DIRECT-DRIVE 2-motor

FULL-AUTOMATIC TURNTABLE

PL-520

SERVICE MANUAL

PIONEER

MODEL PL-520 COMES IN THREE VERSIONS DISTINGUISHED AS FOLLOWS:

Type	Voltage	Remarks
KCT	120V only	Canada model (without cartridge)
KUT	120V only	U.S.A. model (without cartridge)
HGT	220V and 240V (switchable)	Europe or Oceania model (without cartridge)

CONTENTS

1. SPECIFICATIONS

Motor and Turntable

Drive System:	Direct-drive turntable
Motor:	DC servomotor (8 pole 24 slot)
rntable Platter:	330mm diam. aluminum alloy die-cast
ertial Mass:	200kg-cm^2 (including platter mat)
peeds:	33-1/3 and 45rpm
Speeds Control Range:	±2%
Wow and Flutte	Less than 0.03% (WRMS)
Signal-to-Noise tio:	More than 73dB (DIN-B) (with Pioneer cartridge model PC-135)

Tonearm

Type:	Static-balance type, S-shaped pipe arm
Effective Arm Length:	221mm
Overhang:	15.5mm
Tracking Error:	0.525 deg./in, 0.21 deg./cm
Usable Cartridge Weight:	4g (min.) to 10g (max.)

Other Features

Warren motor for automatic functions (auto lead-in, auto return, auto cut, auto repeat), Anti-skating force control, Lateral balancer, Cueing device, Strobe light, Detachable dust cover, Fine speed adjusters, Insulator feet, Plug-in type headshell

Miscellaneous

Power Requirements:	(HGT) 220V, 240V ~ (switchable), 50/60Hz
Power Requirements:	(KCT, KUT) 120V, 50/60Hz
Power Consumption:	8W
Dimensions:	460(W) x 171(H) x 395(D)mm 18-1/8(W) x 6-3/4(H) x 15-9/16(D) in
Weight:	8.7kg/19lb 2oz

Accessories

EP adaptor	1
Screwdriver	1
Cartridge mounting screws	6
Cartridge mounting nuts	2
Cartridge mounting washers	2
Operating instructions	1

NOTE:
Specifications and design subject to possible modification without notice, due to improvements.

HGT

For Use in United Kingdom and Australia

Please note:

Models employ 3-conductor mains leads. Please read the following instructions carefully before connecting.

WARNING: THIS APPARATUS MUST BE EARTHED.

CAUTION 240V: MAINS SUPPLY VOLTAGE IS FACTORY ADJUSTED AT 240 VOLTS.

IMPORTANT

The wires in this mains lead are coloured in accordance with following code:

Green-and-yellow:	Earth
Blue:	Neutral
Brown:	Live

As the colours of the wires in the mains lead of this apparatus may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows.
The wire which is coloured green-and-yellow must be connected to the terminal in the plug which is marked by the letter E or by the safety earth symbol ⏚ or coloured green or green-and-yellow.
The wire which is coloured blue must be connected to the terminal which is marked with the letter N or coloured blue or black.
The wire which is coloured brown must be connected to the terminal which is marked with the letter L or coloured brown or red.
The power cord should be connected last, make sure that the Power switch is OFF.
First insert the female appliance connector of the mains cord into the AC inlet, then plug the cord to the wall socket.
Be sure the appliance connector is fully inserted into the AC inlet.
Unplug the set from the wall socket when it is not to be used for an extended period of time.

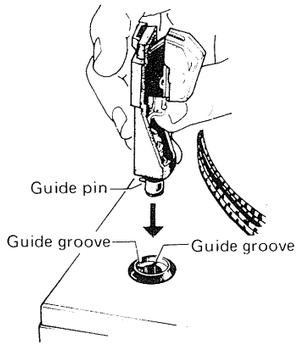
FOR YOUR SAFETY

1. *Insert this plug only into effectively earthed three-pin plug-socket outlet.*
2. *If any doubt exists regarding the earthing, consult a qualified electrician.*
3. *Extension cords, if used, must be three-core correctly wired.*

2. PANEL FACILITIES

HEADSHELL STAND/EP ADAPTOR STAND

This stand will accommodate a spare cartridge. Align the guide pin with the guide groove of the stand's opening, and then insert. You can also use this stand to store an EP adaptor.



STROBE LIGHT

This light comes on when the platter starts to rotate and it lights stroboscopically.

SPEED SELECTOR SWITCH

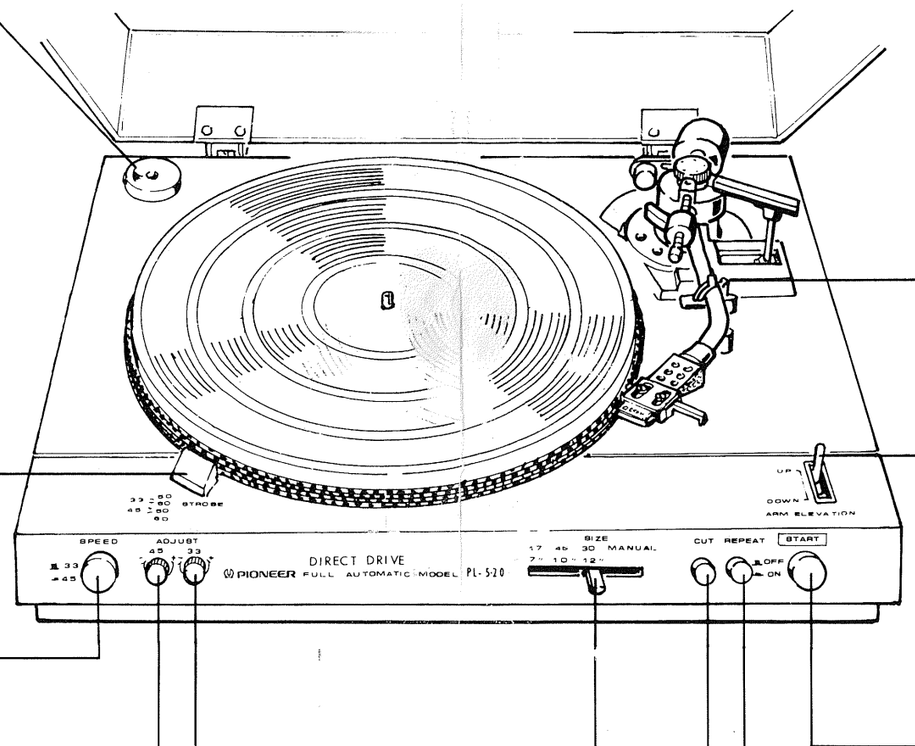
Push this switch to set the platter to 45rpm and release for 33-1/3rpm.

45rpm FINE ADJUSTMENT KNOB

When the platter speed is set to 45rpm, turn this knob and adjust the speed accurately, while looking at the strip of strobe calibration dots on the platter edge. The speed increases if the switch is turned in the + direction, and it decreases when turned in the − direction. (Refer to 'How to finely adjust the platter speed').

33-1/3rpm FINE ADJUSTMENT KNOB

When the platter speed is set to 33-1/3rpm, turn this knob and adjust the speed accurately, while looking at the strip of strobe calibration dots on the platter edge. The speed increases if the switch is turned in the + direction, and it decreases when turned in the − direction. (Refer to 'How to finely adjust the platter speed').



RECORD SIZE SELECTOR

This selector selects the size of the record for automatic play and also selects manual play.

17 7" . . . . . For the automatic play of 17cm (7-inch) LP and EP records.

25 10" . . . . . For the automatic play of 25cm (10-inch) LP records.

30 12" . . . . . For the automatic play of 30cm (12-inch) LP records.

MANUAL . . . For the manual play of records.

NOTE:
The tonearm will not be actuated when the record size selector is at the MANUAL position for automatic play, even if the START button and the REPEAT button are pushed.

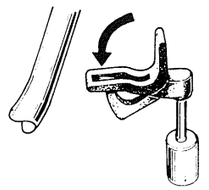
CUT BUTTON

Push this button to stop the record play. When pushed, the tonearm will rise and return to the arm rest. The power to the turntable will then be switched off and a few seconds later, the platter will stop rotating.

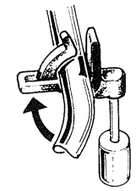
NOTE:
If the REPEAT button is pushed, the tonearm will return to the arm rest and then move across again to the record.

ARM REST

The arm rest supports the tonearm when it is not being used. Set the tonearm on its rest when it is not playing records. Clamp it into position if you don't have any immediate plans to play records (see Figure).



Releasing the arm clamp



Securing the arm clamp

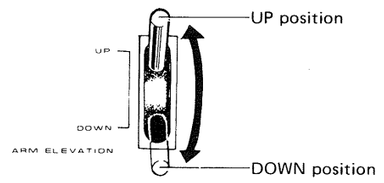
ARM ELEVATION LEVER

This lever controls the ascent and descent of the tonearm.

UP . . . . . The tonearm rises.

DOWN . . . . . The tonearm descends gently. Set to this position for auto play, auto repeat and other automatic operations.

NOTE:
When the arm elevation lever is set to the UP position for automatic play, the tonearm will move over as far as the lead-in groove on the record but it will not descend and the record will therefore not be played.



START BUTTON

The power to the turntable is turned on and the platter starts to rotate when this button is depressed.

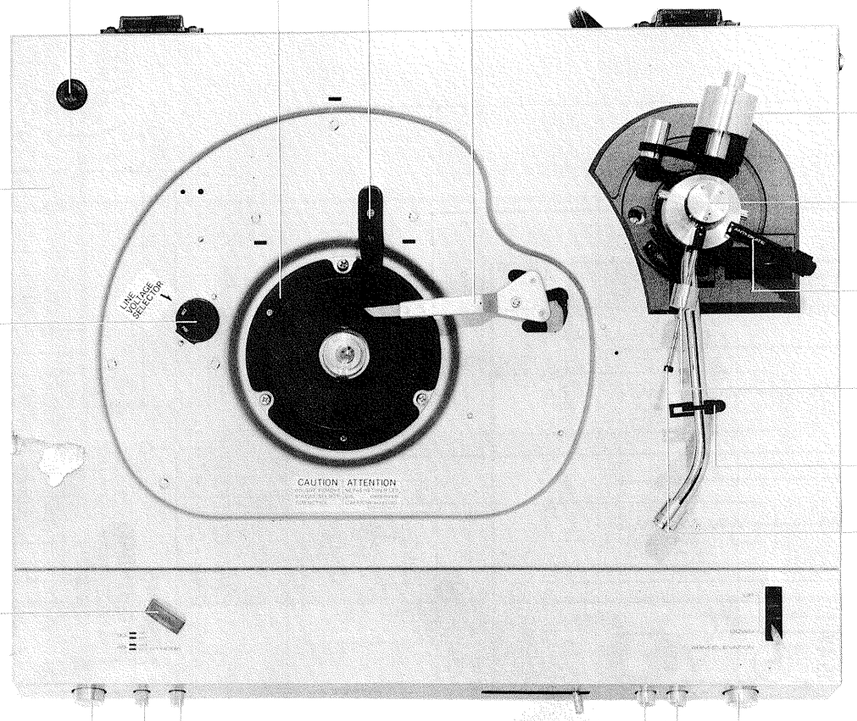
REPEAT BUTTON

Push this button when you want to listen to the same record again. Press the button once more to release.

NOTE:
All you have to do for repeat play is to press the REPEAT button. There is no need to push the START button again.

3. PARTS LOCATIONS (HGT type)

3.1 TOP VIEW



Headshell holder
PNW-314

Motor
MXA-001

Stopper assembly
PXT-219

Stopper
PXT-199

Panel
PNA-086

Line voltage selector
PSB-002

Lens
PNW-302

Weight
PXA-657

Knob
PXT-537

Anti-skating assembly
PYY-009

Weight
PLA-697

Arm rest assembly
PXA-363

Rubber cap
PNT-521

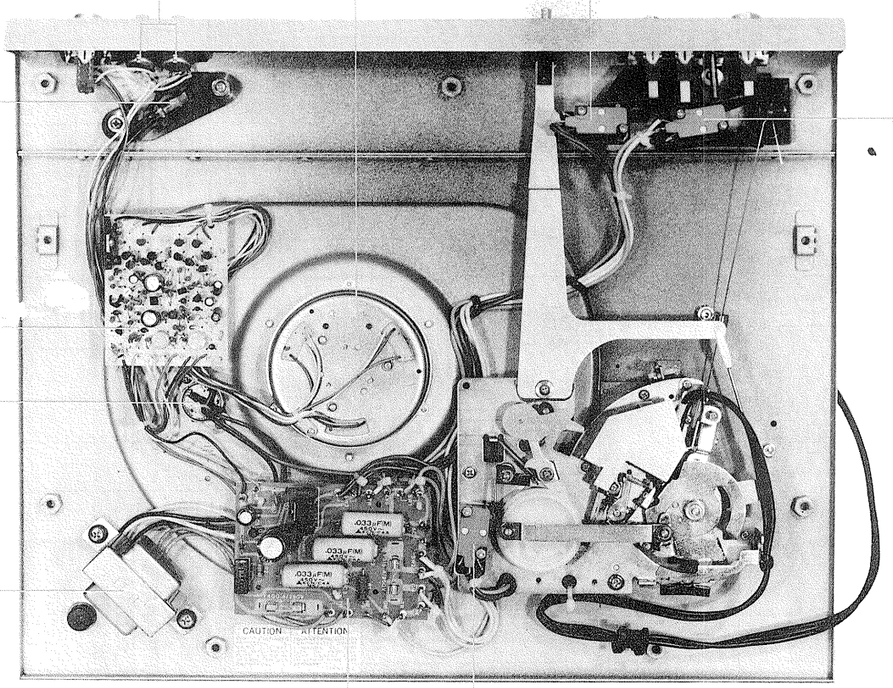
Knob
PAD-023

Knob
PAA-025

Knob
PAD-024

Knob
PAD-023

3.2 BOTTOM VIEW



Variable resistor
PCS-009

Motor
MXA-001

Microswitch
KSF-016

Neon lamp
PEL-005

Microswitch
KSF-016

Line voltage selector
PSB-002

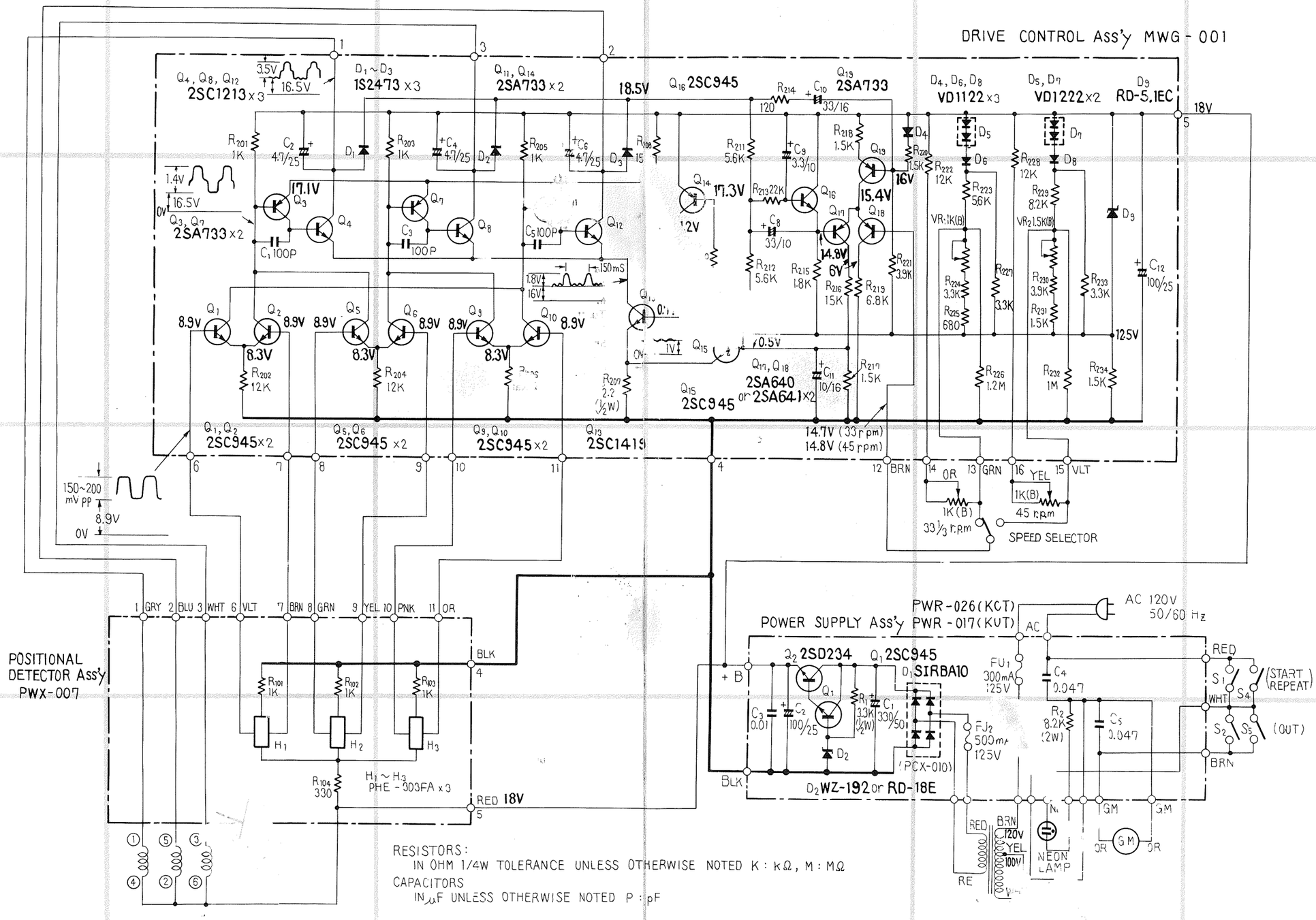
Power transformer
PTT-032

Power supply assembly
PWR-016

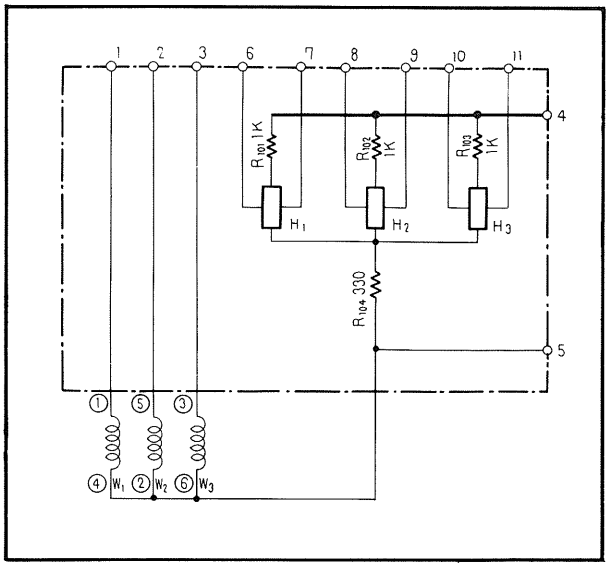
Microswitch
KSF-023

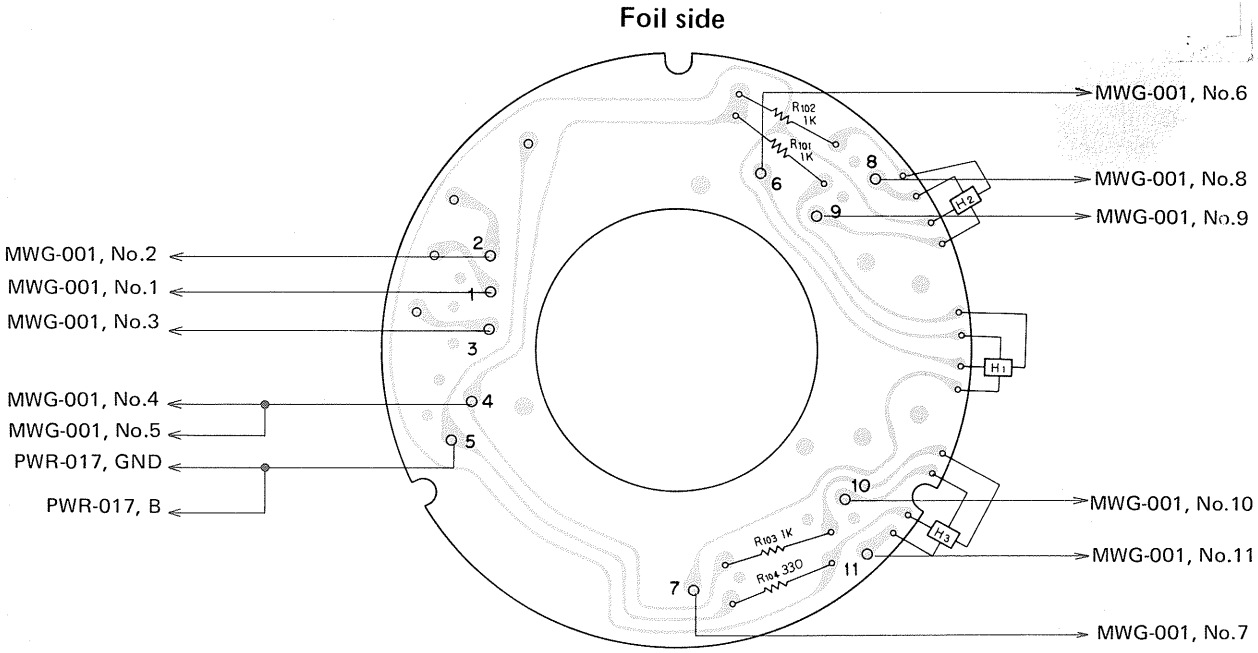
4. SCHEMATIC DIAGRAMS, P.C. BOARD PATTERNS AND PARTS LIST

4.1 SCHEMATIC DIAGRAMS



4.2 POSITIONAL DETECTOR ASSEMBLY (PWX-007)





Part List

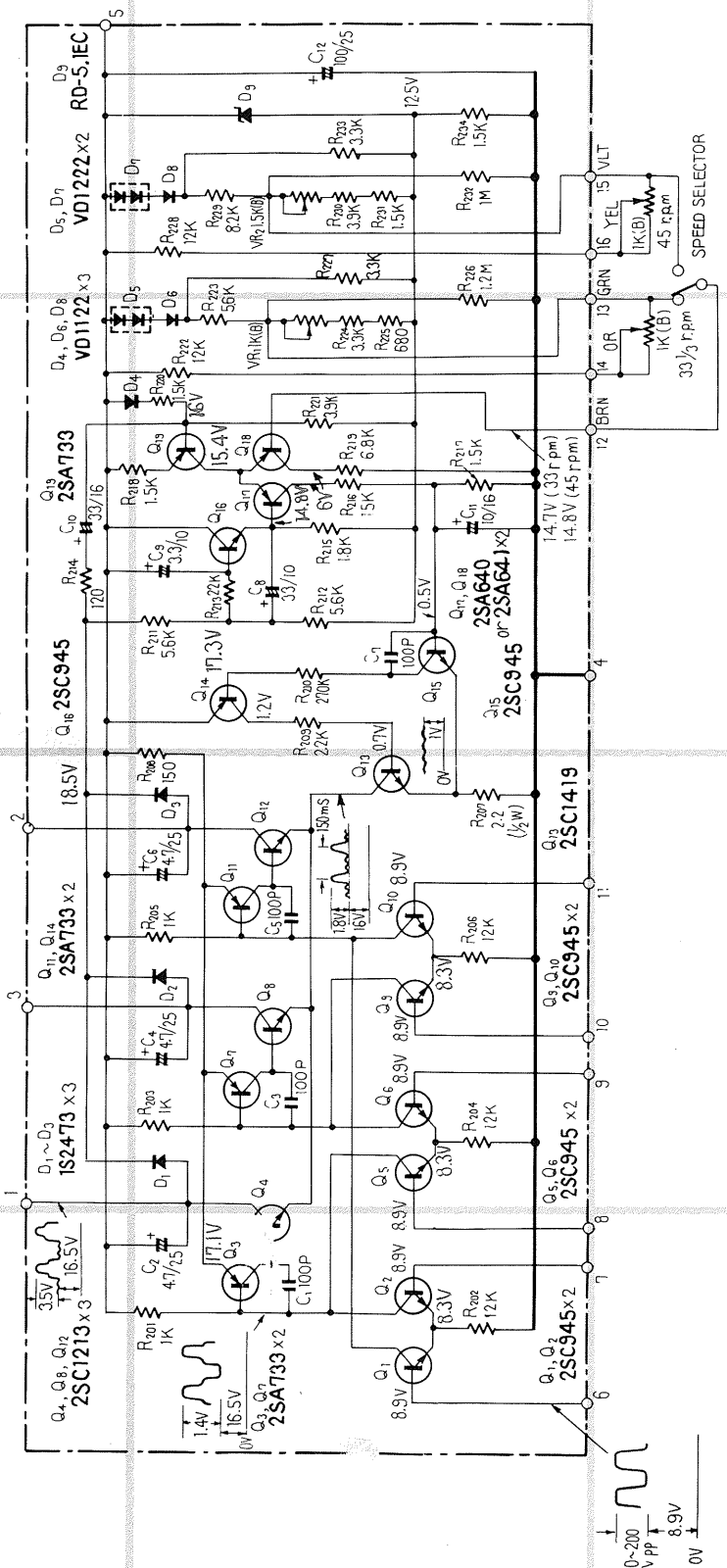
RESISTORS

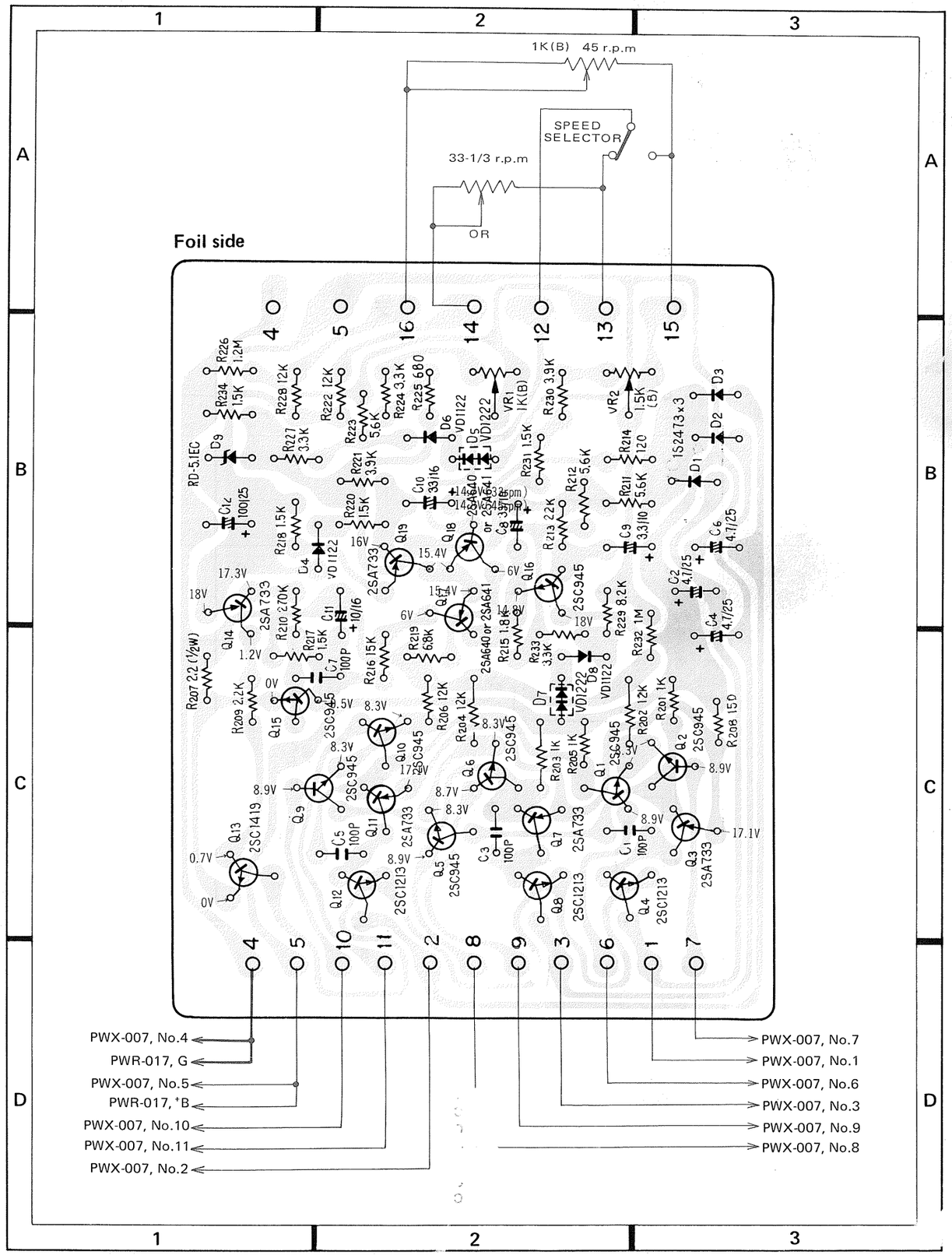
Symbol	Part No.	Description	
R101	RD¼PS 102J	Carbon film	1k
R102	RD¼PS 102J	Carbon film	1k
R103	RD¼PS 102J	Carbon film	1k
R104	RD¼PS 331J	Carbon film	330

OTHERS

Symbol	Part No.	Description
H1	PCX-012	Hall element
H2	PCX-012	Hall element
H3	PCX-012	Hall element

4.3 DRIVE CONTROL ASSEMBLY (MWG-001)





Parts List of Drive Control Assembly (MWG-001)

SEMICONDUCTORS

Symbol	Part No.	Description
Q1	2SC945-P	Transistor
Q2	2SC945-P	Transistor
Q3	2SA733-Q or P	Transistor
Q4	2SC1213-C or B	Transistor
Q5	2SC945-P	Transistor
Q6	2SC945-P	Transistor
Q7	2SA733-Q or P	Transistor
Q8	2SC1213-C or B	Transistor
Q9	2SC945-P	Transistor
Q10	2SC945-P	Transistor
Q11	2SA733-Q or P	Transistor
Q12	2SC1213-C or B	Transistor
Q13	2SC1419-B, A, C or D	Transistor
Q14	2SA733-Q or P	Transistor
Q15	2SC945-P	Transistor
Q16	2SC945-P	Transistor
Q17	2SA641-E (2SA640-E)	Transistor
Q18	2SA641-E (2SA640-E)	Transistor
Q19	2SA733-Q or P	Transistor
D1	1S2473	Diode
D2	1S2473	Diode
D3	1S2473	Diode
D4	VD1122	Diode
D5	VD1222	Diode
D6	VD1122	Diode
D7	VD1222	Diode
D8	VD1122	Diode
D9	RD5.1EC	Zener

RESISTORS

Symbol	Part No.	Description	
VR1	MCP-001	Semi-fixed	(1K-B)
VR2	PCP-005	Semi-fixed	(1.5K-B)

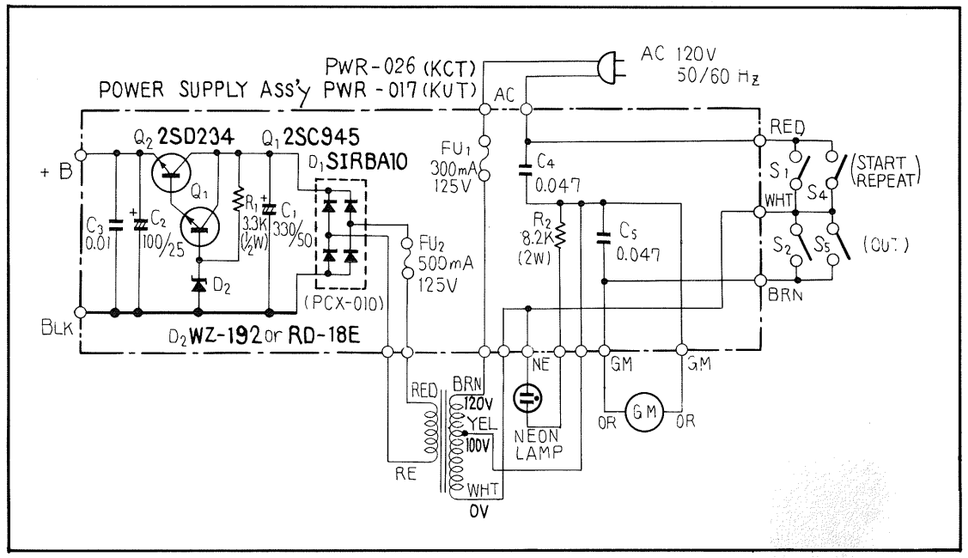
Symbol	Part No.	Description		
R201	RD¼VS 102J	Carbon film	1k	
R202	RD¼VS 123J	Carbon film	12k	
R203	RD¼VS 102J	Carbon film	1k	
R204	RD¼VS 123J	Carbon film	12k	
R205	RD¼VS 102J	Carbon film	1k	
R206	RD¼VS 123J	Carbon film	12k	
R207	RD½VS 2R2J	Carbon film	2.2	½W
R208	RD¼VS 151J	Carbon film	150	
R209	RD¼VS 222J	Carbon film	2.2k	
R210	RD¼VS 274J	Carbon film	270k	
R211	RD¼VS 562J	Carbon film	5.6k	
R212	RD¼VS 562J	Carbon film	5.6k	
R213	RD¼VS 223J	Carbon film	22k	
R214	RD¼VS 121J	Carbon film	120	
R215	RD¼VS 182J	Carbon film	1.8k	
R216	RD¼VS 153J	Carbon film	15k	
R217	RD¼VS 152J	Carbon film	1.5k	
R218	RD¼VS 152J	Carbon film	1.5k	
R219	RD¼VS 682J	Carbon film	6.8k	
R220	RD¼VS 152J	Carbon film	1.5k	
R221	RD¼VS 392J	Carbon film	3.9k	
R222	RD¼VS 123J	Carbon film	12k	
R223	RD¼VS 562J	Carbon film	5.6k	
R224	RD¼VS 332J	Carbon film	3.3k	
R225	RD¼VS 681J	Carbon film	680	
R226	RD¼VS 125J	Carbon film	1.2M	
R227	RD¼VS 332J	Carbon film	3.3k	
R228	RD¼VS 123J	Carbon film	12k	
R229	RD¼VS 822J	Carbon film	8.2k	
R230	RD¼VS 392J	Carbon film	3.9k	
R231	RD¼VS 152J	Carbon film	1.5k	
R232	RD¼VS 105J	Carbon film	1M	
R233	RD¼VS 332J	Carbon film	3.3k	
R234	RD¼VS 152J	Carbon film	1.5k	

CAPACITORS

Symbol	Part No.	Description		
C1	CCDSL 101K 50	Ceramic	100p	50V
C2	CEA 4R7P 25	Electrolytic	4.7	25V
C3	CCDSL 101K 50	Ceramic	100p	50V
C4	CEA 4R7P 25	Electrolytic	4.7	25V
C5	CCDSL 101K 50	Ceramic	100p	50V
C6	CEA 4R7P 25	Electrolytic	4.7	25V
C7	CCDSL 101K 50	Ceramic	100p	50V
C8	CSZA 330M 10	Electrolytic	33	10V
C9	CSZA 3R3M 10	Electrolytic	3.3	10V
C10	CEA 330P 10	Electrolytic	33	16V
C11	CEA 100P 16	Electrolytic	10	16V
C12	CEA 101P 25	Electrolytic	100	25V

4.4 POWER SUPPLY ASSEMBLY
KCT type (PWR-026)
KUT type (PWR-017)

HGT type on page 36.



Parts List

SEMICONDUCTORS

Symbol	Part No.	Description
Q2	2SD234	Transistor
Q1	2SC945-P	Transistor
D1	PCX-010	Bridge rectifiers
D2	WZ-192 or RD18E	Zener diode

RESISTORS

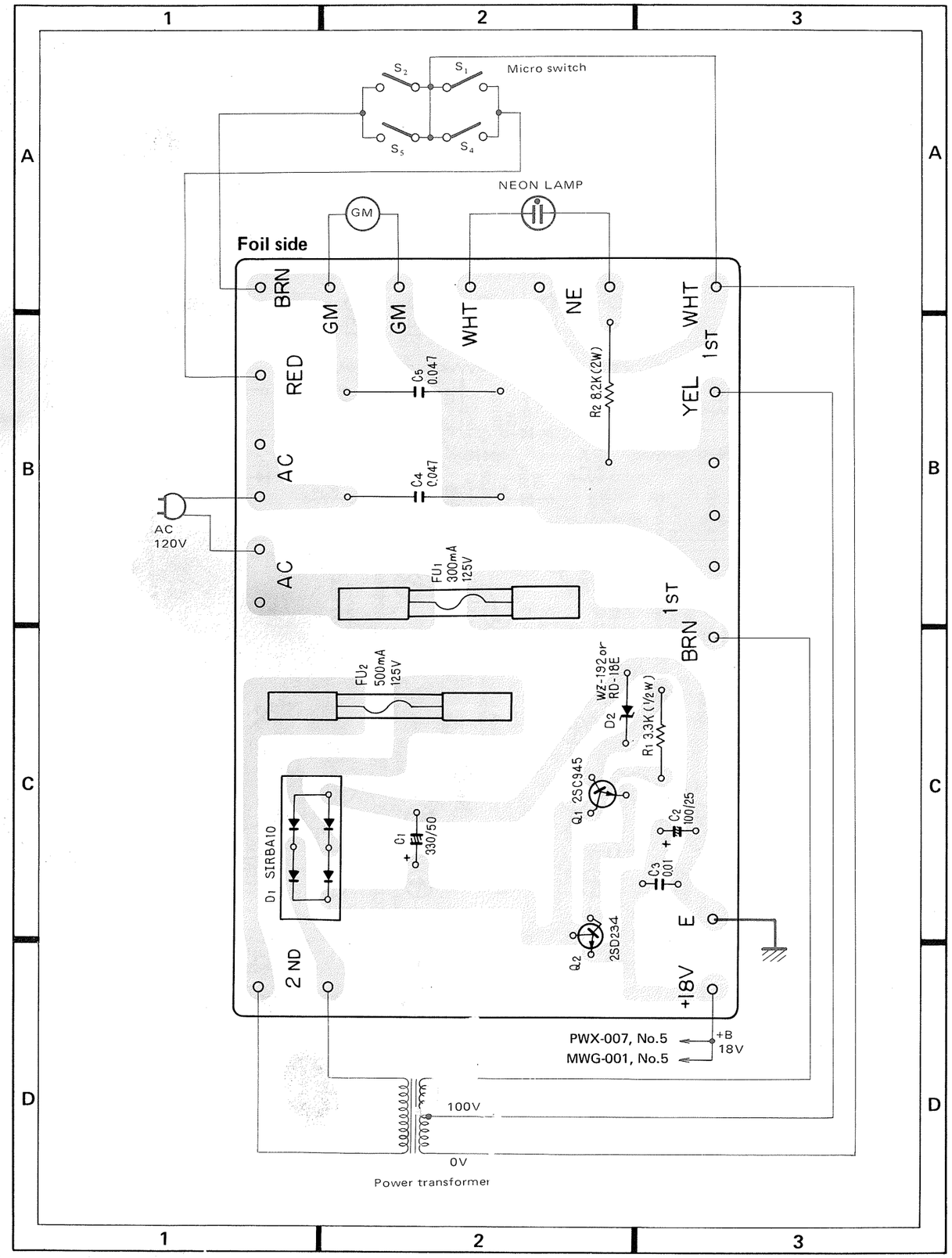
Symbol	Part No.	Description		
R1	RD½PS 332J	Carbon film	3.3k	½W
R2	RS2P 822J	Metal oxide	8.2k	2W

CAPACITORS * mark KCT type only

Symbol	Part No.	Description		
C4	KCE-005	Ceramic	0.047	125V
C5	KCE-005	Ceramic	0.047	125V
C1	CEA 331P 50	Electrolytic	330	50V
C2	CEA 101P 25	Electrolytic	100	25V
C3	CKDYF 103Z 50	Ceramic	0.01	50V
* C4	PCL-019	Ceramic	0.047	125V
* C5	PCL-019	Ceramic	0.047	125V

OTHERS

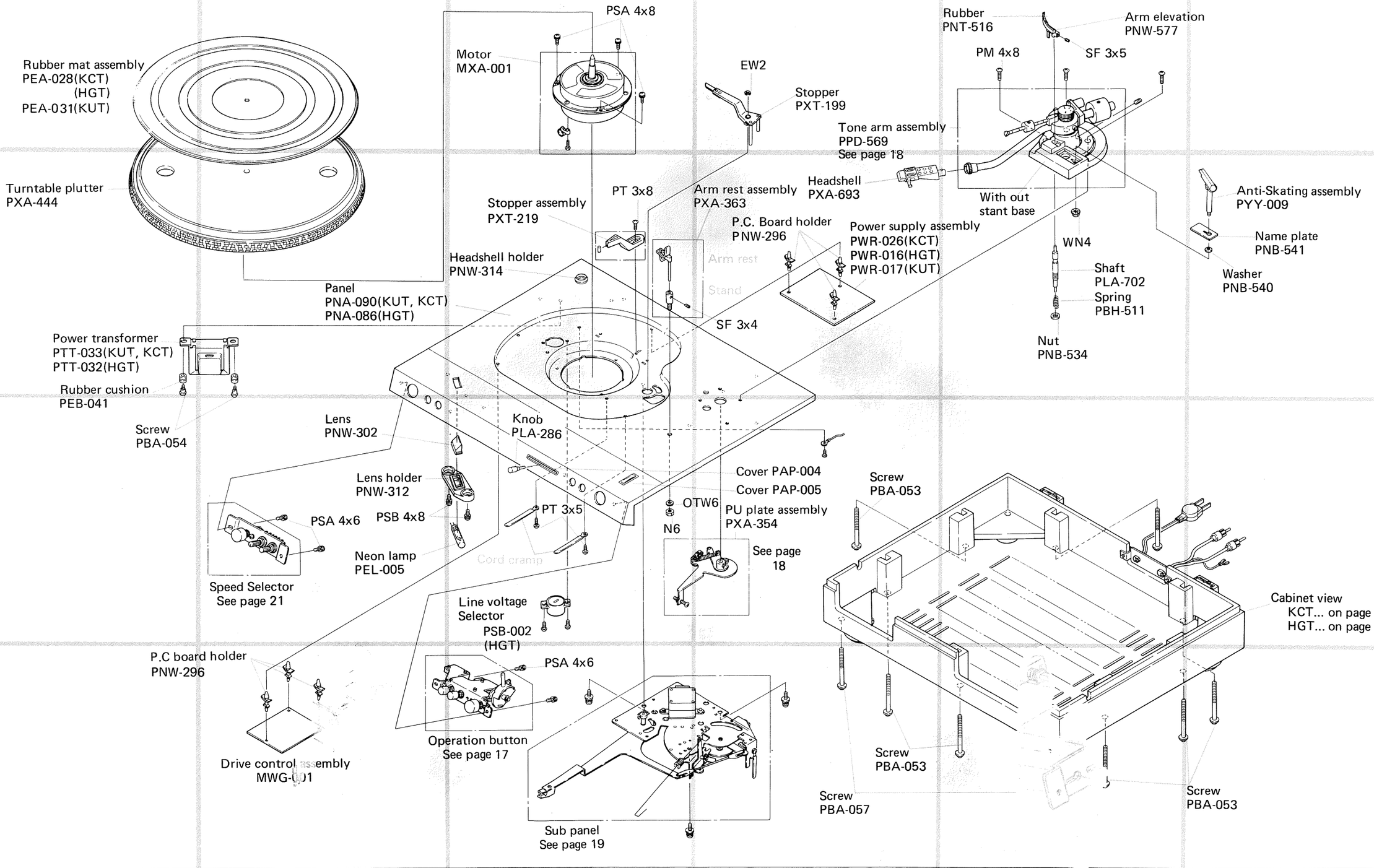
Symbol	Part No.	Description	
FU1	PEK-009	Fuse	300mA
FU2	PEK-004	Fuse	500mA
	PNS-001	Heat sink	
	K91-006	Fuse clip	



5. EXPLODED VIEW

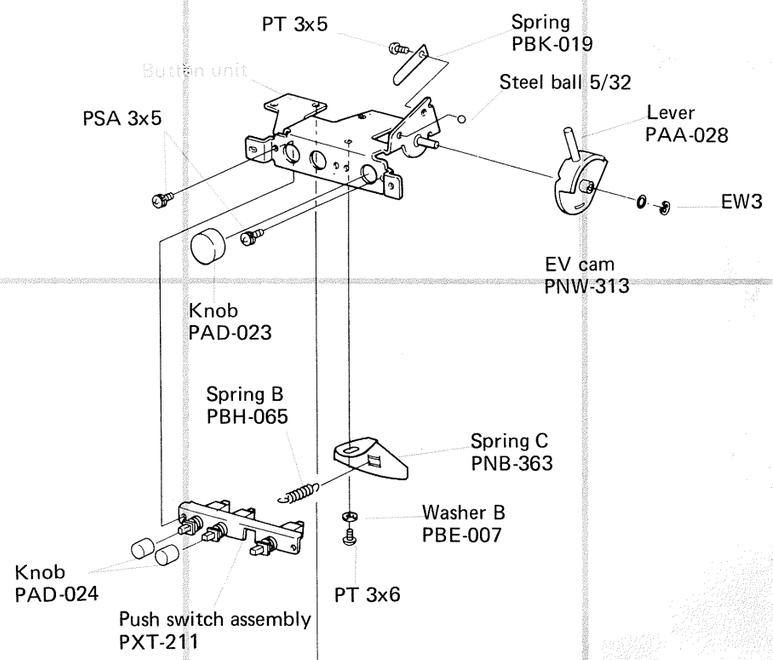
5.1 OVER ALL

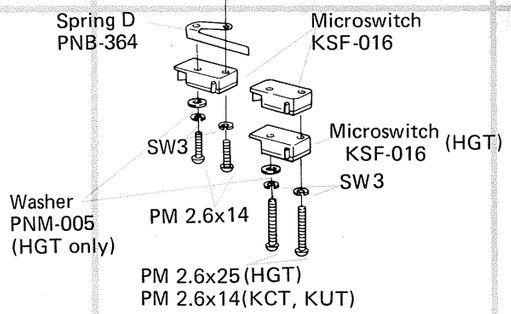
NOTE:
Parts indicated in green type cannot be supplied.



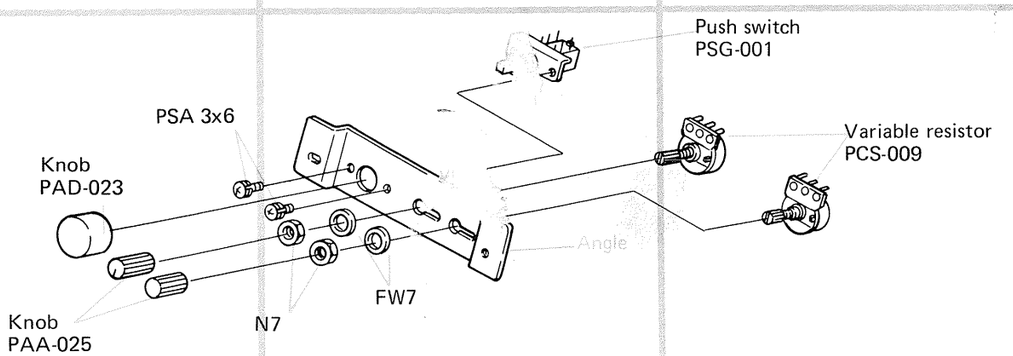
5.2 OPERATION BUTTON

NOTE:
Parts indicated in green type cannot be supplied.



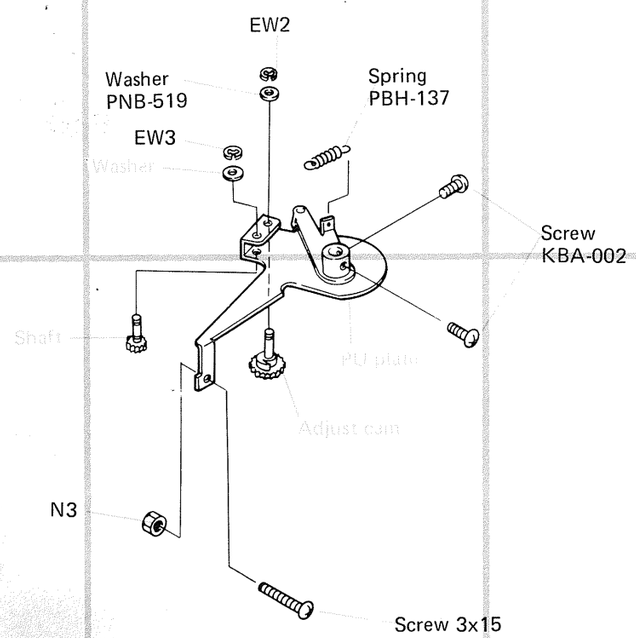


5.3 SPEED SELECT BUTTON

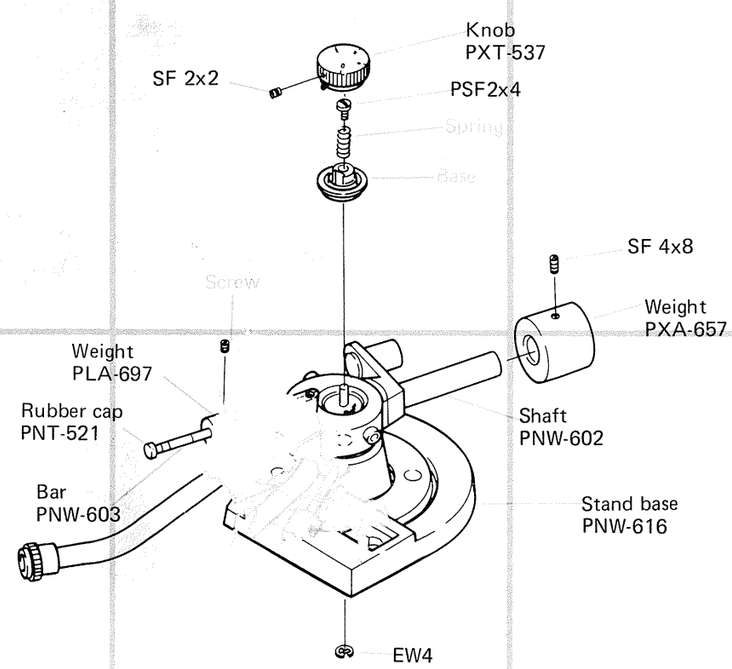


5.4 PU PLATE

NOTE:
Parts indicated in green type cannot be supplied.

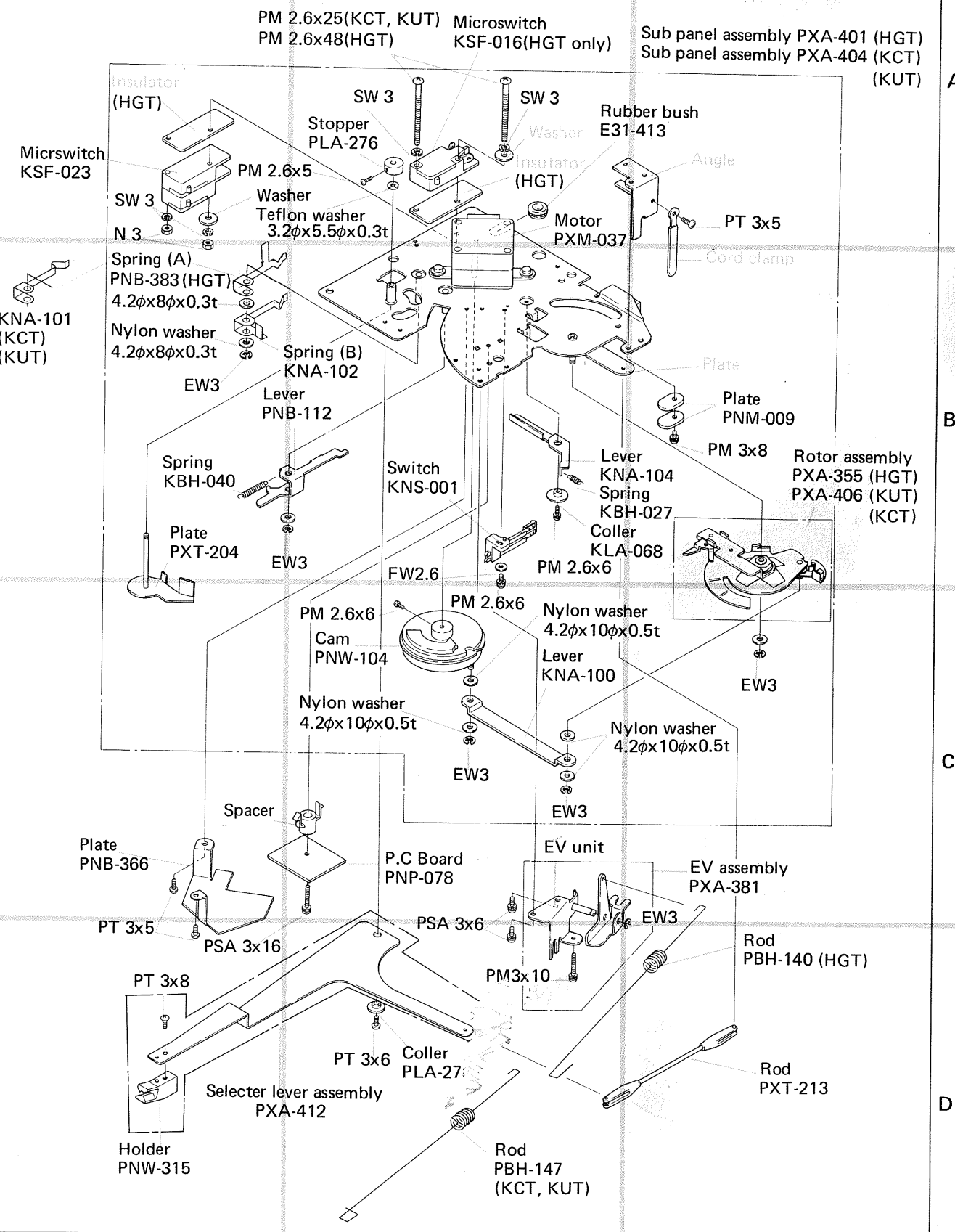


5.5 TONEARM



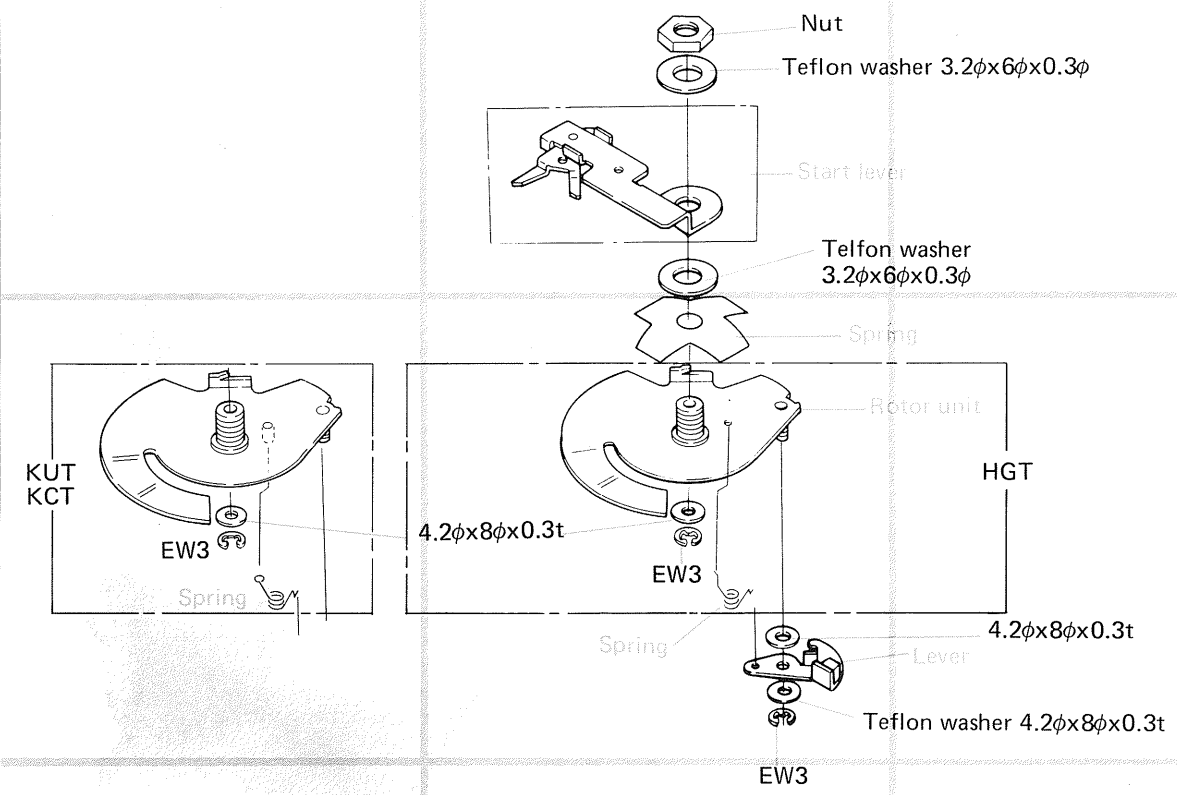
5.6 SUB PANEL

NOTE:
Parts indicated in green type cannot be supplied.

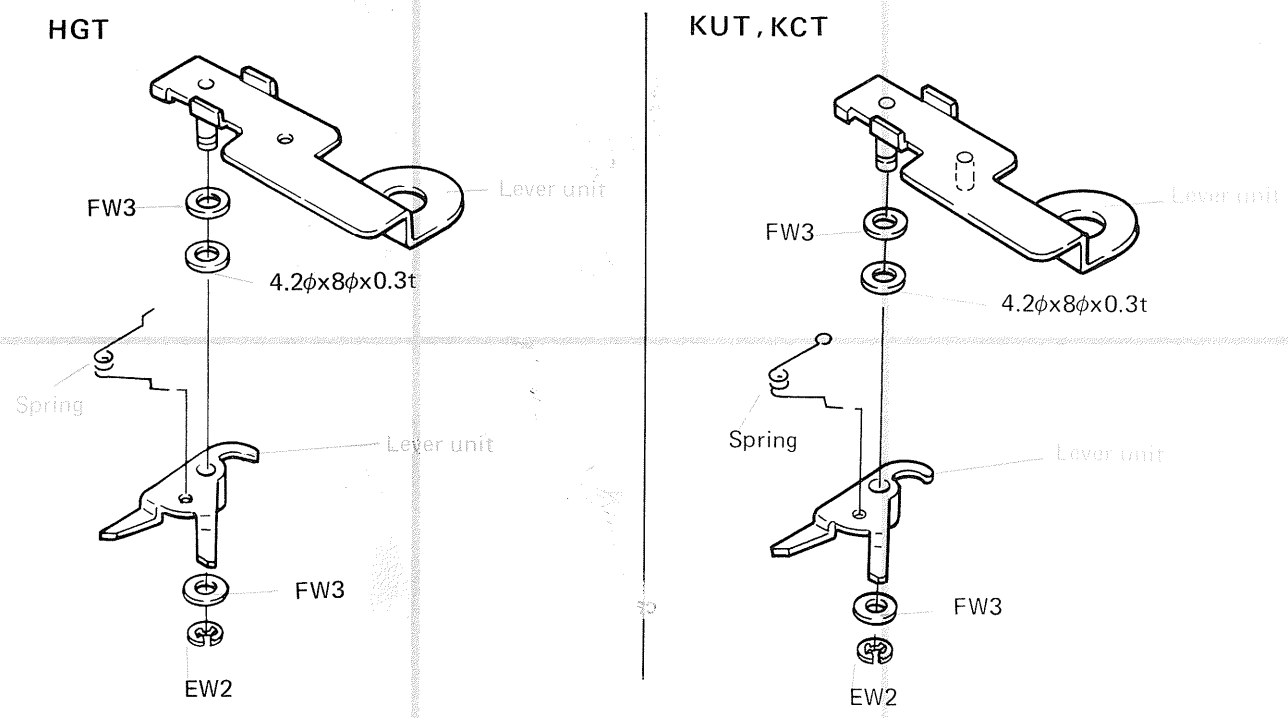


5.7 ROTOR

NOTE:
Parts indicated in green type cannot be supplied.

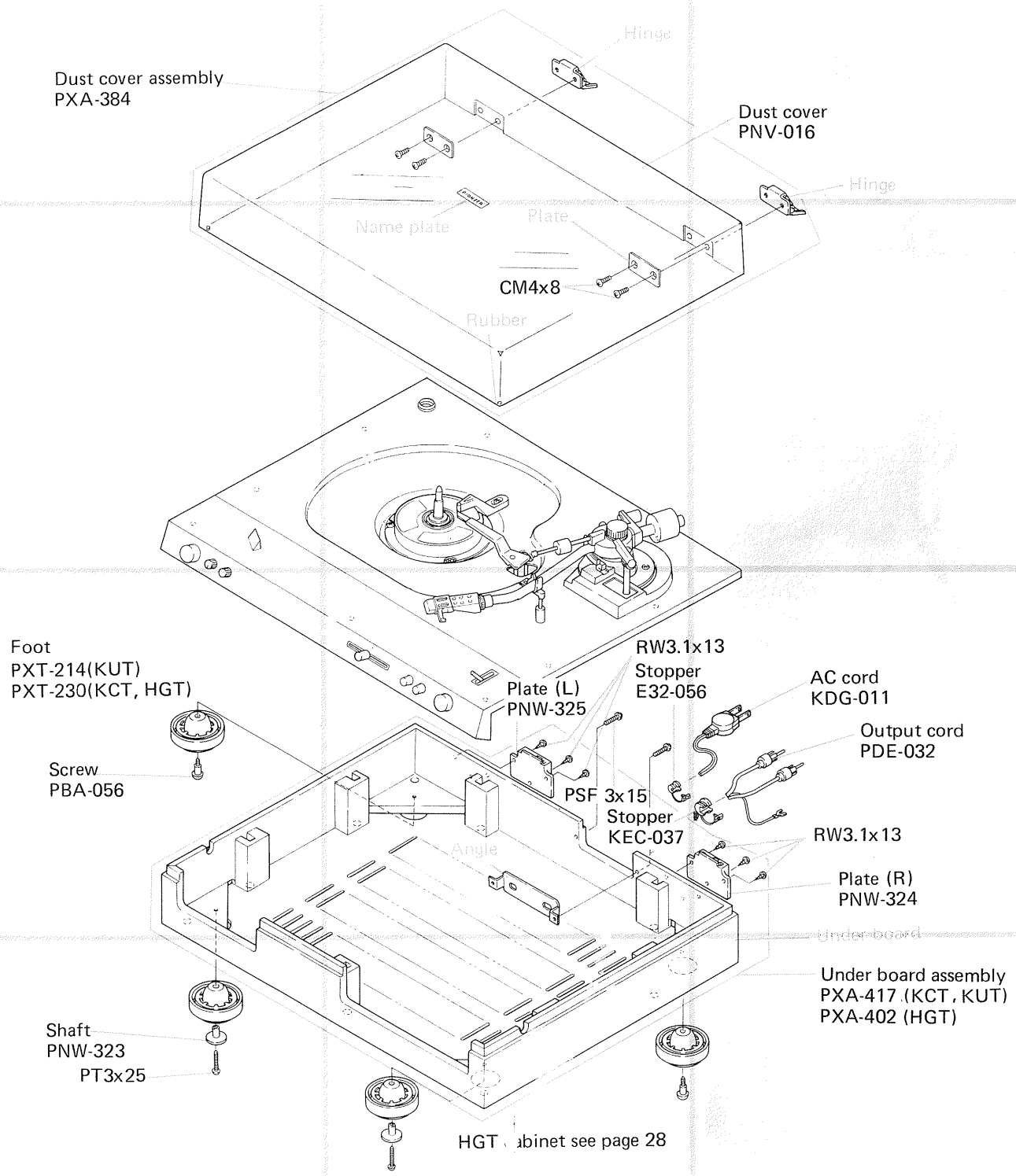


5.8 LEVER



5.9 CABINET

NOTE:
Parts indicated in green type cannot be supplied.



HGT ... abinet see page 28

5.10 MOTOR

NOTE:
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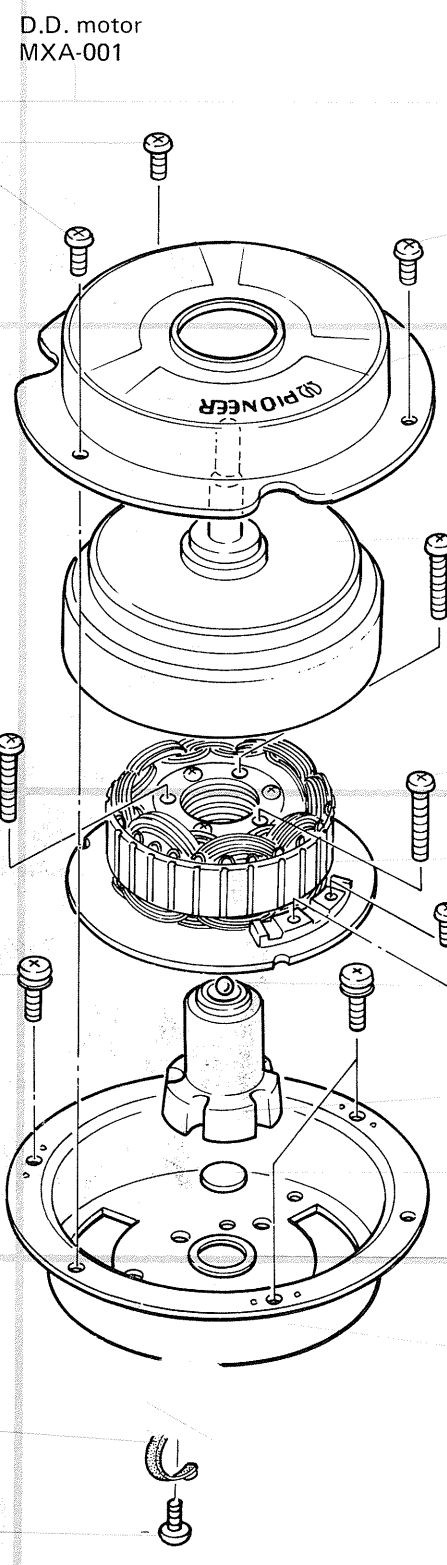
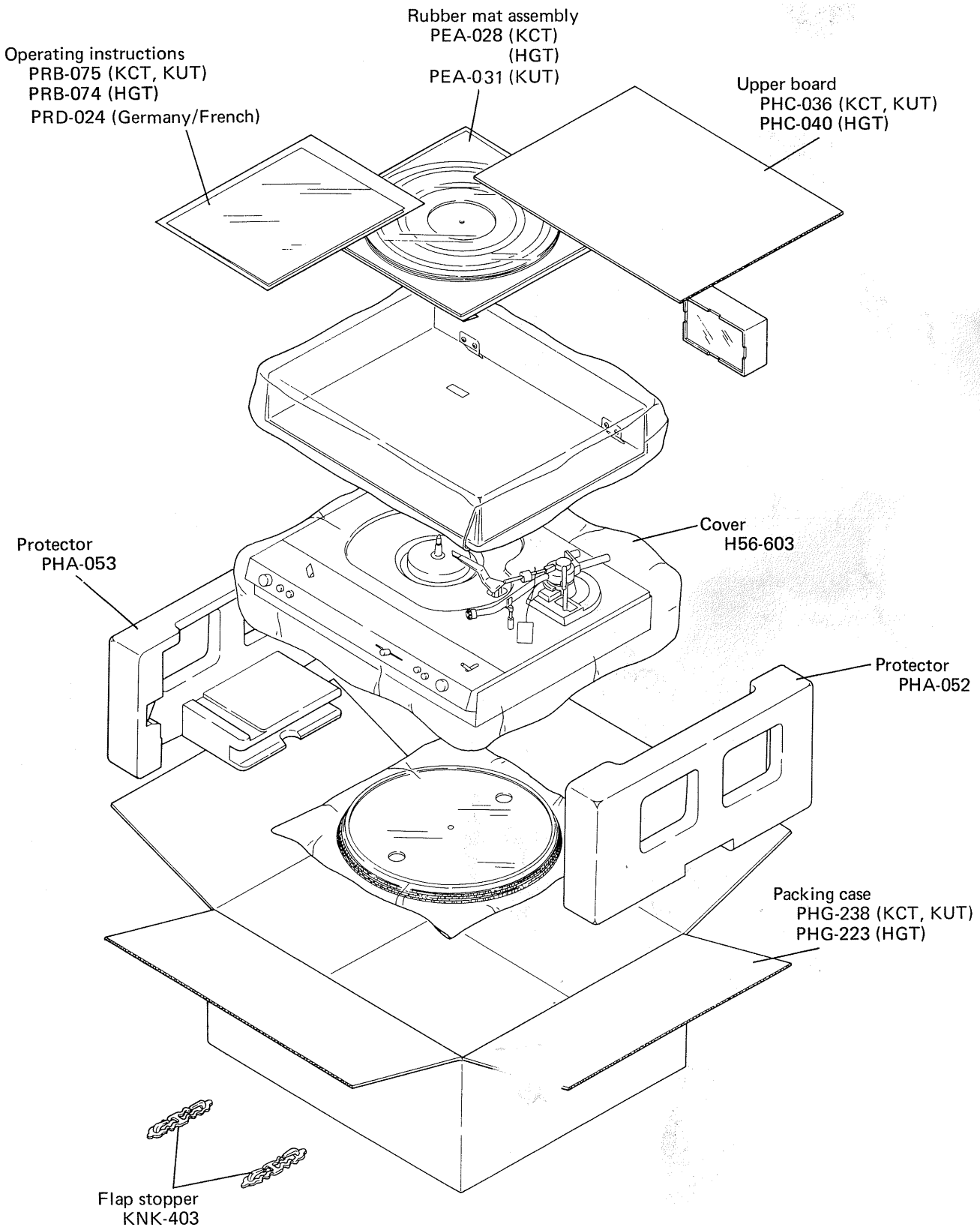
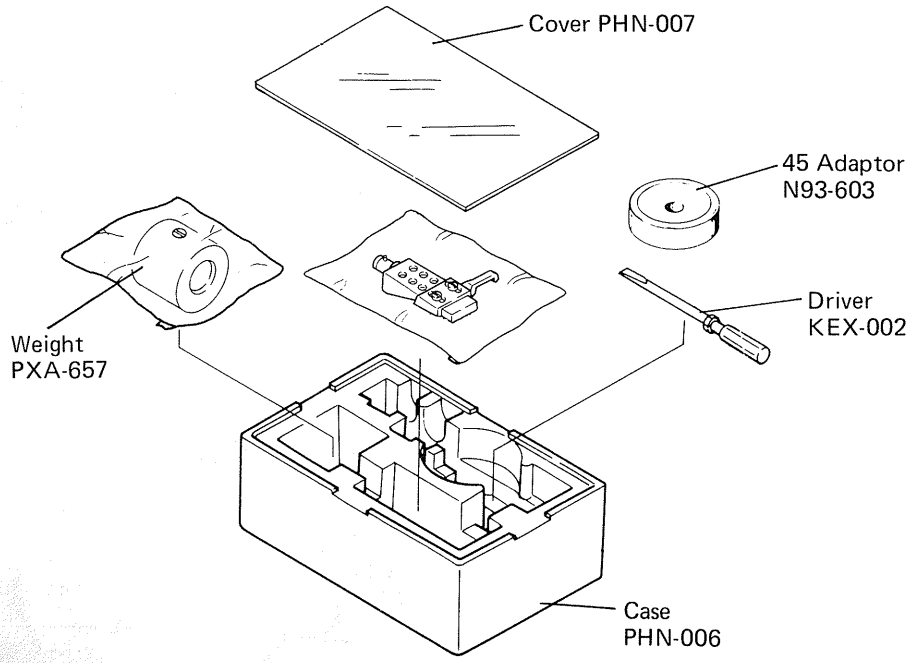


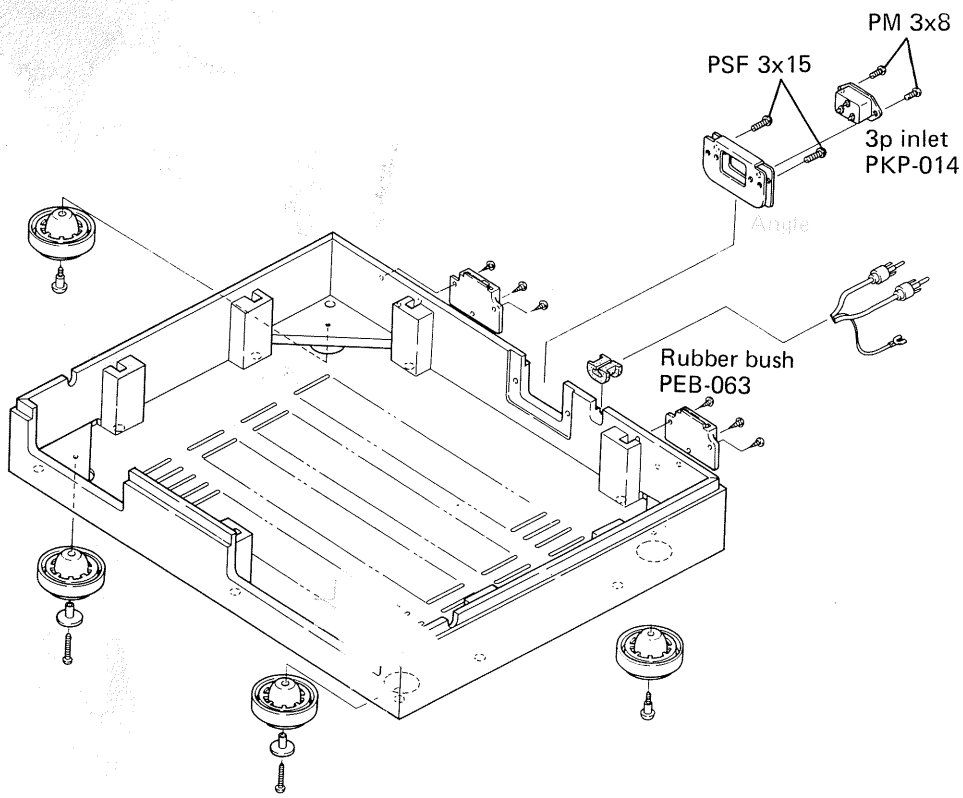
5.11 PACKING


Operating instructions
PRB-075 (KCT, KUT)
PRB-074 (HGT)
PRD-024 (Germany/French)
Rubber mat assembly
PEA-028 (KCT)
(HGT)
PEA-031 (KUT)
Upper board
PHC-036 (KCT, KUT)
PHC-040 (HGT)
Cover
H56-603
Protector
PHA-053
Protector
PHA-052
Packing case
PHG-238 (KCT, KUT)
PHG-223 (HGT)
Flap stopper
KNK-403

5.12 ACCESSORY PART



5.13 HGT CABINET



5.14 NOMENCLATURE OF SCREW WASHER AND NUT

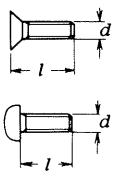
The following symbols stand for screws, washers and nuts as shown in exploded view.

Symbol	Description	Shape
RT	Brazier head tapping screw	
PT	Pan head tapping screw	
BT	Binding head tapping screw	
CT	Countersunk head tapping screw	
TT	Truss head tapping screw	
OCT	Oval countersunk head tapping screw	
PM	Pan head machine screw	
CM	Countersunk head machine screw	
OCM	Oval countersunk head machine screw	
TM	Truss head machine screw	
BM	Binding head machine screw	
PSA	Pan head screw with spring lock washer	
PSB	Pan head screw with spring lock washer and flat washer	
PSF	Pan head screw with flat washer	

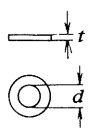
Symbol	Description	Shape
EW	E type washer	
FW	Flat washer	
SW	Spring lock washer	
N	Nut	
WN	Washer faced nut	
ITW	Internal toothed lock washer	
OTW	Outernal toothed lock washer	
SC	Slotted set screw (Cone point)	
SF	Slotted set screw (Flat point)	
HS	Hexagon socket headless set screw	
OCW	Oval countersunk head wood screw	
CW	Countersunk head wood screw	
RW	Round head wood screw	

EXAMPLE

PM・3x8
- 3: length in mm (l)
- 8: diameter in mm (d)
- PM: Symbol



FW・9φx1^{t}
- 1: thickness in mm (t)
- 9φ: diameter in mm (d)
- FW: Symbol



6. D.D. MOTOR OUTLINE OF OPERATION

6.1 STRUCTURE

The PXM-030-D is an external-rotor type DC motor in which Hall-effect elements are used to detect the rotor position, with electronic ON-OFF switching of the current to the motor windings. As shown in Figure 1a, the ferrite rotor is magnetized alternately N and S in 45° segments. Figure 1b shows the three Hall-effect elements under the rotor.

The Hall-effect elements, H_1, H_2, and H_3, are fitted 30° apart (120° magnetically), so that whatever the orientation of the rotor, one of them will experience a Hall potential at a particular time.

6.2 OPERATION OF THE MOTOR (SEE CONNECTION DIAGRAM)

When the electrical supply is connected to the motor, current flows through the three Hall-effect elements, which go into the operating condition. If we assume, at this time, that a rotor S pole is located at the H_2 Hall-effect element position, then the Hall potential developed in H_2 sends the base of Q_5 negative (−) and that of Q_6 positive (+). Due to this Hall-effect potential Q_1, Q_6 turns ON, voltage at the Q_1, Q_6 collector drops, the potential on the base of Q_7 drops, and Q_7, Q_8 turns ON. With Q_8 ON, the motor drive coil W_3 is energized by the collector current, and the rotor begins to move. After some small movement of the rotor, the S pole approaching the Hall-effect element H_1 causes Q_2 to turn ON. The first N pole passes H_3 as the next one approaches H_1, putting Q_6 and Q_7 ON, and thus the rotation of the rotor is continuously sustained.

On the other hand, when a N pole approaches the Hall-effect element(s) H_1 (H_2, H_3), the polarity of the Hall potential changes, the base(s) of Q_5 go positive (+), the base(s) of Q_6 go negative (−), and so Q_1, Q_6 turn OFF. This means that Q_7, Q_8 also turn OFF and the current ceases to flow in the drive coil(s) W_3 (W_1, W_2).

6.3 SPEED CONTROL

When no current is flowing through a drive coil (that is when a S pole is approaching the Hall-effect element), a voltage proportional to the speed of rotation of the rotor is induced in the drive coil (the same effect as with a generator). This voltage is rectified by the diode(s) D_1 (D_2, D_3) and the positive potential derived is applied to the base of Q_{16}. Q_{17} and Q_{18} form a differential amplifier circuit, and the standard voltage for 33-1/3 or 45 rpm rotation is applied to the base of Q_{16}. It follows that so long as the rotor is

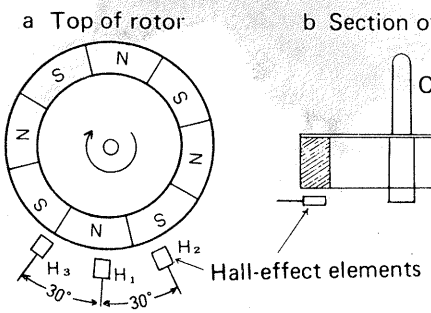


Fig. 1: Relative Locations of Rotor and Hall-Effect Elements

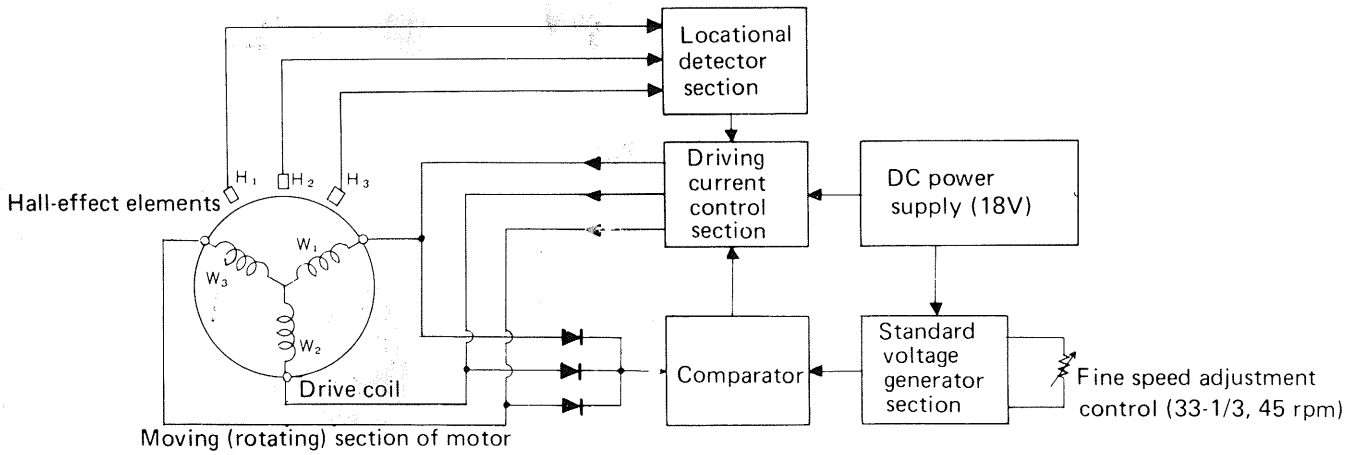


Fig. 2: Block Diagram of the PXM-030

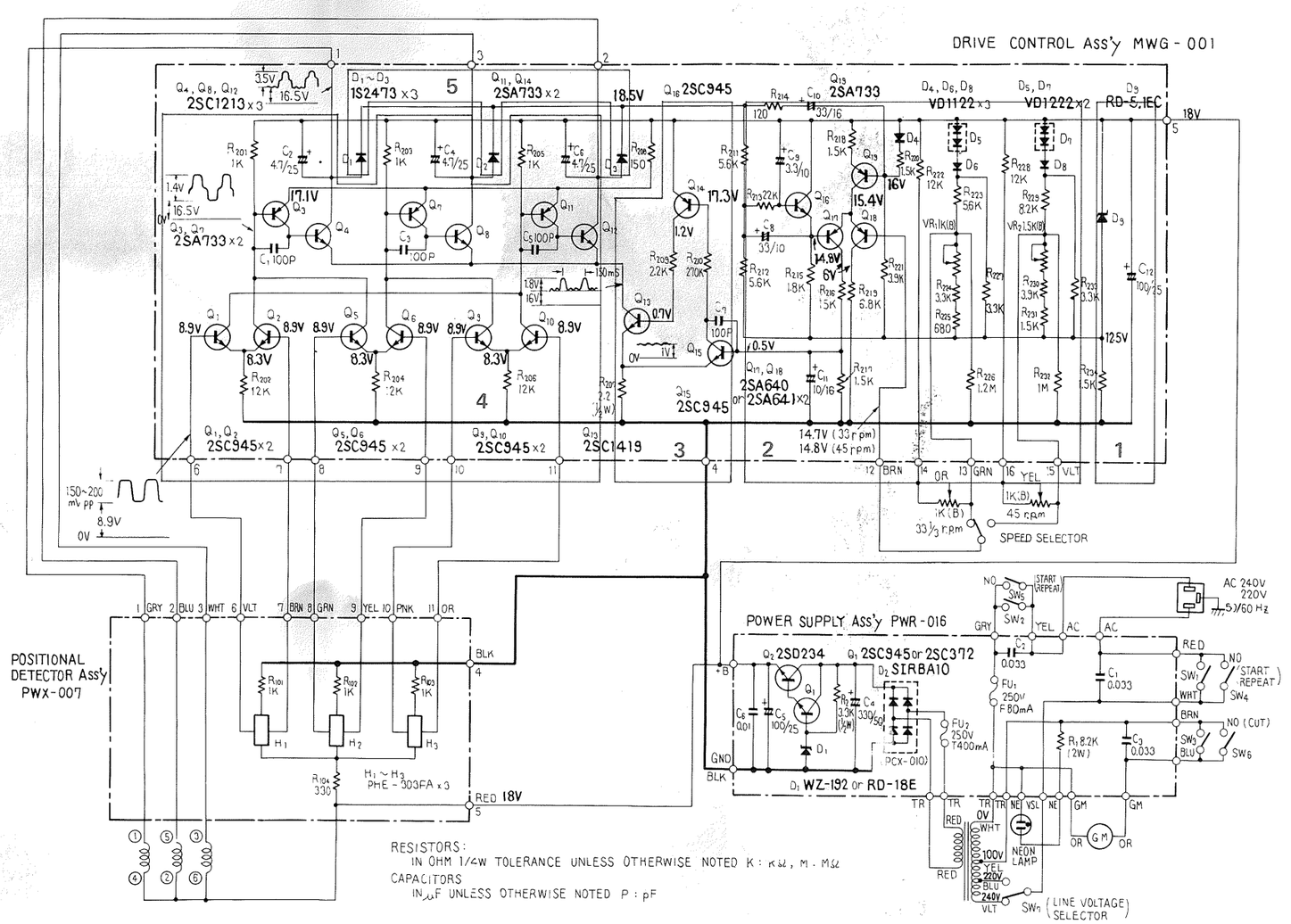
turning at the correct speed (revs), this circuit is balanced. If for any reason the speed of rotation of the rotor exceeds the proper value, the voltage generated in each drive coil will increase.
This causes the potential on the base of Q_{16}, Q_{17} to rises, and the potential on the bases of Q_{15} drops. As the potential on the base of Q_{15} drops the collector current drops and this reduces the potential on the base(s) of Q_{13}. This results in a reduction in the current flowing through Q_{13}, and a rise in the potential on the emitter(s) of Q_4 (Q_8, Q_{12}), so that the collector current(s) of Q_4 (Q_8, Q_{12}) drop. If the collector current drops, the field strength of the drive coil also drops, the rotor speed drops, and it returns to the correct speed of rotation.
On the other hand, if the rate of rotation of the rotor drops below its proper value, the process is precisely the reverse of the above: the voltage across each drive coil drops, and the base potential of Q_{16} drops. This causes the collector current of Q_{14} to increase, and the current(s) through Q_{13} also rise. As the collector current(s) of Q_{13} increase, the emitter potential(s) on Q_4 (Q_8, Q_{12}) drop, the collector current(s) rise, the magnetic field strength of the drive coil(s) increases, and the rotor speed increases to the correct value.

6.4 TEMPERATURE COMPENSATION

To prevent any changes in surrounding temperature from effecting rotational speed, a means of compensating for temperature changes has been employed, consisting of the varistors D_4, D_5, D_6, D_7, and D_8.

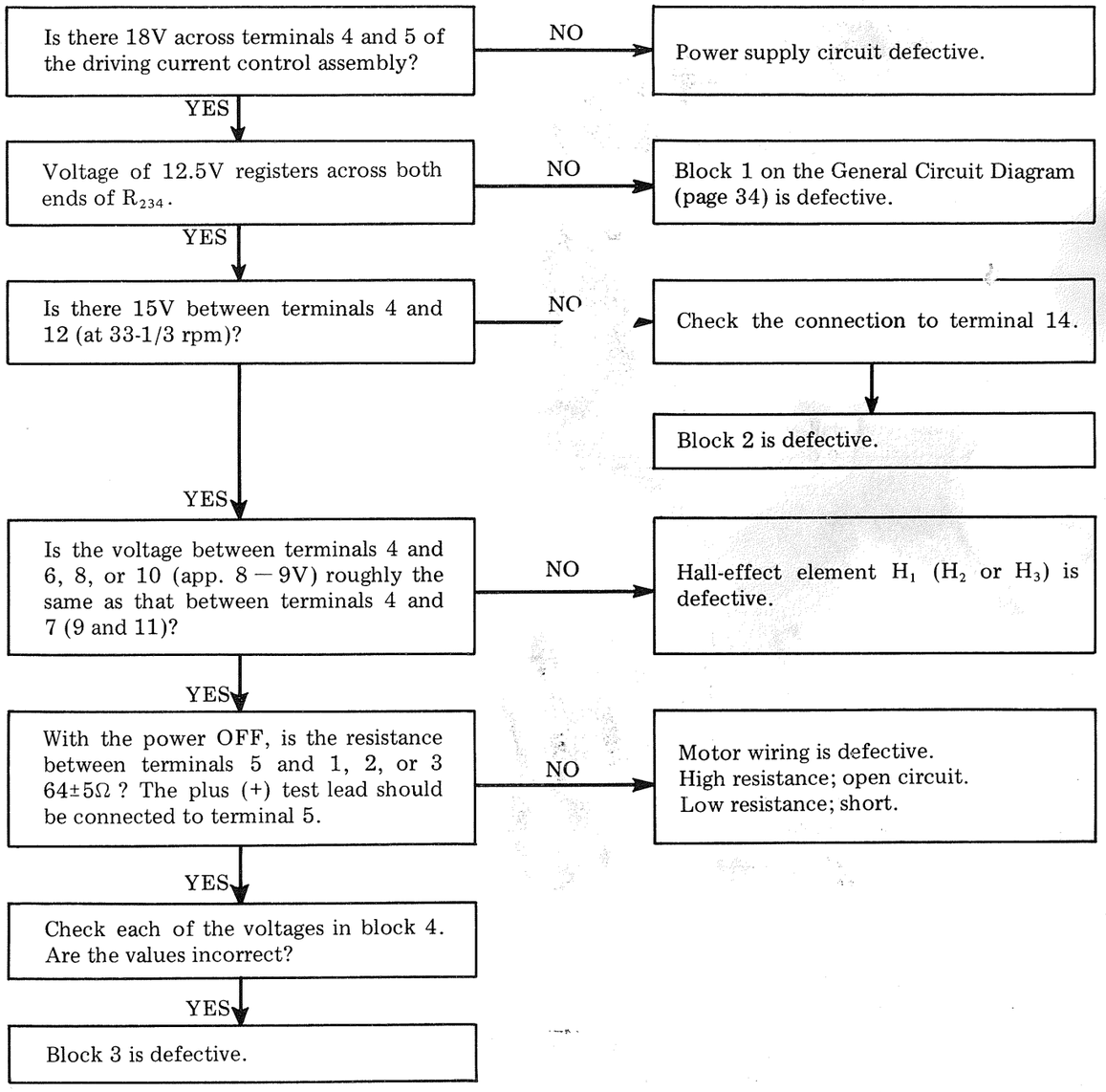
- D_4 is designed to compensate the effect of temperature change on Q_{19}. Without this varistor, the Q_{19} collector current would increase with temperature, resulting in increases in collector current through Q_{17}, and the base potential on Q_{15}. The Q_{14} and Q_{13} collector currents would also increase, resulting in a reduction of the Q_4, Q_8, and Q_{12} emitter potentials, and an increase in rotational speed.
- D_5, D_6, D_7, and D_8 are employed to compensate for the effects of temperature changes on the rotor magnets and drive control transistors. The magnetic force generated by the magnets decreases by 0.18% per degree (C) rise in temperature. Without these varistors, the counter electromotive force generated in the drive coils would decrease with temperature increases, even if the rotor was rotating at the exact rotational speed. The comparator stage would therefore interpret this as a drop in rotational speed, and consequently respond by increasing the speed.
The drive control transistors are also effected by temperature changes. D_5 and D_6 (33rpm) and D_7 and D_8 (45rpm) counteract the effect of temperature rises by increasing the base potential on Q_{18}, thereby maintaining Q_{17}/Q_{18} balanced to ensure correct rotational speed.
- D_9 is a 5.1V Zener diode whose voltage level is uneffected by temperature change (i.e. thermal coefficient of zero).

Block numbers and block names
1. Voltage stabilizer section
2. Comparator
3. Drive coil current control section
4. Drive section
5. Back voltage detector section

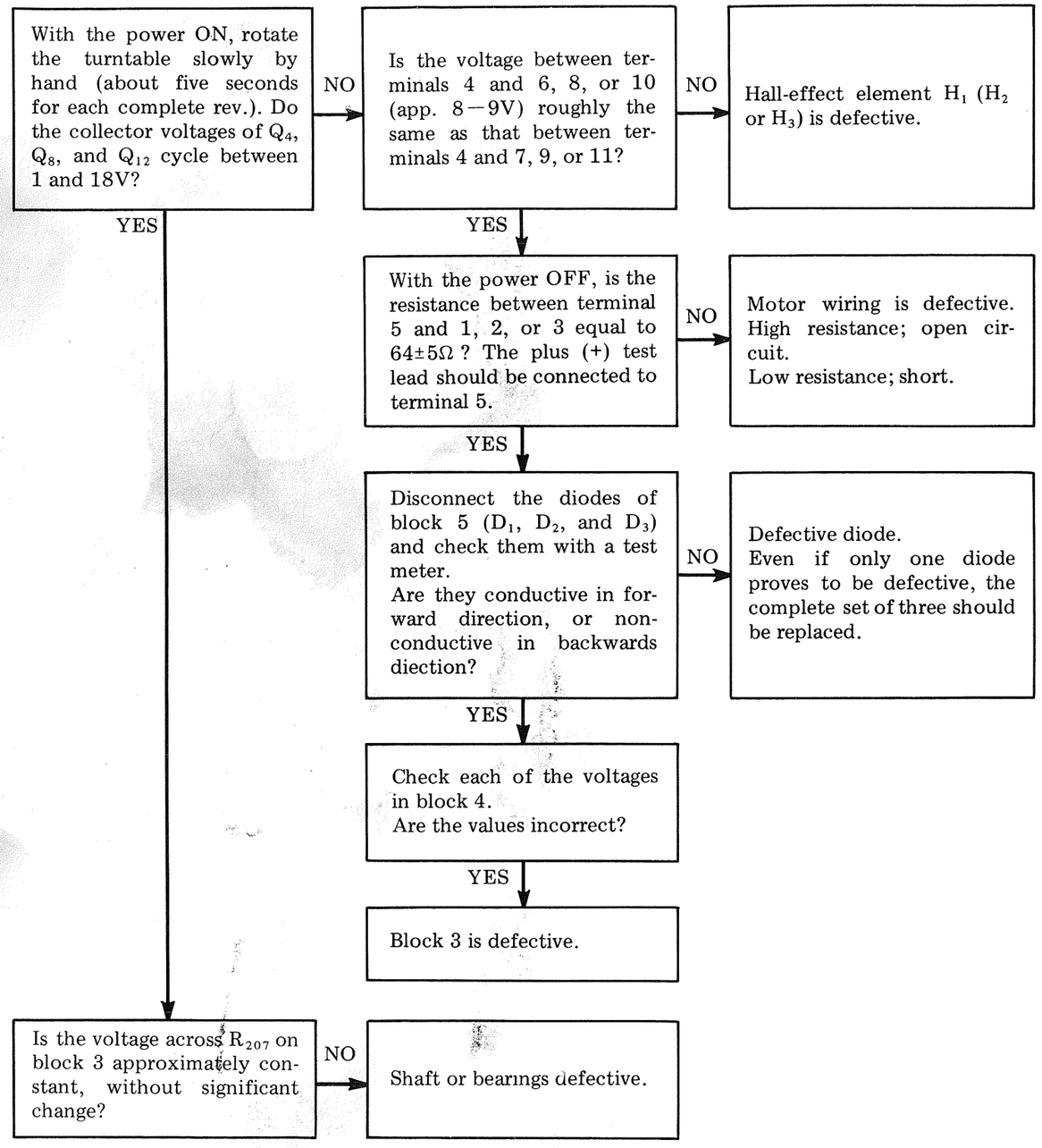


7. D.D. MOTOR TROUBLE SHOOTING CHART

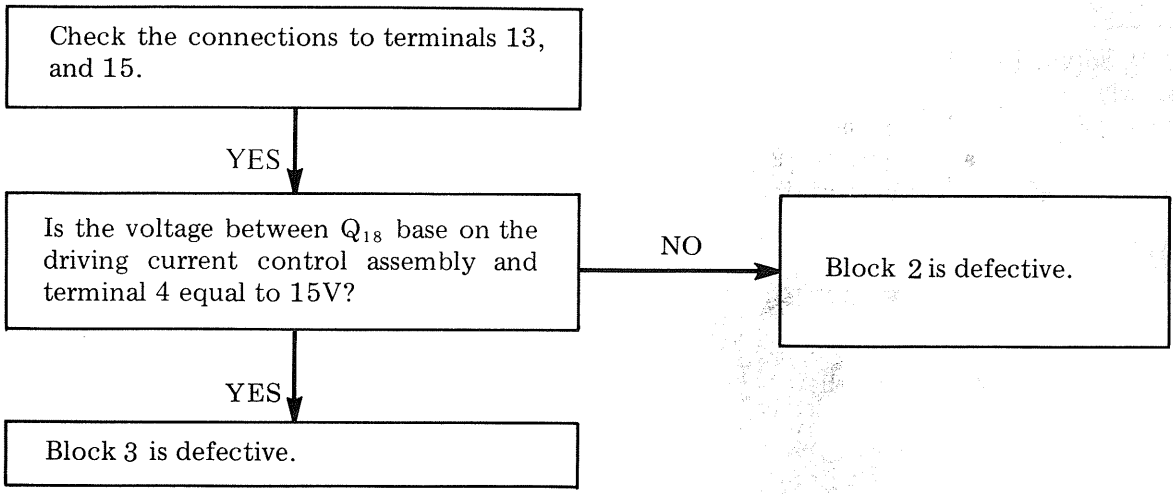
7.1 MOTOR DOES NOT TURN



7.2 WIDE VARIATIONS IN MOTOR SPEED



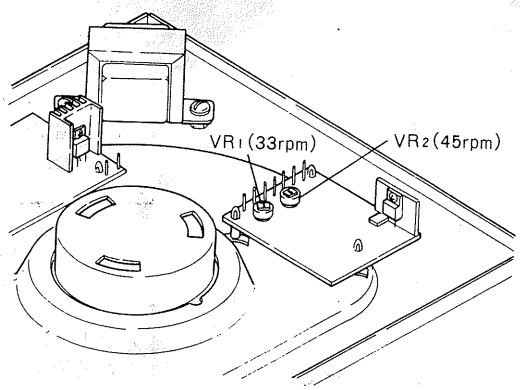
7.3 MOTOR RACES



7.4 MOTOR SPEED ADJUSTMENT

If it is no longer possible to adjust rpms by means of the pitch controls, adjust according to the following procedure.

1. Open up the rear cover.
2. Set the pitch controls to the center positions.
3. Turn the power supply on, and adjust the speed precisely to 33-1/3rpm and 45rpm (stationary stroboscope) by means of the volume control in the drive control circuit assembly.
4. If it is not possible to adjust this volume control any further, change the values of R_{225} (33rpm) and R_{231}(45rpm) shown in the circuit diagram on page .
   If any of the circuit constants are found to be different, correct immediately in accordance to the circuit diagram.



8. MECHANISM OPERATION

• AUTOMATIC LEAD-IN

When the START or REPEAT buttons are pressed, the Warren motor is started up, rotating the cam connected to the motor. During half a turn of this cam, the following operations occur.

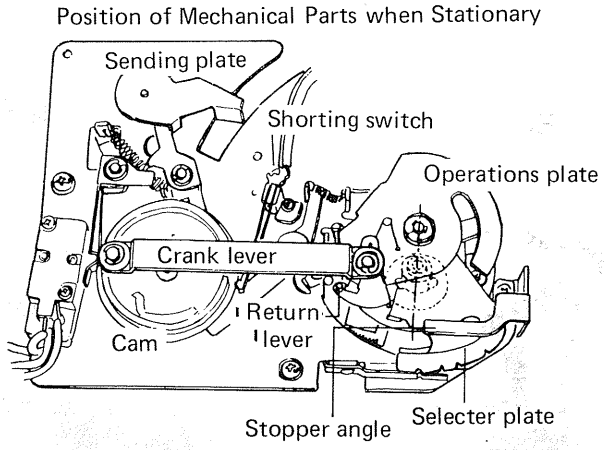


Fig. 4

1. As soon as the cam commences to rotate, micro-switch A is activated, thereby starting up the main motor.
2. The crank lever connected to the cam forces the operations plate to rotate together with the cam.
3. Rotation of the operations plate causes the starter lever to move, resulting in the lock lever engaging the PU plate shaft (see Fig. 5-1).
4. As the cam continues to rotate, both the starter lever and lock lever move the tonearm up to the position determined by the selector lever (Fig. 5-2).

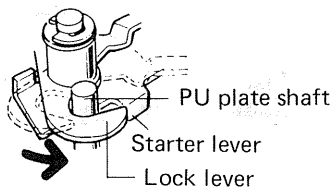


Fig. 5-1

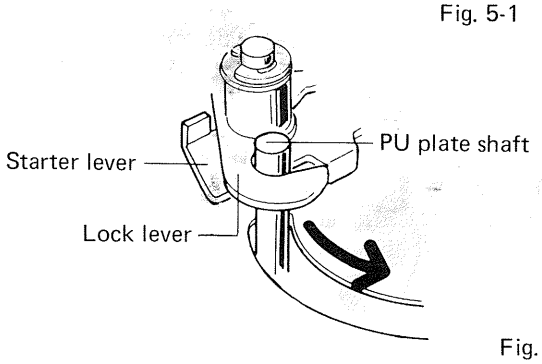


Fig. 5-2

5. The starter lever is brought to a stop by the selector plate stopper (Fig. 6).

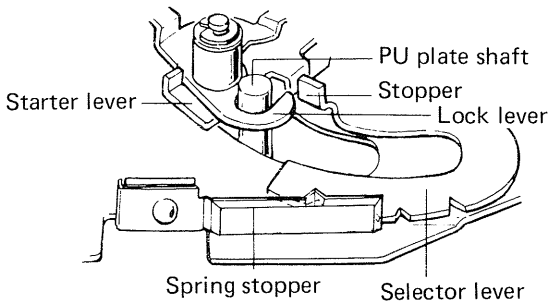


Fig. 6

6. Although the starter lever stops, the operations plate continues to rotate, releasing the lock lever from the PU plate shaft (Fig. 7).

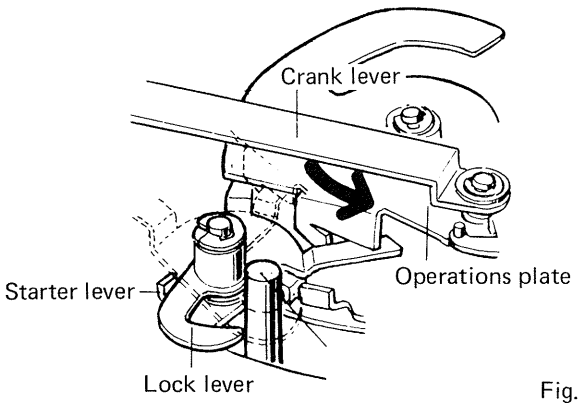


Fig. 7

7. Further rotation of the operations plate results in the tonearm being lowered onto the record (i.e. arm elevation is reduced) (Fig. 6).

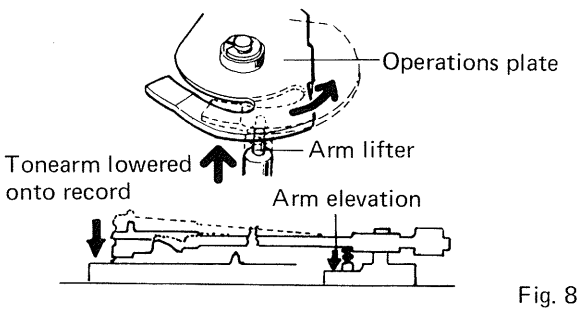


Fig. 8

8. Once the tonearm has been lowered onto the record, the Warren motor stops.
9. At the same as the Warren motor stops, the switch which had been short circuiting the cartridge output terminal, is opened.

• AUTO RETURN

To return the tonearm back to the arm rest automatically, the following procedure is followed.

1. As the tonearm approaches the lead-out groove, the screw at the tip of the PU plate pushes against the sending plate, moving the stopper over to the center shaft (Fig. 9).

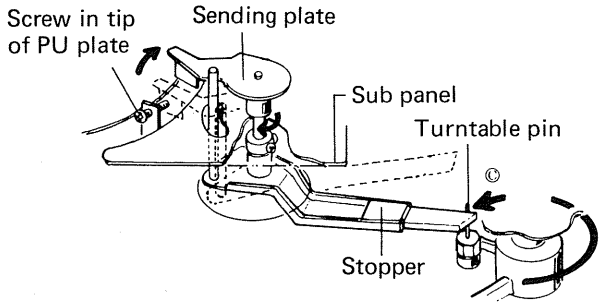


Fig. 9

2. When the stopper is repelled by the turntable pin, micro-switch B is turned on by the send back lever, thereby re-energizing the Warren motor (Fig. 10).

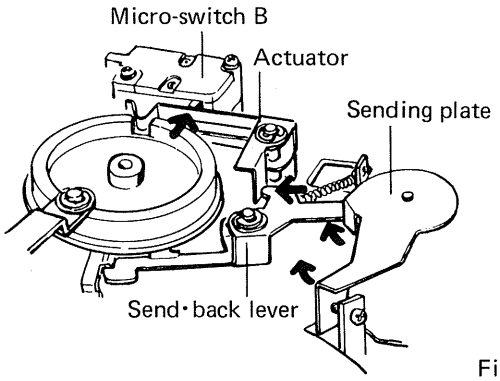


Fig. 10

3. Once the Warren motor starts to turn, both the cam and the operations plate (via the crank shaft) will also recommence to rotate. At the same time, shorting switch S will also short circuit the cartridge output.
4. The arm lifter is moved by the operations plate, resulting in the tonearm lifting up from the record.
5. The return lever linked to the operations plate will start to move the PU plate shaft back to its former position, thereby returning the tonearm to the arm rest.
6. Once the tonearm has been returned to the arm rest, the power supply to the main motor, and in fact to all parts of the PL-520, is turned off by cam action.

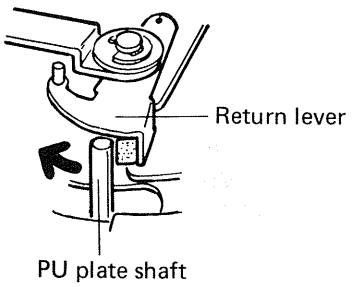


Fig. 11

• MANUAL OPERATIONS

1. Tonearm Operated Manually After Turntable Has Been Started Up

1. Set the selector lever to MANUAL.
2. Press the START button. The Warren motor will commence to rotate, activating the operations plate. The starter lever and lock lever will engage the PU plate shaft almost immediately.
3. Without moving the PU plate shaft, the starter lever comes to a halt once it strikes the selector plate stopper. The operations plate continues to rotate, resulting in the shaft of the operations plate forcing the lock lever to release the PU plate shaft.
4. As the operations plate continues to rotate, the sloped section of this plate causes the elevation pin to drop down. The Warren motor will then come to a stop when the operations plate can be moved no further.
5. The tonearm is then raised by hand, and lowered onto the record to commence play. The return operation is the same as described earlier under section 8.2.

• Turntable Started After Tonearm Raised Manually

When the START button is pressed after the tonearm is first raised by hand and positioned above the record, the Warren motor and operations plate will commence to rotate as before. The sloped section of the operations plate will again bring the Warren motor to a halt, and permit the tonearm to be lowered onto the record.

• AUTO CUT

When the CUT button pressed, the Warren motor is started up again, followed by the auto return of the tonearm according to the same procedure described above in steps 3 to 6 of section 8.2.

9. MECHANISM ADJUSTMENT

Prior to making any adjustments, check that the PU plate shaft is located in the center of the cut out section of the sub panel (as shown in Fig. 12 below).

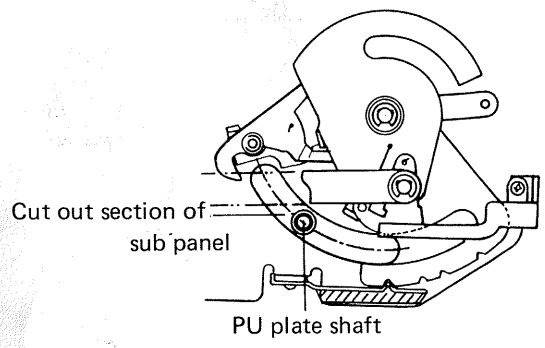


Fig. 12

Tonearm Descent Positions

The tonearm descent positions may be adjusted by turning the adjustment screws located in the panel holes at the base of the tonearm pivot (see Fig. 13).

When turned clockwise . . the descent position is center.

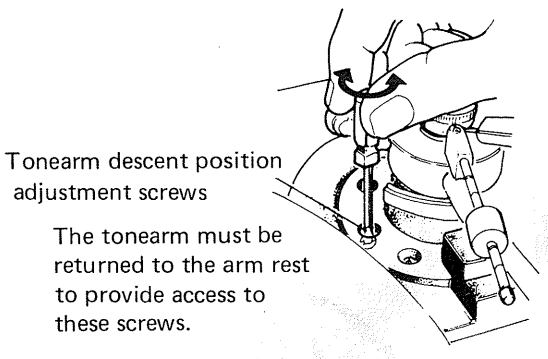
When turned counter clockwise . . . . . the descent position is moved outwards.

This is quite a simple operation when a test record is used.

For 30cm records . . . . . tonearm descent should occur in the 304 to 319 count range.

For 25cm records . . . . . tonearm descent should occur in the 252 to 267 count range.

For 17cm records . . . . . tonearm descent should occur in the 173 to 184 count range.



13-a

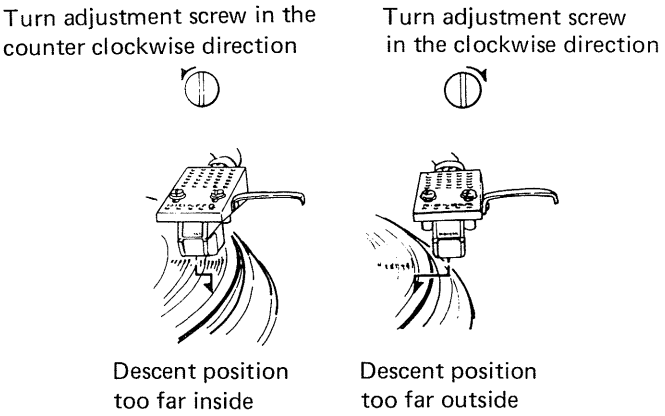


Fig. 13-b

When Tonearm Fails to Return

1. Adjust the stopper angle so that it makes contact with the return lever pin (Fig. 14).

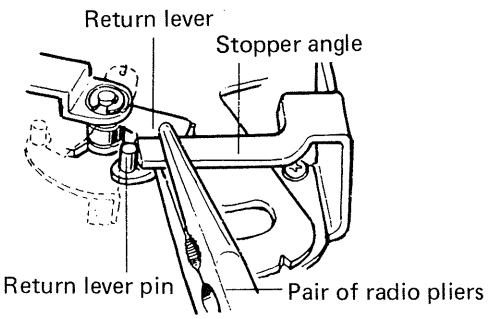


Fig. 14

Arm Elevation Adjustment

1. Leave the tonearm in the up position, and adjust the height of the arm elevation sheet so that the gap between stylus tip and record surface is about 10mm. (Fig. 15).

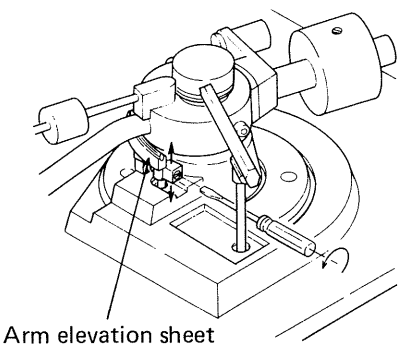


Fig. 15

Auto Return Lift Off Position

First check that the turntable pin (attached to the turntable) has not been bent over. Strighten out if necessary.

1. Tonearm lifts off too soon.
   Unscrew the screw in the tip of the PU plate by a suitable amount (Fig. 16).
2. Tonearm too slow in lifting off
   Screw the PU plate tip screw in further (Fig. 16).

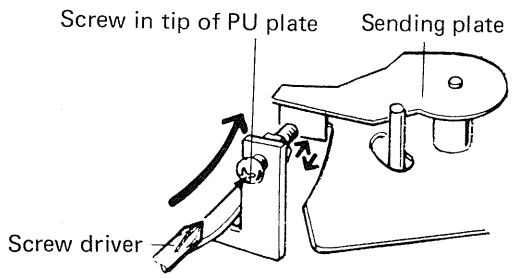


Fig. 16

Faulty Tonearm Movement

If the tonearm is interfered with, or halted altogether during the lead in operation, tighten up the screw shown in Fig. 17.

NOTE:
This adjustment screw should be made neither too tight nor too loose.

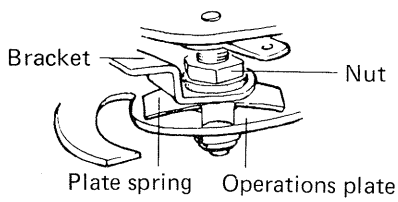


Fig. 17

Shorting Switch

Adjust the switch mounting screw so that the gap between contacts during play is 0.5mm (Fig. 18).

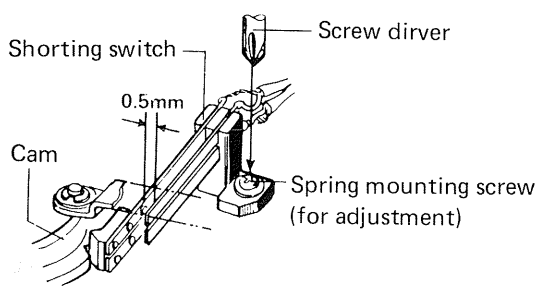


Fig. 18

Replacing the Anti-skating Assembly

When the anti-skating string or spring is broken or deformed, replace the whole anti-skating assembly.

1. Mount the anti-skating assembly.
2. Turn the anti-skating knob on top of the axle of tonearm and adjust to the "0" position.
3. Wind the string around the axle once (1 turn) and then hook the end of the string to the projection on the axle tweezers (GGK-036).
4. Turn the knob and check the smooth operation.

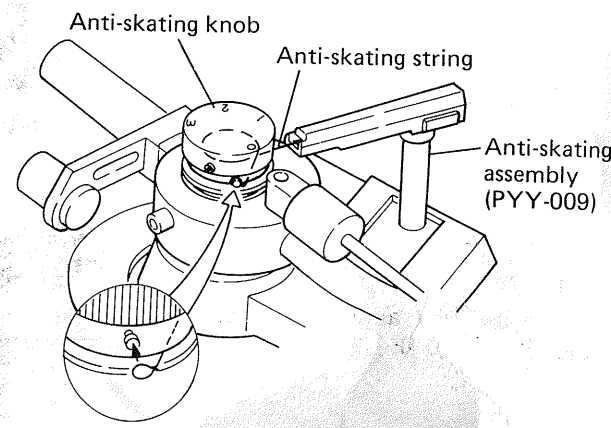
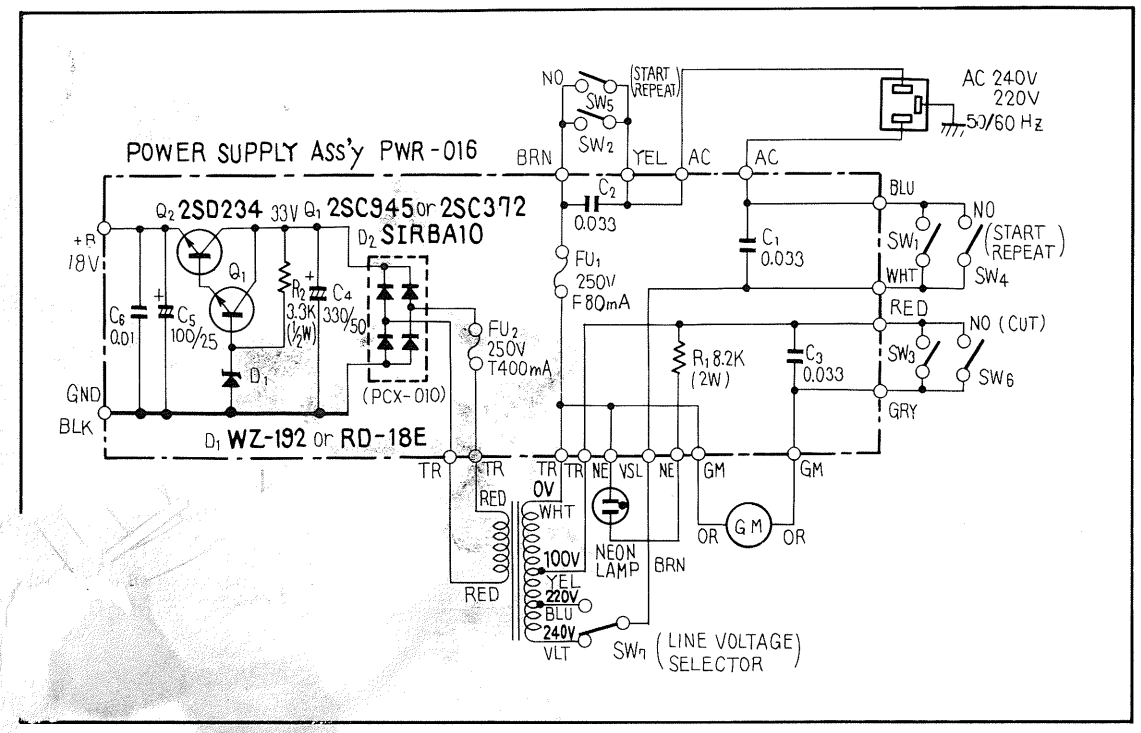


Fig. 19

10. HGT type CIRCUIT DIAGRAMS

Power supply Assembly (PWR-016)



Pa

SEM ICTORS

Symbol	No.	Description
Q2	2234	Transistor
Q1	2SC372-Y or 2SC945-P	Transistor
D2	PCX-010	Bridge rectifiers
D1	WZ-192 or RD18E	Zener diode

CAPACITORS

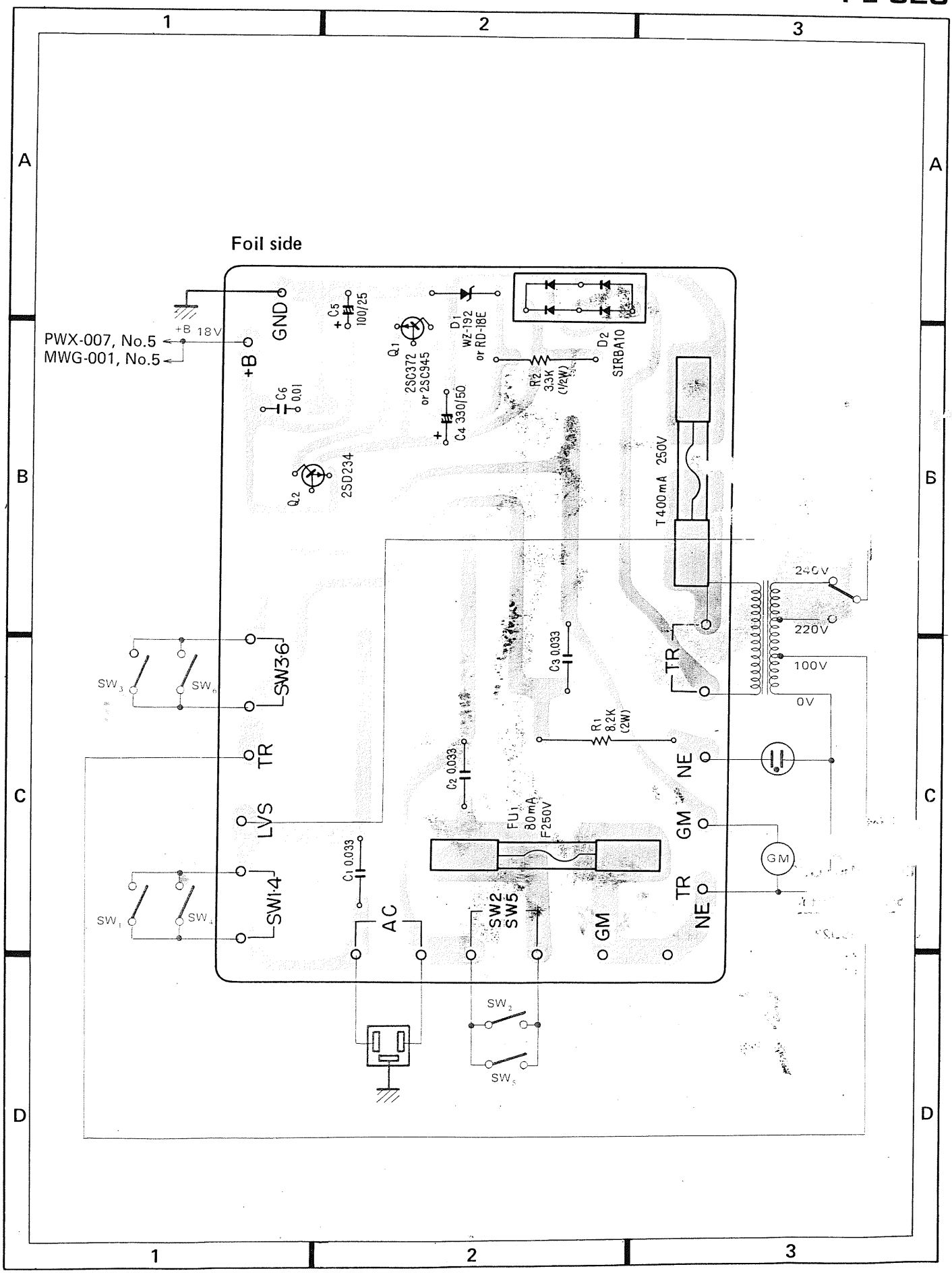
Symbol	Part No.	Description		
C1	PCL-023	Ceramic	0.033	250V
C2	PCL-023	Ceramic	0.033	250V
C4	CEA 331P 50	Electrolytic	330	50V
C5	CEA 101P 25	Electrolytic	100	25V
C6	CKDYF 103Z 50	Ceramic	0.01	50V
C3	PCL-023	Ceramic	0.033	250V

RESISTORS

Symbol	Part No.	Description		
R1	RS2P 822J	Metal oxide	8.2k	2W
R2	RD½PS 332J	Carbon film	3.3k	½W

OTHERS

Symbol	Part No.	Description	
FU1	PEK-016	Fuse	80mA
FU2	PEK-005	Fuse	400mA
	PNS-001	Heat sink	
	KKR-001	Fuse clip	


Foil side
PWX-007, No.5
MWG-001, No.5
+B 18V
+B
GND
C5 100/25
C6 0.01
Q1 2SC372 or 2SC945
D1 WZ-192 or RD-18E
D2 SIRBA10
R2 33K (1/2W)
C4 330/50
Q2 2SD234
T 400mA 250V
240V
220V
100V
0V
TR
C3 0.033
R1 8.2K (2W)
C2 0.033
FU1 80mA F250V
NE
GM
C1 0.033
AC
SW2
SW5
SW3
SW6
SW36
SW1
SW4
SW14
SW7
SW8