

**PANASONIC®****Service Manual****DIRECT DRIVE TURNTABLE****MODEL SP-10****■ SPECIFICATIONS**

Turntable:	Aluminum die-cast; 12 in. diameter; 113 lb·in <sup>2</sup> . 113 lb·in <sup>2</sup> . inertial moment; 6 lb weight
Motor:	20-poles, 60-slots, ultra-low speed electronic commutator motor (15 V, 85 mA)
Power supply:	AC 120 V, 50/60 Hz
Turntable speeds:	33-1/3 and 45 rpm
Speed change method:	Electrical change
Fine speed control:	Individual adjustment by variable resistor; ±2% adjustment range
Wow and flutter:	less than 0.03% WRMS
Rumble:	better than -60 dB
Build-up time:	Within 1/2 rotation at 33-1/3 rpm
Dimensions:	14 (w) × 14 (d) × 4 (h)
Weight:	20 lb

**■ TURNTABLE**

The turntable has an inertial moment of 113 lb. in<sup>2</sup>. The marks (stripes) of the strobe disk are located on its under side (figure 1). If the turntable is installed without first removing the transformer clamp screws and the rotor clamp fittings, these marks may become scarred, making it difficult to read the strobe marks. Be careful regarding this point.

The turntable has a dynamic balance which is extremely precise. There is, however, one position at which the turntable can be mounted, in relation to the rotor of the motor, which will result in maximum performance. This position is indicated by ▲ marks: when these marks are aligned, the turntable installation is optimum. This is not, however, a critically important issue unless the unit is to be used for special purposes in which extremely high precision is required; the performance is quite satisfactory even the turntable is installed without aligning these marks. (See figure 2.)

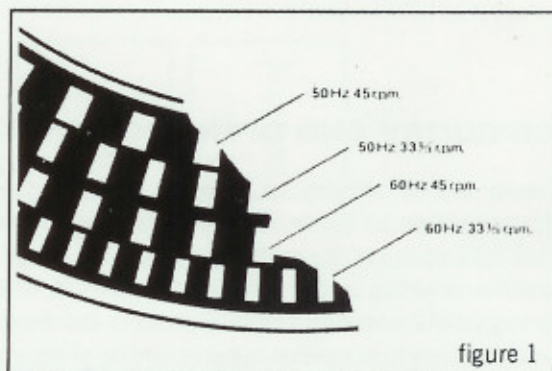


figure 1

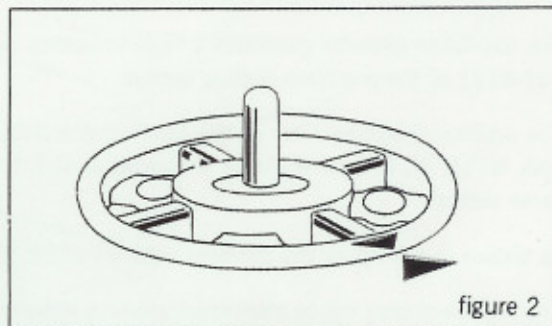


figure 2

**MATSUSHITA ELECTRIC CORP. OF AMERICA**  
**MATSUSHITA ELECTRIC OF HAWAII, INC.**  
**MATSUSHITA ELECTRIC OF CANADA LTD.**

Pan-Am Bldg., 200 Park Ave., New York, N.Y. 10017  
 320 Waiakamilo Road, Honolulu, Hawaii 96817  
 40 Ronson Drive, Rexdale, Ont.

## ■ LUBRICATION

The bearing parts of this unit are designed with an ultra-precise finish to prevent the generation of "wow" and "flutter". A special oil has been used to maintain the high-performance efficiency of this unit by forming a uniform film of oil over the parts. (In order to prevent deterioration of this ultra-precise finish, the rotor cannot be removed.) For this reason, use only the oil included with this unit for its lubrication. Never use any other type of oil. To lubricate, remove the turntable and the lubrication cover and then apply about 10 drops (0.1cc) of the oil into the oil hole, using the special oiling tool included with this unit (figure 3). It is sufficient to lubricate the unit once after approximately 2,000 hours of use.

Two thousand hours is equivalent to 5-1/2 years if the unit is used one hour per day, or to 8 months if used 8 hours per day. This period is much longer than has been necessary on previous, conventional motors. Do not apply too much oil, nor more often than necessary.

## ■ FREQUENCY CHANGE

The rotation speed of this turntable is constant, without relation to the power frequency. Because, however, commercial electric power is used for illumination of the neon lamps of the illuminated strobe marker the frequency setting should be done to agree with the locality in which the unit is used. This adjustment is made by setting the frequency change screws located beneath the turntable. Remove the turntable and loosen the two screws by turning twice, as shown in figure 4. Move them to the appropriate setting (50 Hz or 60 Hz) and then re-tighten them. If the strobe image appears to bend or lean, it can be corrected by changing the position of these screws.

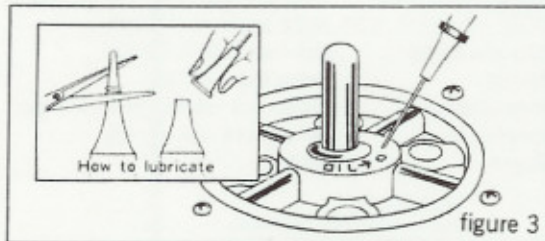


figure 3

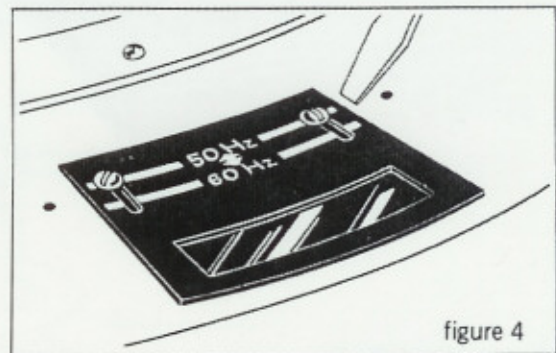


figure 4

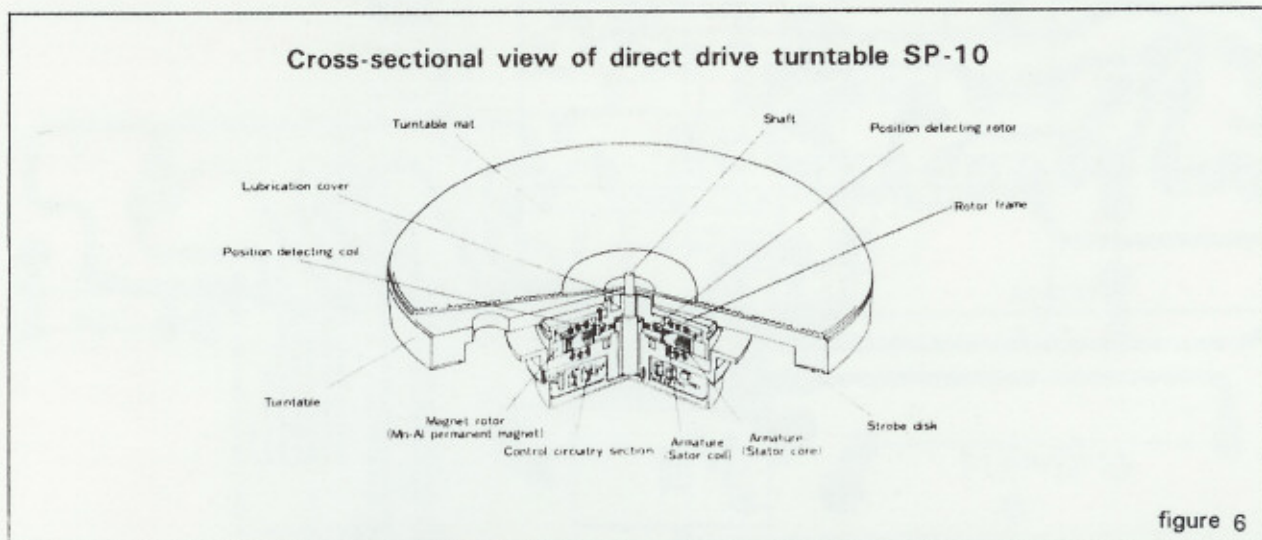
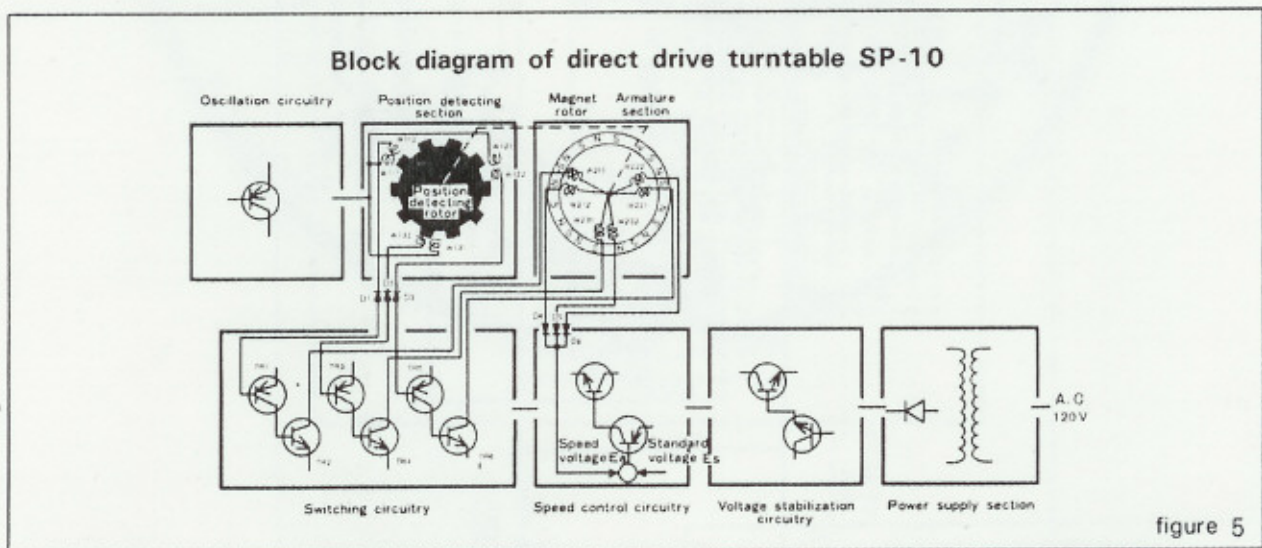
## ■ CIRCUITRY AND OPERATION PRINCIPLES

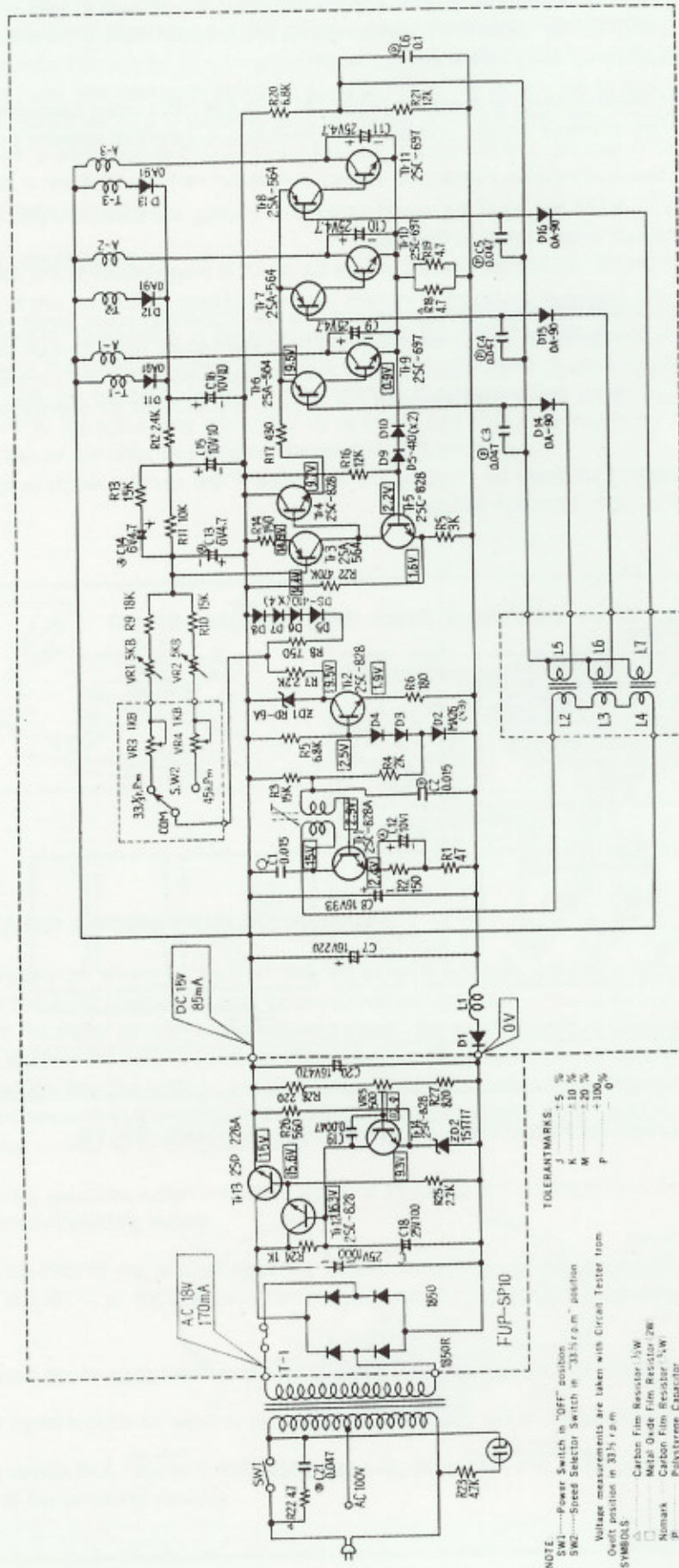
The motor and its circuitry are shown in the block diagram of figure 5. Figure 6 shows a sectional view of the motor. The photograph shown on the inside cover pages is of the motor without the rotor.

The control circuitry of the motor consists of the following circuit: the oscillation circuit, which generates the input signal of the position detecting section; the switching circuit, which controls the current of the armature (stator core) winding by the output signal of the position detecting section; and the speed control circuit, which detects the voltage generated in the speed generator winding in proportion to the revolution of the motor and keeps the motor speed constant. In addition, a DC stabilized power supply is included in order to supply power to each assembly.

- The oscillation circuitry generates a high-frequency signal of about 50 kHz and supplies it to primary coils W111, W121 and W131 of the position detecting section.
- The position detecting rotor of the position detecting section changes by rotating the coupling degree between primary coils W111, W121 and W131 of the position detecting section and the secondary coils (112, W122 and W132) of the same section.
- As shown in the figure, the coupling between W111 and W112 is the closest, and that between W121 and W122 is less.
- The high-frequency signal mentioned above is induced to the secondary coil of the closely-coupled section.
- The high-frequency voltage thus induced is rectified by diodes D1, D2 and D3, and, as the position signal, controls transistors TR1, TR3 and TR5 of the switching circuitry.

- Power transistors TR2, TR4 and TR6 are controlled by TR1, TR3 and TR5.  
As shown in the figure, the high-frequency signal which is generated by W112 is rectified by D1, and this voltage is applied to TR1, making TR2 in the condition of continuity.
- By the three continuity circuit-breaking actions of power transistors TR2, TR4 and TR6, current flows through drive windings W211, W231 and W221 of the armature section, and power for revolution is generated between the armature and the magnet rotor.
- Speed generation winding W212, W222 and W232 are wound on the drive winding and bifilar, and they generate three-phase AC voltage which has an amplitude proportionate to the speed.  
This voltage is rectified by diodes D4, D5 and D6, and DC voltage  $E_a$ , which is proportionate to the speed, is obtained.
- Comparing this speed voltage ( $E_a$ ) with the standard voltage ( $E_s$ ) from the standard voltage power supply, which is determined corresponding to the necessary rotation speed, adjustment is made of the current which flows through the power transistors of the switching circuitry. In other words, if the speed is faster than the specified speed, the current decreases and the speed becomes slower. If the speed is slower than specified, the current increases and the speed increases. In this way, the speed is stabilized.
- The speed change and adjustment are made by changing the resistance of the circuitry which compares the standard voltage with the speed voltage, and by standard voltage.





TOLERANCE MARKS

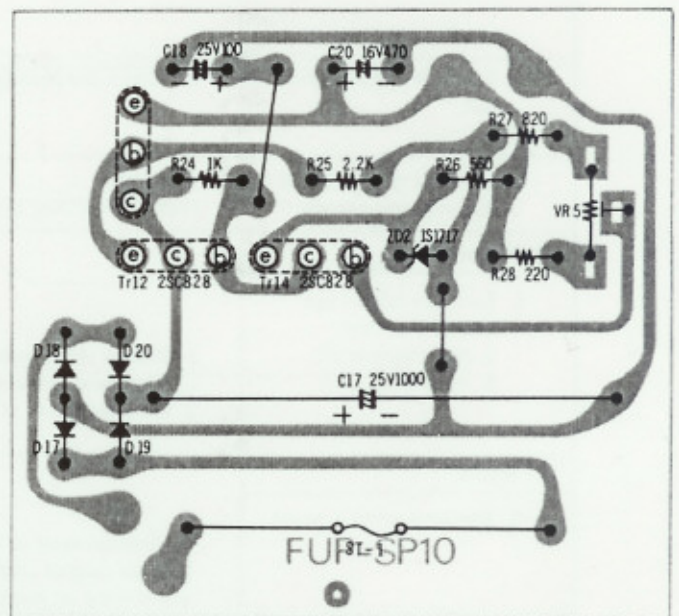
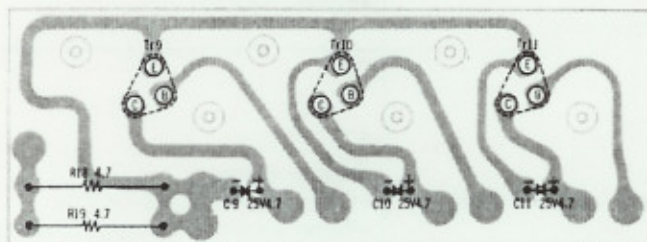
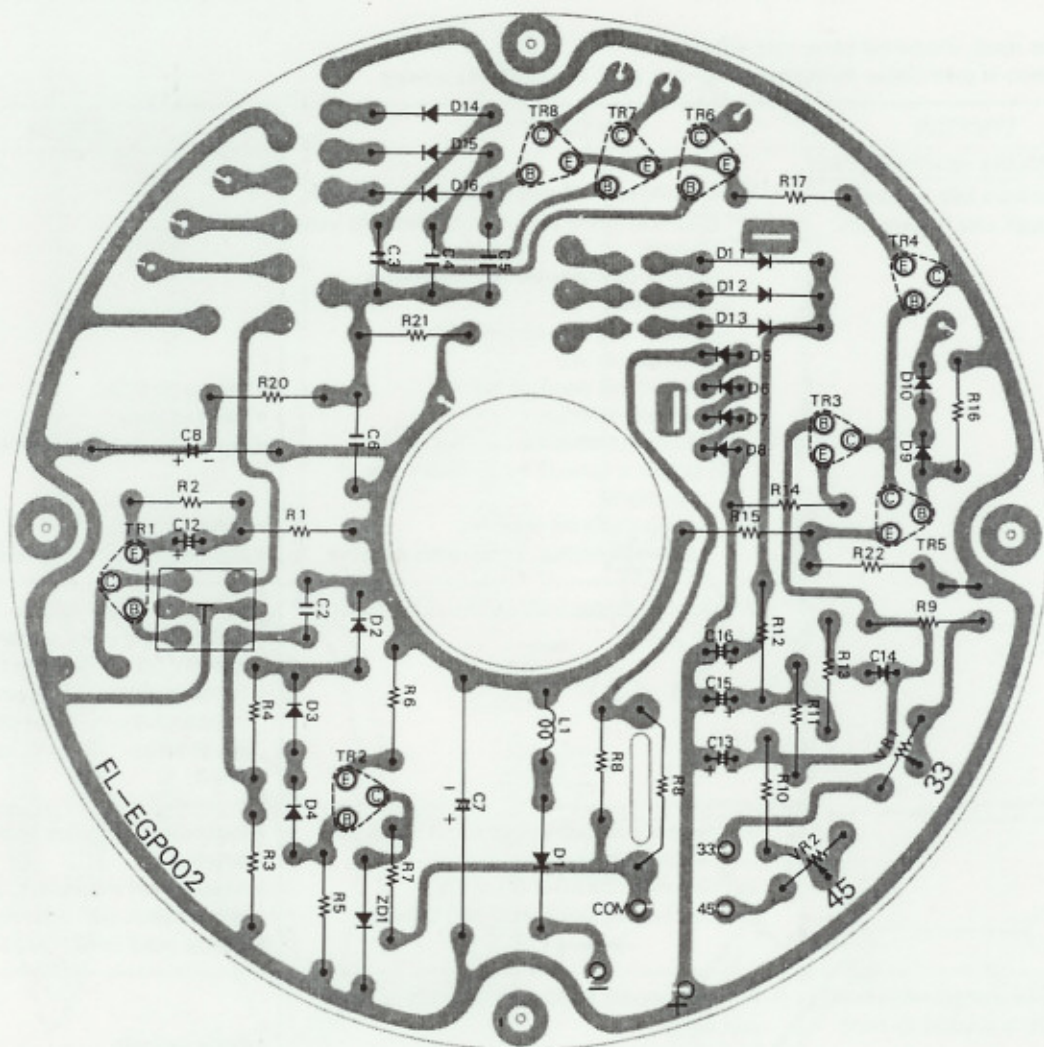
J	-5%
K	-10%
M	-20%
P	+100%
	0%

NOTE  
 SW1.....Power Switch in "OFF" position  
 SW2.....Speed Selector Switch in "33 1/3 r.p.m." position  
 Voltage measurements are taken with Circuit Tester from  
 point position in 33 1/3 r.p.m.

- SYMBOLS
- Carbon Film Resistor, 1/4W
  - Metal Gride Film Resistor, 2W
  - Nomark Carbon Film Resistor, 1/4W
  - Polyesterene Capacitor
  - Solid Aluminum Electrolytic Capacitor
  - Paper Capacitor
  - Ceramic
  - No mark Aluminum Electrolytic Capacitor

■ **CIRCUIT BOARD**

**MODEL SP-10**



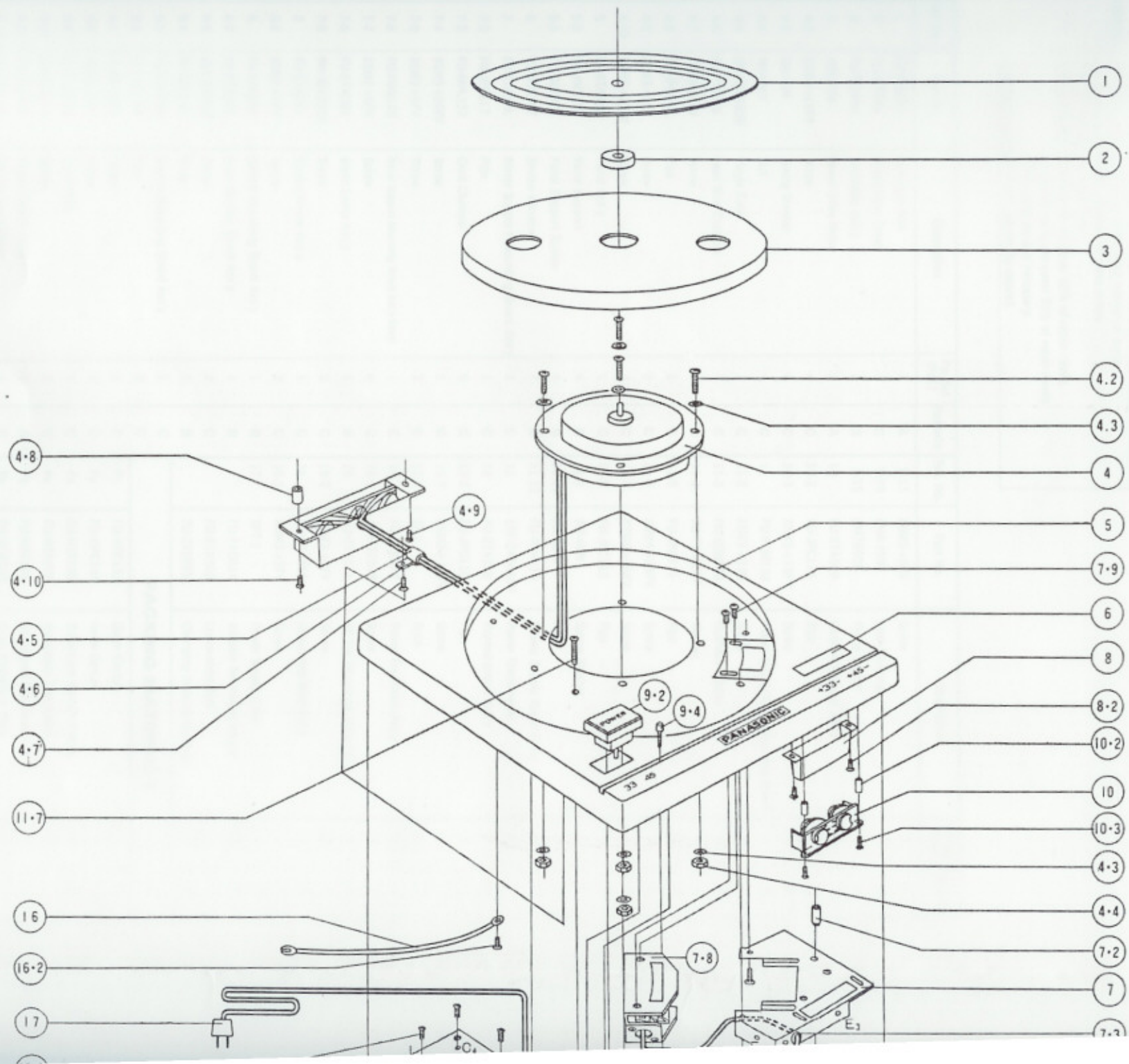
## ■ TROUBLE SHOOTING GUIDE

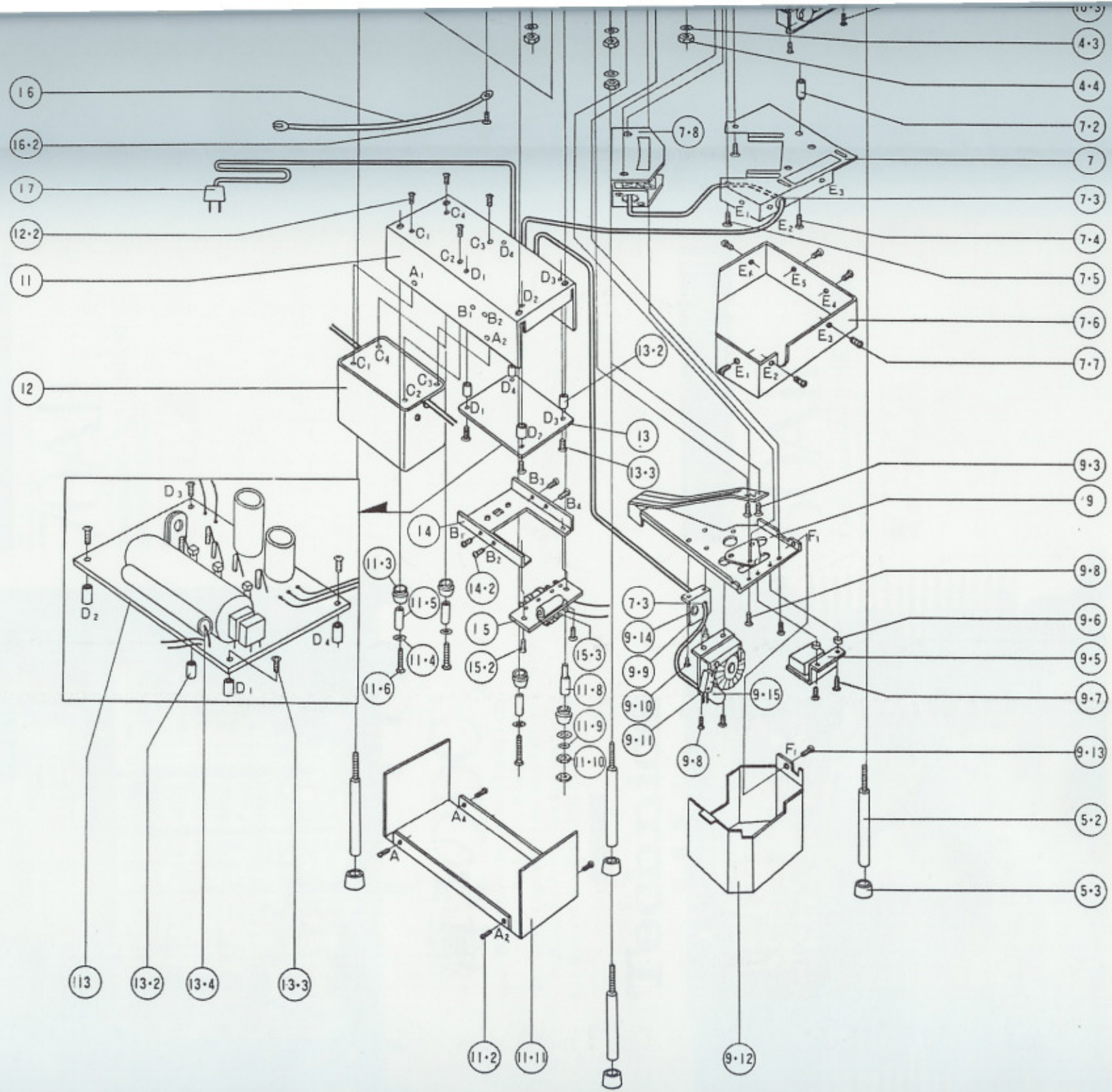
### Notes :

1. Before repair, disconnect power cord without fail.
2. Numbers in parentheses correspond to numbers given in disassembly drawing.

SYMPTON	CAUSE	REMEDY
<b>(1) Turntable rotation speed:</b>		
A. Turntable fails to rotate though unit is turned on.	A. Remove back cover of motor and check voltage at (+) and (-) points of printed circuit board by using DC voltmeter. 1. Output of constant-voltage circuit (41) is unobtainable. (1) Output fails on secondary side of transformer (43). * Cord (18) disconnected * Solder defective * Power transformer (43) out of order (2) Output is obtained on secondary side of transformer. * Fuse (ST-1) (41-1) broken * Constant-voltage circuit parts defective	* Replace cord (18). * Solder securely * Replace power transformer (43)  * Replace fuse (41-1) * Replace constant-voltage circuit
	2. Output of constant-voltage circuit (41) lower than 15V.	* Adjust semi-fixed resistor VR on printed circuit board of power section and so arrange that 15V DC will be applied to (+) and (-) points on printed circuit board of motor. If unadjustable, electronic circuit parts must be defective. Replace constant-voltage circuit.
	3. Output of constant-voltage circuit (41) is 15V. * Motor body (6) 4. Power switch (49-1) is not at ON. 5. Speed selector switch ass'y (47) defective.	* Replace motor because electronic circuit is defective. * Adjust switch mechanism. If unadjustable, replace switch cam assembly. * Replace speed selector switch ass'y (47)
B. Speed changes when unit body is touched by hand.	B. Part near selector switch shorting with panel of unit body. (1) Solder defective of selector switch. (2) Broken covered wire.	* Solder securely * Coated insulating tape
C. Turntable rotation speed too slow.	C. Rotation speed maladjusted.	* Turn motor speed regulating resistor counterclockwise with (-) screwdriver, adjusting speed while watching stroboscope(8). * Make sure that Neon Lamp Ass'y(53) is adjusted to correct position (60 Hz).
D. Turntable rotation speed too fast.	D. Rotation speed maladjusted.	* Turn motor speed regulating resistor clockwise with (-) screwdriver, adjusting speed while watching stroboscope (8).
E. Turntable rotation speed fluctuates excessively.	E. Motor body (3-phase switching circuit defective.)	* Replace motor (6).
<b>(2) Strobe</b>		
A. Turntable rotates but strobo is unseen. 1. Neon lamp is off. 2. Neon lamp is on.	1. Resistor (40-1) broken. 2. Neon lamp disconnected or lead wire broken. 3. Mirror broken or off.	* Replace resistor. * Replace neon lamp assembly (53). * Replace neon lamp assembly (53) or mirror support base plate assembly.
<b>(3) Noise</b>		
A. Abnormal noise is heard.	1. Vibration noise of power transformer too loud. 2. Rotor magnet cracked, or iron chips attracted and sticking on magnet, causing frictional noise.	* Replace power transformer (43). * Replace motor (6).

■ EXPLODED VIEW OF DIRECT DRIVE TURNTABLE MODEL SP-10







# I ■ REPLACEMENT PARTS LIST

## D.D. TURNTABLE MODEL SP-10

**NOTES :**

1. Part numbers are indicated on most mechanical parts.  
Please use this Part number for parts orders.
2. (N) indicates the New Parts.
3. A-C rank: A rank parts will cover 80% of repair needs.  
A+B rank parts will cover 95% of repair needs.  
Crank parts are less necessary.
4. Please use the "Price" column as desired.

Ref. No.	Part No.	Description	Per Set (Pcs.)	Remarks	Ref. No.	Part No.	Description	Per Set (Pcs.)	Remarks
1	FU-TCS051	Turntable Mat	1	A	9-13	XSM3 +6FV	Screw	1	C
2	FU-JET082	Lubrication Cover	1	C	9-14	RHR-109	Lead Bushing	1	C
3	FU-TTA053	Turntable Ass'y	1	B	9-15	AM78909	Power Switch	1	B
4	MPL-10A	Direct Drive Motor	1	A	10	FU-ETA369	Variable Resistor Ass'y	1	B
4-2	XSM4 +15FV	Screw	4	C	10-2	FU-JPC116	Pipe	2	C
4-3	SW-40N	Spring Washer	4	C	10-3	XSM3 +15FV	Screw	2	C
4-4	RN-40CF	Nut	4	C	11	FU-PUB132	Power Supply Ass'y Mounting Board	1	B
4-5	BT-80U6B20	Vinyle Tube	1	C	11-2	XSM3 +5 FV	Screw	4	C
4-6	FU-PTD166	Lead Wire Clumper	1	C	11-3	FU-GBS033	Cushion Rubber	4	C
4-7	XSM3 +5FV	Screw	1	C	11-4	FU-PWM037	Washer	4	C
4-8	FU-JPC117	Pipe	1	C	11-5	FU-JPC111	Pipe	3	C
4-9	XSM3 +5FV	Screw	1	C	11-6	XSM4 +35FV	Screw	3	C
4-10	XSM3 +20FV	Screw	1	C	11-7	XSM4 +26FV	Screw	1	C
5	FU-ETA368	Panel Ass'y	1	C	11-8	FU-JPC112	Pipe	1	C
5-2	FU-JSC107	Panel Support	4	B	11-9	SW-40N	Spring Washer	1	C
5-3	FU-GET032	Panel Support Rubber	4	B	11-10	RN-40CF	Nut	2	C
6	FU-MPL147	Strobo Window	1	C	11-11	FU-PFH114	(Power Supply Ass'y) Cover	1	C
7	FU-ETA376	Mirror Support Mounting Board Ass'y	1	C	12	ETP-24S4ASU	Power Transformer	1	A
7-2	FU-JPC117	Pipe	1	C	13	FU-ETA328	Printed circuit Ass'y	1	C
7-3	FU-MPL157	Cord Clumper	6	C	13-2	FU-JPC110	Pipe	4	C
7-4	XSM3 +20FV	Screw	1	C	13-3	XSM3 +10FV	Screw	4	C
7-5	XSM3 +5FV	Screw	2	C	13-4	ST-1	Fuse	1	A
7-6	FU-PUB120	Mirror Support Mounting Board Ass'y Cover	1	C	14	FU-ETA372	Power Transistor Ass'y	1	B
7-7	XSM3 +5FV	Screw	6	C	14-2	JMK-3050RF	Screw	4	C
7-8	FU-ETA380	Neon Lamp Ass'y	1	B	15	FU-ETA371	6P Tag Mounting Strip Ass'y	1	C
7-9	NK-30100CF	Screw	2	C	15-2	XSM3 +5FV	Screw	2	C
8	FU-ETA281	Strobo Frame Ass'y	1	C	16	FU-ETA259	Grounding Wire Ass'y	1	B
8-2	XSM3 +5FV	Screw	2	C	16-2	XSM3 +5FV	Screw	1	C
9	FU-ETA370	Switch Mounting Board Ass'y	1	B	17	SPT-1	Power Supply Cord	1	B
9-2	FU-ETA285	Push Button Board Ass'y	1	B		FU-FAD014	Adaptor for 45rpm record	1	C
9-3	JSK-3050UF	Screw	2	C		FU-ETA300	Lubrication Tool	1	C
9-4	FU-JSC100	Knob	1	B		FU-ZTE095	Clamping Instruction Sheet	1	B
9-5	FU-ETA298	Switch Mounting Board Ass'y	1	C	<b>PACKING MATERIALS</b>				
9-6	FU-JPC106	Pipe	2	C	P1	FU-HPC151	Outer Carton.	1	C
9-7	XSM3 +8FV	Screw	2	C	P2	FU-HPC144	Inner Carton	1	C
9-8	XSM3 +6FV	Screw	4	C	P3	FU-HST096	Snowfoam Bottom Frame	1	C
9-9	FU-PLB142	Cord Plate	1	C	P4	FU-HST095	Snowfoam Top Frame	1	C
9-10	XSM3 +6FV	Screw	2	C	P5	FU-HST094	Snowfoam Top Cover	1	C
9-11	FU-ETA373	Power Switch Ass'y	1	A	P6	FU-HCR065	Knob Protection Plate	1	C
9-12	FU-PUB135	Switch Ass'y Cover	1	C					

# ■ COMPONENT PACKING PROCEDURE

