan Head SEMS A ScrewPSA	12. Slot Type Set ScrewSS
5. Pan Head SEMS B ScrewPSB	13. Binding Head SEMS A ScrewBSA
6. Pan Head SEMS F ScrewPSF	14. Spring WasherS
7. Binding Head ScrewB	15. Plain WasherP
8. Flat Countersunk Head ScrewF	16. Retaining Ring (E Washer)E
	17. Toothed Lock Washer (External)TLE

5. ADJUSTMENTS

5-1. Confirmation of output frequency from Quartz element (See Fig. 5-1)

- Note:** 1. Q-Servo button ON (push down)
 2. Before this adjustment, run the unit for more than 4 minutes.

EQUIPMENT	MEASURE OUTPUT	ADJUST	ADJUST FOR
Frequency Counter	Lead 1 of IC03 (Numbers are printed on circuit board S-0008)	CV01	9.95328 MHz

5-2. Speed Adjustment

- Note:** 1. Mount the platter on turntable (namely, fit the platter gently and securely onto motor spindle).
 2. Set the turntable to flat level.
 3. Before this adjustment, run the unit for more than 4 minutes.
 4. Proceed speed adjustment, either 5-2-1 or 5-2-2 method indicated below.

5-2-1. Physical adjustment (See Fig. 5-2)

STEP	Q SERVO BUTTON	SPEED	ADJUST	ADJUST FOR	REMARKS
1	OFF	33 r.p.m	RV01	The stroboscope must be standstill.	Before this adjustment, turn Pitch control knob to center position.
		45 r.p.m	RV02	Same as above	
2	ON	33 r.p.m	—	—	Confirm that the stroboscope shows standstill.
		45 r.p.m	—	—	

5-2-2. Electronic adjustment (See Fig. 5-1)

STEP	Q SERVO BUTTON	SPEED	EQUIPMENT	MEASURE OUTPUT	ADJUST	ADJUST FOR
1	ON	33 r.p.m	Oscilloscope	Lug terminal V on printed Circuit Board S-0008	RV01	Make output pulse waveform(B) on oscilloscope as shown below (A) (B) (C)
2	ON	45 r.p.m	Oscilloscope	Lug terminal V on printed Circuit Board S-0008	VR02	Faster speed Correct speed Slower speed
3	Next, switch Q servo button off, then confirm that the stroboscope shows standstill at the center-turn position of Pitch Control volume.					

Fig. 5-1

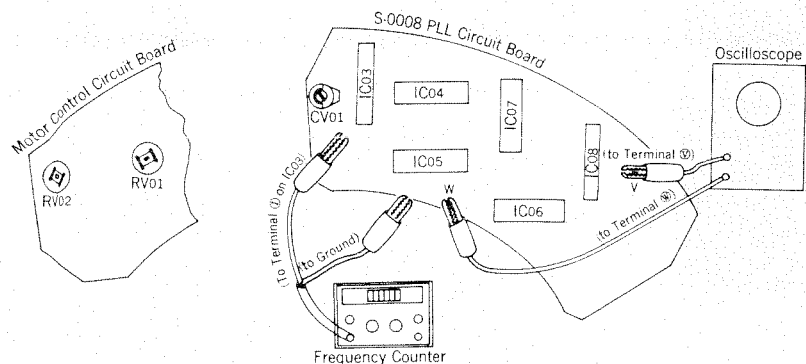
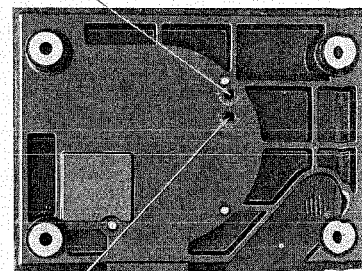


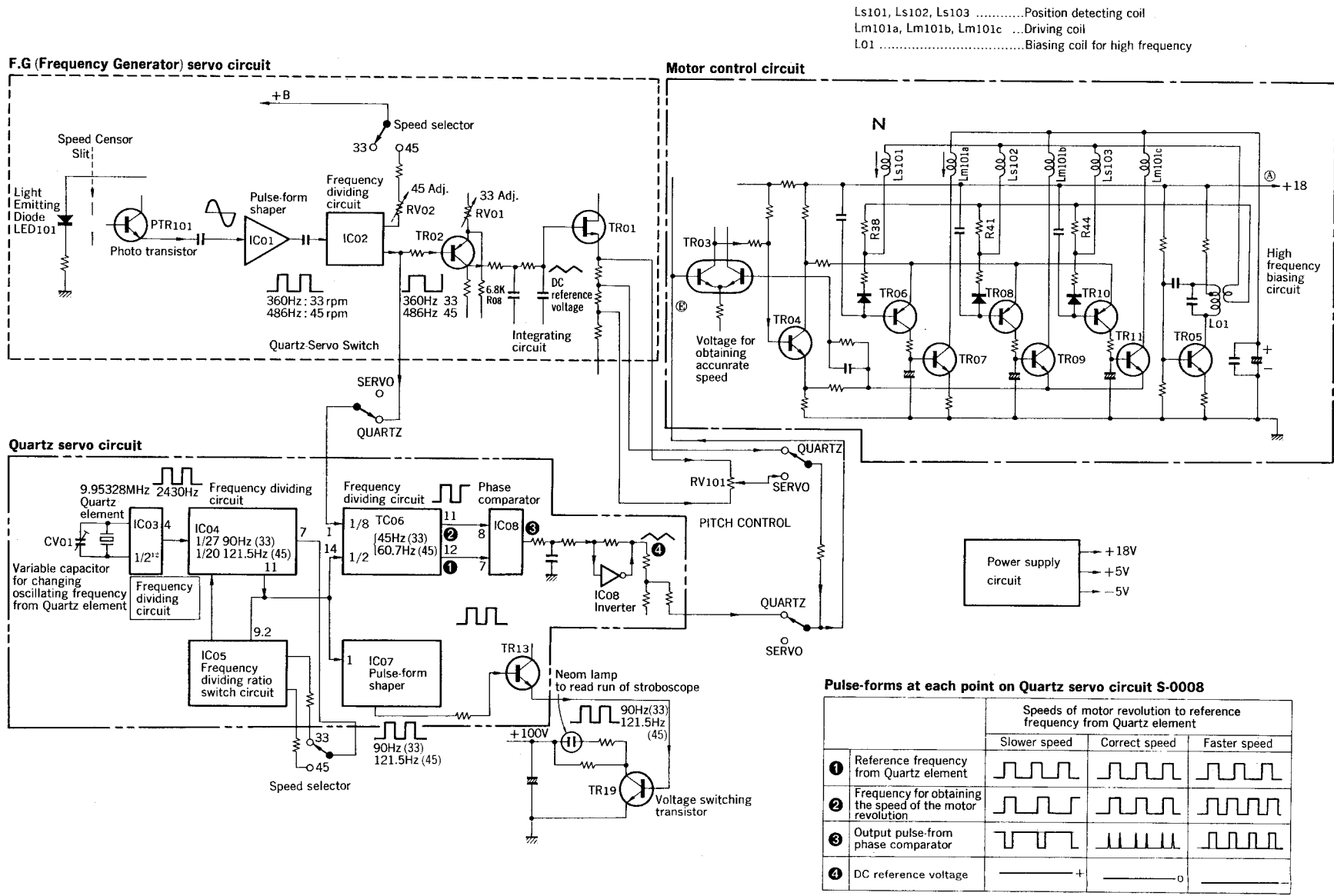
Fig. 5-2

(RV02) 45 r.p.m Adj. VR



(RV01) 33 r.p.m Adj. VR

6. OPERATION BLOCK DIAGRAM



7. FUNCTIONS AND OPERATIONS OF ELECTRIC CIRCUITS

(Refer to Operation Block Diagram on page 8)

◆Functions

The electric circuits in Model SR-929 turntable have the following four primary functions:

1. Power supply circuit.
2. Motor control circuit.
3. F.G. (Frequency Generator) servo circuit.
4. Quartz servo circuit.

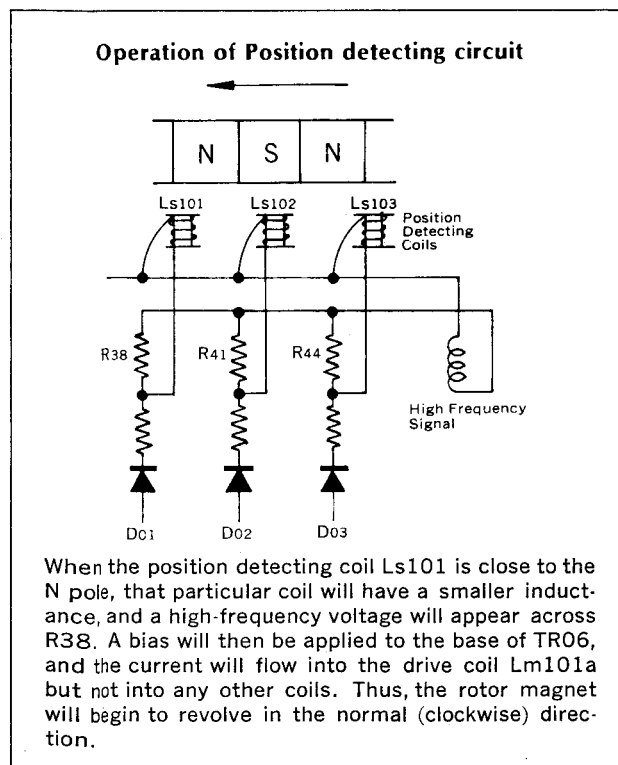
◆Operations

1. Motor Control Circuit

1) Start-up and driving of the motor

Because there's no output from the FG servo circuit at the start-up time, voltage E is plus when the power is switched on, and the collector of TR04 almost has the voltage A. Hence, the current is ready to flow to the collectors of TR06, TR08 and TR10 whenever a bias is applied to their bases.

Under this condition, the moment the magnetic field of the rotor passes any of the position detecting coils and saturates it, the inductance of that coil will decrease and the high-frequency current from the oscillator circuit will pass through the position detecting coil. This high-frequency current is then minus-detected by the diode, so that the bias will be applied to the base and the collector current will flow. As a result, a bias will be applied to the base of the transistors for controlling driving coils, enabling the current to flow into the drive coil and start the motor.



2) Normal (correct) revolution

Once the motor starts, the rotor magnet begins to revolve and the position detecting coil Ls102 will approach the N pole, so that the current will flow into the driving coil Lm101b and the rotor magnet will be further activated to revolve in the normal direction. Other drive coils will receive the current in turn to accomplish the normal revolution. But once the revolution starts, the FG servo circuit will deliver an output voltage to obtain normal revolution and the collector voltage of TR04 will begin to go down. The drive current will thus gradually decrease as the revolution speed approaches the normal revolution.

Should there be a change in the revolution speed due to some change in the load, the frequency of the FG circuit will become lower and the output voltage of the integrating circuit will decrease. Consequently, the voltage of E in the control circuit will also go down, and more current will in turn flow into the driving coils to speed up the revolution.

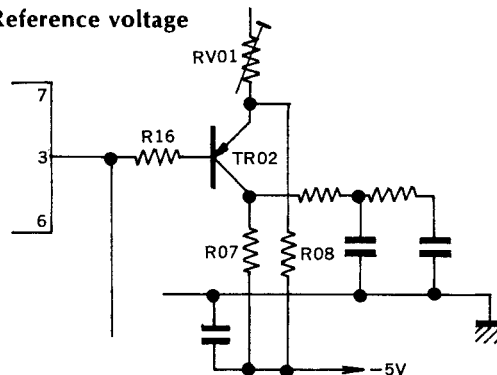
2. FG Servo Circuit

The basic operation of the FG servo circuit is: The speed sensor built into the motor delivers a "speed signal" reflecting the speed of the motor revolution. This speed signal is then converted to a DC voltage in order to control the motor control circuit.

1) Speed signal

The speed signal is produced by the speed sensor built into the motor, is waveform-shaped into 360Hz (33 rpm) or 486Hz (45 rpm) pulse, and then is frequency-divided by a CR timer and a frequency-dividing circuit. This pulse becomes the input signal for the FG servo circuit and the quartz servo circuit.

2) Reference voltage



In order to obtain the reference voltage, operation point of transistor, TR02 is determined across RV01 and R08 by feeding a stabilized $\pm 5V$ from power supply circuit into FG servo circuit. This voltage is then compared and synthesized with the pulse that enters the base of TR02, and output voltage of this process appears at the

collector of the transistor, TR02. This output voltage then becomes the input voltage for the integrating circuit.

3) Integrating circuit

This is the circuit which produces the output signal from the FG servo circuit, by converting the pulse proportional to the motor speed into a DC voltage and also setting the voltage. To keep the drift of the voltage to a minimum, this circuit uses metalized film resistors.

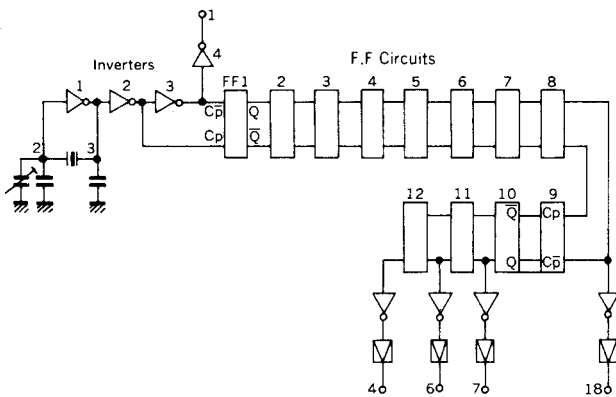
3. Quartz Servo Circuit

The quartz servo circuit consists of a reference signal circuit and a phase comparator circuit.

1) Reference signal circuit

The reference signal circuit comprises three CMOS IC's—TC5082P (IC03), TC4520P (IC04), and TC4082P (IC05). Their functions are divided into two—an oscillator/frequency-dividing circuit and a frequency-dividing ratio switch circuit.

(1) Oscillator/frequency-dividing circuit

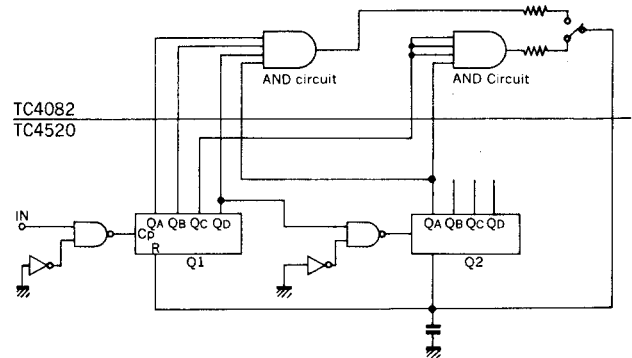


The first inverter is used to make the crystal (9.95328 MHz) oscillate, and the resultant signal is fed through another inverter to minimize load changes. The final output voltage of this oscillator section is then passed on to the frequency-dividing section in this circuit.

The subsequent frequency-dividing section in this circuit has twelve (12) FF (Flip-Flop) circuits connected in series, with each FF circuit performing a 1/2 division. An inverter is provided before the first FF circuit so that signals 3 with a 180-degree phase difference of $C\bar{p}$ and Cp may be applied to input the F.F. circuit, and the output signal taken from the front and back of this inverter 3 are fed to the input of the first FF circuit. Also, in order to permit direct readout of the oscillating frequency of the crystal, the output after the inverter is delivered at terminal (1).

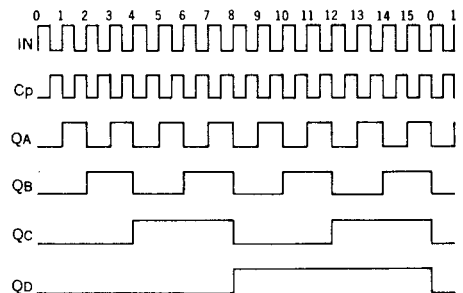
The signal used in the quartz servo circuit is $1/2^{12}$ ($1/4,096$) of the signal from the crystal oscillator. This is obtained by taking out the Q output (terminal (4)) from the FF circuits, and is supplied to the subsequent frequency-dividing ratio switch circuit. Output frequency obtained in this circuit is 2,430Hz pulse.

(2) Frequency-dividing ratio switch circuit



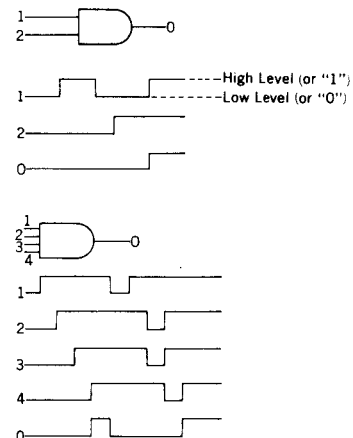
The frequency-dividing ratio switch circuit consists of two IC's—TC4520P (IC04) and TC4082P (IC05). TC4520P contains two binary counters connected in series, and also, reset circuit contains AND circuit for switching the count of counter.

Operation of a Binary Counter



A binary counter is exactly what it means: a counter operating on the binary system. It has four FF circuits to count from 0 to 15, and output signal (pulse) indicated by the binary system appears at its output Q. Hence this output is usually referred to as a BCD (Binary Code Decimal) output.

Operation of an AND Circuit

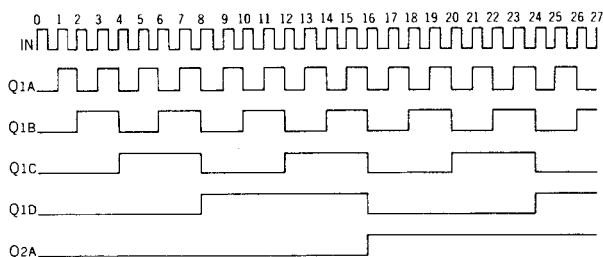


An AND circuit is a circuit whose output becomes high-level (or "1") when its two or more inputs are all high-levels ("1"). If any of its multiple inputs is low-level, its output is invariably low-level.

The TC4082 used here is "dual 4-input AND gate" containing two 4-input AND gate circuits in one package. Its output becomes high-level (or "1") only if all four gates are high-level (or "1").

◇The switching of the frequency-dividing ratio is accomplished by making high level (or "1") in the R (Reset) circuit of the previously mentioned binary counters. Namely, by becoming high level (or "1") in the reset circuit, the counters will return to 0 and start counting again. Since two ratios, 1/27 for 33 rpm and 1/20 for 45 rpm, are required, two AND gates are utilized.

For the 1/27 division, the counters count to 26, and when they reach 27, they are reset and made to start counting from 0 again. The 1/27 output is taken out from terminal, Q2A when the counters reach 27.



◇For the 33 r.p.m speed, frequency-dividing ratio switch circuit needs a pulse that is 1/27 of the 415.22 μ s. This is obtained by letting the counters count the 415.22 μ s pulse. When the counters count 27, these outputs in F.Fs Q1A, Q1B, Q1D and Q2A momentarily become high-level (or "1"), and the four signals are fed to the 4-input AND gates, and their outputs also become high-level to reset the counters.

◇For the 45 r.p.m speed, the circuit needs 1/20 pulse, so a similar operation is undertaken. In other words, when the counters count 20, Q1C becomes high-level, and when the output of Q2A and that of Q1C are applied to the 4-input AND gates, their outputs also become high-level to reset the counters. However, since there are only two inputs to the four AND gates, the remaining two AND gates are operated in parallel with the output of Q1C.

Finally, the output of Q2A is passed on to the input of the subsequent phase comparator, and is also used to illuminate neon lamp, for checking run of stroboscope pattern.

(3) Frequency-dividing circuit

This frequency-dividing circuit divides two signals (pulses) coming into the subsequent phase comparator; one from output of FG servo circuit into 1/8 and other one from Quartz servo circuit into 1/2 respectively. This IC (MSM 5538: IC06) is 4-stage binary counter, and the last three of the F.F. circuit are used for performing the function described above.

2) Phase comparator

(Refer to the block diagram where it says "Pulses-forms at each point on Quartz servo circuit Board S-0008")

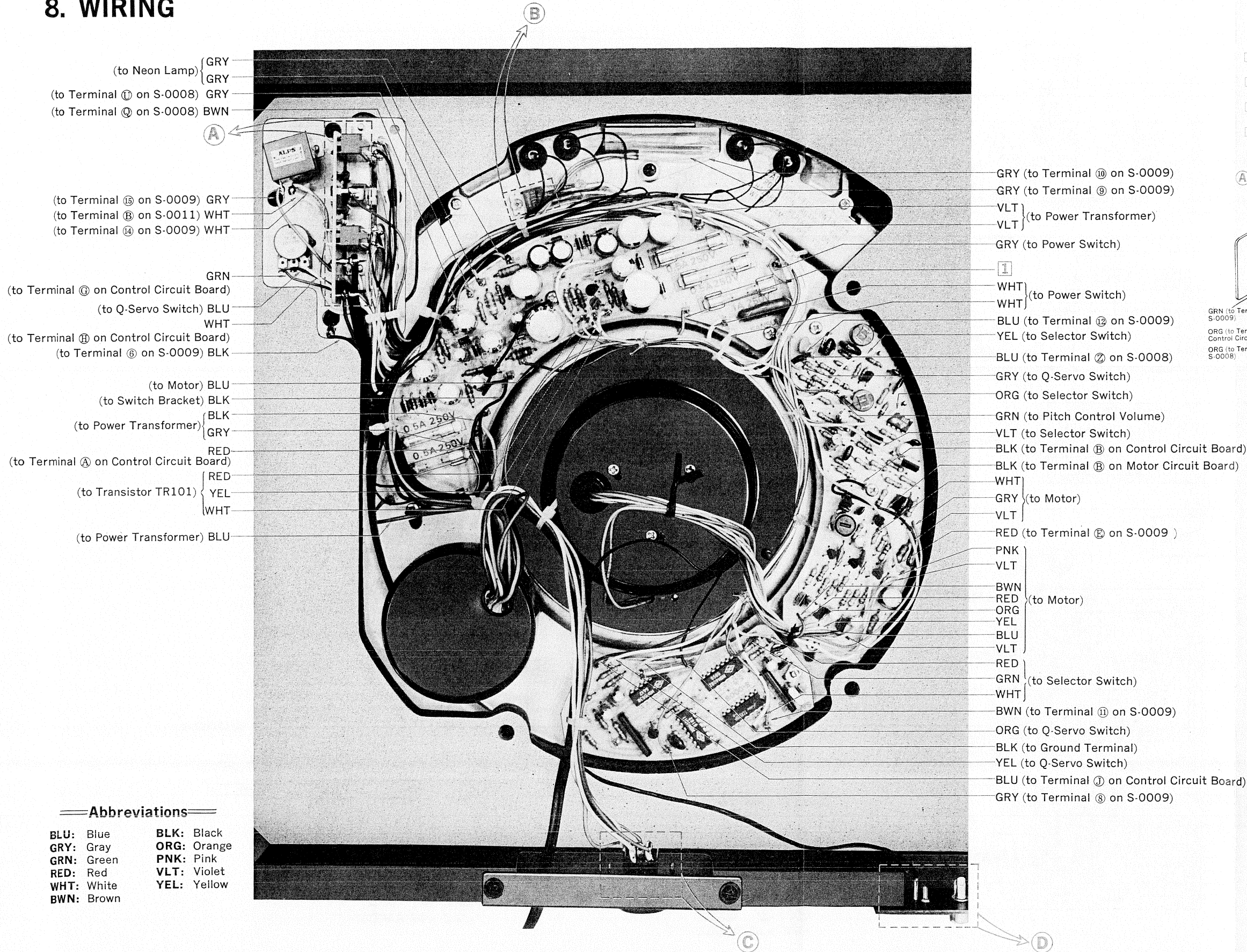
The phase comparator receives the signal (pulse) from the FG servo circuit coming into terminal 8, and also the reference signal (pulse) from Quartz servo circuit com-

phase difference, and the difference is taken out as an output.

When the motor is revolving at the correct speed, a thin trigger pulse appears at terminal 3. This trigger is then converted into a ripple voltage by the integrating circuit, and passed through an inverter to minimize ripples.

The resulting compared voltage is then level-shifted at -5V via resistor R60, in order to match the potential voltage of the motor control circuit. This voltage and the output of the integrating circuit for the FG servo circuit are then synthesized to control accurately the speed of the motor revolution.

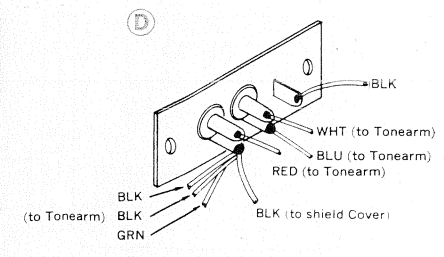
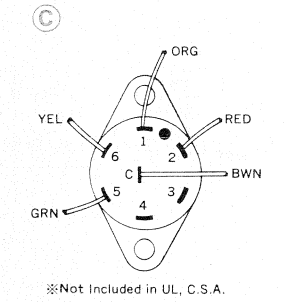
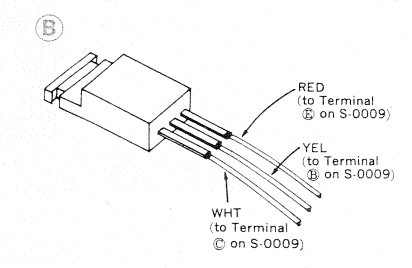
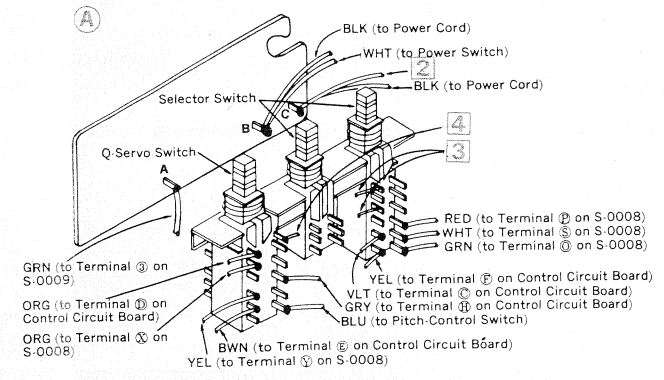
8. WIRING



- (to Neon Lamp) { GRY
- (to Terminal ① on S-0008) GRY
- (to Terminal ④ on S-0008) BWN
- (to Terminal ⑮ on S-0009) GRY
- (to Terminal ⑩ on S-0011) WHT
- (to Terminal ⑭ on S-0009) WHT
- GRN (to Terminal ③ on Control Circuit Board)
- (to Q-Servo Switch) BLU
- WHT (to Terminal ⑫ on Control Circuit Board)
- (to Terminal ⑥ on S-0009) BLK
- (to Motor) BLU
- (to Switch Bracket) BLK
- (to Power Transformer) { BLK
- GRY
- RED (to Terminal A on Control Circuit Board)
- (to Transistor TR101) { RED
- YEL
- WHT
- (to Power Transformer) BLU

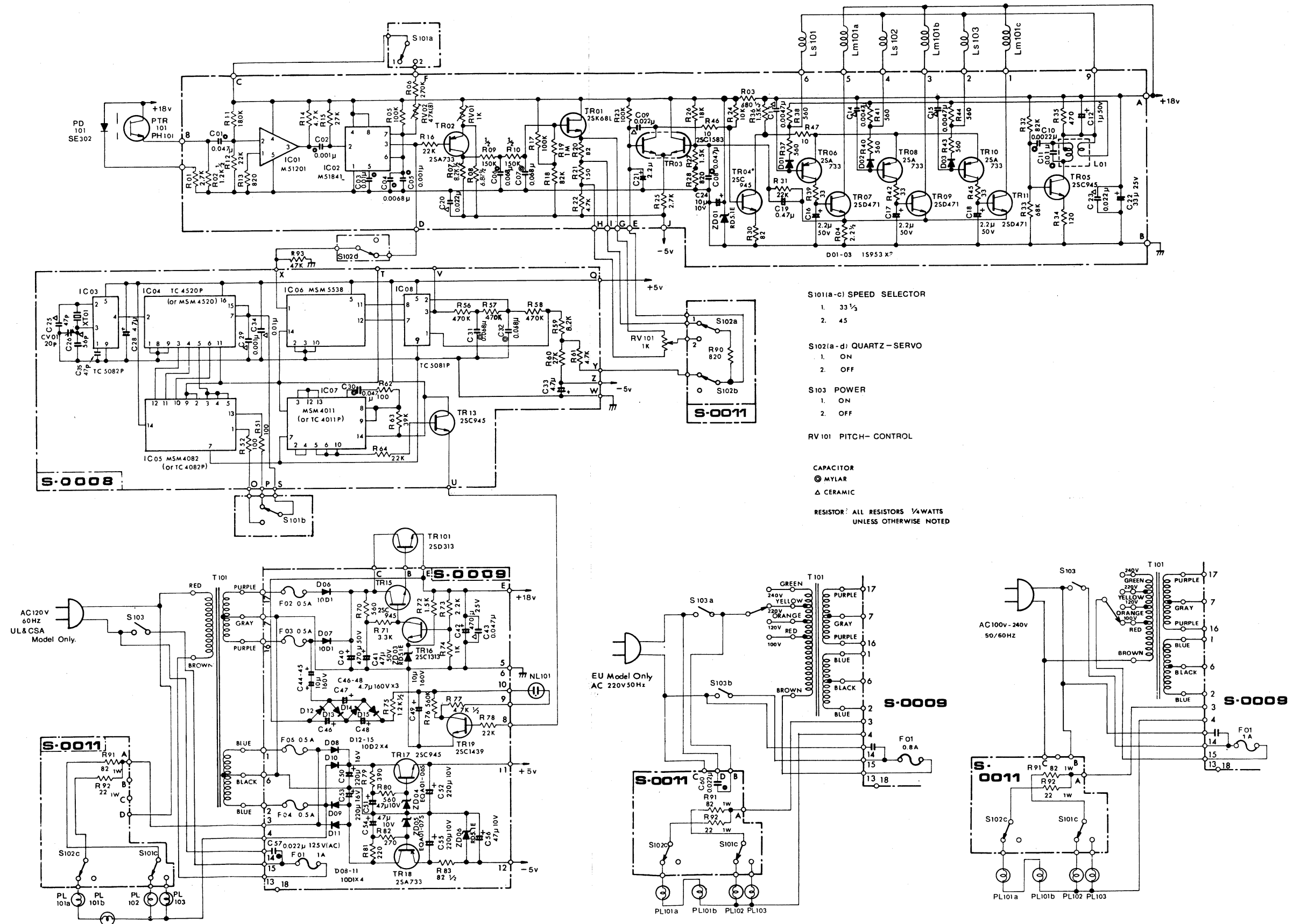
- GRY (to Terminal ⑩ on S-0009)
- GRY (to Terminal ⑨ on S-0009)
- VLT } (to Power Transformer)
- VLT
- GRY (to Power Switch)
- ① WHT (to Power Switch)
- WHT
- BLU (to Terminal ⑫ on S-0009)
- YEL (to Selector Switch)
- BLU (to Terminal ② on S-0008)
- GRY (to Q-Servo Switch)
- ORG (to Selector Switch)
- GRN (to Pitch Control Volume)
- VLT (to Selector Switch)
- BLK (to Terminal ⑧ on Control Circuit Board)
- BLK (to Terminal ⑧ on Motor Circuit Board)
- WHT
- GRY } (to Motor)
- VLT
- RED (to Terminal ⑬ on S-0009)
- PNK
- VLT
- BWN } (to Motor)
- RED
- ORG
- YEL
- BLU
- VLT
- RED
- GRN (to Selector Switch)
- WHT
- BWN (to Terminal ⑪ on S-0009)
- ORG (to Q-Servo Switch)
- BLK (to Ground Terminal)
- YEL (to Q-Servo Switch)
- BLU (to Terminal ① on Control Circuit Board)
- GRY (to Terminal ⑧ on S-0009)

- ① { BWN (to Voltage Selector ✖, BS, EU)
- BWN (to Transformer UL, C.S.A)
- ② { BWN (to Transformer ✖, BS, EU)
- RED (to Transformer UL, C.S.A)
- ③ { BLK (to Pilot Lamp ✖, BS, EU)
- WHT (to Pilot Lamp UL, C.S.A)
- ④ { BLK (to Pilot Lamp ✖, BS, EU)
- WHT (to Pilot Lamp UL, C.S.A)



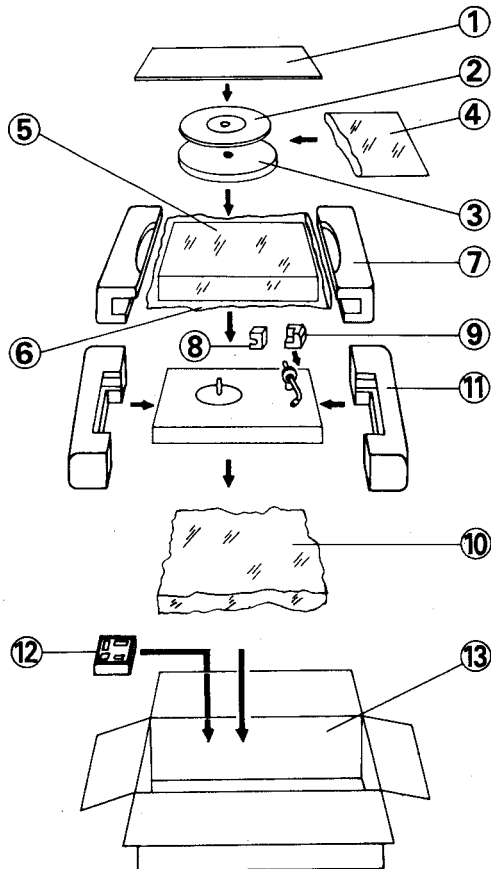
- Abbreviations**
- | | |
|------------|-------------|
| BLU: Blue | BLK: Black |
| GRY: Gray | ORG: Orange |
| GRN: Green | PNK: Pink |
| RED: Red | VLT: Violet |
| WHT: White | YEL: Yellow |
| BWN: Brown | |

9. SCHEMATIC DIAGRAM



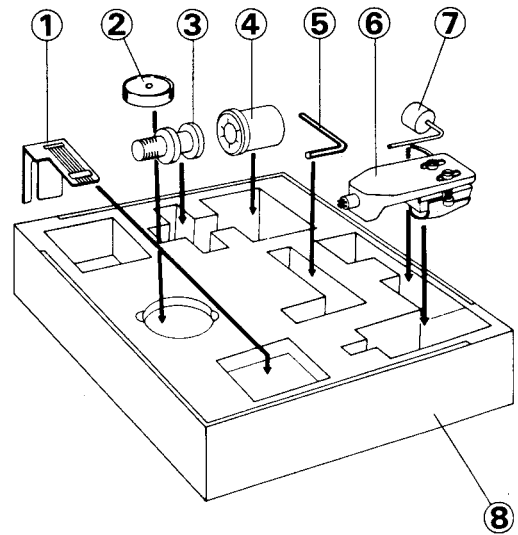
10. PACKING LIST

Parts No.	Stock No.	Description
1	9012151	Inner Packing
2	5502631	Rubber Mat, turntable
3	6112171	Turntable (Platter)
4	9116600	Vinyl bag (for rubber mat and platter)
5	7012120	Dust Cover Ass'y
	5362581	Name Plate, dust cover
	5502021	Rubber Cushion
	6922290	Auto Hinge
	6922320	Plate, auto hinge
	5101163	B Type Screw, M4 × 10
6	9112141	Poryethylene Bag
7	9022381	Stylofoam Packing
8	9082030	Arm packing
9	9082040	Arm packing
10	9112032	Poryethylene Bag
11	9082050	Stylofoam Packing
12	9022601	Accessory Parts Box
13	9002601	Corton Case
	5996080	Curl Stopper



11. ACCESSORY PARTS LIST

Parts No.	Stock No.	Description
1	5242590	Cartridge Mounting Gauge
2	6172040	45 r.p.m Adaptor
3	6912490	Sub Weight
4	6912470	Main Weight
5	5192080	Hexagon Wrench
	6642210	Head Shell Ass'y
	4310280	Head Shell
	4940090	Cartridge (with stylus) SV-27A ...Not Included in the unit sold in U.S.A. Canada & Europe.
		Stylus (SN-27) ...Not Included in the unit sold in U.S.A. Canada & Europe.
7	6912500	I.F.C Ass'y
8	9022601	Accessory Parts Box
	9082060	Accessory Parts Box Lid
	3810220	PU Output Cord
	9209720	Operating Instructions
	9232110	Schematic Diagram
	9406022	Polishing Cloth
	9432030	Polishing Liguid (Silicon oil)





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