



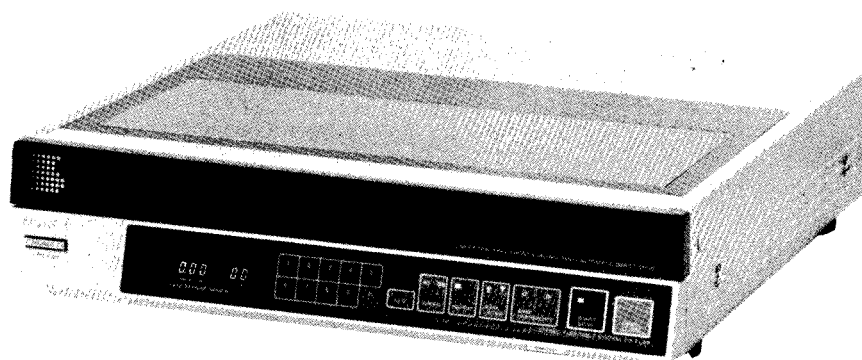
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PS-FL99

SERVICE MANUAL

*AEP Model
UK Model
E Model*



SPECIFICATIONS

Turntable

Platter	29 cm (11½ in.), aluminum-alloy diecast
Motor	Linear torque BSL (brushless and slotless) motor
Drive system	Direct drive
Control system	FG servo control system
Speed	33⅓ rpm, 45 rpm
Wow and flutter	0.03% (WRMS)*, 0.035% (WRMS)
Signal-to-noise ratio	75 dB (DIN-B)
Automatic system	Loading, lead-in, return, reject, repeat, tonearm up/down, record size detection, RMS, AMS

Tonearm

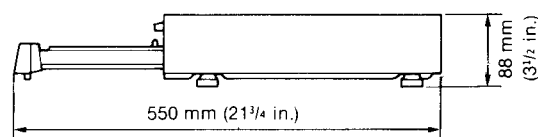
Type	linear tracking tonearm
Pivot-to-stylus length	75 mm (3 in.)
Overall arm length	170 mm (7⅞ in.)
Tracking error	±0.1°
Tracking force adjustment range	1.25 ±0.25 g
Cartridge	plug-in type, 6 g

Cartridge XL-250G

Type	Moving magnet type
Frequency response	10 Hz to 20,000 Hz
Channel separation	23 dB at 1 kHz
Output voltage	5 mV at 1 kHz, 5 cm/sec., 45°
Load impedance	50 to 100 kilohms
Tracking force	1.0 to 1.5 g (1.25 g recommended)
Stylus	Sony ND-250G
Weight	6 g

General

Power requirements	AEP model: 220 V ac UK model: 240 V ac E model: 110–120 or 220–240 V ac adjustable
	50/60 Hz
Power consumption	15 W
Dimensions	Approx. 355 × 88 × 380 mm (w/h/d) (14 × 3½ × 15 in.) including projecting parts and controls



Weight

Approx. 7 kg (15 lbs 7 oz), net
Approx. 8.3 kg (40 lbs 6 oz), in shipping carton

SAFETY-RELATED COMPONENT WARNING!!

COMPONENTS IDENTIFIED BY SHADING AND MARK  ON THE SCHEMATIC DIAGRAMS AND IN THE PARTS LIST ARE CRITICAL TO SAFE OPERATION. REPLACE THESE COMPONENTS WITH SONY PARTS WHOSE PART NUMBERS APPEAR AS SHOWN IN THIS MANUAL OR IN SUPPLEMENTS PUBLISHED BY SONY.

* This new measuring method concerns only the turntable assembly, including the platter. It excludes wow and flutter caused by the tonearm, the cartridge, or the record. Measured by obtaining signal from magnetic pick-up head.

STEREO TURNTABLE SYSTEM

SONY®

AUD



FEATURES

Unique modular turntable system

When you touch the OPEN/CLOSE key the turntable module will smoothly slide out. Other audio components can be positioned on top of the turntable cabinet.

Servo-controlled linear tracking tonearm

A linear tracking tonearm is designed to duplicate the movement of the head which cuts the record master.

Compared with a pivoted tonearm, a linear tracking arm has a very small tracking error (which means greatly reduced harmonic distortion) and almost no pressure on the inside wall of the groove (which means improved tracking ability and channel separation).

Programmed play

The RMS (Random Music Sensor), AMS (Automatic Music Sensor) and skip function allow you to program record play as you like.

RMS: for playing the selections on one side of the record in a desired sequence.

AMS: for starting record play from the desired selection.

Skip function: for skipping selections to the desired selection.

A microcomputer controls three motors

The movement of the turntable, the tonearm and the turntable module is controlled by a microcomputer. When you press the START/STOP key, the module will close, the turntable will rotate and the tonearm will lower onto the record.

Fully automatic system

With the module closed, automatic record play and tonearm up/down are operated by the "feather-touch" function keys on the front panel. The record size is automatically set by a photo-sensor system. If no record is on the turntable, the tonearm will not descend but will automatically return to the arm rest. A muting system activates when the tonearm is lifted and deactivates after the tonearm lowers onto a record so there is no need to turn the amplifier volume down every time a stylus is placed on a record.

Linear torque BSL motor

Direct drive system with Sony's unique BSL (brushless and slotless) motor which has an extremely low noise level and whose smoothness virtually eliminates wow and flutter. Its high torque assures a quick start to $33\frac{1}{3}$ rpm after only a half revolution.

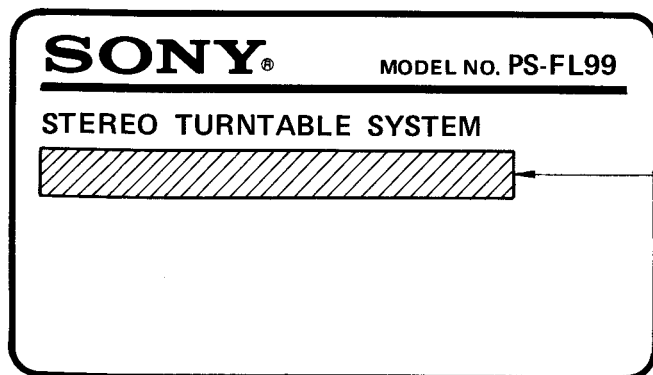
Synchronized operation with the Sony cassette decks

When the tonearm lowers onto the lead-in groove of a record, the cassette deck stand-by mode is released and the record mode assumed.

When play finishes, the cassette deck is automatically set first in the record muting mode, then in the pause mode. This synchronized operation is possible with Sony cassette decks equipped with a four-pin remote control jack which is connected with the Sony RM-65 synchro remote control unit.

Wireless remote control operation

Using the optional ST-V7/V7L system control tuner, various operations—power on/off, start/stop play, tonearm up/down—can be remotely controlled.



- { AEP model: 220 V 50/60 Hz 15 W
- { UK model: 240 V 50/60 Hz 15 W
- { E model: 110–120 V, 220–240 V 50/60 Hz 15 W

NOTES ON REPAIR

- In this set, the voltage is applied to the power supplying line (± 21 V) even if the POWER switch is turned OFF. When repairing the unit, unplug the power cord with the POWER switch ON (to discharge electrolytic capacitor in the power supply circuit).

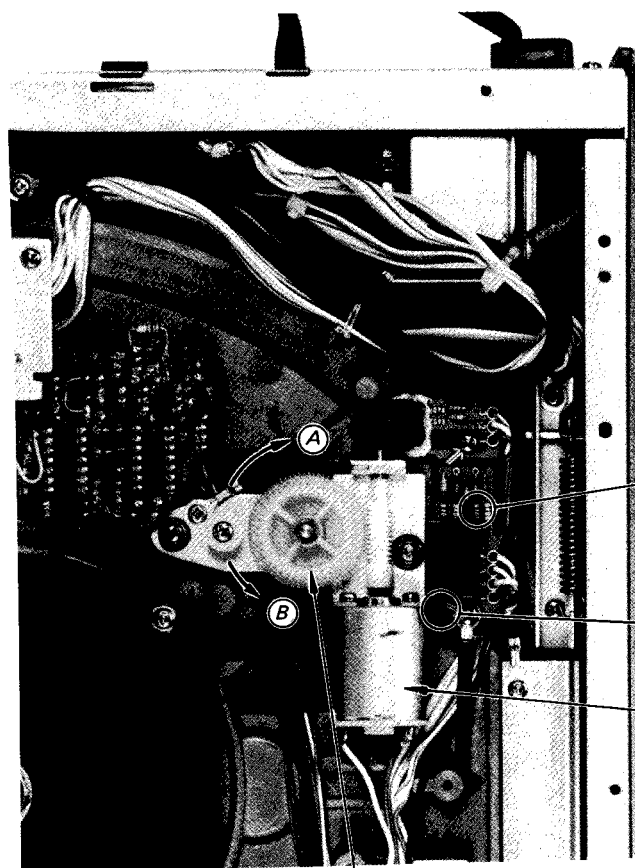
— When removing the bottom plate —

- When the module closes, the photo detector searches over the record to detect the record size (30 cm, 25 cm or 17 cm) and sense how many selections are on the record by detecting the blank spaces between selections, and then this model is ready for AUTO play. Therefore, when removing bottom plate, record size and the number of selections can not be detected because of mechanical reasons and there will be no operations even if the START/STOP button is pressed. Perform MANUAL play with ARM TRANSPORT ($\triangleleft, \triangleright$), ARM LIFTER ($\nabla/\triangledown$) button in order to check the boards.

- When POWER switch (S1) turns ON with bottom plate removed, loading motor (M901) continues to rotate and does not stop. But, it is not broken.

1. When POWER switch (S1) turns ON with TABLE END switch (S3 or S4) pressed, loading motor (M901) does not rotate.
2. When TABLE END switch (S3 or S4) is pressed according to the rotating direction of loading motor (M901), the motor stops even if the motor is rotating (See the figure below).
3. System control IC checks the condition of TABLE END switch by pressing ARM TRANSPORT ($\triangleleft, \triangleright$), ARM LIFTER ($\nabla, \triangledown$), START/STOP button.

When operation buttons are pressed, be sure to keep TABLE END switch (S3 or S4) pressed. If not, key input can not be found.



When worm wheel (A) is rotating in the direction of (B), press S4 (close end det).

When worm wheel (A) is rotating in the direction of (A), press S3 (open end det).

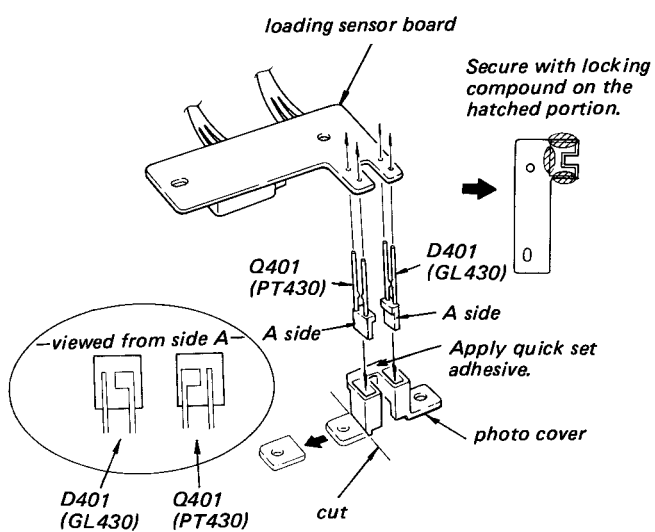
loading motor (M901)

worm wheel (A)

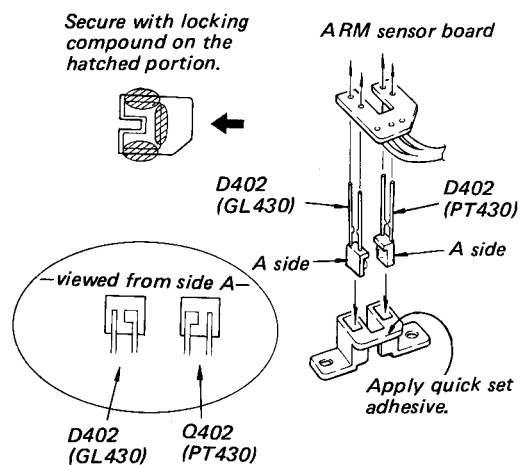
CAUTION ON REPLACING PHOTO TRANSISTORS (Q401, 402), LED (D401, 402) FOR BLANK SPACE POSITION AND ARM POSITION DETECTION.

- Be careful of the mounting direction on replacing photo transistors (Q401, 402), LED (D401, 402).
- After replacing, secure photo cover to the board by applying quick set adhesive and then locking compound.

For blank space position detection (Q401, D401)



For arm position detection (Q402, D402)



REPAIR METHOD FOR HYBRID CIRCUIT BLOCK

cutting pliers

insulating cover

Cut off about 1 mm.

Using a cutting pliers, cut off the upper portion of the insulating cover about 1 mm, exposing the top of the connecting brackets.

connecting bracket

Open insulating cover out to remove.

connecting bracket

cutting pliers

soldering iron

Cut off the lead of the defective part with cutting pliers. Remove solder and take out the defective part.

solder

about 0.5 mm

After soldering, cut off to match other leads.

soldering iron

Insert the new part on the board and solder the lead to the board. Cut off the lead on the connecting bracket side so that it overlaps by about 0.5 mm, and solder to the connecting bracket.

insulating cover

connecting bracket

Open the insulating cover groove about 0.7 mm and place over the connecting brackets, positioning one end first.

Insulating Cover
Part No.:

	3-677-012-01	3-677-012-11
A	3.4 mm	2.2 mm
B	2.6 mm	1.8 mm

blade screwdriver

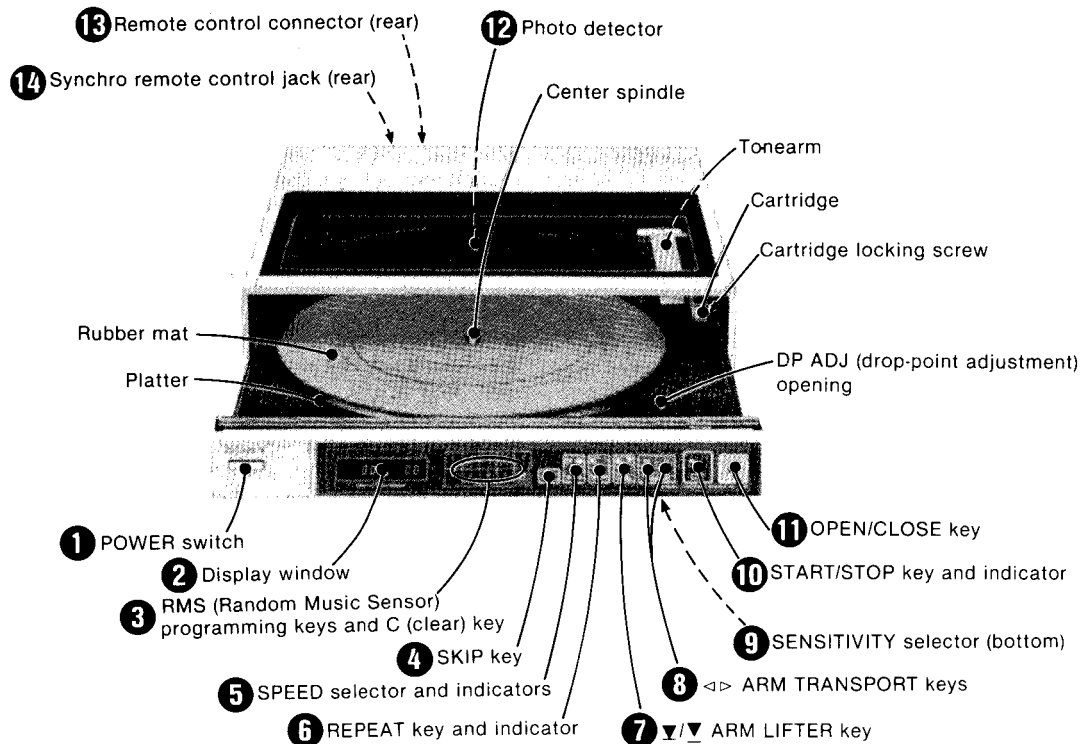
Open about 0.7 mm.

A

B

LOCATION AND FUNCTION OF CONTROLS

The photo below shows the assembled turntable.



❶ POWER switch

Depress to turn on the turntable. To turn the turntable off, press it again.

❷ Display window

The elapsed playing time of the selection, the number of the selection being played, the programmed selections for RMS play, etc. are displayed in this window. See page 11.

❸ RMS (Random Music Sensor) programming keys and C (clear) key

Used for programming the selections to be played in the desired sequence. See "RMS play" on page 10.

❹ SKIP key

Press this key to skip from the selection being played to the next selection. See "To skip to the desired selection while the record is playing" on page 10.

This key is also used for AMS (Automatic Music Sensor) play. See "AMS play" on page 10.

❺ SPEED selector and indicators

When the power is turned on, the speed is automatically set to 33 $\frac{1}{3}$ rpm, and the "33" indicator lights up.

Press this key when a 45 rpm record is to be played, the "45" indicator lights up. Press it again for a 33 $\frac{1}{3}$ rpm record.

❻ REPEAT key and indicator

Press this key to repeat play. Repeat play continues until this key is pressed to release it. During RMS play, only the programmed selections will be repeated in the programmed sequence.

❼ ARM LIFTER key

This key lifts and lowers the tonearm. When the tonearm is on the arm rest, this key is not operative.

❽ ARM TRANSPORT keys

To move the tonearm inward, press the < key, and to move outward, the > key. The tonearm is raised and continues to move while the key is pressed. The tonearm will stop when the key is released. For fine adjustments, press and immediately release the appropriate key.

❾ SENSITIVITY selector (on the bottom)

Normally set this selector to M.

When the number of the selections detected is not correct, set the selector to either H or L. See page 7.

❿ START/STOP key and indicator

Press to start the record playing. The □ indicator on the key will light up. To stop during play, press it again.

⓫ OPEN/CLOSE key

With one touch of this key the turntable module automatically opens for loading a record. With another touch the module automatically closes.

⓬ Photo detector

Detects the record size (30 cm, 25 cm and 17 cm) and how many selections are on a record, by searching for blank spaces between selections when the module closes.

See page 7.

⓭ Remote control connector (rear)

Connect the remote control cord of the optional ST-V7/V7L system control tuner. For details, read the instruction manual for the system control tuner.

⓮ Synchro remote control jack (rear)

Synchronized recording from disc to tape is possible on specified Sony cassette decks by using the optional RM-65 synchro remote control unit.

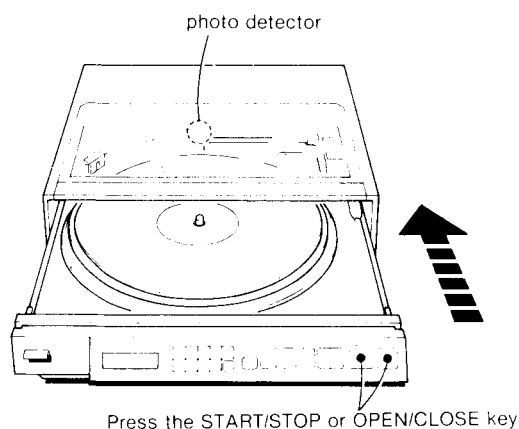
HOW RECORD SIZED AND SELECTIONS ARE DETECTED

When the module closes, the photo detector searches over the record to detect the record size (30 cm, 25 cm or 17 cm) and sense how many selections are on the record, by detecting the blank spaces between selections. The selection number indicator changes rapidly from 01 to the number of the selection contained on the record. Up to 15 selections can be counted. The data is input into the memory of the microcomputer incorporated.

This data will be erased from the memory when the OPEN/CLOSE key is pressed to open the module or when the POWER switch is turned off.

Special records

The photo detector cannot operate with transparent records, non-standardized records and records of an unusual shape or color (red or blue). Play these record manually.



Caution

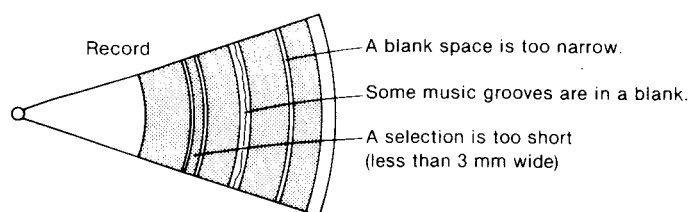
Do not press the OPEN/CLOSE key while the module is closing. If the key is pressed at such a time, the module will slide out and it will not slide back in, even if the OPEN/CLOSE key is pressed again. In this case, after the module has been opened completely, press the OPEN/CLOSE key again.

SENSITIVITY selector

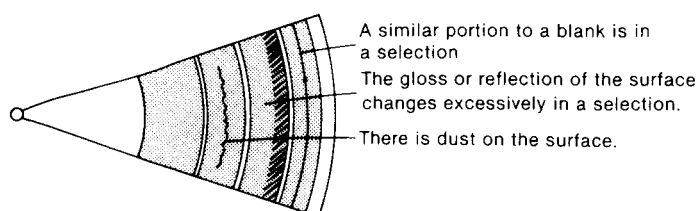
Since the photo detector searches for the blank spaces on a record, it cannot operate correctly if the blank spaces and music grooves are not in good condition. As a result, the RMS, AMS and skip function may malfunction.

If the number of the selections detected is different from the number of the selections actually existing, change the position of the SENSITIVITY selector on the bottom of the unit to either H (high) or L (low).

Why too few selections are detected :

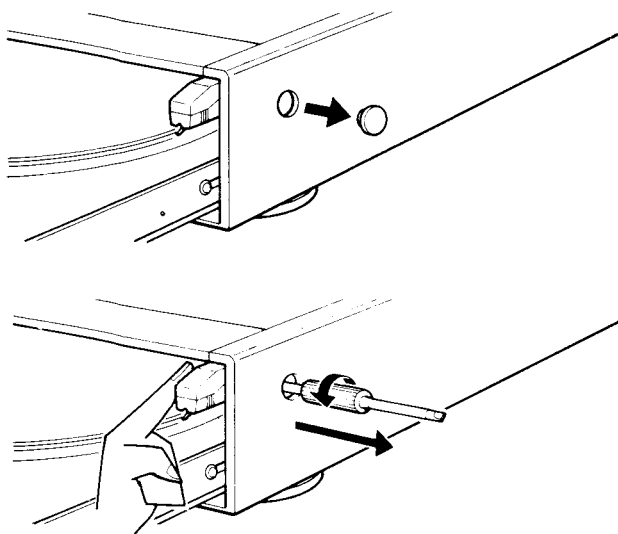


Why too many selections are detected :

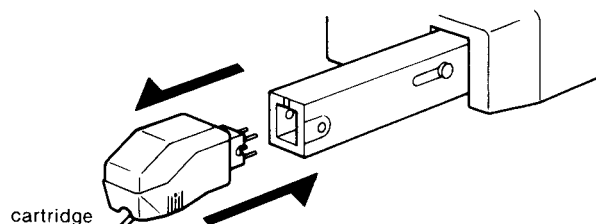


INSTALLING A CARTRIDGE OTHER THAN THE ONE SUPPLIED

- 1 Press the POWER switch, then press the OPEN/CLOSE key to open the module.
- 2 Remove the cap on the right side, insert the supplied screwdriver through the hole, and remove the cartridge locking screw with the screwdriver.
The screw can be removed, clinging to the head of the screwdriver.



- 3 Remove the rubber mat and platter.
- 4 Press the ◀ key to move the tonearm for easier installation. Then turn the POWER switch off.
- 5 Remove the old cartridge and plug the new one into the tonearm.



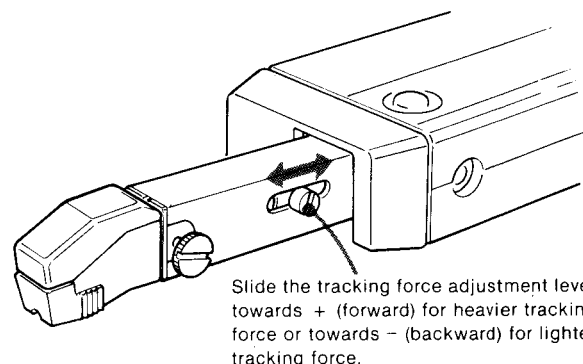
- 6 Depress the POWER switch (⏻ ON), and the tonearm will return to the arm rest.
- 7 Tighten the cartridge locking screw to the tonearm, by inserting the screwdriver holding the screw through the hole and turning it clockwise.
- 8 Replace the cap, platter and rubber mat.

The **TAP** label indicates that a cartridge is a standardized plug-in type.

TRACKING FORCE FINE ADJUSTMENT

The tracking force has been correctly adjusted at the factory. Make fine adjustment only when the tracking force is so light that the stylus skips grooves.

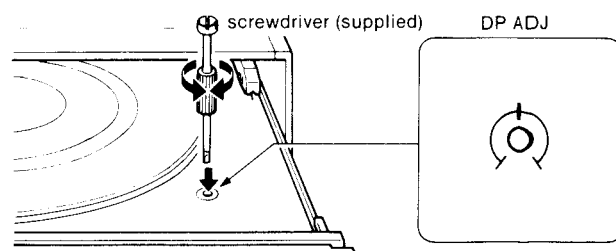
- 1 Depress the POWER switch, then press the OPEN/CLOSE key to open the module.
- 2 Press the ◀ key to move the tonearm toward the center spindle.
- 3 Slide the tracking force adjustment lever.



ONEARM DROP-POINT ADJUSTMENT

The tonearm's drop-point during auto play, AMS play or RMS play has been adjusted at the factory. Adjust this if the stylus does not lower correctly at the beginning of the desired selection.

- 1 Press the OPEN/CLOSE key to open the module.
- 2 Insert the supplied screwdriver into the DP ADJ opening.
To move the drop-point inward, turn the screw clockwise.
To move the drop-point outward, turn the screw counterclockwise. Do not turn it so far counterclockwise that the stylus tip cannot make contact with the record.



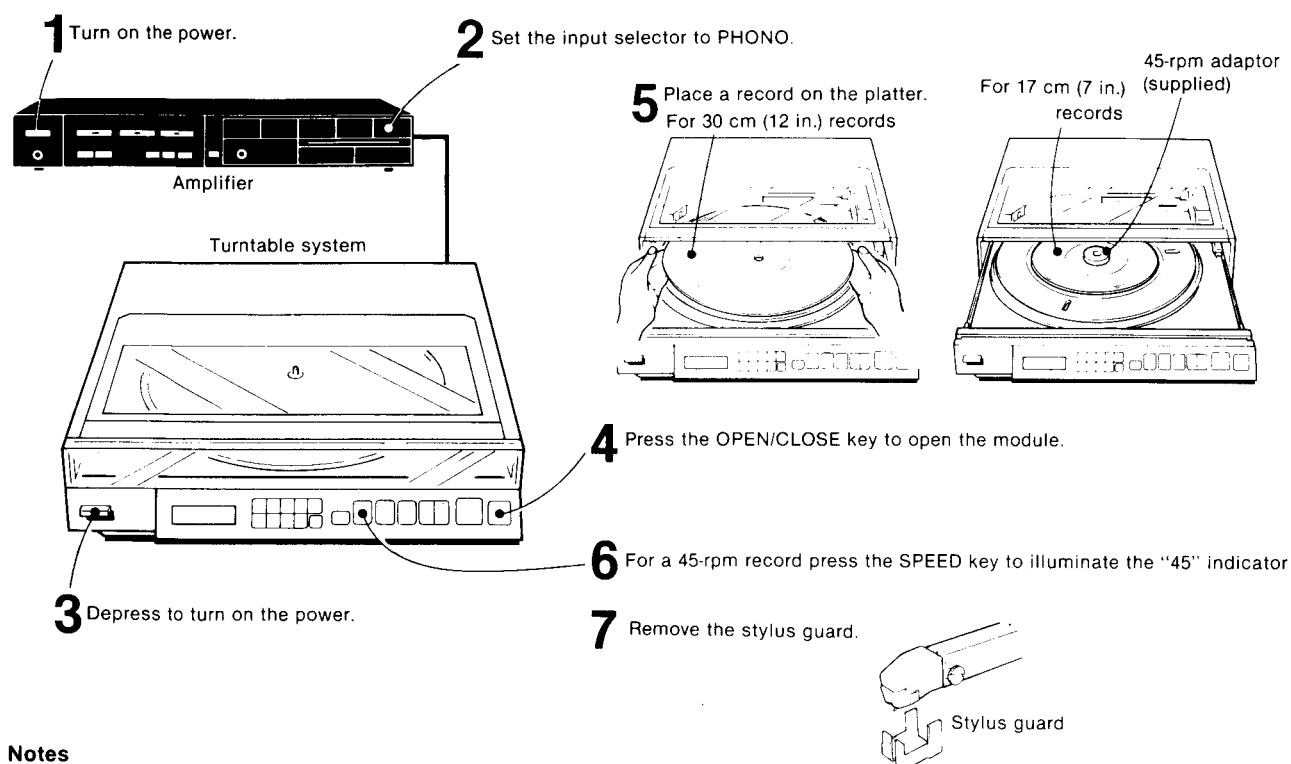
- 3 Check if the drop-point is correctly adjusted by lowering the tonearm to the beginning of a selection in the middle of the record, using the AMS function.
(Checking the drop-point for the first selection is not sufficiently accurate.)

If the drop-point is correct for one selection, it will also be correct for all the selections.

RECORD PLAYING

PREPARATION

This turntable's photo detector detects the record size and the number of the selections on the record when the module closes. Therefore **after turning the power on, be sure to press the OPEN/CLOSE key to open the module** so that the detector is on standby.



Notes

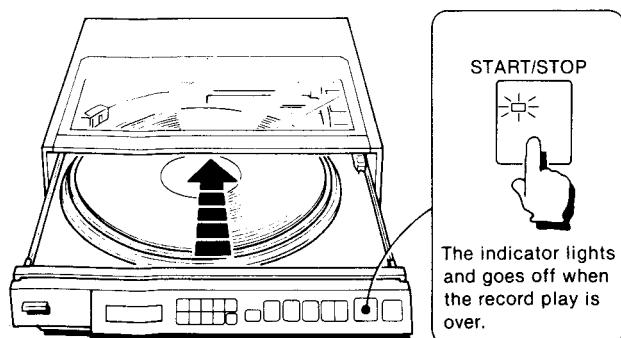
- If the turntable causes interference to radio and television reception, turn off the turntable or move the turntable away from the receiver.
- A badly warped record cannot be played because it will rub against the tonearm.

AUTO PLAY

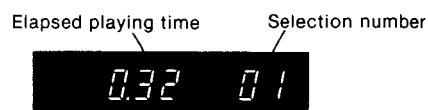
—To begin record play from the beginning of the record

The record size is detected and playback starts from the beginning of the first selection for either 30 cm (12 inch), 25 cm (10 inch) or 17 cm (7 inch) records.

- 1 Press the START/STOP key. The module closes and play will begin.



The selection number being played and the elapsed playing time from the beginning of the selection (in minutes and seconds) are displayed in the display window.



When the tonearm reaches the end of the record, the turntable will stop and the tonearm will automatically return to the arm rest.

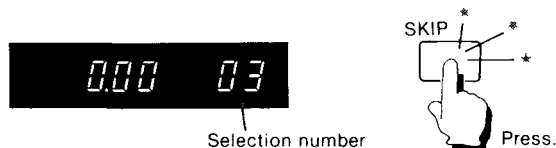
Notes

- Transparent records, records of an unusual shape or color (red or blue), or non-standardized records cannot be played automatically. To play these records, follow the instructions on page 11.
- Turn off the POWER switch after the tonearm returns to the arm rest. If the POWER switch is turned off while the tonearm is returning to the arm rest, when you press the POWER switch the next time the tonearm will return to the arm rest. While the tonearm is moving, the START/STOP key is not activated.

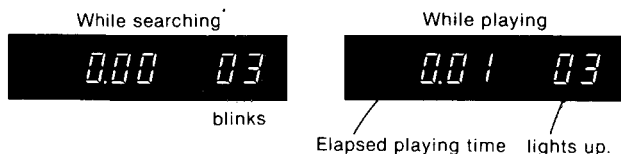
AMS (AUTOMATIC MUSIC SENSOR) PLAY

—To begin record play from the desired selection

- 1 Press the OPEN/CLOSE key to open the module, put on a record and select the correct record speed.
- 2 Press the SKIP key repeatedly until the number of the selection from which you want to start play is displayed. Each time the SKIP button is pressed, the selection number display changes up 1, as far as 15, then resets to 01.



- 3 Press the START/STOP key. The module closes, the tonearm searches for the preset selection and play begins.

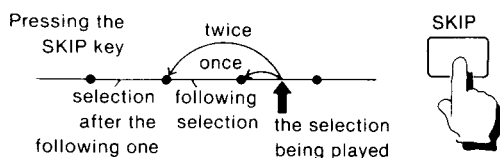


Note

If selection number which does not exist (for example, "08" for a record which contains only 7 selections) is input, the "E" (error) indicator appears and flashes several times. In this case, input an appropriate selection number.

TO SKIP TO THE DESIRED SELECTION WHILE THE RECORD IS PLAYING —Using the SKIP function

- 1 Press the SKIP key repeatedly during play until the number of the desired selection is displayed. Each time the SKIP key is pressed, the next selection in advance is displayed, and when the last selection has been played, the display reverts to 01.



The tonearm will lift up, search for the preset selection and play will start automatically.

Note

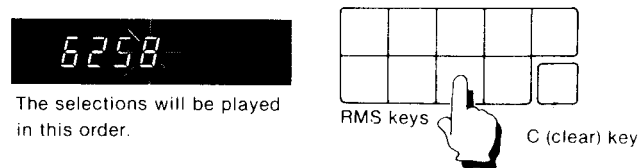
The SKIP function is inoperative while the tonearm is in the raised position after the $\blacktriangledown/\blacktriangledown$ key or the $\blacktriangleleft/\blacktriangleright$ key has been pressed or while the record is playing with the module open.

RMS (RANDOM MUSIC SENSOR) PLAY

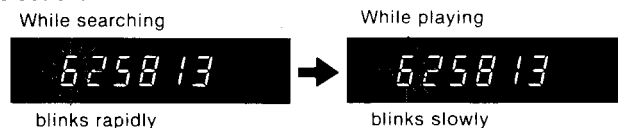
You can play selections on one side of the record in the desired sequence, which has been programmed using the RMS keys.

- 1 Press the OPEN/CLOSE key to open the module, put on a record and select the record speed.
- 2 Press the RMS keys in the sequence in which you want to listen to the selections.

The programmed selection numbers are displayed from left to right in the order in which they are to be played. Up to 8 selections can be programmed.



- 3 Press the START/STOP key. The module closes and play begins from the first-programmed selection.



At the end of the last-programmed selection, the turntable will stop rotating and the tonearm will return to the arm rest automatically. If you wish to play the same selections in the same sequence again, press the START/STOP key.

To change the programmed sequence

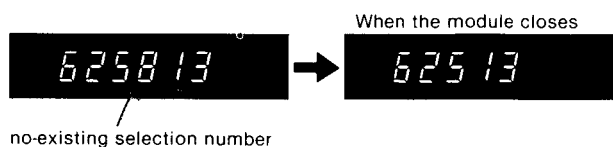
Press the C key when the tonearm is on the arm rest. The display will change to 0.00 and the programmed sequence will be erased. Then press the RMS keys again in the desired sequence.

To add to the programmed sequence

Just press the desired RMS key(s) during play or when the tonearm is on the arm rest. (While the tonearm is searching for a selection, the RMS keys are not operative.) Up to 8 selections can be programmed.

Automatic editing function of the RMS program

If an RMS key whose number exceeds the existing selections is pressed with the module open, the display of that number will disappear automatically when the module closes.



If an incorrect RMS key is pressed with the module closed, the number of the key will not be displayed.

This is an automatic editing function of the RMS program.

If the pressed RMS keys are all incorrect, the "E" (error) indicator will flash several times, then go out. In this case press the correct RMS keys.

To cancel the RMS program

Press the $\blacktriangleleft/\blacktriangleright$ key or the OPEN/CLOSE key during play, or press the C key when the tonearm is on the arm rest. The display will change to 0.00 and the programmed sequence will be erased.

DISPLAY WINDOW

TO LIFT UP THE STYLUS DURING RMS PLAY

To lift up the stylus for a moment and then start playing from the same point, press the **▼/▼** key. To lower the tonearm onto the record, press the **▼/▼** key again.

TO STOP DURING RMS PLAY

Press the START/STOP key. The tonearm will return to the arm rest and the turntable will stop rotating. When the START/STOP key is pressed again, the RMS play will restart.

TO SKIP SELECTIONS DURING RMS PLAY

Press the SKIP key during play. Each time the SKIP key is pressed, the next selection ahead is played.

TO REPEAT RMS PLAY IN THE PROGRAMMED SEQUENCE

Press the REPEAT key either before or after starting RMS play. At the end of the last-programmed selection, the tonearm will return to the first-programmed selection automatically, then play will restart.

To stop during repeat play, press the REPEAT key. When the last-programmed selection has been played, the tonearm will return to the arm rest and repeat function will be cancelled.

If you press the START/STOP key during repeat play, play will stop immediately, the tonearm will return to the arm rest and the repeat function will be cancelled.

Time counter and selection number indicator

Normally, the time counter and the selection number indicator are displayed in the display window.



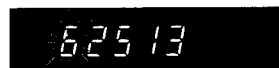
Time counter : Indicates the elapsed playing time of the selection being played in minutes and seconds. The counter starts counting the time at the beginning of the selection (in auto play and RMS play) or at the point where the tonearm is lowered onto the record (in manual play).

Selection number indicator : Remains lit to indicate the number of the selection being played, and flashes while the tonearm is searching for the selection.

When the record is being played with the module open, this indicator does not operate.

RMS program indicator

When the RMS key is pressed, the display switches to the RMS program indicator.



The selection number are displayed from left to right in the programmed sequence. When the tonearm is searching for the selection, the number flashes rapidly. When the selection is being played, the number flashes slowly.

Error indicator



The "E" (error) indicator appears and will disappear after flashing several times in the following cases.

- When the START/STOP key is pressed, but there is no record on the platter.
- When the START/STOP key is pressed before the module has opened once.
- When inappropriate selection numbers are set for AMS or RMS play with the module open, and the START/STOP key is pressed.

Note

The time counter indication may be slightly different from the time indicated on the record jacket, as the former includes the time equivalent to the blank space between the selections.

SECTION 1

OUTLINE

1-1. CIRCUIT DESCRIPTION

SYSTEM CONTROL MICROCOMPUTER IC301

Conditions for IC301 beginning operation:

1. 5 V supplied to power supply pin (④①).
2. Reset pin (⑦) goes from 0 V to 5 V.
3. Clock oscillation pins (①, ④②) are oscillating at 800 kHz.
4. Check input in other operation modes.

Pin No.	Pin Name	Function
1	XTAL (I/O)	Clock oscillation pin.
2	C0 (O)	Marker correction.
3	C1 (O)	Reset output to fluorescent display tube drive IC. Drum correction.
4	C2 (O)	Data transmission clock output to fluorescent display tube drive IC. Function key output.
5	C3 (O)	Decimal point output to fluorescent display tube drive IC. Function key output.
6	Blank sensor (I)	Record blank (between selection) position data input. (active: L)
7	$\overline{\text{RES}}$ (I)	Reset input.
8 – 11	D0 – D3 (O)	Function key output. (active: L) Data output to fluorescent display drive IC.
12	$\overline{\text{S/S}}$ (O)	Function key display LED output. (active: L)
13	$\overline{\text{33}}$ (O)	
14	$\overline{\text{45}}$ (O)	
15	$\overline{\text{REPEAT}}$ (O)	
16	$\overline{\text{MUTE}}$ (O)	Cartridge muting output. (active: L)
17	CLOSE (O)	Output to close turntable. (active: H)
18	OPEN (O)	Output to open turntable. (active: H)
19	_____	Not used on this model.
20	TEST (I)	Test pin. Connected to GND.
21	VSS	Power supply ground pin.
22	◀◀ (O)	Tonearm drive high speed FWD output. (active: H)
23	▶▶ (O)	Tonearm drive high speed BACK output. (active: H)
24	◀ (O)	Tonearm drive low speed FWD output. Outputs for 400 mS after ARM TRANSPORT key (◀) is pushed. (active: H)
25	▶ (O)	Tonearm drive low speed BACK output. Outputs for 400 mS after ARM TRANSPORT key (▶) is pushed. (active: H)
26	PM Kick (O)	Arm UP/DOWN solenoid kick signal output. Outputs for 800 mS after ARM LIFTER (▼/ ▼) key is pushed. (active: H)
27	PM Hold (O)	Arm UP/DOWN solenoid hold signal output. (active: H)

Pin No.	Pin Name	Function
28	PAUSE (O)	Synchro PAUSE signal output. Outputs for 200 mS after arm completes down operation. (active: H)
29	REC MUTE (O)	Synchro REC MUTE signal output. Outputs for 200 mS before arm performs up operation. (active: H)
30	ARM INH (I)	Arm offset angle correction prohibition. (active: L)
31	—————	Not used on this model.
32	TT (O)	Turntable drive signal output. (active: H)
33	Arm position (I)	Input to detect tonearm position.
34	Record position (I)	Address pulse signal input of record blank position data.
35	END sensor (I)	Record END position data input.
36	—————	Not used on this model.
37	B0 (I)	Function key matrix input. (active: L)
38	B1 (I)	
39	B2 (I)	
40	B3 (I)	
41	VDD (I)	5 V power supply.
42	EXTAL (I)	Clock oscillation pin.

KEY MATRIX

Pin No. (O) Pin No. (I)	② C0	③ C1	④ C2	⑤ C3	⑧ D0	⑨ D1	⑩ D2	⑪ D3
③⑦ B0	marker correction	drum correction	OPEN SW	SPEED KEY	1 KEY	5 KEY	9 KEY	OPEN/CLOSE KEY
③⑧ B1			CLOSE SW	REPEAT KEY	2 KEY	6 KEY	CLEAR KEY	▼/▼ ARM LIFTER KEY
③⑨ B2		—————	ARM REST SW	▷ (FWD) KEY	3 KEY	7 KEY	SKIP KEY	REMOTE CONTROL START
④⑩ B3		—————	DOWN SW	◁ (BACK) KEY	4 KEY	8 KEY	START/ STOP KEY	REMOTE CONTROL STOP

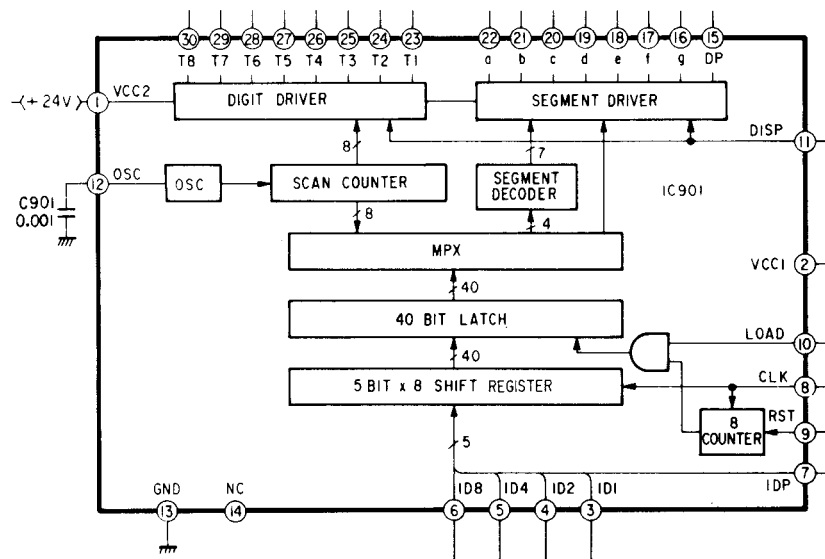
Note: Marker correction, drum correction, Down SW: active high
others: active low

8 DIGIT INDICATOR TUBE DRIVER (M54940P)

M54940P is a fluorescent indicator tube decode driver which memorizes the 5 bit x 8 digit data from the system control microcomputer (IC102) and performs (7 segment + decimal point) x 8 digit display by the dynamic lighting method.

One digit worth of data consists of BCD 4 bits and decimal point 1 bit (always high on this model).

The data memory is carried out by the shift register latch form, and previous data can be indicated during data forwarding.

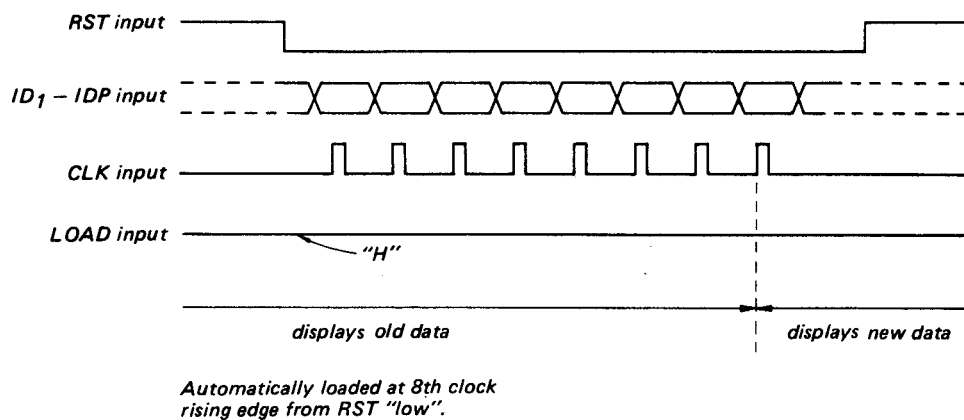


M54940P Block Diagram

1) Pin Function Description

Pin No.	Pin Name	Function
1	Vcc2	Power supply for indicator tube output.
2	Vcc1	Power supply for logic circuit.
3 – 6	ID _{1–8}	BCD data input pins.
7	IDP	Decimal point data input pin.
8	CLK	Data forwarding clock input pin. Data is read in at clock rising edge.
9	RST	Reset input pin. At high, resets CLK input pulse counter.
10	LOAD	Input pin for signal which loads shift register data to data latch.
11	DISP	Indicates at high, no indication at low. During no indication, segment and digit outputs are low. The display can be erased by making this low.
12	OSC	Oscillation pin.
13	GND	Ground.
14	NC	Do not connect.
15	DP	Decimal point output pin.
16 – 22	a – g	Segment output pin.
23 – 30	T _{1–8}	Digit output.

2) Data Read-in Timing



Data Read-in Timing

3) Input Data and Indication

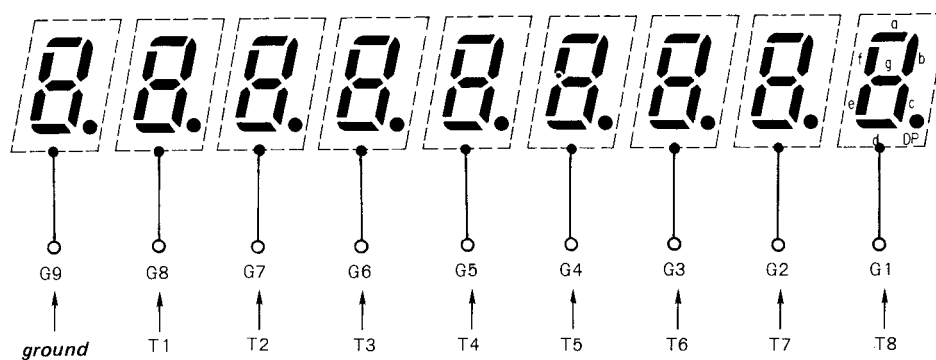
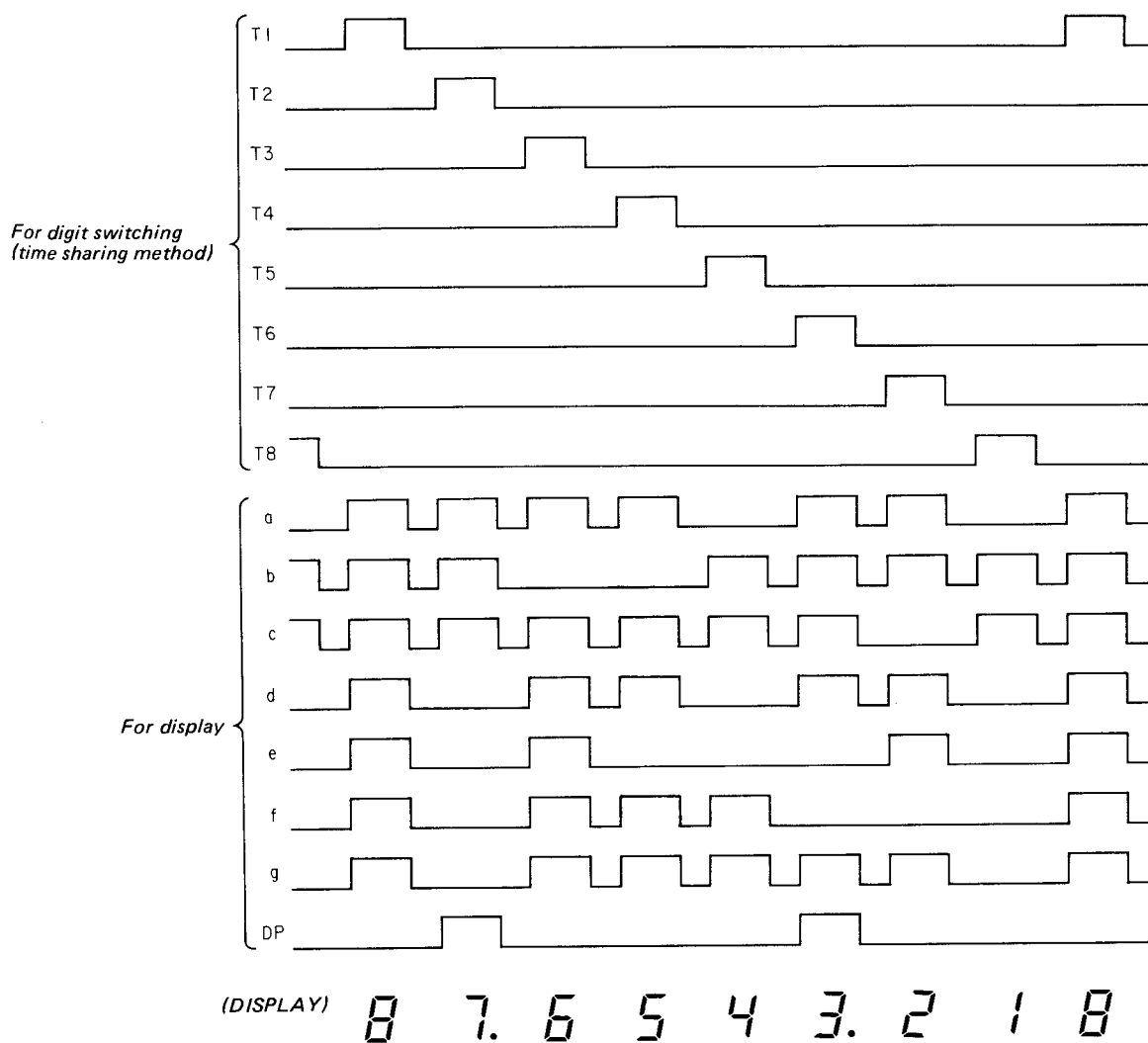
	BCD Data Input				Display
	ID ₈	ID ₄	ID ₂	ID ₁	
0	L	L	L	L	0
1	L	L	L	H	1
2	L	L	H	L	2
3	L	L	H	H	3
4	L	H	L	L	4
5	L	H	L	H	5
6	L	H	H	L	6
7	L	H	H	H	7
8	H	L	L	L	8
9	H	L	L	H	9
A	H	L	H	L	A
B	H	L	H	H	B
C	H	H	L	L	C
D	H	H	L	H	D
E	H	H	H	L	E
F	H	H	H	H	F

Decimal point output is output when a digit's decimal point bit is high, independent of BCD data.

Also, if several decimal point bits are made high, multiple decimal points will be displayed.

Relationship between Input Data and Indication

4) Data Output and Indication



Pin No.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Con- nec- tion	F $\ominus$	G9	g	G8	f	G7	e	G6	d	G5	NP	G4	DP	G3	c	G2	b	G1	a	F $\oplus$

Indicator tube grid is controlled by time sharing method.

Relationship Between Data Output and Indication

BLANK DETECTION CIRCUIT

When turntable loading close operation is performed, this set checks record information (record loaded or not, size (30 cm, 25 cm, 17 cm), number of selections) optically.

For blank (between selection) detection, there are two types of data relative to system control microcomputer IC301: horizontal position data (address) and data which identifies blanks.

Horizontal position data is obtained by converting the light intensity from the slit plate directly connected to the loading motor to an electrical signal by photo Tr (Q401), and counting this pulse inside the system control microcomputer. Blank data is obtained by converting the intensity of the reflected light at sound grooves and non-sound grooves into electrical signals by photosensor (Q405) and identifying blanks inside the system control microcomputer.

The system control microcomputer gets the number of pulse changes from the marker position from these two data and judges record mounted or not, size (30, 25, 17 cm) and blank, record end, etc. positions. The difference between blanks and record end is identified inside the system control microcomputer by the length of time that the blank signal is low.

The circuit operation is shown in Figure 3.

- Reference voltage waveforms during turntable loading close operation.

Q703-705, IC703 (1/2) CIRCUIT

When the blank sensor (Q405) finds the marker, voltage with a widening at the bottom of more than 5 V is output. At this time, if comparator (IC303) reference voltage is low, the marker position looks fast as seen from the system control microcomputer (IC301). Because of this, Q705 is turned on during marker detection to raise reference voltage to 2.5 V. See Figure 3 for circuit operation.

(IC302 pin ② input voltage waveform)

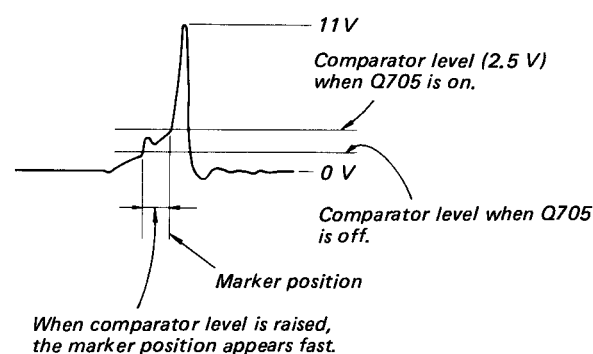


Figure 2

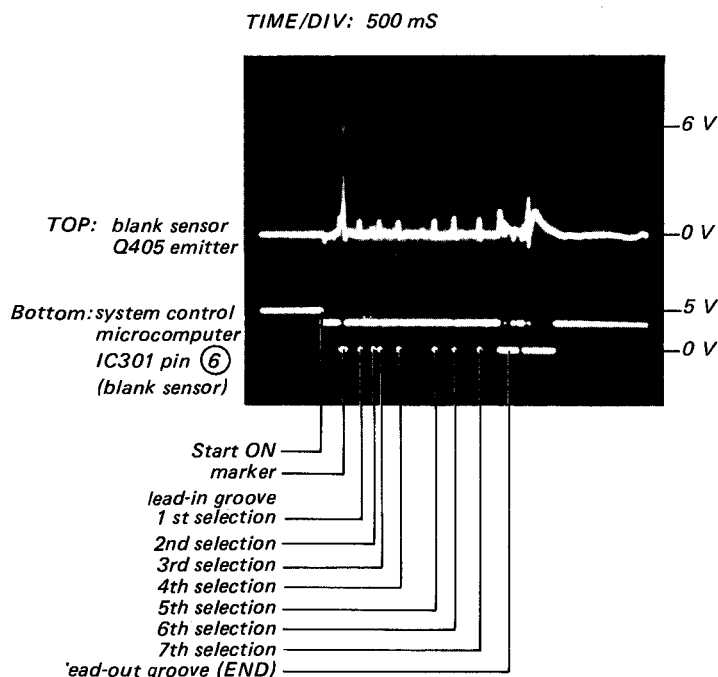


Figure 1

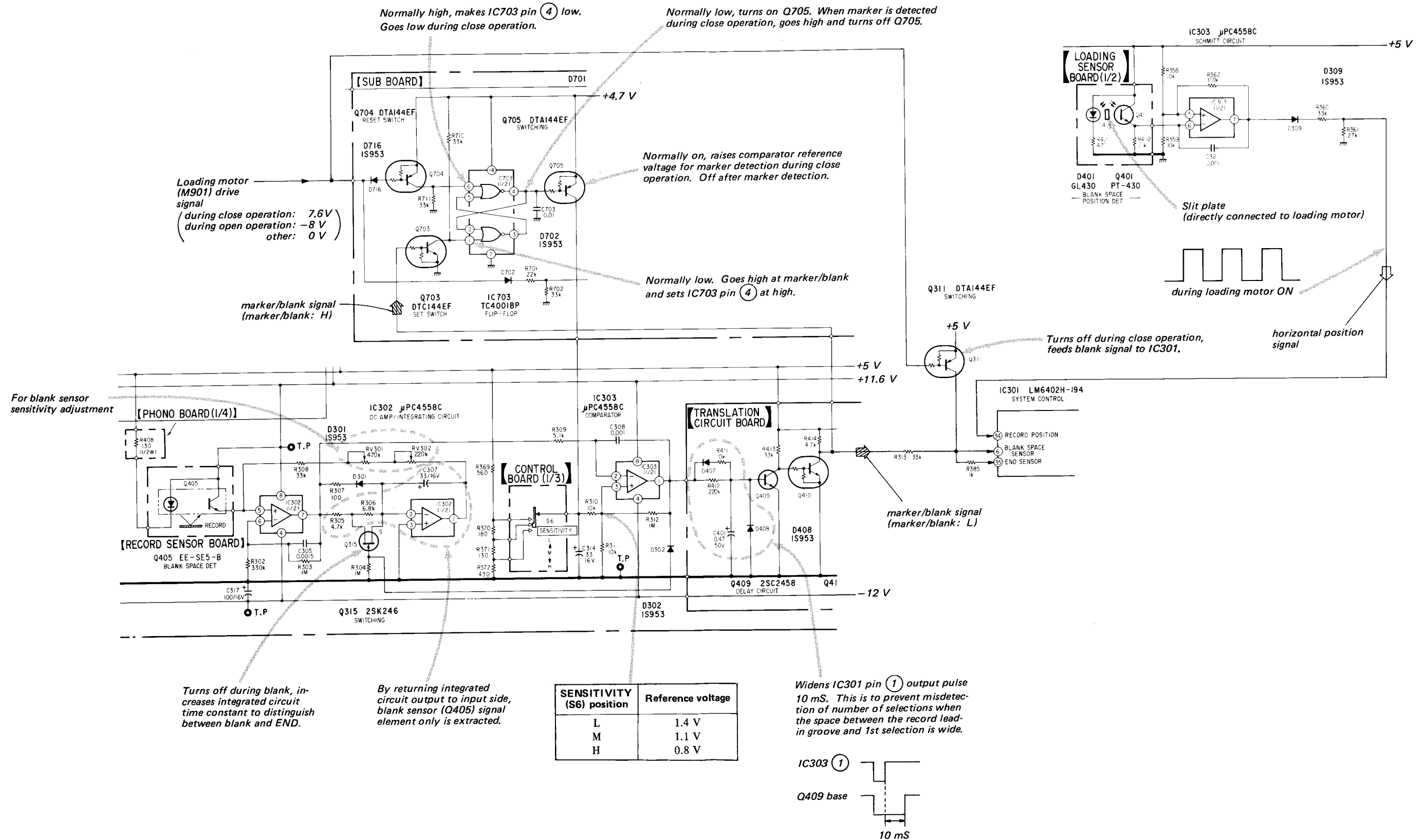


Figure 3

RECORD WARP SERVO CIRCUIT

This circuit is so that the stylus will always be lowered at the place where blank was detected during turntable loading close operation for auto play.

If there is record hole play, or warp, even if the stylus is lowered at the location detected as blank by the system control microcomputer (IC301), the position may be wrong.

In order to get rid of this difference, this circuit causes the arm UP/DOWN solenoid (PM401) kick signal to be generated so that the stylus descends at the blank detected location.

The method of kick signal generation is as follows.

The turntable motor 8-pole magnet is used, and it is detected by the hole sensor (H401), DC amplification and wave shaping are performed at IC401, and this signal is input as an octal counter clock. Then,

by resetting the octal counter at the completion of turntable loading close, the 8 outputs of this octal counter have memorized 8 set locations when the turntable was rotating. (Counter "0" is where blank was detected.)

Even if the kick signal for lowering the stylus on the blank detected location on a rotating record is generated when the detected location is under the stylus, the location will move during the time that the stylus is descending. So, it is generated at the location which is the blank detected location minus the amount of movement.

The speed of descent varies with the arm, so by switching the octal counter output, kick signal generation timing can be changed and adjusted.

Refer to waveforms ① - ⑧ below and Figure 4 for circuit operation.

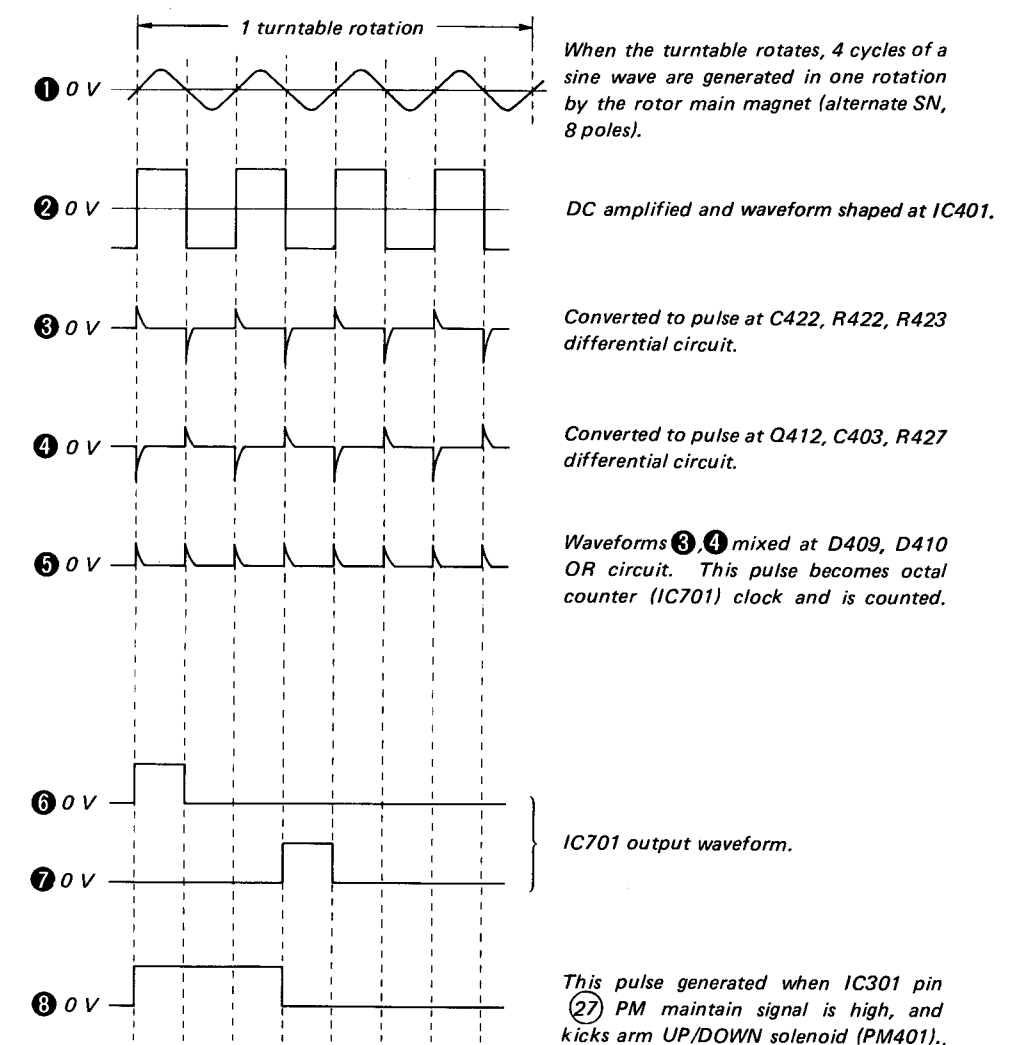


Figure 4

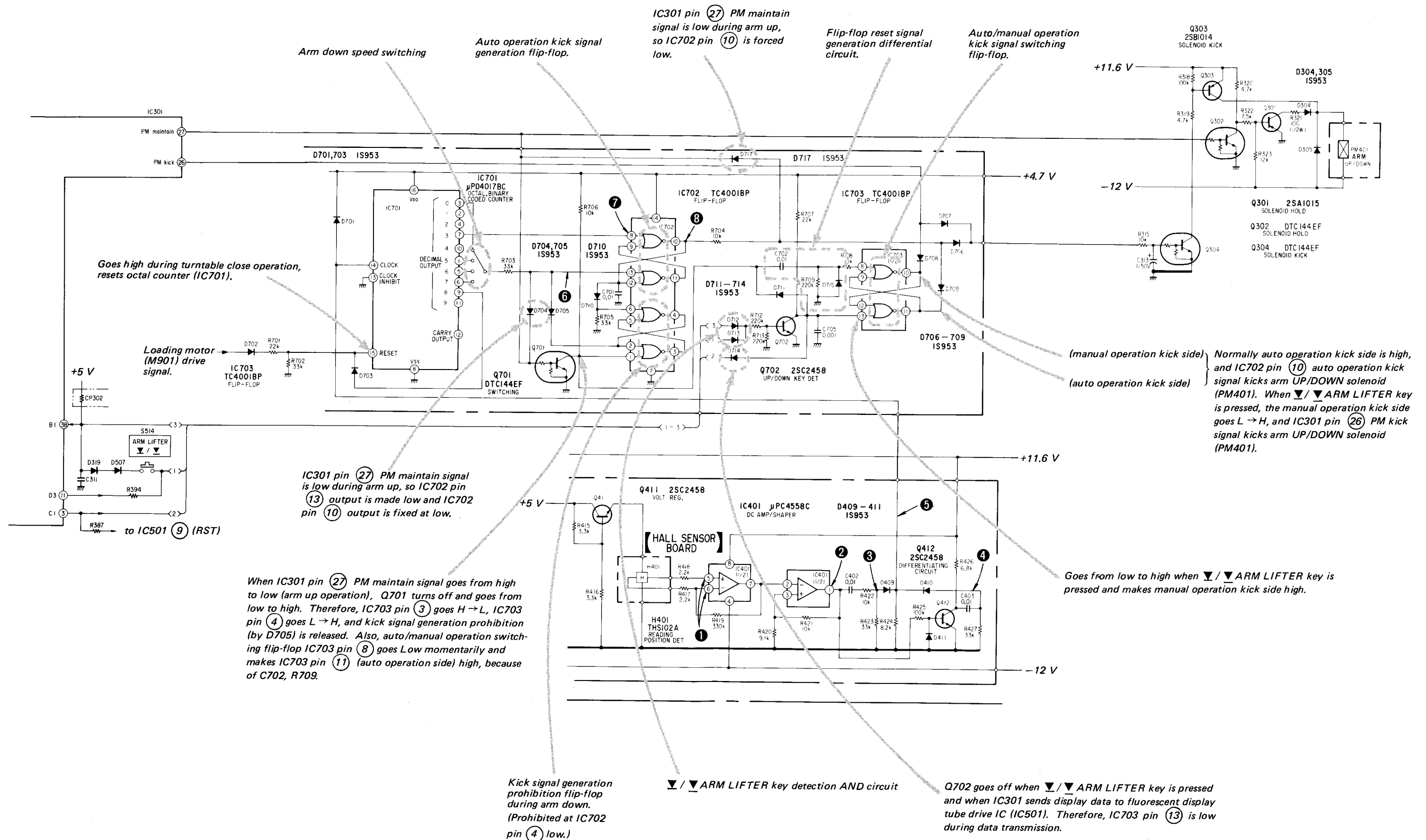


Figure 5

TIMING CHART

Indicates timing from turntable open state when START key is turned on and close switch (S4) turns on.

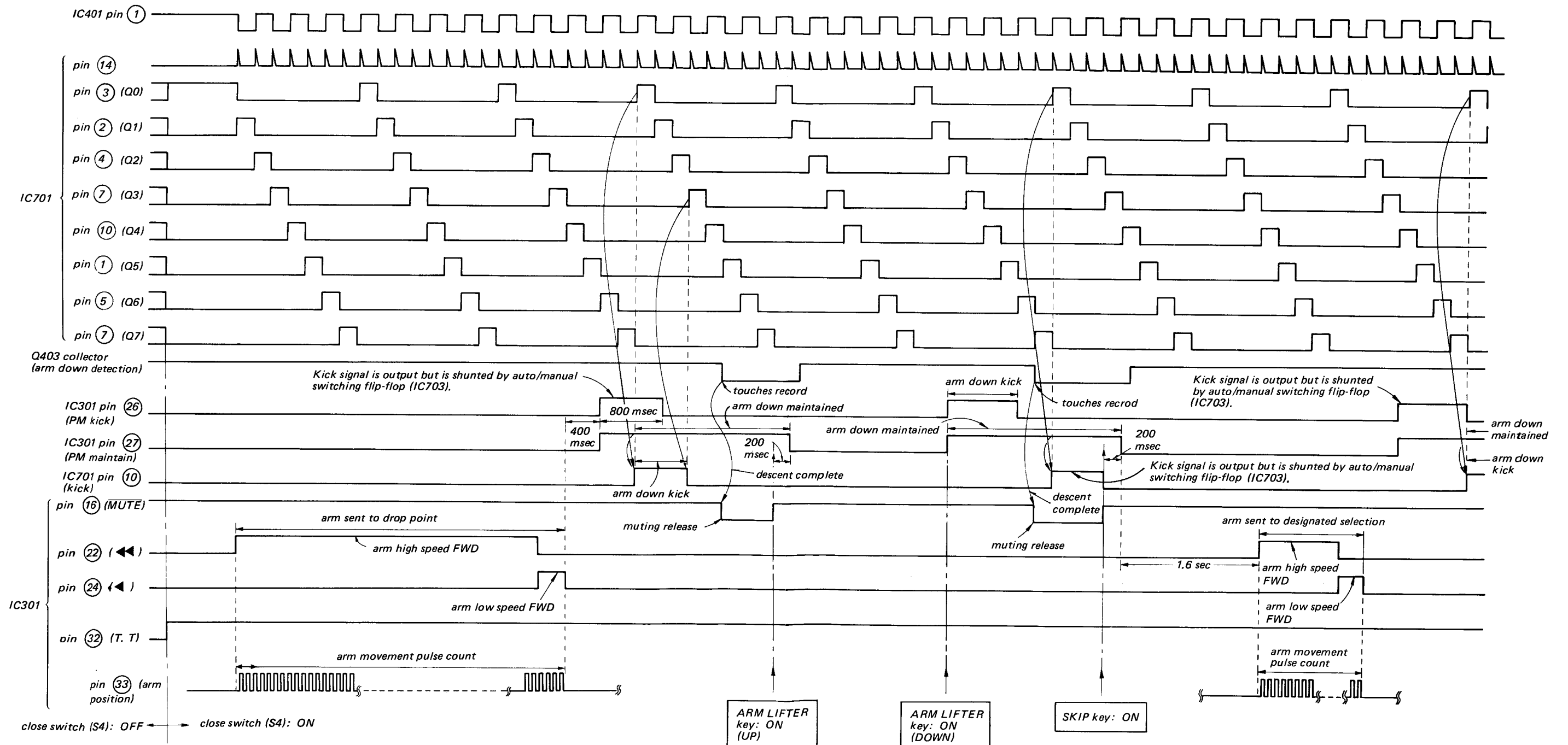
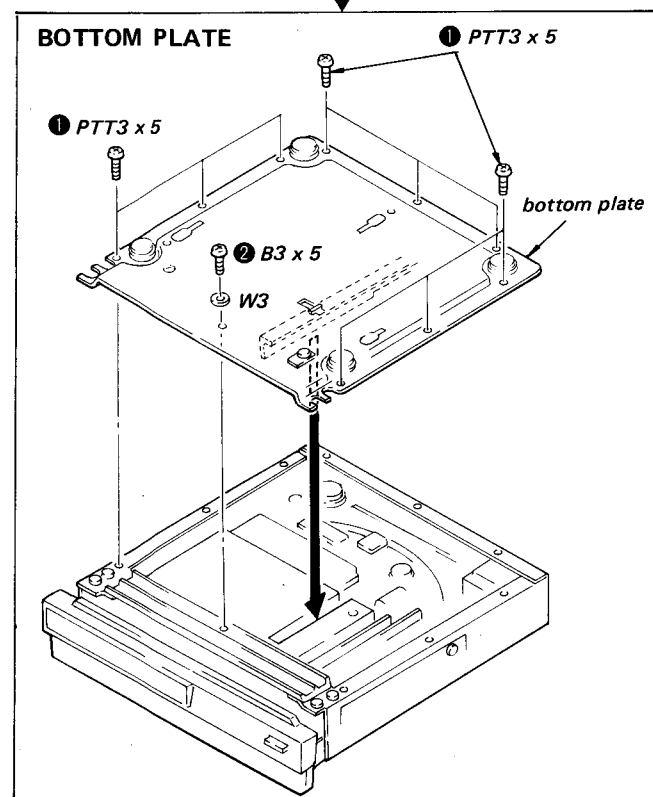
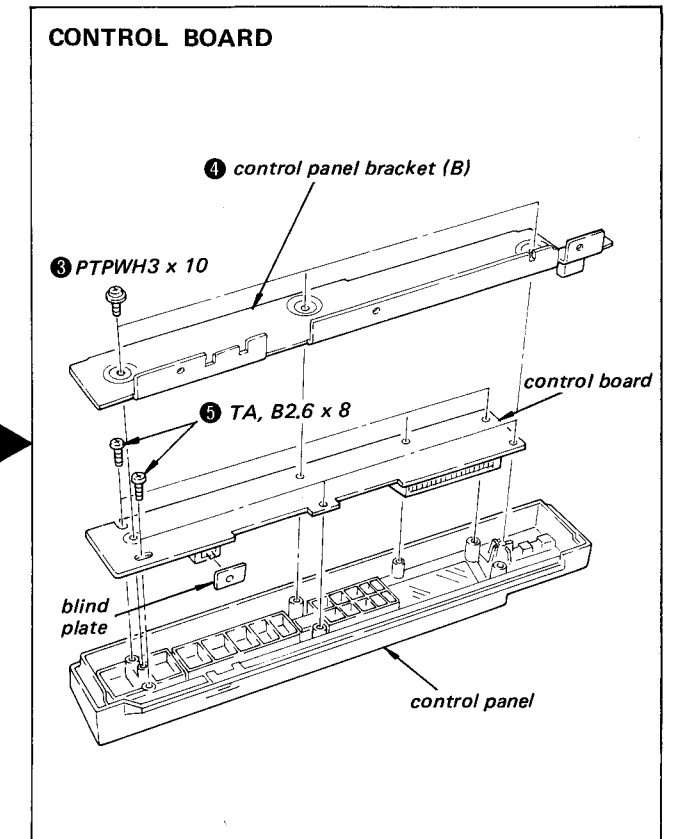
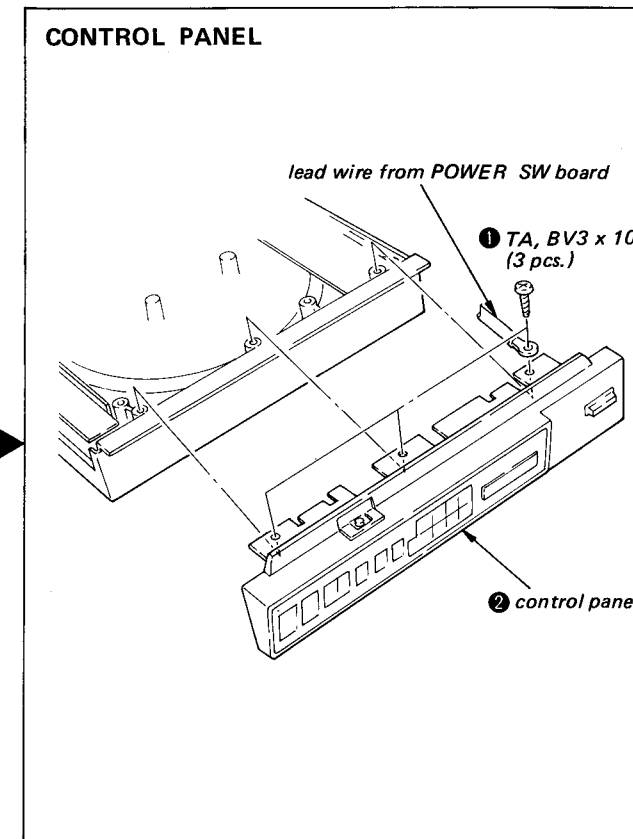
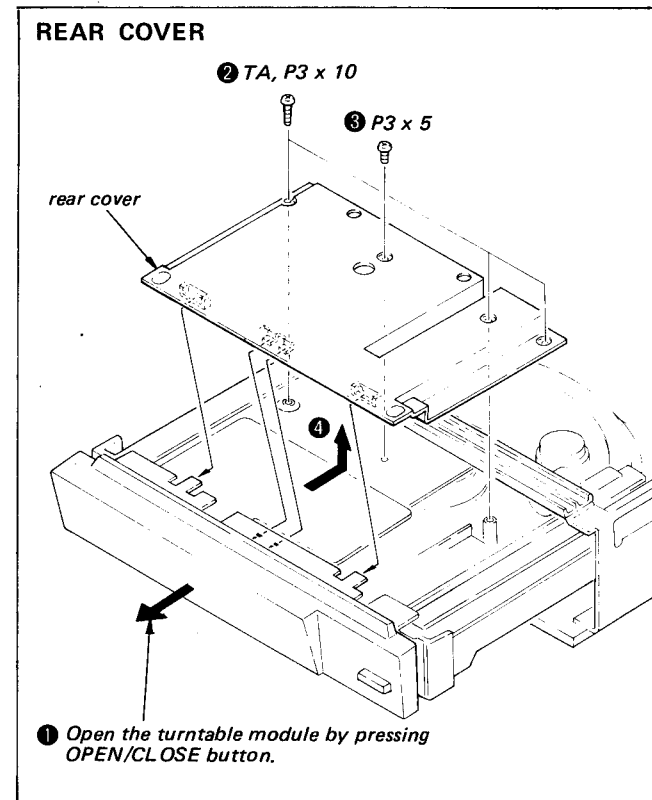
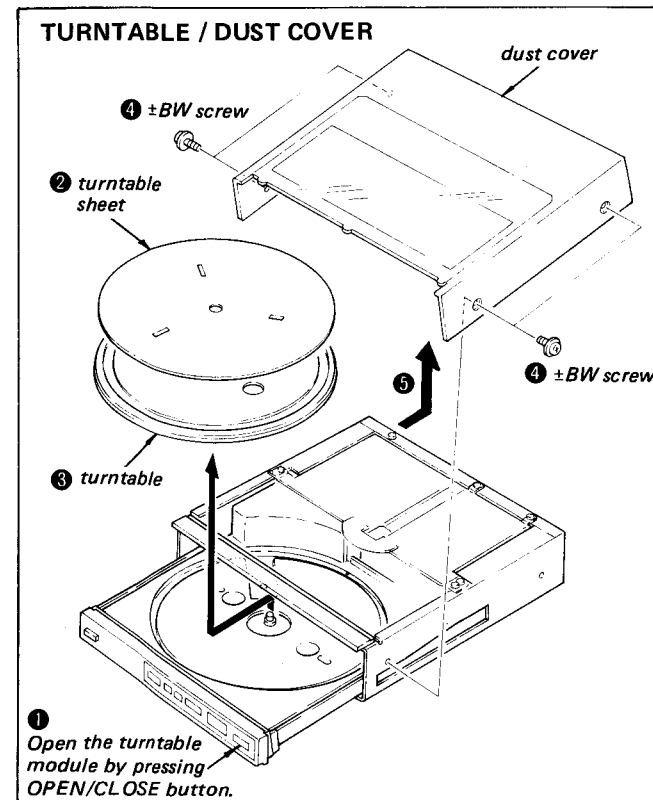


Figure 6

SECTION 2 DISASSEMBLY

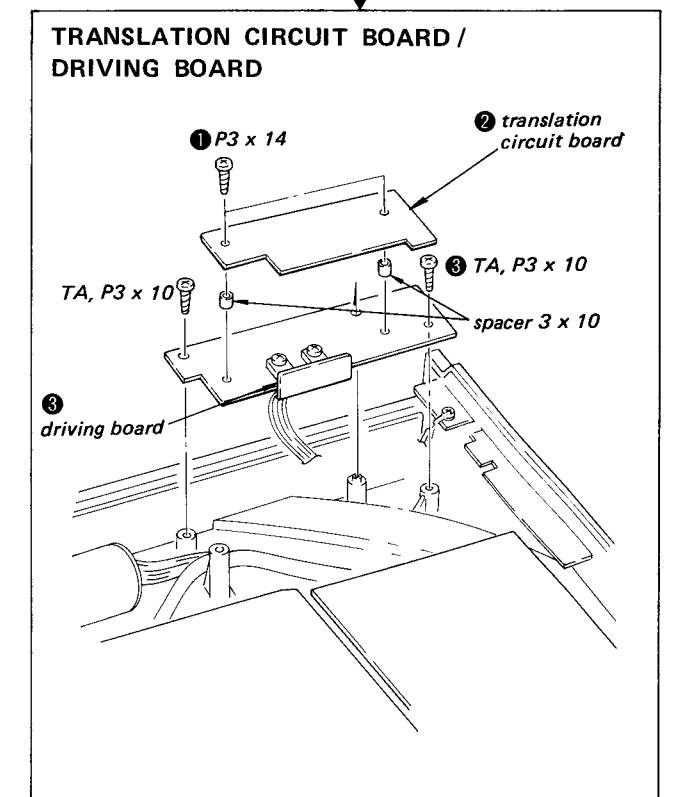
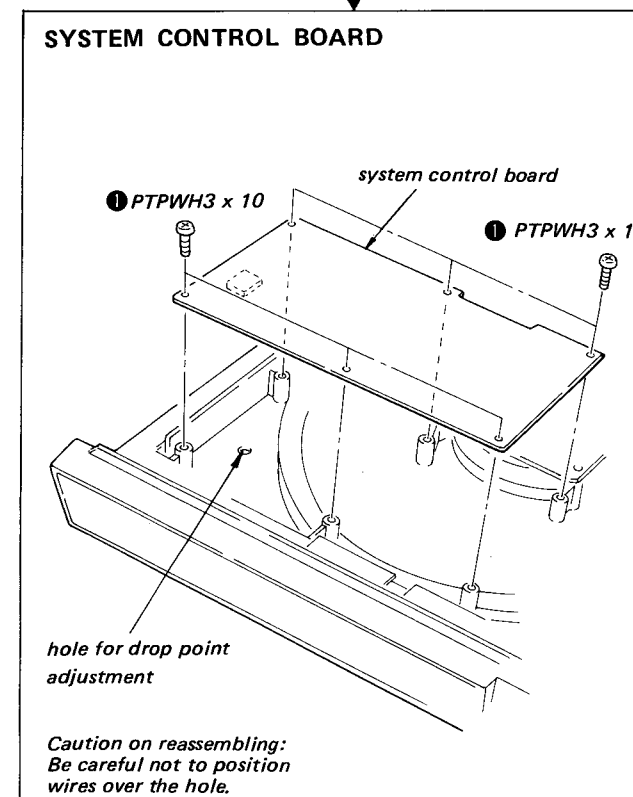
2-1. REMOVAL

Note: Follow the disassembly procedure in the numerical order given.

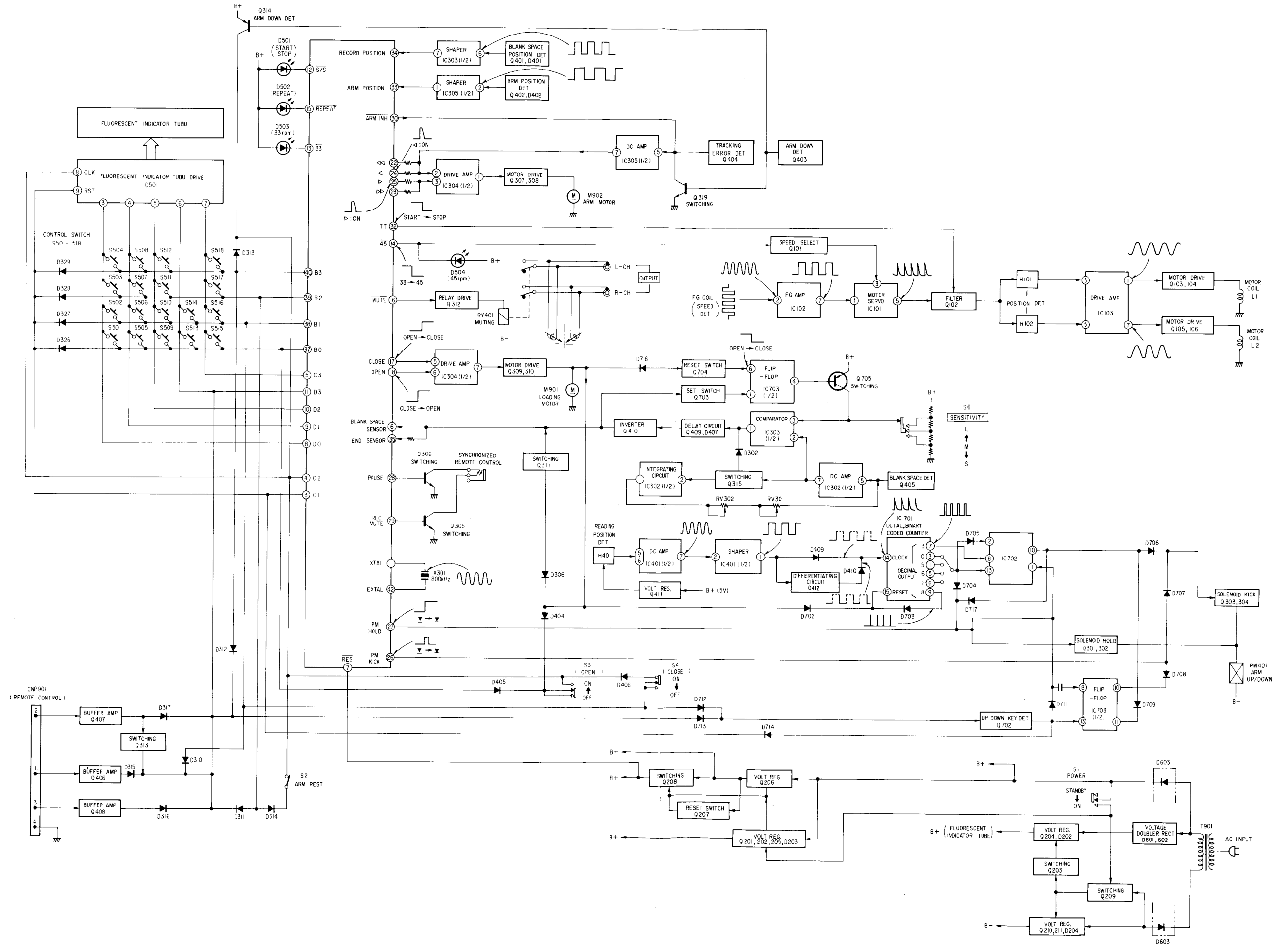


ROTOR/STATOR/SERVO AMP BOARD
(See page 33.)

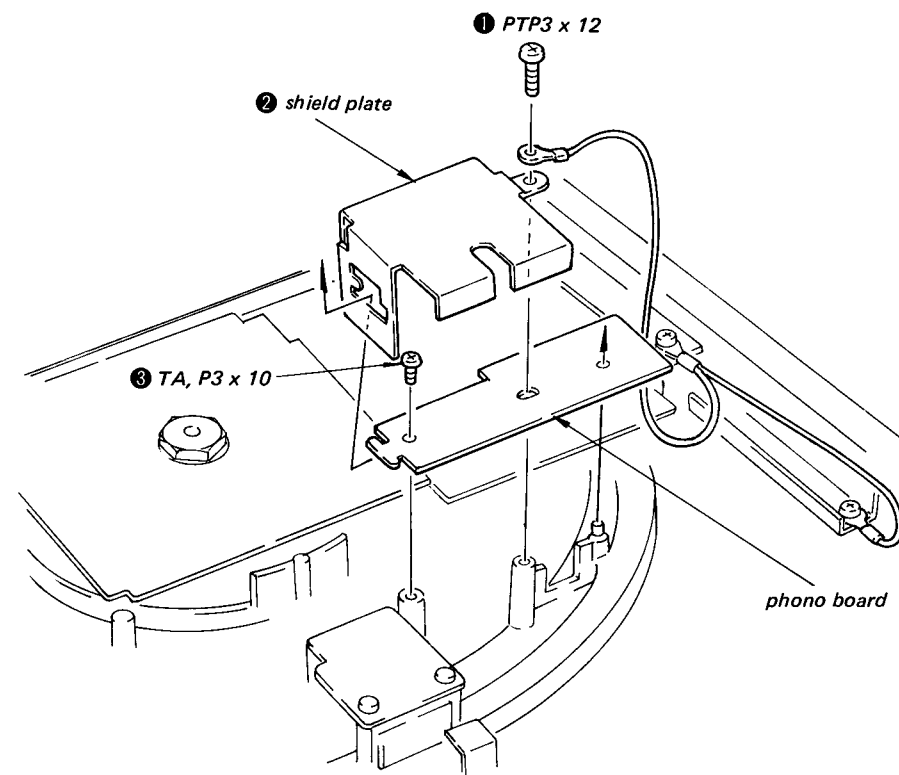
- PHONO BOARD (See page 31.)
- SUB BOARD (See page 31.)
- LOADING SENSOR BOARD/LOADING GEAR SECTION (See page 32.)



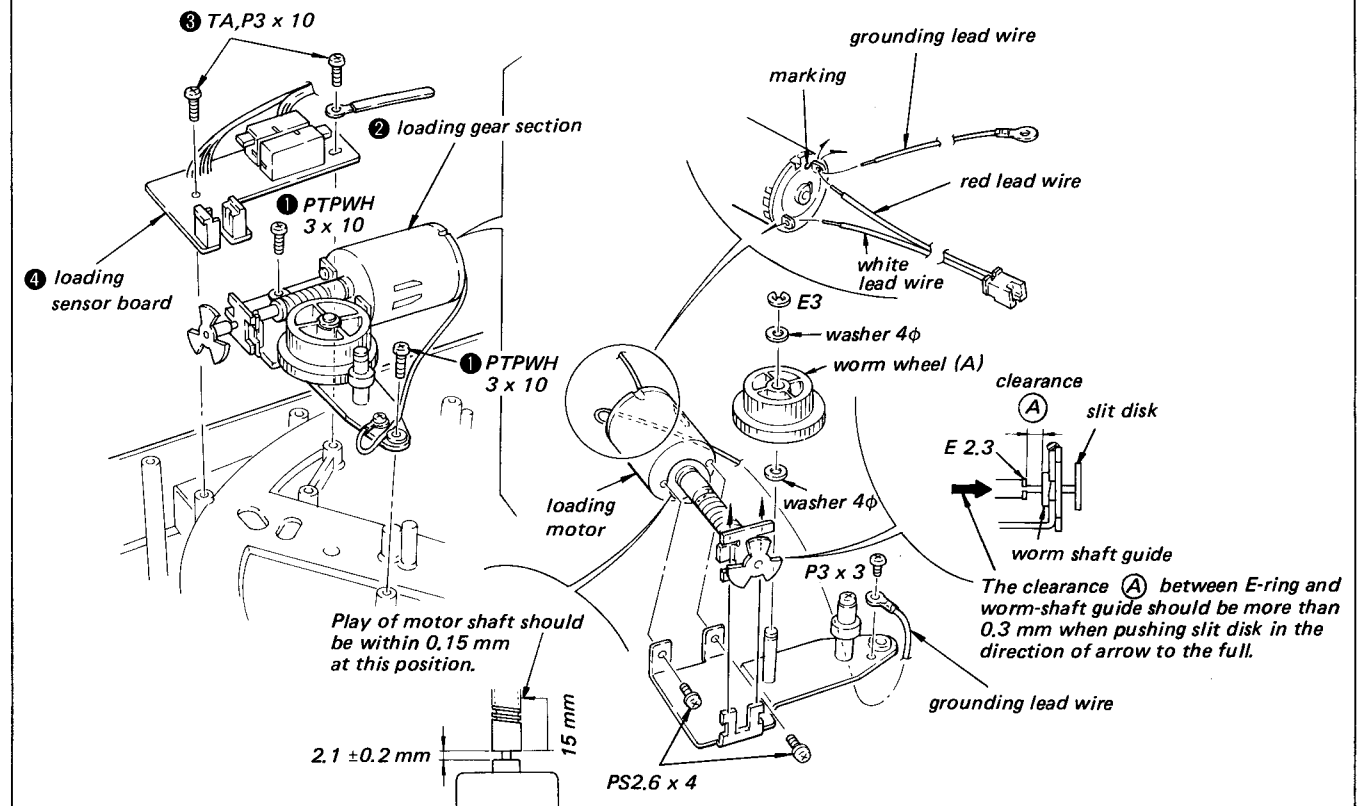
1-2. BLOCK DIAGRAM



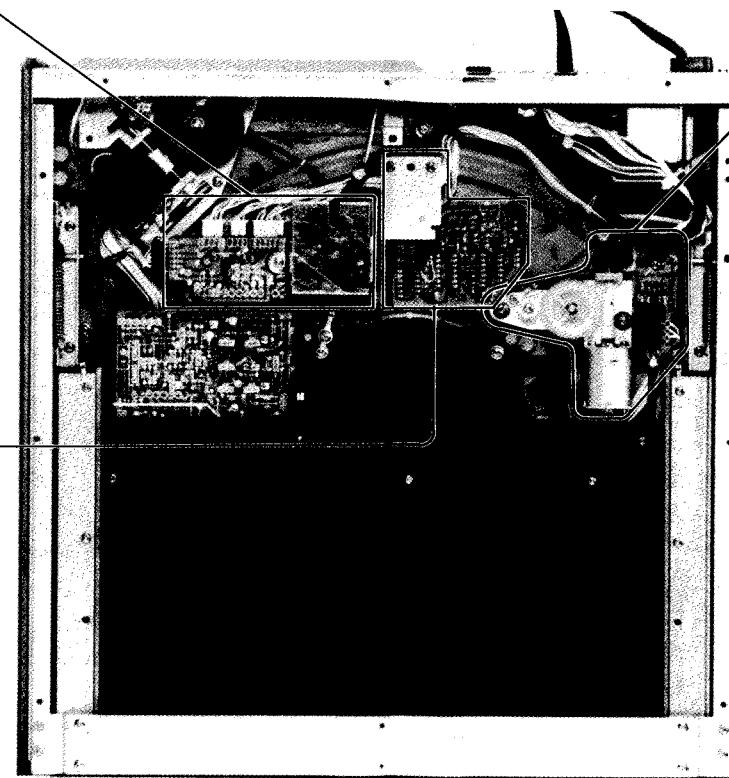
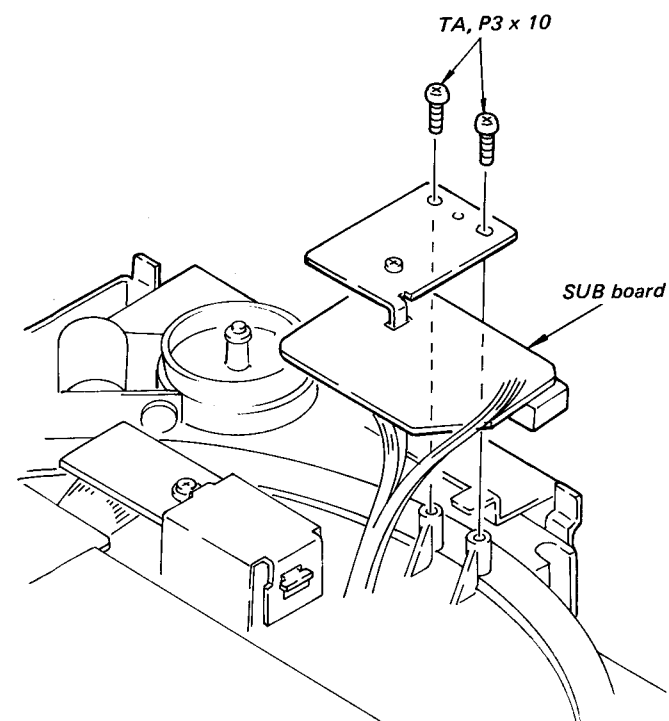
PHONO BOARD



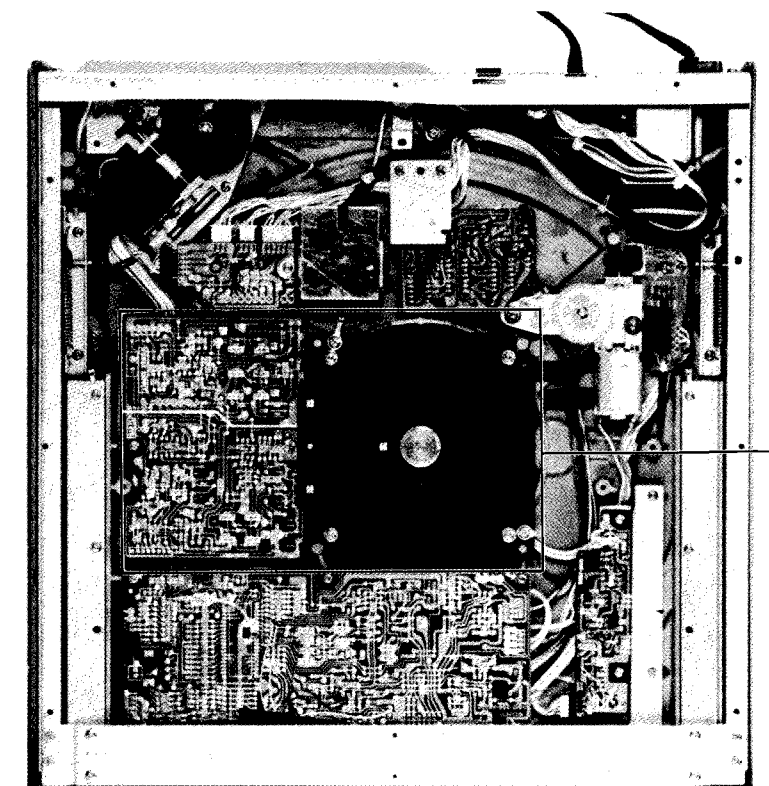
LOADING SENSOR BOARD / LOADING GEAR SECTION



SUB BOARD



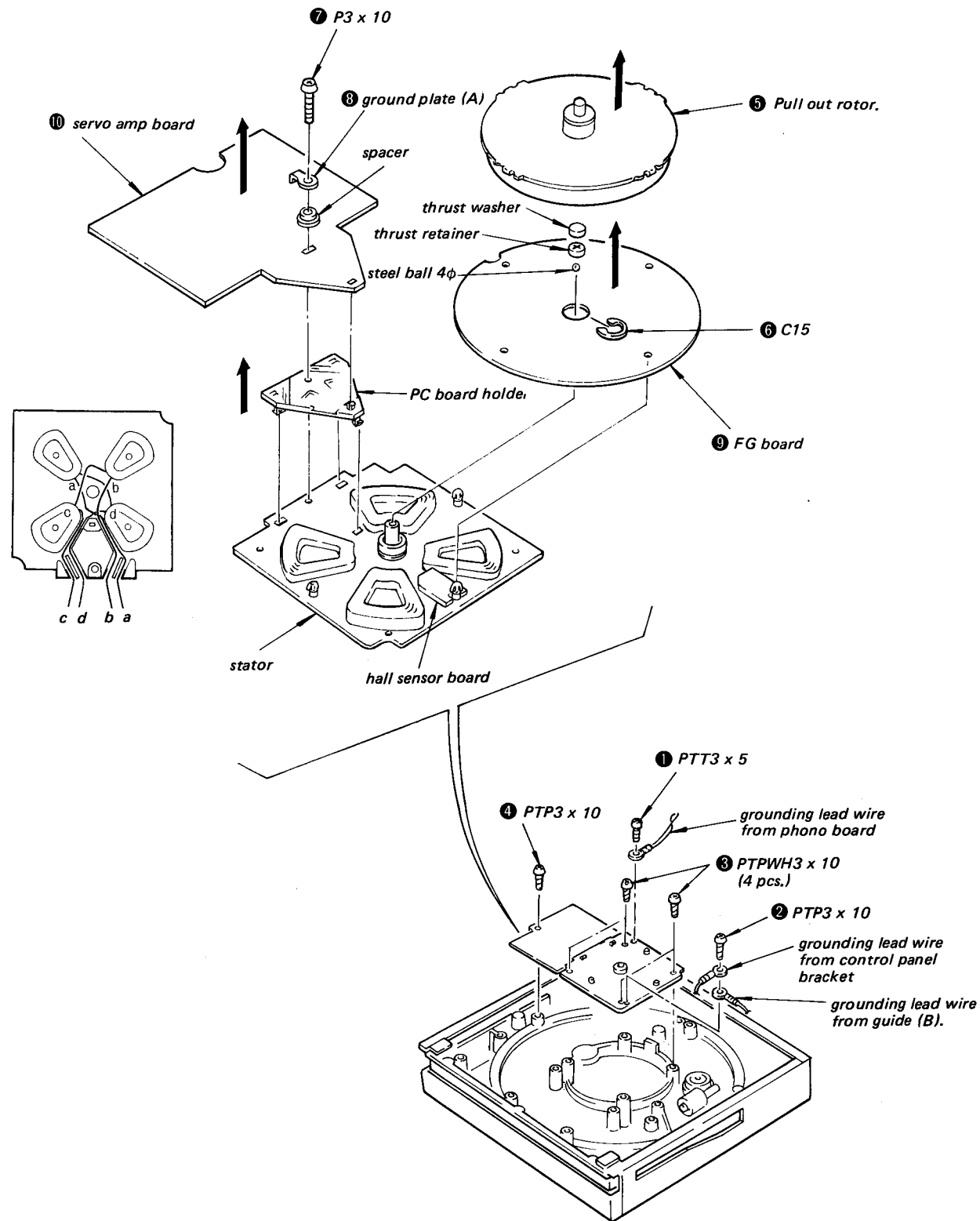
— With bottom plate removed. —



— With rear cover removed. —

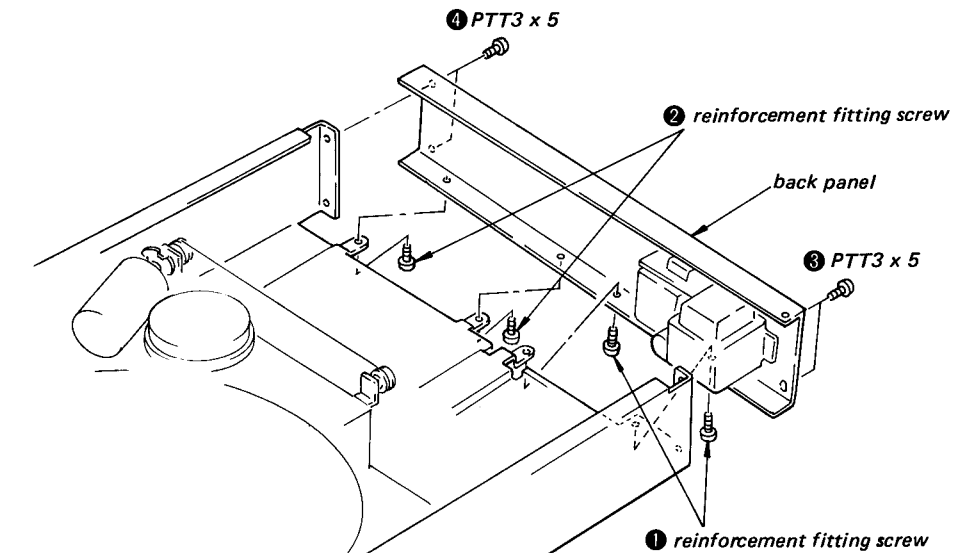
See next page.

ROTOR / STATOR / SERVO AMP BOARD

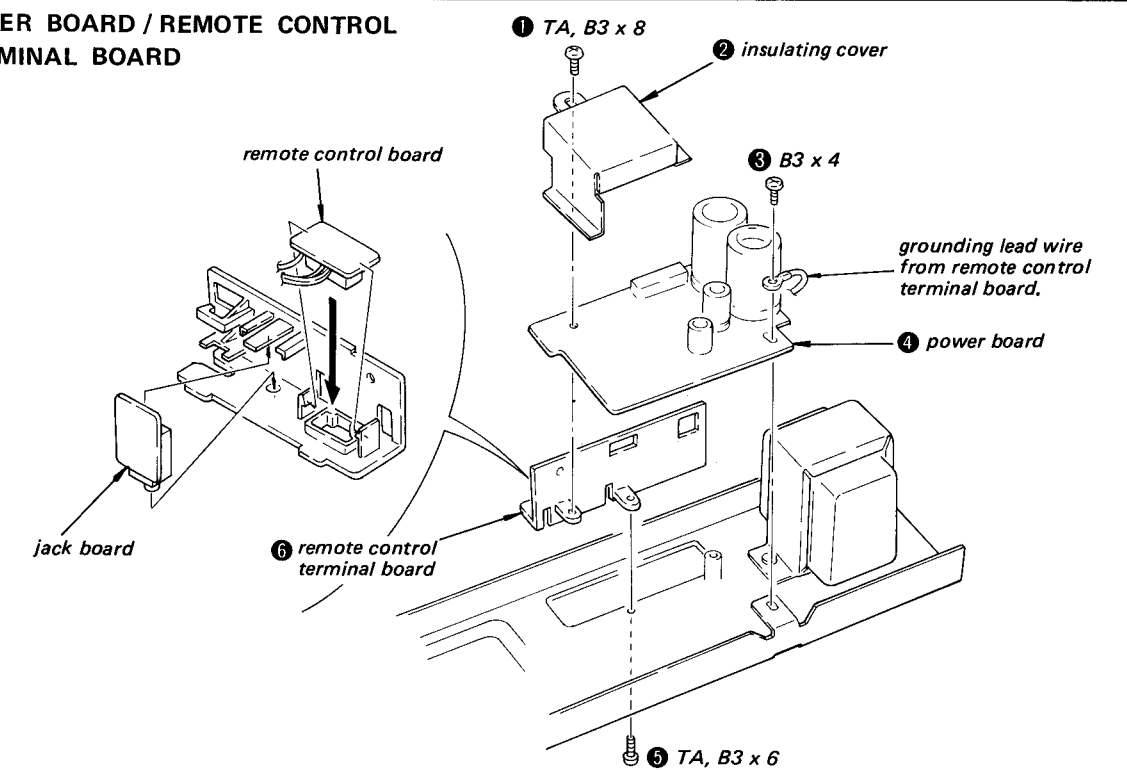


Remove bottom plate.
(See page 29.)

BACK PANEL



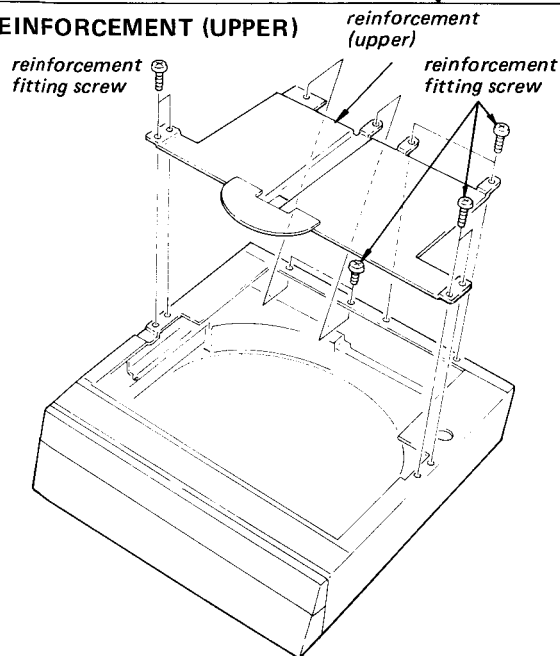
POWER BOARD / REMOTE CONTROL
TERMINAL BOARD



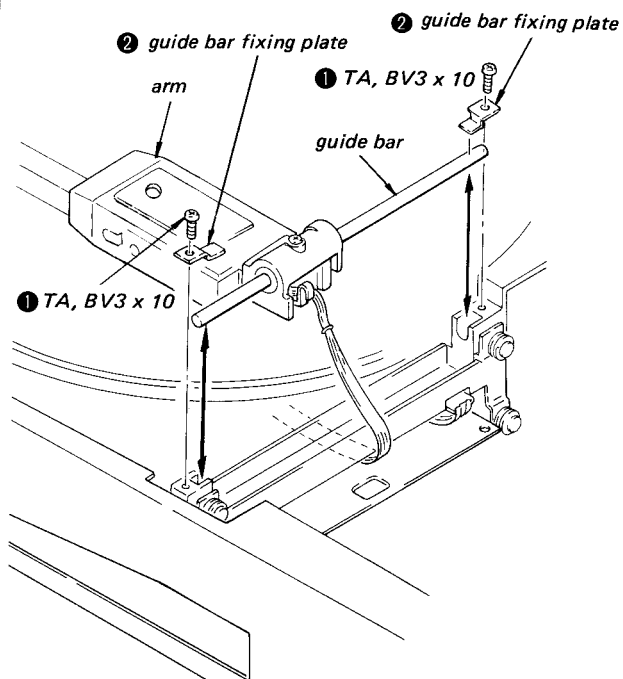
Remove dust cover.

(See page 29.)

REINFORCEMENT (UPPER)



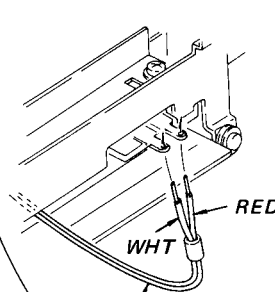
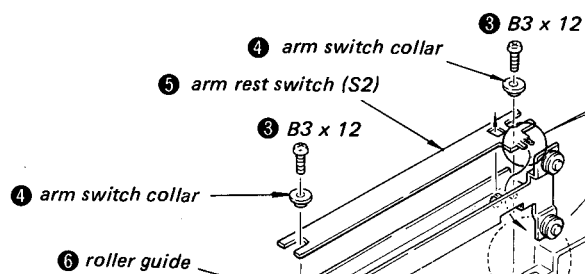
ARM



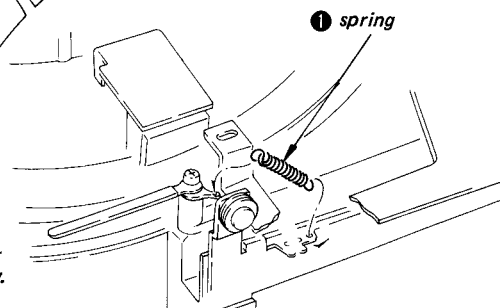
ARM DRIVE CORD STRINGING

(See page 40.)

ARM REST SWITCH (S2) / ROLLER GUIDE

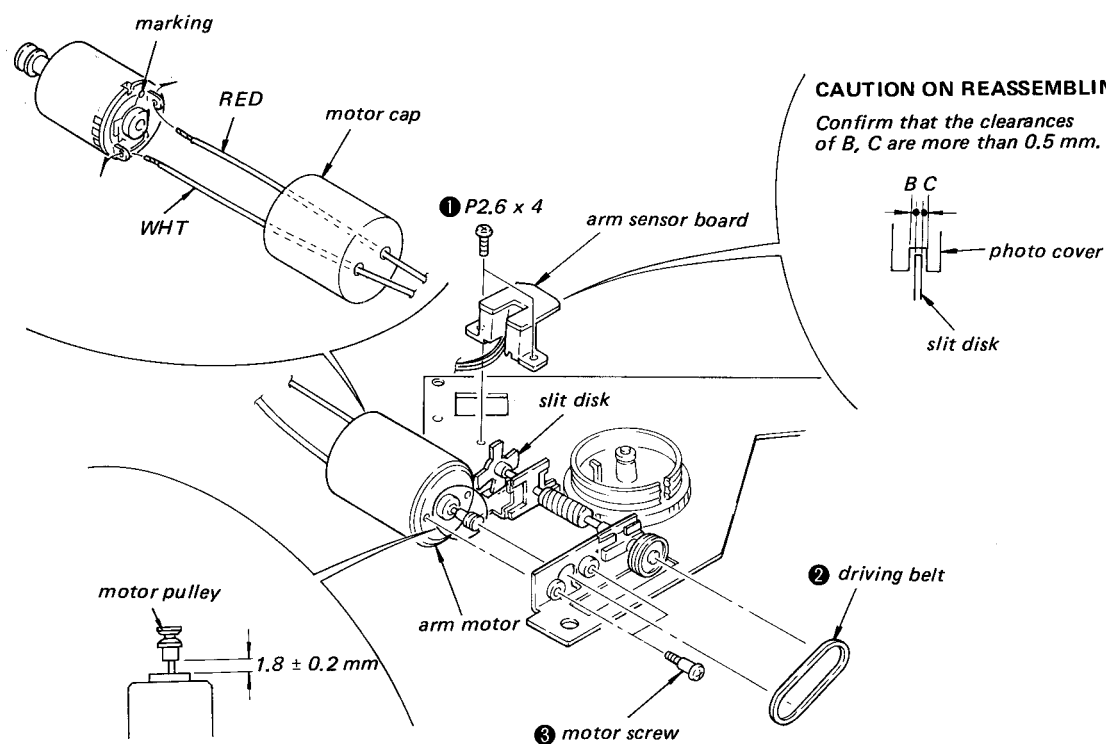


2 Remove the lead wires.

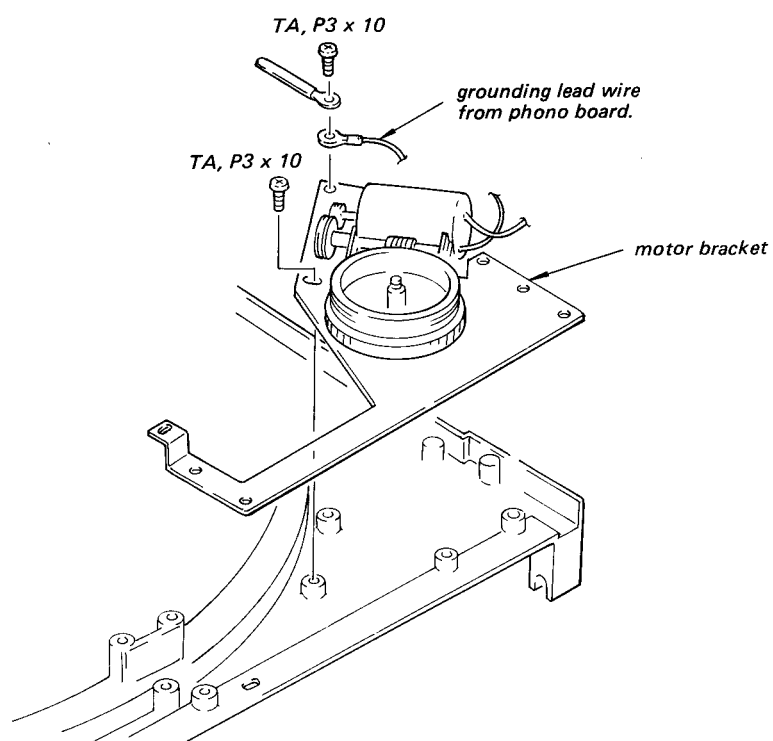


When reassembling, slide roller guide in the direction of arrow.

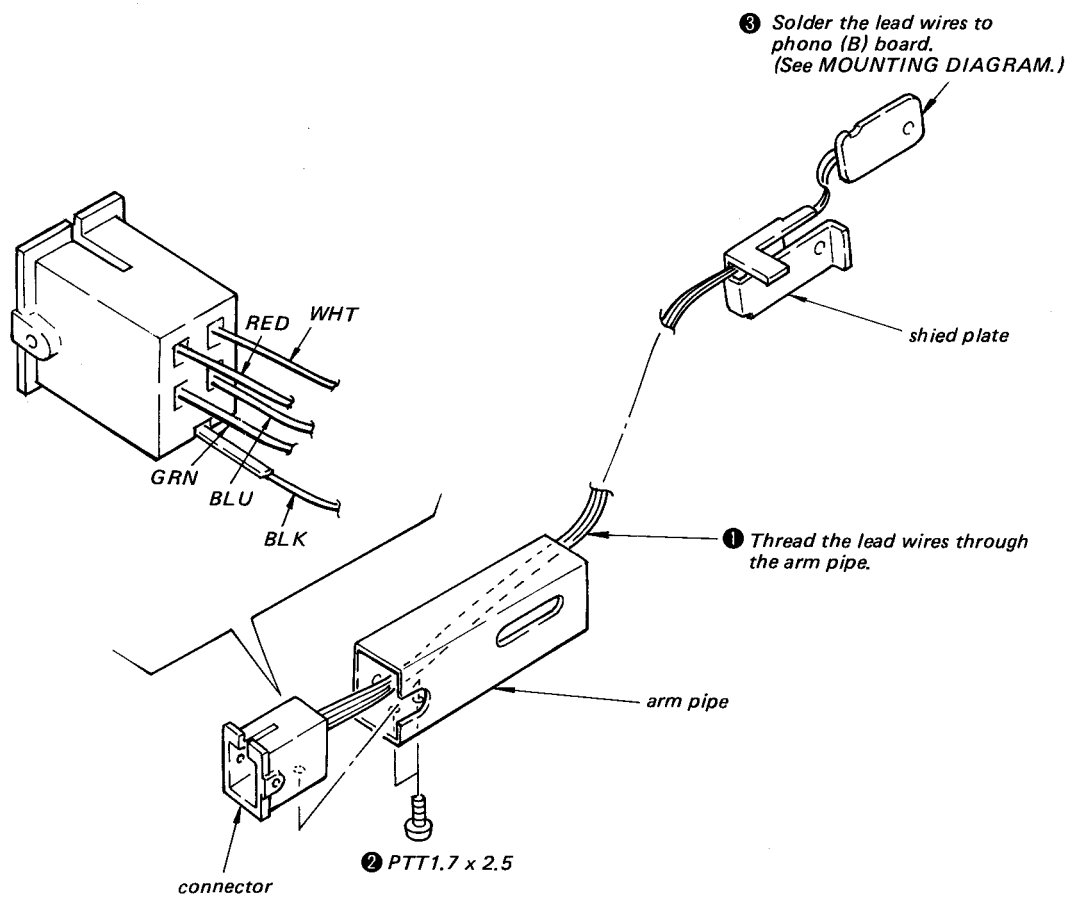
ARM MOTOR



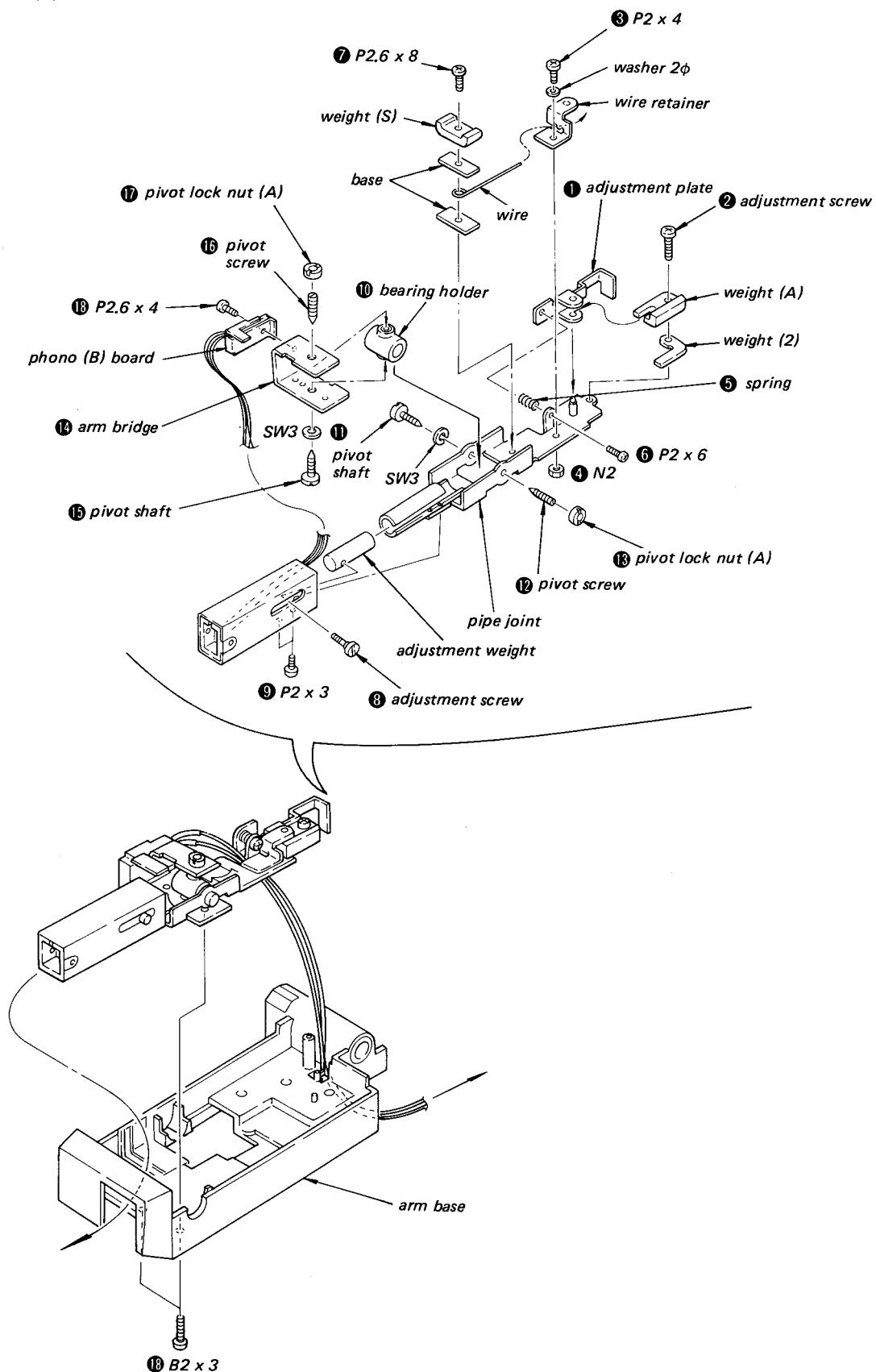
ARM MOTOR BRACKET



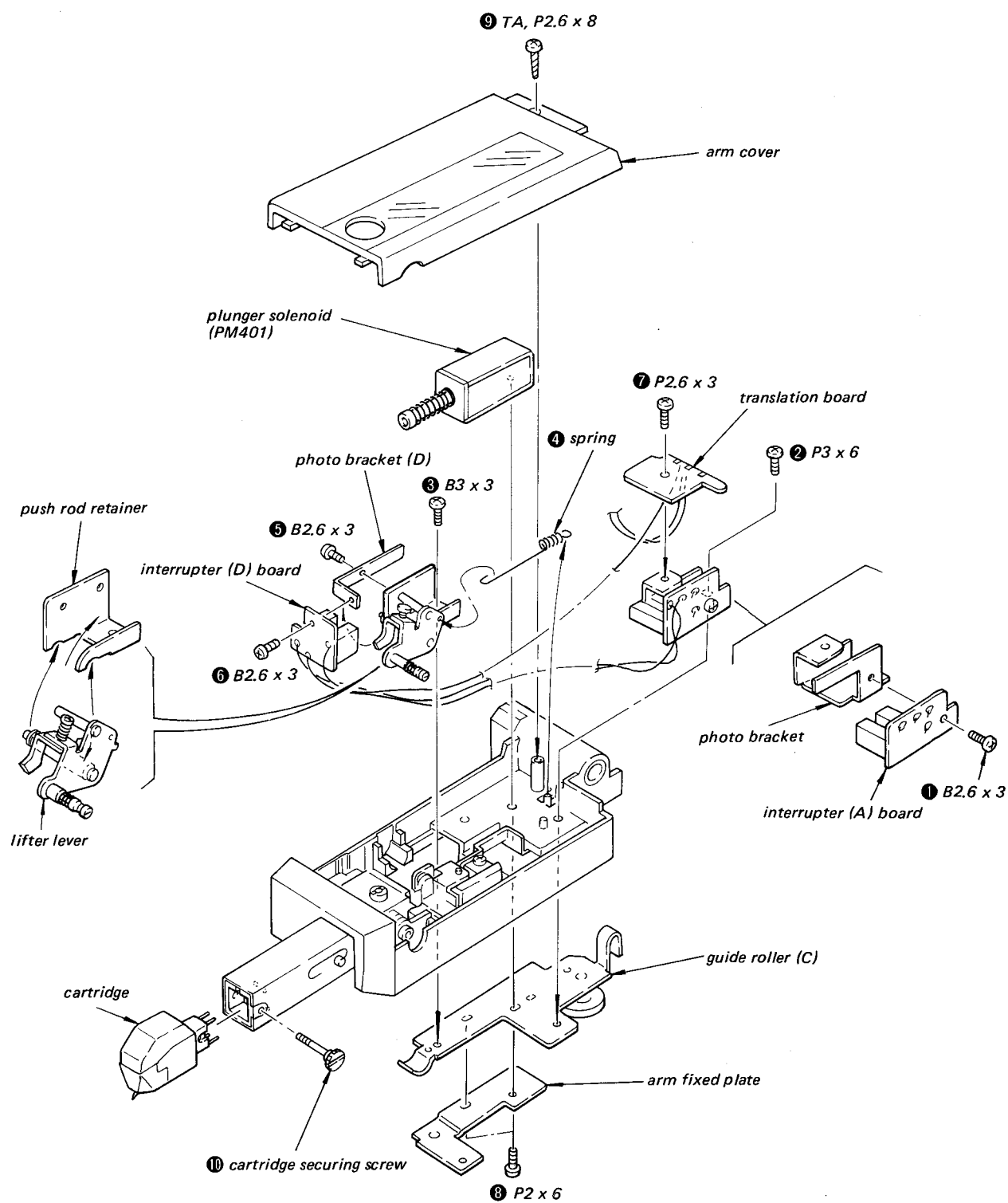
ARM ASSEMBLING (1)



ARM ASSEMBLING (2)

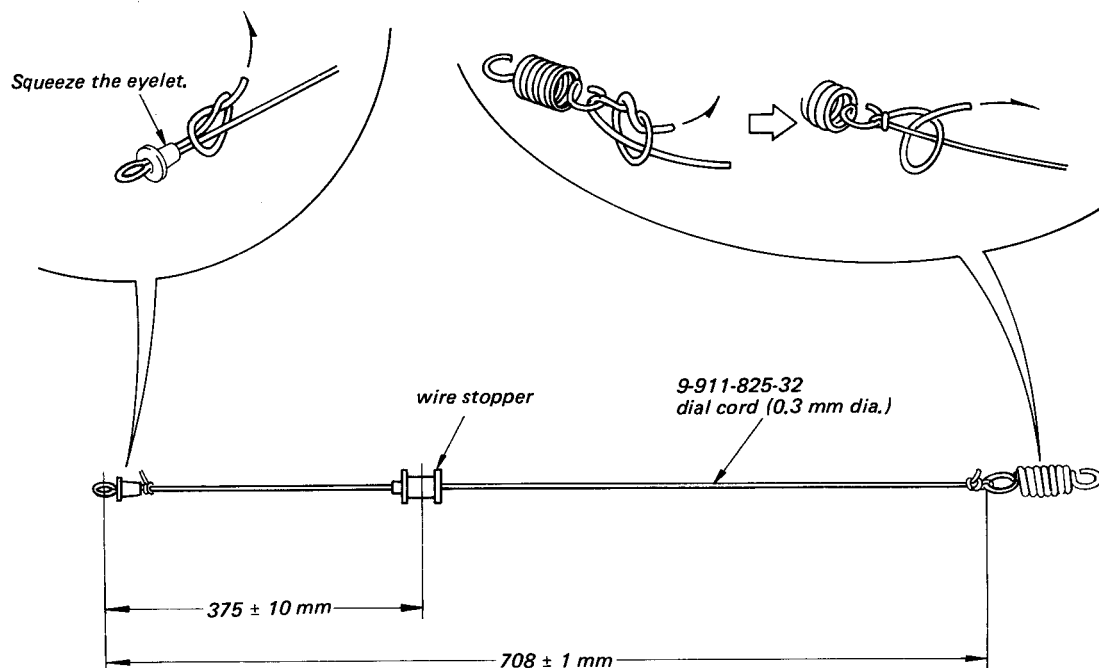


ARM ASSEMBLING (3)

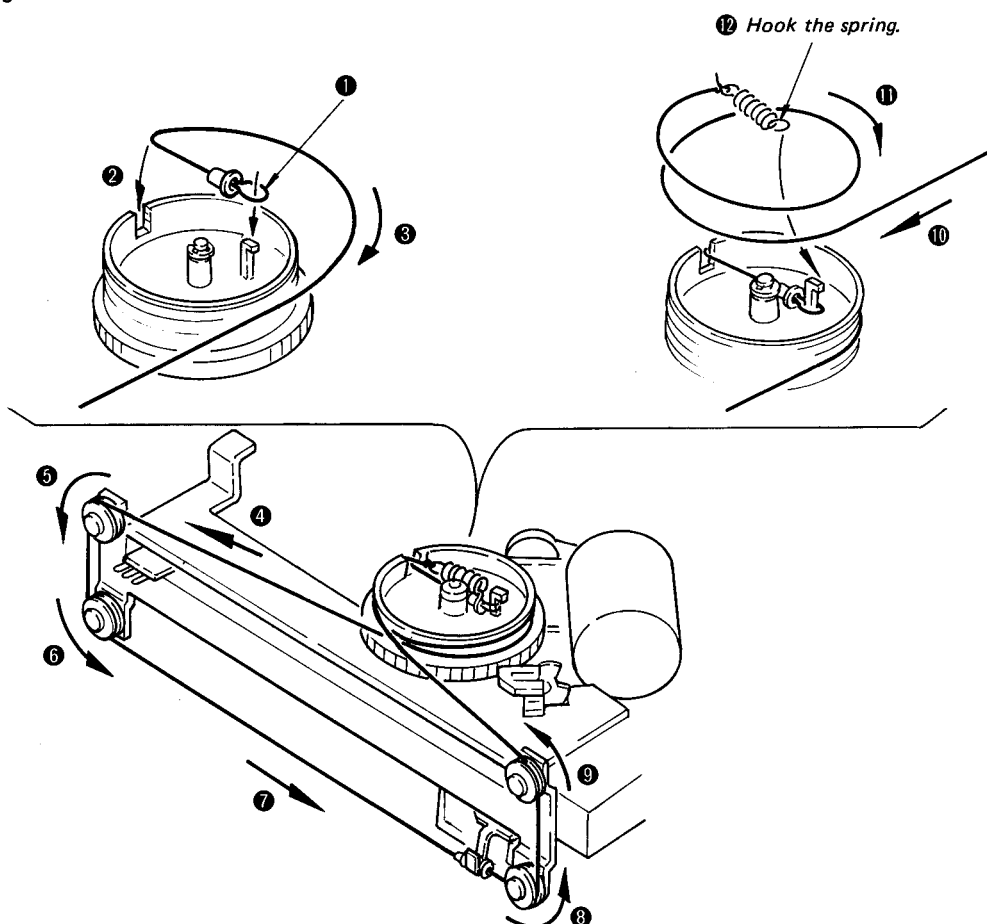


2-2. ARM DRIVE CORD STRINGING

(1) Preparation



(2) Stringing



SECTION 3 ADJUSTMENTS

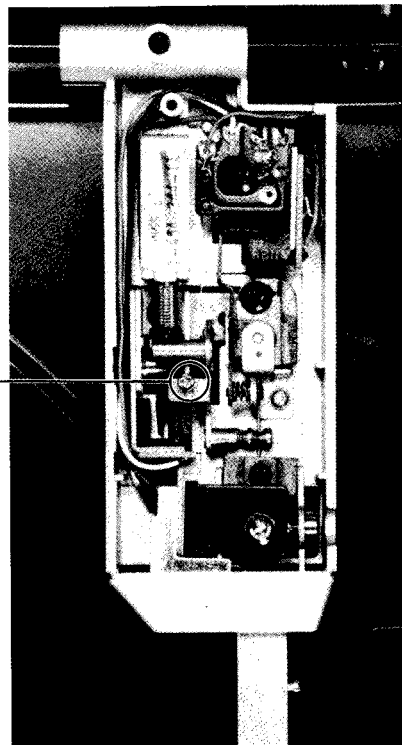
3-1. MECHANICAL ADJUSTMENTS

Note: The adjustment should be performed in the order given in this service manual.
After the adjustments, apply suitable locking compound to the adjustment screws.

Muting Position Adjustment

1. Put a record.
2. Attach the cartridge and set the stylus force adjustment knob to the center.
3. Press ARM TRANSPORT button (◁) and move the arm over the turntable.
4. Press ARM LIFTER button (▼/▼) and adjust with the shutter adjustment screw so that sound comes out 0.5 – 1 seconds after a stylus tip drops on the record.

shutter adjustment
screw



Arm Pipe Angle Check

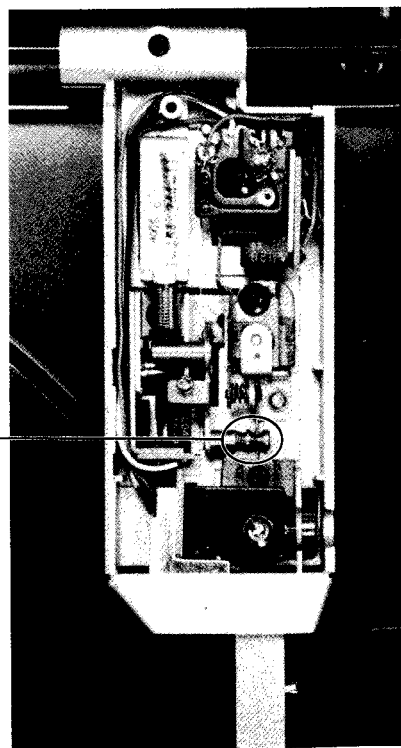
1. Position the slit of arm rest switch (S2) position adjustment screw to the center. (See page 44.)
2. Put the test record (YFSC-16).
3. Press START/STOP button.
4. Adjust with the horizontal position adjustment screw so that the drop point at this time is within the specification.

Specification: 9 – 12 counts

Turning to the right: Count decreases.

Turning to the left: Count increases.

arm pipe horizontal position
adjustment screw



Tracking Error Adjustment

1. Place a test record (YFSC-16) on the turntable and press START/STOP button for lead-in.
2. Just after the first count appears since the arm went DOWN, cause the arm to go UP and then go DOWN again. Note the counts at these two points, and then confirm that the difference in count is within 3 counts.

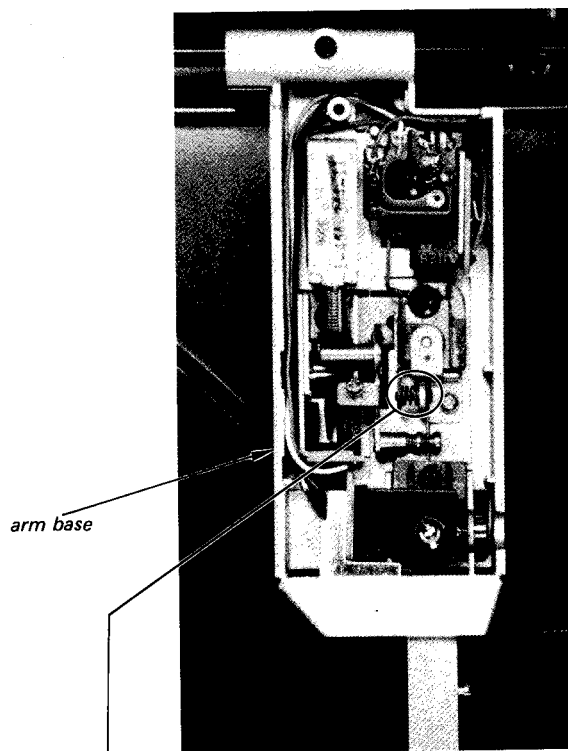
If necessary, adjust with tracking error adjustment screw.

3. After completing step (2), cause the arm to go DOWN, and then go UP just after the arm base moves.
4. Check the count at that time, and then confirm that the difference in count when the arm goes DOWN again is within 2 counts.
5. After installing the arm cover to arm base, confirm tracking error adjustment. If necessary, perform step (1) – (5).

— Adjustment Direction —

For (2) when arm base moves, turn to the right.

For (4) when the difference in count is too large, turn to the left.



tracking error adjustment screw

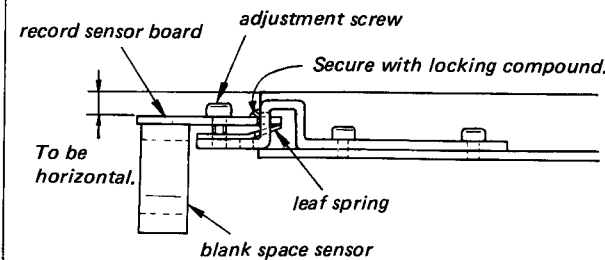
Blank Space Sensor Adjustment

This adjustment should be performed only when the followings have been done.

- When assembling blank space sensor section:
- When replacing photo coupler of blank space sensor:

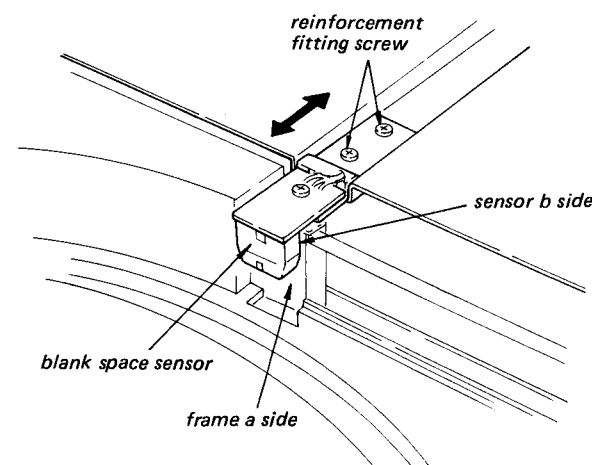
1. Blank Space Sensor Inclination Adjustment

- 1) Press OPEN/CLOSE button and open the turntable module.
- 2) Adjust with the adjustment screw so that record sensor board is horizontal.



2. Blank Space Sensor Position Adjustment

- 1) Press OPEN/CLOSE button and open the turntable module.
- 2) Move the blank space sensor in the direction of arrow so that the clearance between frame a-side and rear side of blank space sensor (b-side) is 0.5 – 1 mm and tighten the reinforcement fitting screws.



3. Blank Space Sensor Voltage Adjustment

Setting:

SENSITIVITY switch: H

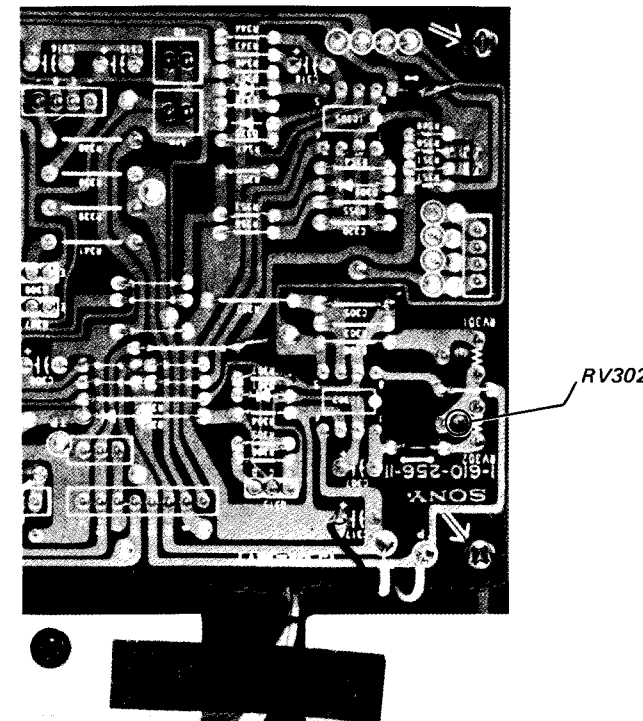
- 1) Put the test record (YFSC-16).
- 2) Press OPEN/CLOSE button and close the turntable module.
- 3) Adjust RV302 so that the indication on the display at this time is within the specification.

Note: This adjustment should be performed for both A side and B side of the test record (YESC-16).

Specifications:

A side: 6 – 7
B side: 13 – 14

— system control board (conductor side) —

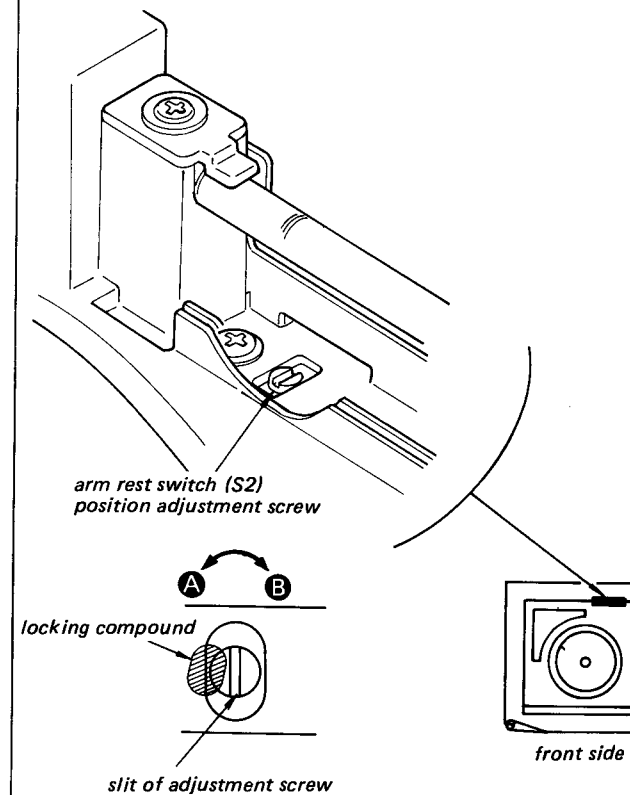


Drop Point Adjustment

1. Put the test record (YFSC-16).
2. Press START/STOP button.
3. Adjust with the adjustment screw so that the drop point at this time is within the specification.

Test Record	Specification
YFSC-16 (30 cm)	6-16 count

4. After adjustment, apply suitable locking compound as shown in the figure. (Do not apply locking compound on the screw slit.)



- The position in the figure above is the center of adjustment screw.

- A The count increases.
(The stylus moves toward inner grooves.)
- B The count decreases.
(The stylus moves outer grooves.)

Note: This adjustment screw turns 360° and has no stoppers.

Arm Interrupter Adjustment

1. Press OPEN/CLOSE button and open the turntable module.
2. Solder the pattern A. If the pattern B is soldered, unsolder the pattern B.
3. Set the arm fully rightward.

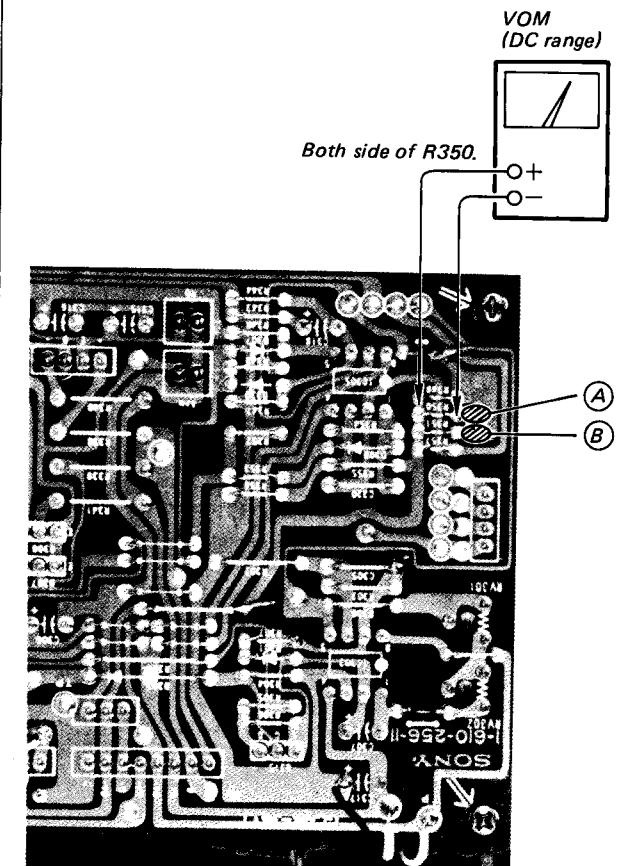
(Be sure that the interrupter for tracking error detection is fully opened.)

4. Read the voltage on the VOM.

- If the reading is 0.3 – 0.6 V, unsolder the pattern A.
- If the reading is more than 0.6 V, unsolder the pattern A and solder the pattern B.

Adjustment Location:

— system control board —

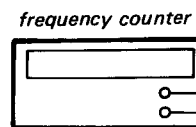


ELECTRICAL ADJUSTMENTS

- Perform the adjustments with the set operating normally.
- In this set, the voltage is applied to the power supplying line (± 21 V) even if the POWER switch is turned OFF. When repairing the unit, unplug the power cord with the POWER switch ON (to discharge electrolytic capacitor after rectifying AC power supply voltage).
- Repeat the procedure 2 – 3 times.

Turntable Speed Adjustment

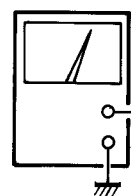
1. Connect frequency counter to test point.



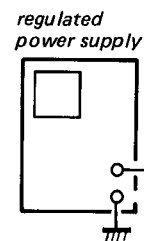
2. POWER switch : ON
START switch : ON
SPEED switch : 45 rpm
3. Adjust RV102 so that the frequency counter reading is 96.00 – 96.38 Hz.
4. SPEED switch : 33 rpm
5. Adjust RV101 so that the frequency counter reading is 71.11 – 71.39 Hz.

Note: When the adjustment of 45 rpm (RV102) is performed, it makes a difference of adjustment value of 33 rpm. So, the adjustment should be finally done by 33 rpm (RV101).

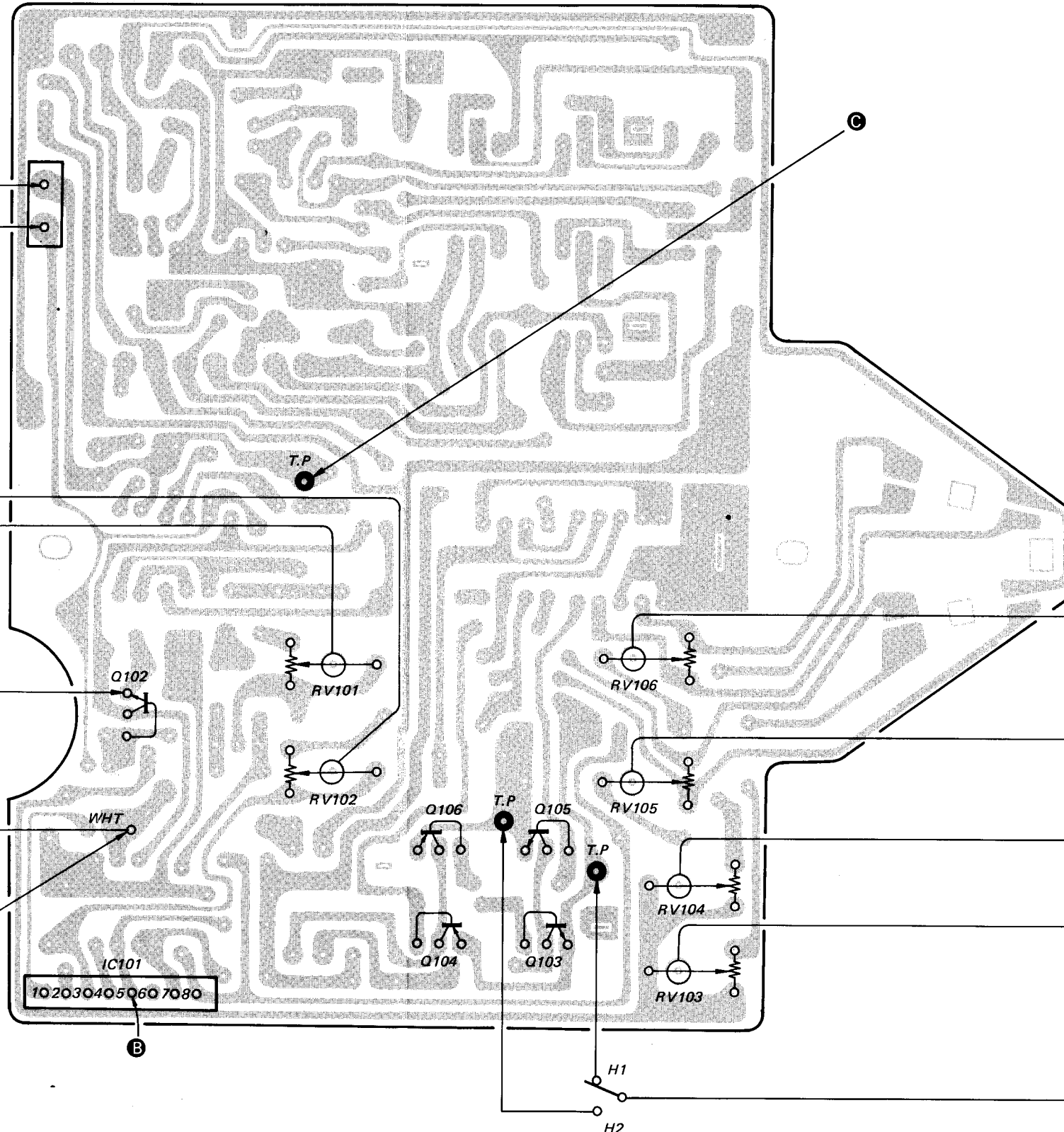
VOM
(DC 3 V range)



A Remove the lead wire.



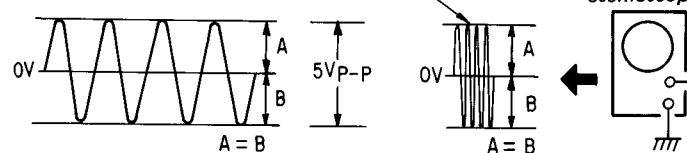
[SERVO AMP BOARD]



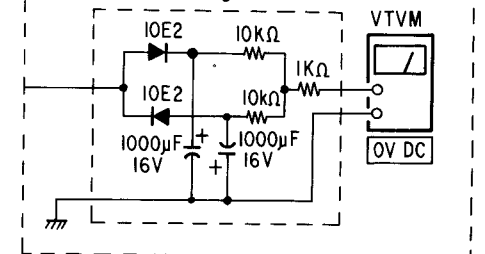
Gain/Offset Adjustment

1. Remove the lead wire **A** for the turntable driving signal from system control IC.
2. Connect the pattern **B** to **C**, and apply regulated power supply to the lead wire **A**.
3. Connect a VOM to the emitter of Q102, and adjust the regulated power supply voltage for DC1.5 V.
4. Adjust RV103 (H1) and RV104 (H2) so that the emitter voltage of Q103, 104 (H1) and Q105, 106 (H2) are 5 Vp-p. Gain Adjustment
5. Adjust RV105 (H1) and RV106 (H2) so that the emitter waveforms of Q103, 104 (H1) and Q105, 106 (H2) are as shown below (or so that DC potential is 0 V). Offset Adjustment
6. After adjustment, remove the lead wire connecting pattern **B** to **C** and solder the lead wire **A**.

Note: Set the sweep time longer for easy waveform checking.



Measuring Circuit



RICAL ADJUSTMENTS

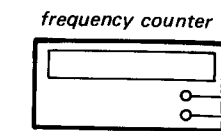
the adjustments with the set operating y.

set, the voltage is applied to the power ng line (± 21 V) even if the POWER switch d OFF. When repairing the unit, unplug ver cord with the POWER switch ON (to e electrolytic capacitor after rectifying AC supply voltage).

the procedure 2 - 3 times.

Speed Adjustment

frequency counter to test point.



switch: ON

switch: ON

switch: 45 rpm

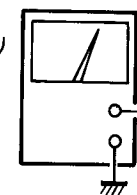
RV102 so that the frequency counter s 96.00 - 96.38 Hz.

switch: 33 rpm

RV101 so that the frequency counter s 71.11 - 71.39 Hz.

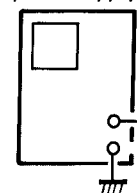
en the adjustment of 45 rpm (RV102) is per- med, it makes a difference of adjustment value 33 rpm. So, the adjustment should be finally ne by 33 rpm (RV101).

VOM
(DC 3 V range)

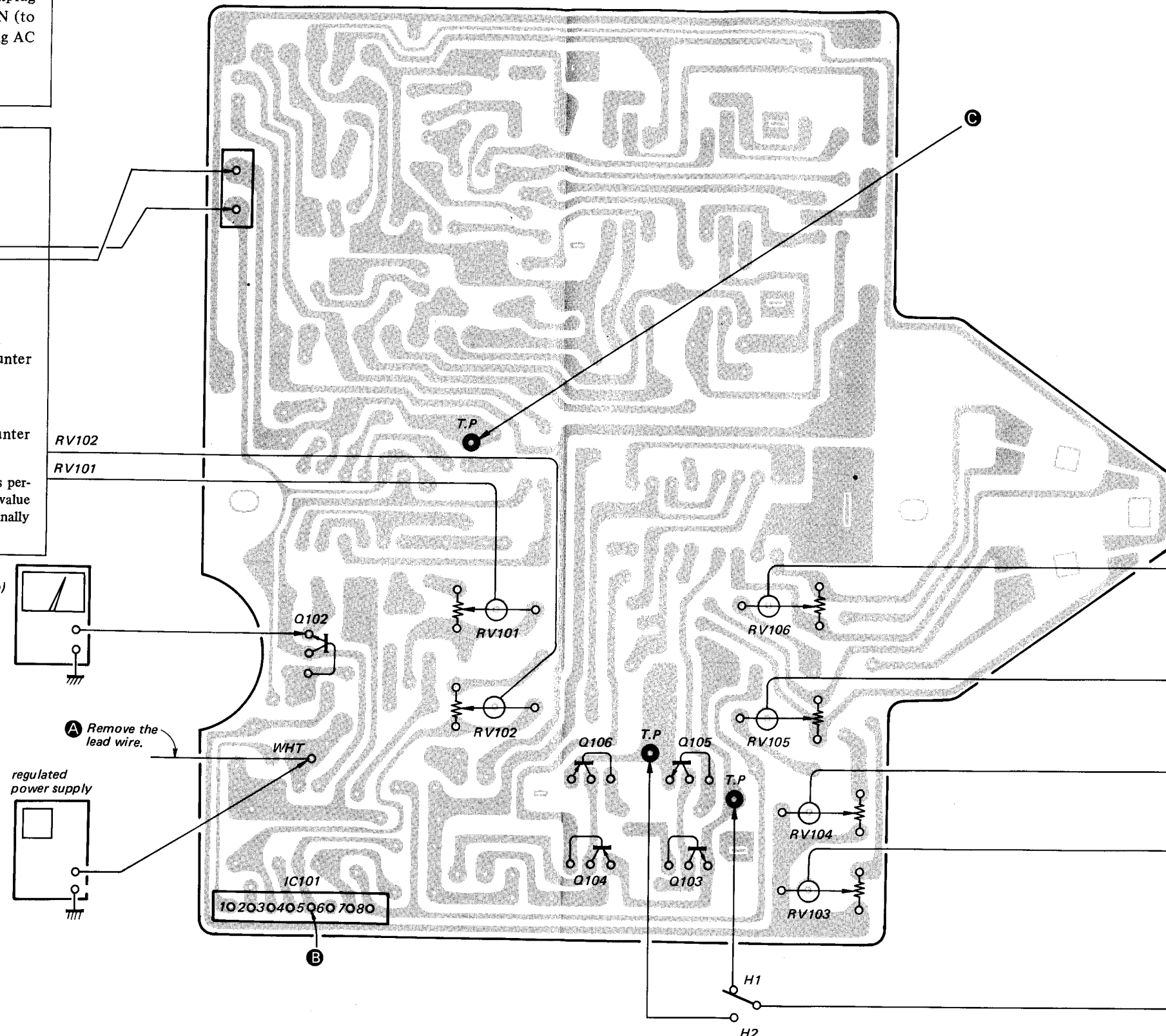


A Remove the lead wire.

regulated power supply



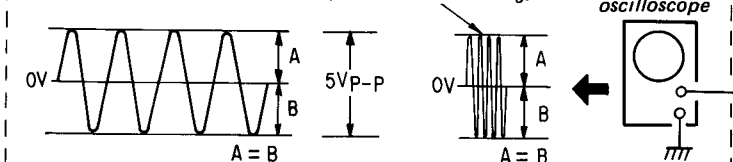
[SERVO AMP BOARD]



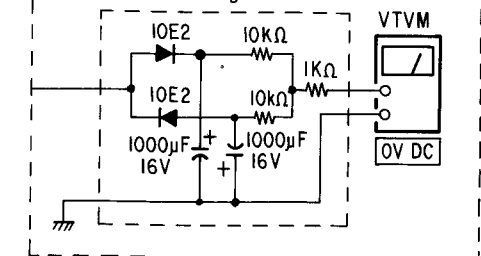
Gain/Offset Adjustment

1. Remove the lead wire A for the turntable driving signal from system control IC.
2. Connect the pattern B to C, and apply regulated power supply to the lead wire A.
3. Connect a VOM to the emitter of Q102, and adjust the regulated power supply voltage for DC1.5 V.
4. Adjust RV103 (H1) and RV104 (H2) so that the emitter voltage of Q103, 104 (H1) and Q105, 106 (H2) are 5 Vp-p. Gain Adjustment
5. Adjust RV105 (H1) and RV106 (H2) so that the emitter waveforms of Q103, 104 (H1) and Q105, 106 (H2) are as shown below (or so that DC potential is 0 V). Offset Adjustment
6. After adjustment, remove the lead wire connecting pattern B to C and solder the lead wire A.

Note: Set the sweep time longer for easy waveform checking.

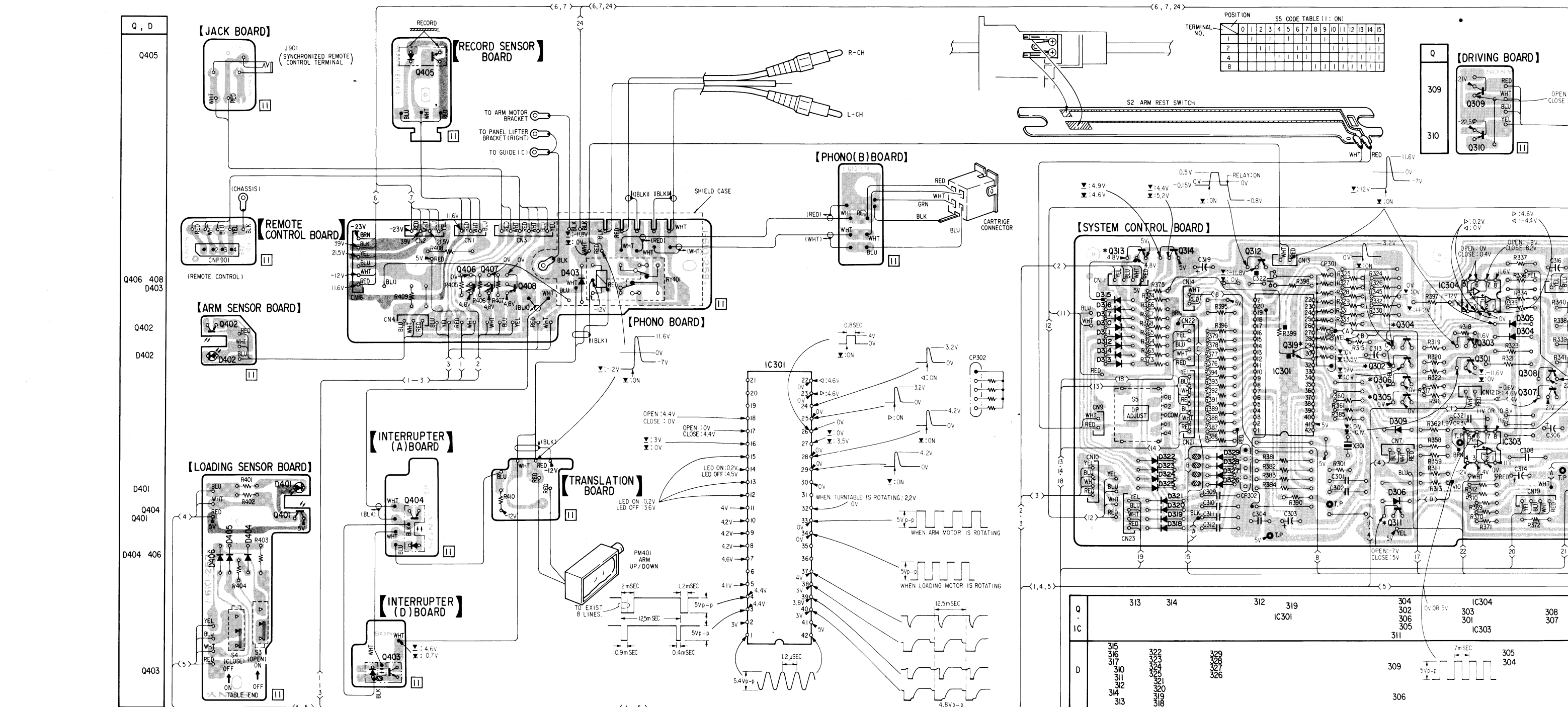


Measuring Circuit

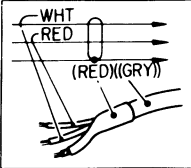


SECTION 4
DIAGRAMS

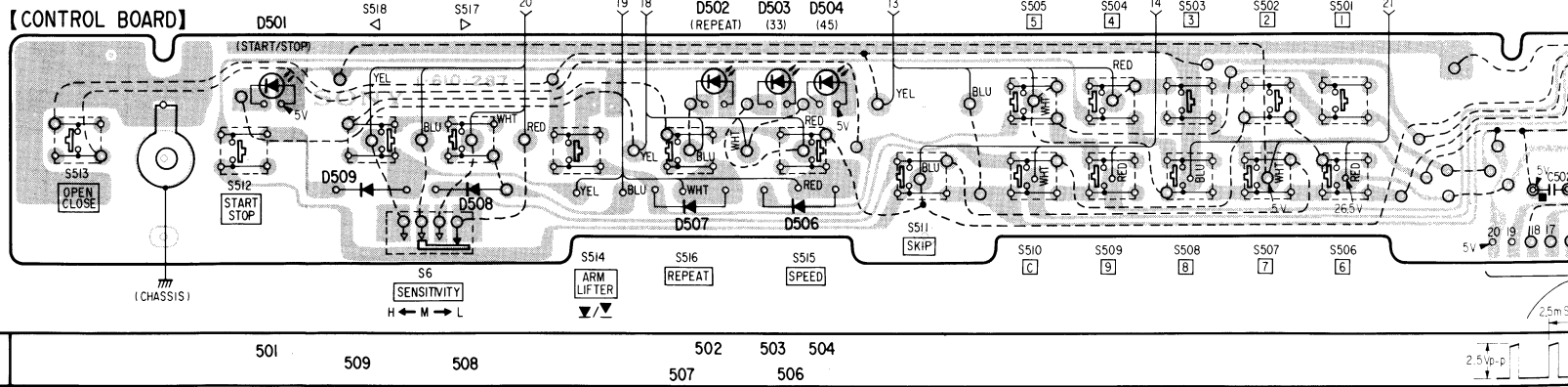
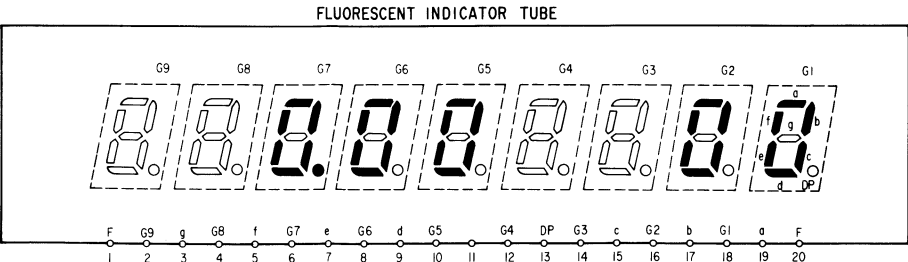
A B C D E F G H I J K L M N O P Q

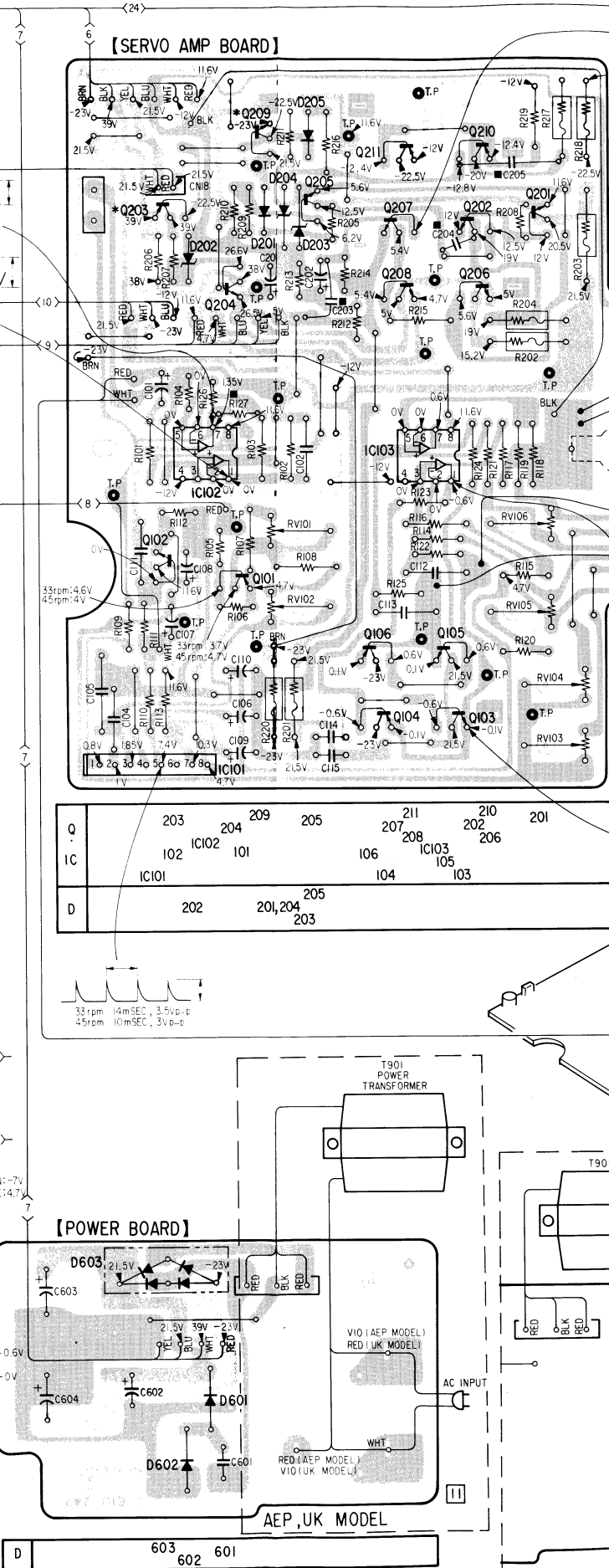
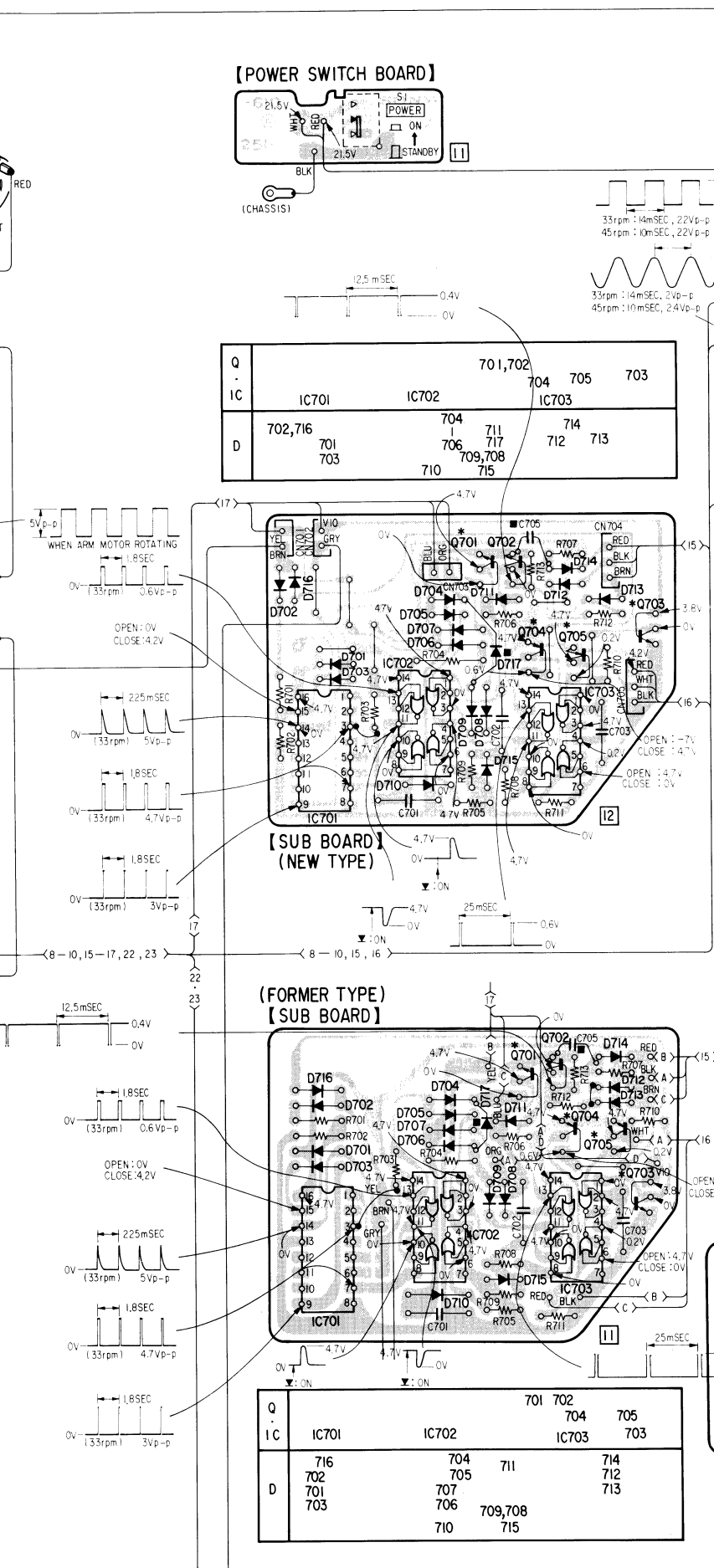
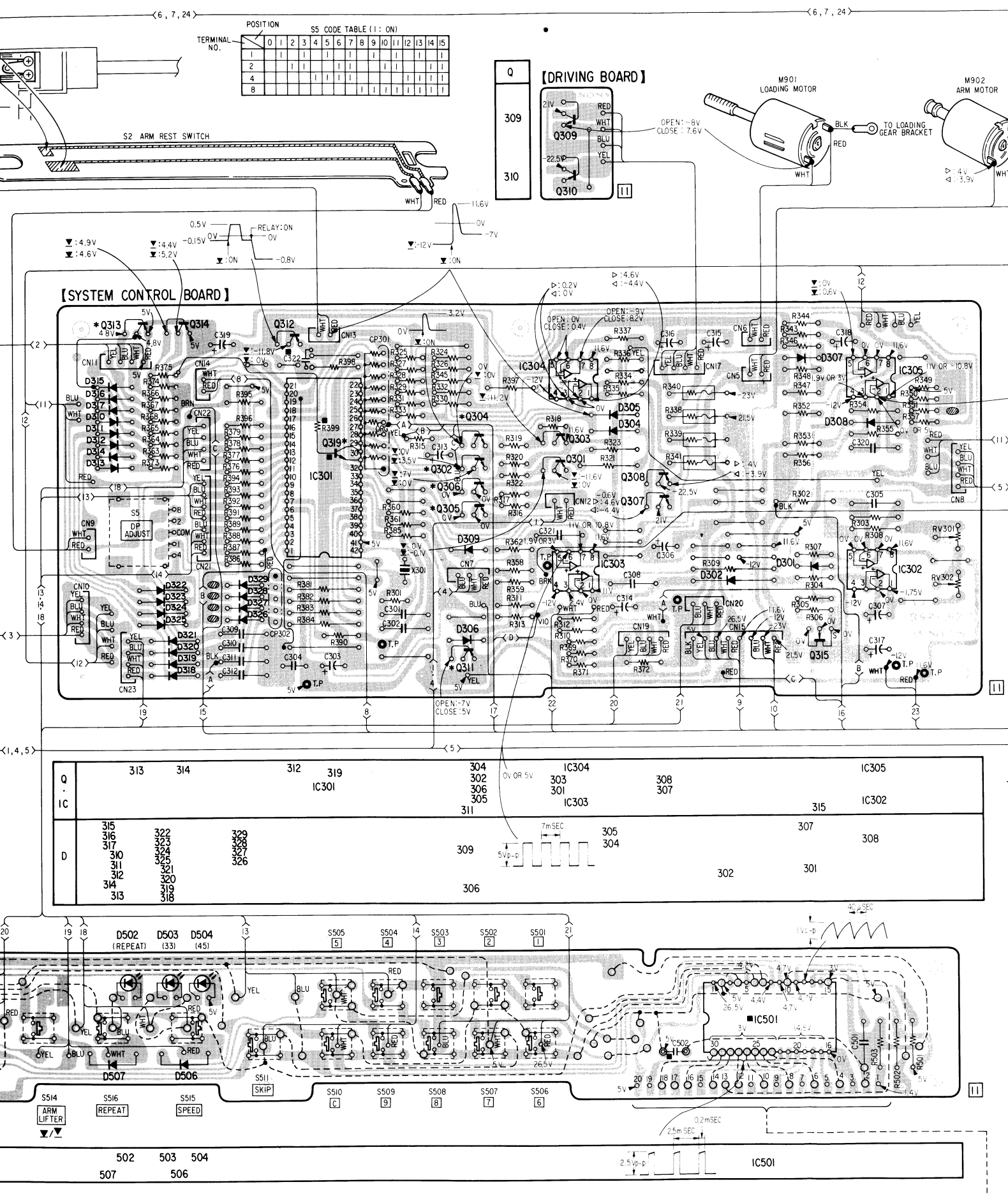


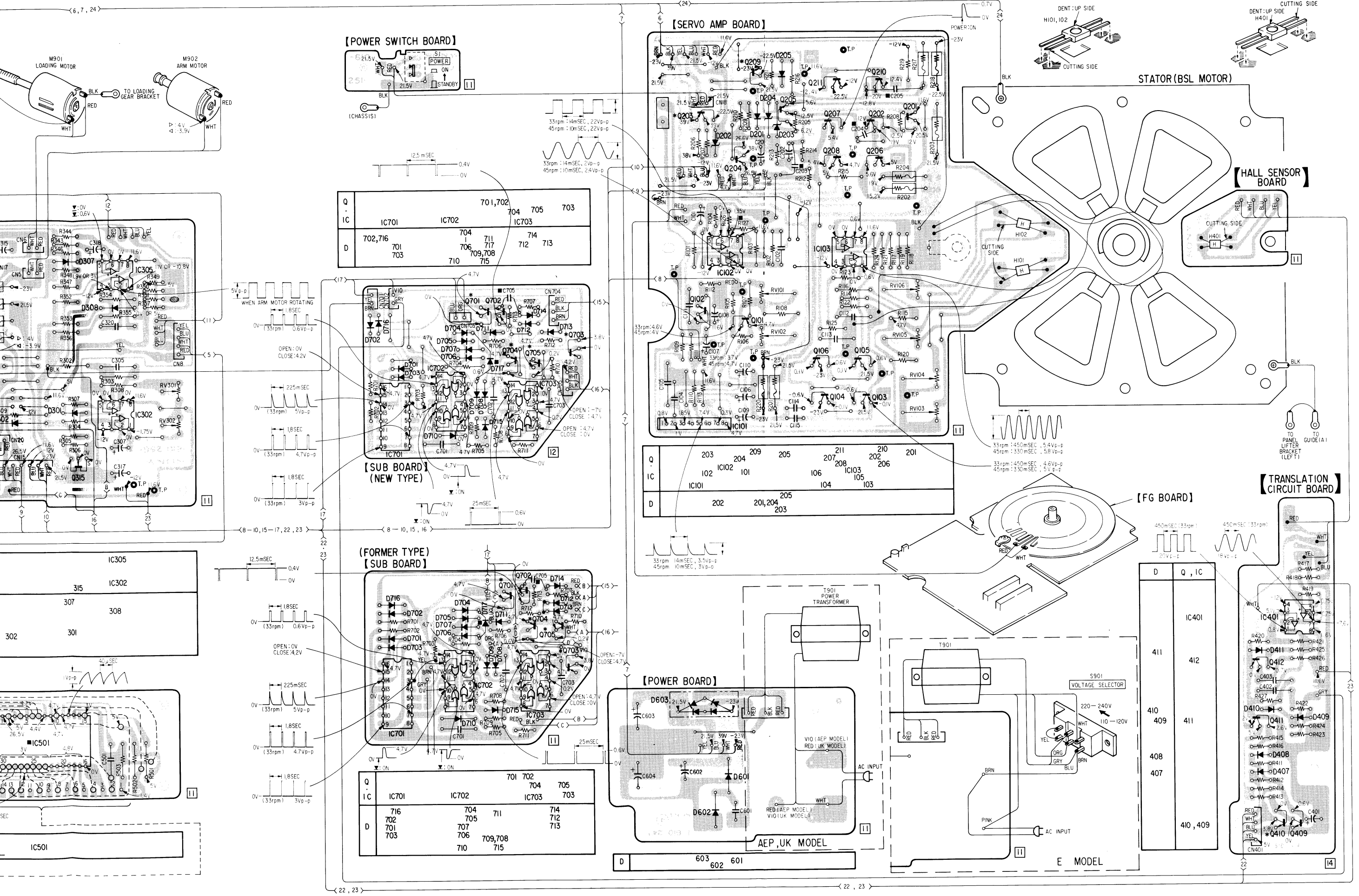
Note:
• Color code of sleeving over the end of the jacket.

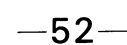


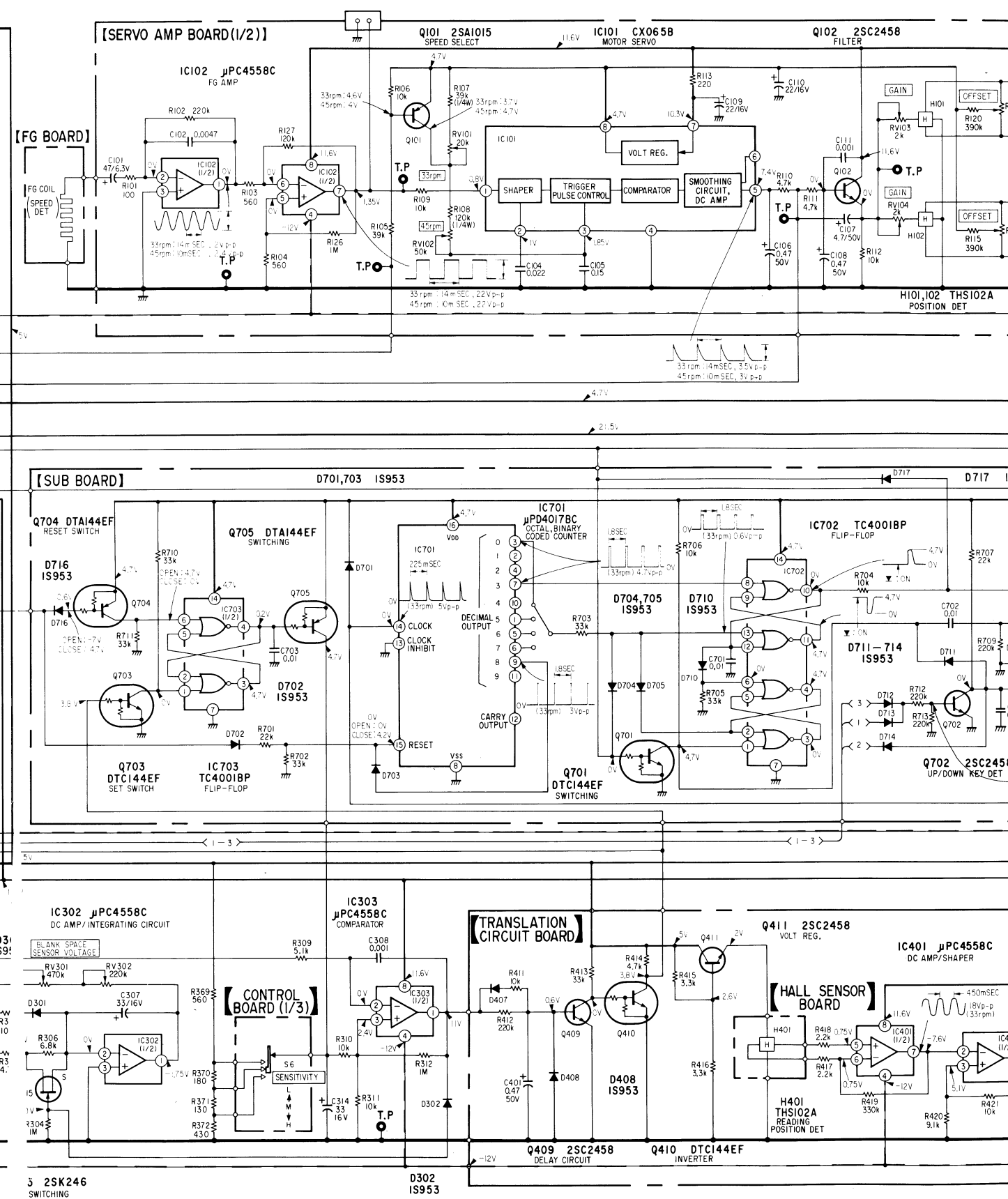
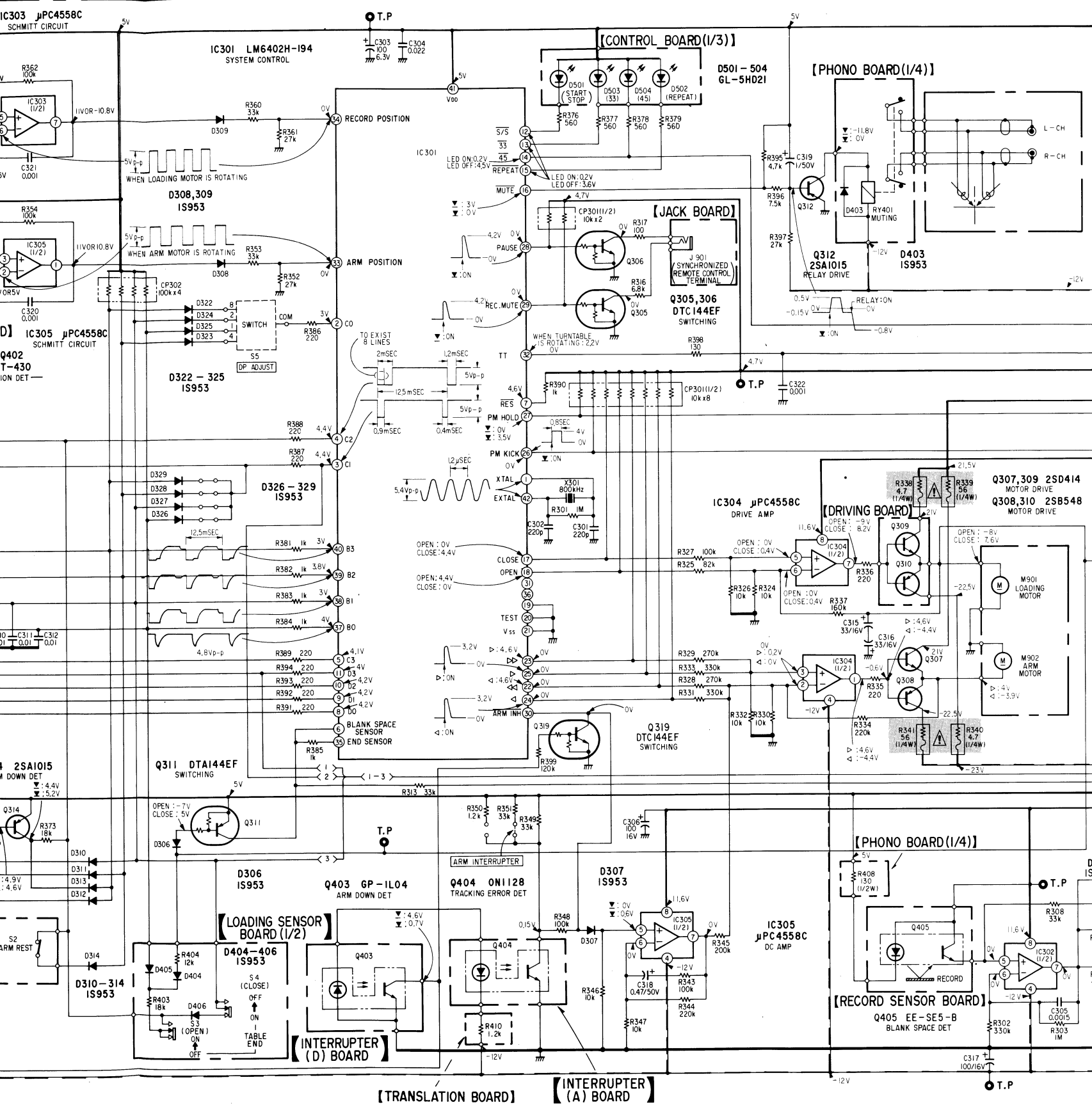
- : parts extracted from the component side.
- : parts extracted from the conductor side.
- * : transistor with resistor
- : B + pattern

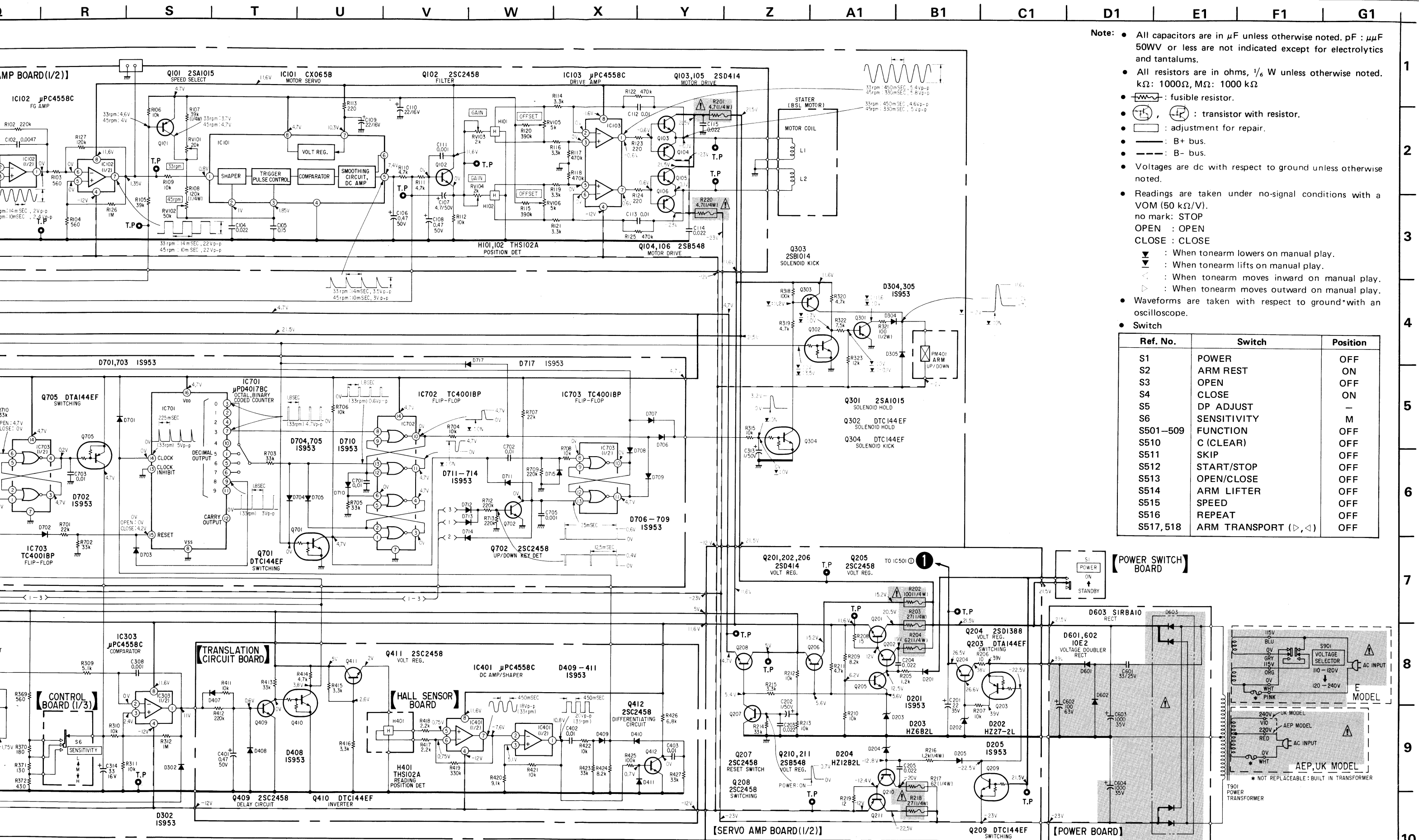












Note:

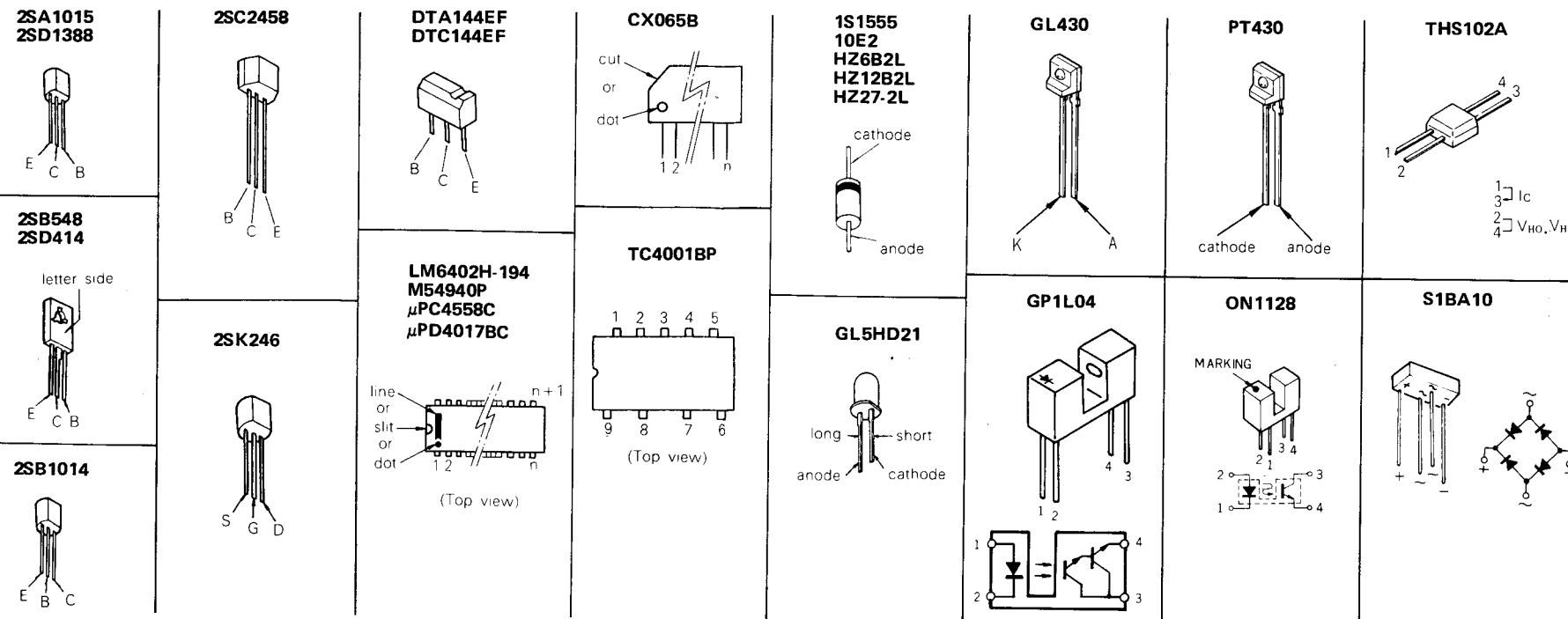
- All capacitors are in μF unless otherwise noted, pF : $\mu\mu\text{F}$ 50WV or less are not indicated except for electrolytics and tantalums.
- All resistors are in ohms, $\frac{1}{6}$ W unless otherwise noted.
 $\text{k}\Omega$: 1000 Ω , $\text{M}\Omega$: 1000 $\text{k}\Omega$
-  : fusible resistor.
-  ,  : transistor with resistor.
-  : adjustment for repair.
-  : B+ bus.
-  : B- bus.
- Voltages are dc with respect to ground unless otherwise noted.
- Readings are taken under no-signal conditions with a VOM (50 $\text{k}\Omega/\text{V}$).
 no mark: STOP
 OPEN : OPEN
 CLOSE : CLOSE
-  : When tonearm lowers on manual play.
-  : When tonearm lifts on manual play.
-  : When tonearm moves inward on manual play.
-  : When tonearm moves outward on manual play.
- Waveforms are taken with respect to ground*with an oscilloscope.
- Switch

Ref. No.	Switch	Position
S1	POWER	OFF
S2	ARM REST	ON
S3	OPEN	OFF
S4	CLOSE	ON
S5	DP ADJUST	—
S6	SENSITIVITY	M
S501—509	FUNCTION	OFF
S510	C (CLEAR)	OFF
S511	SKIP	OFF
S512	START/STOP	OFF
S513	OPEN/CLOSE	OFF
S514	ARM LIFTER	OFF
S515	SPEED	OFF
S516	REPEAT	OFF
S517, 518	ARM TRANSPORT (▷, ◁)	OFF

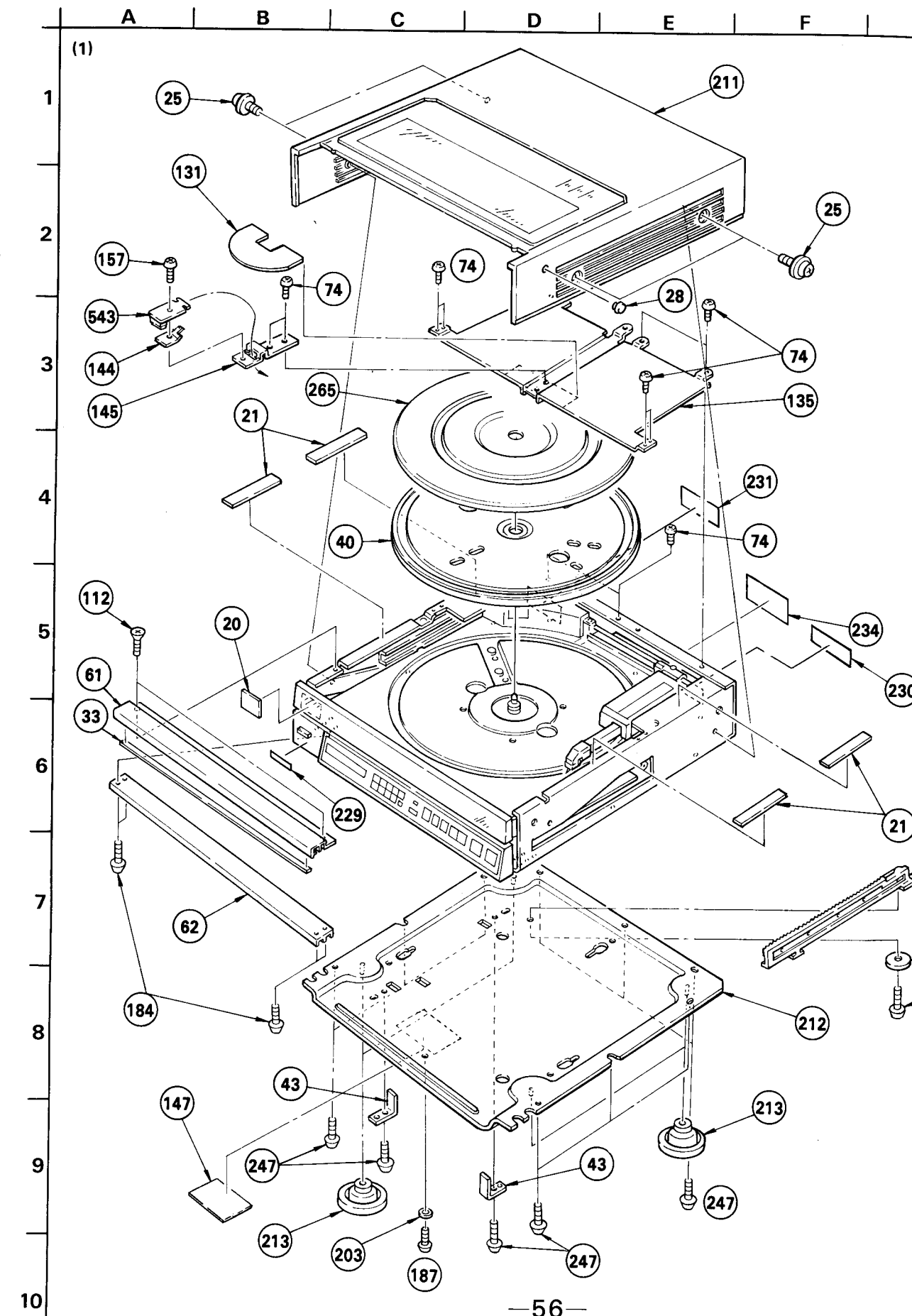
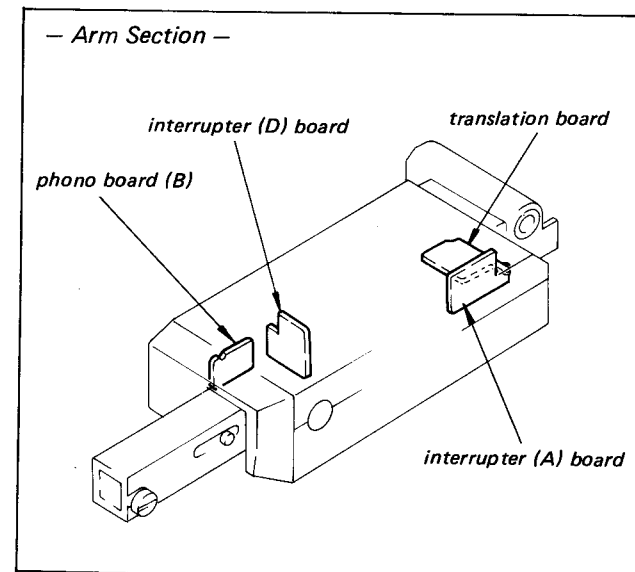
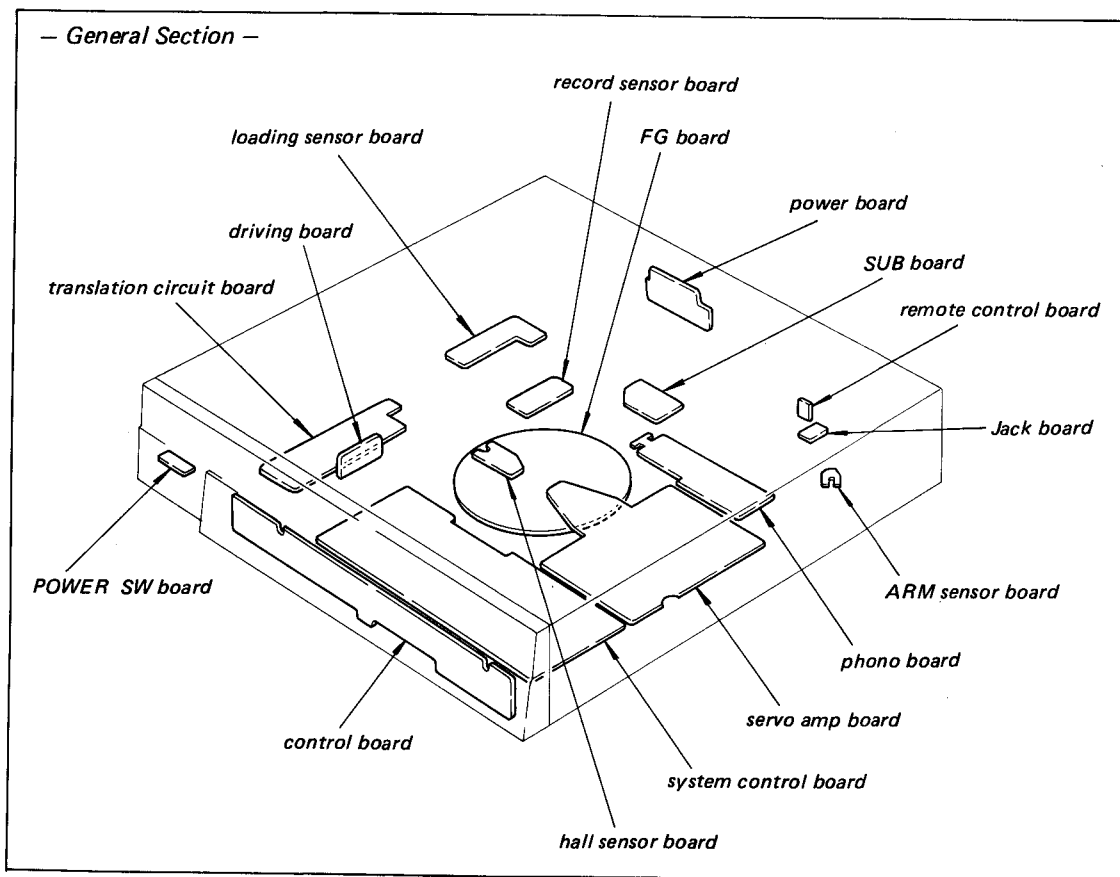
Note: The components identified by shading and mark  are critical for safety. Replace only with part number specified.

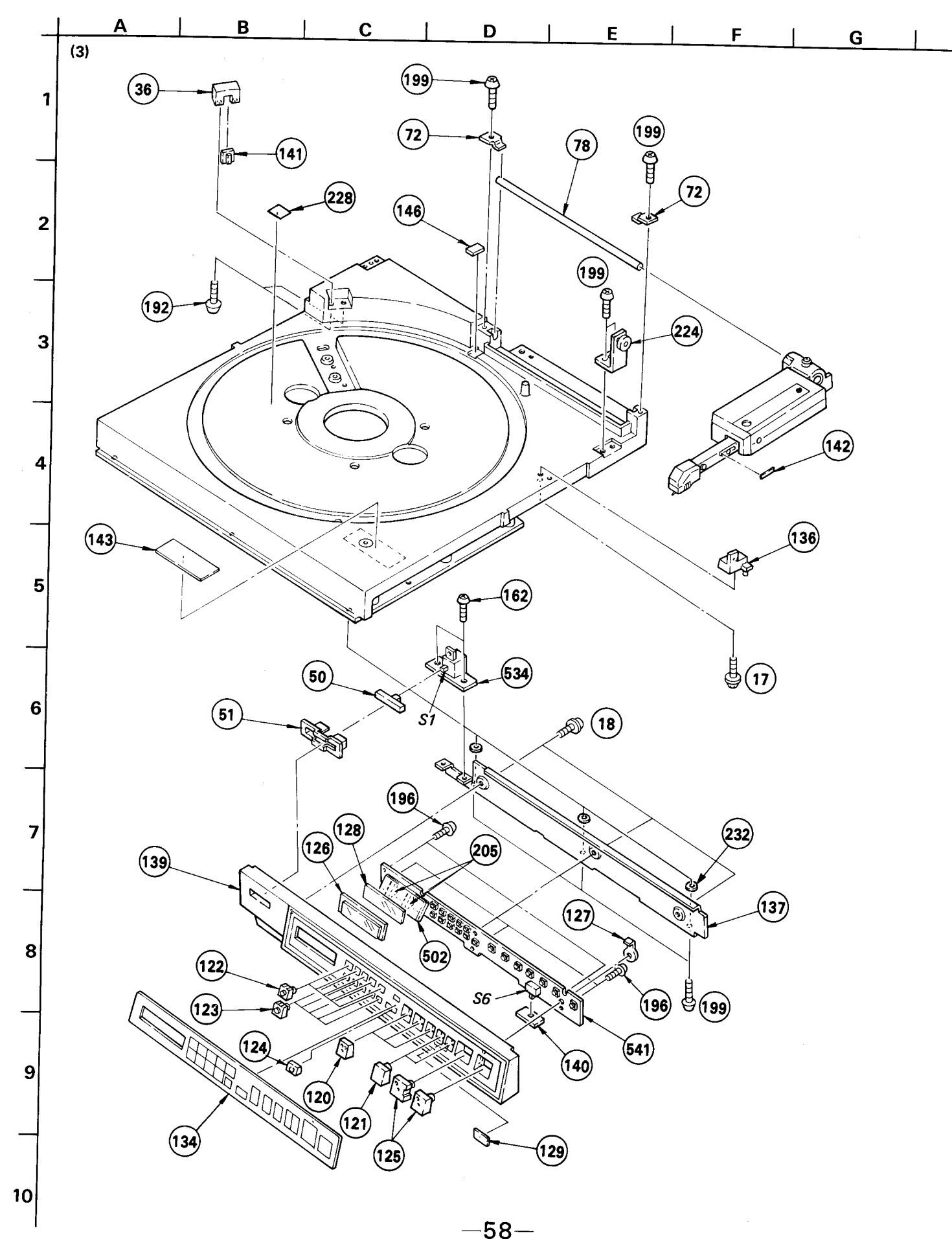
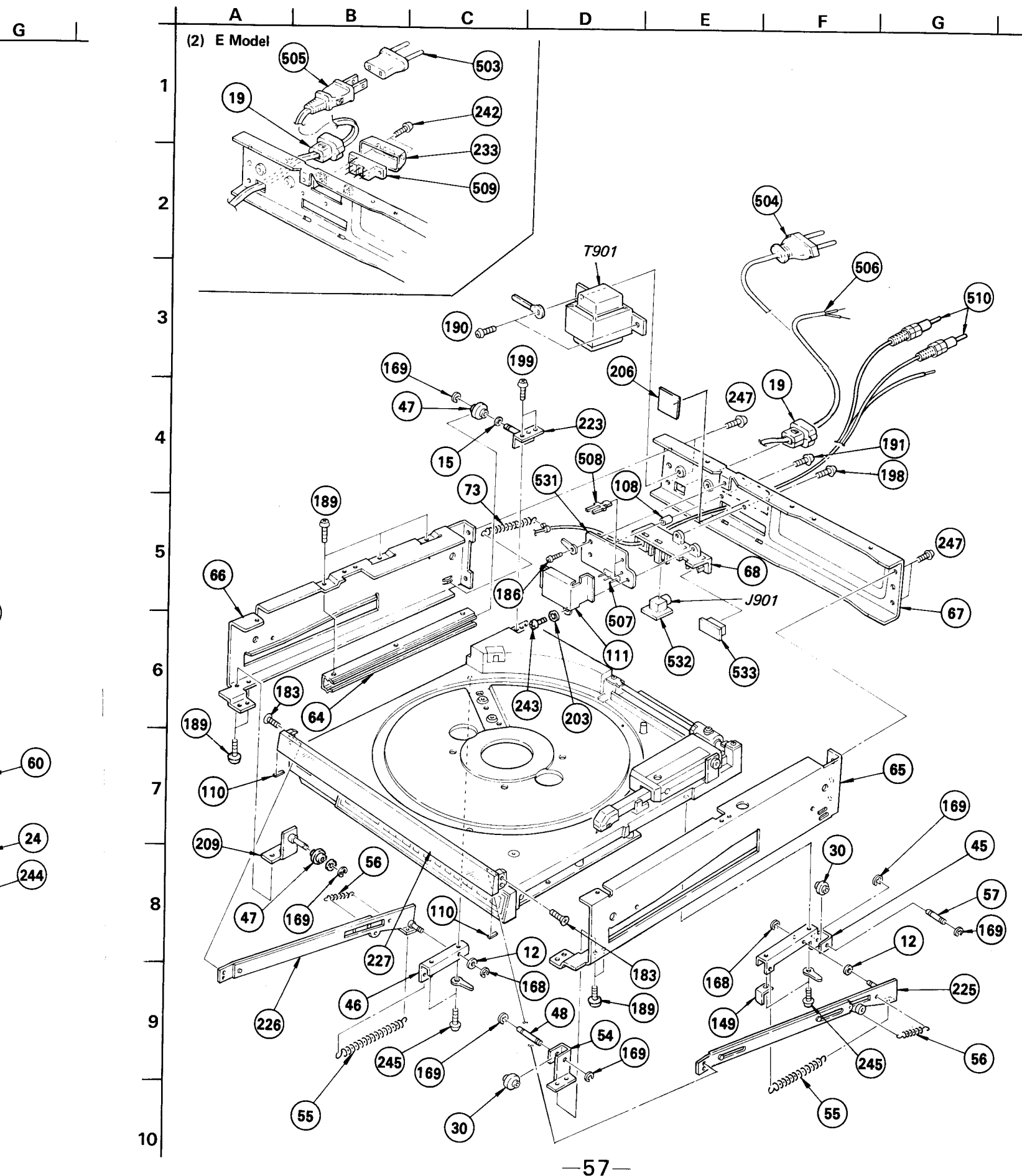
SECTION 5 EXPLODED VIEWS AND PARTS LIST

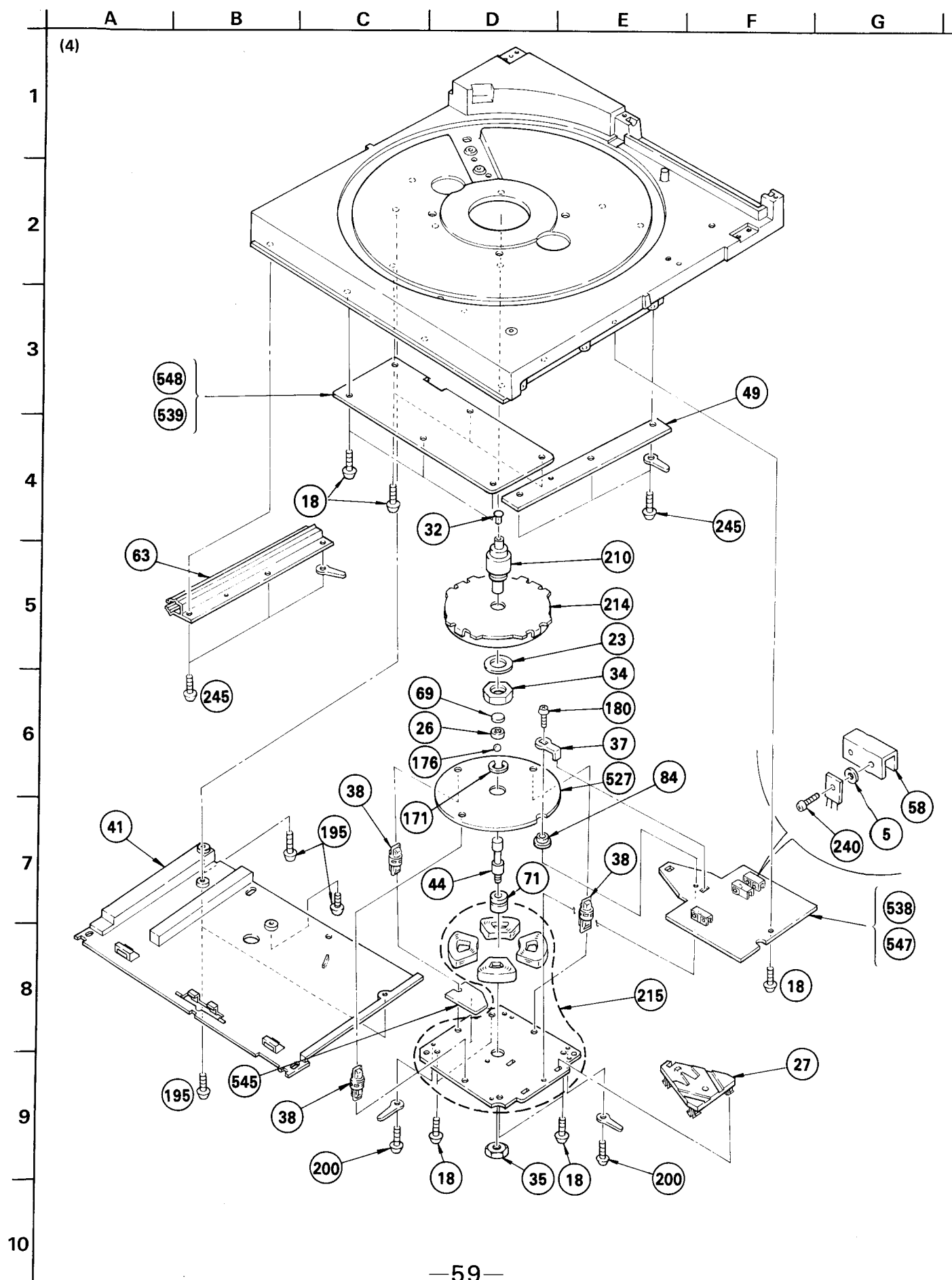
• Semiconductor Lead Layouts

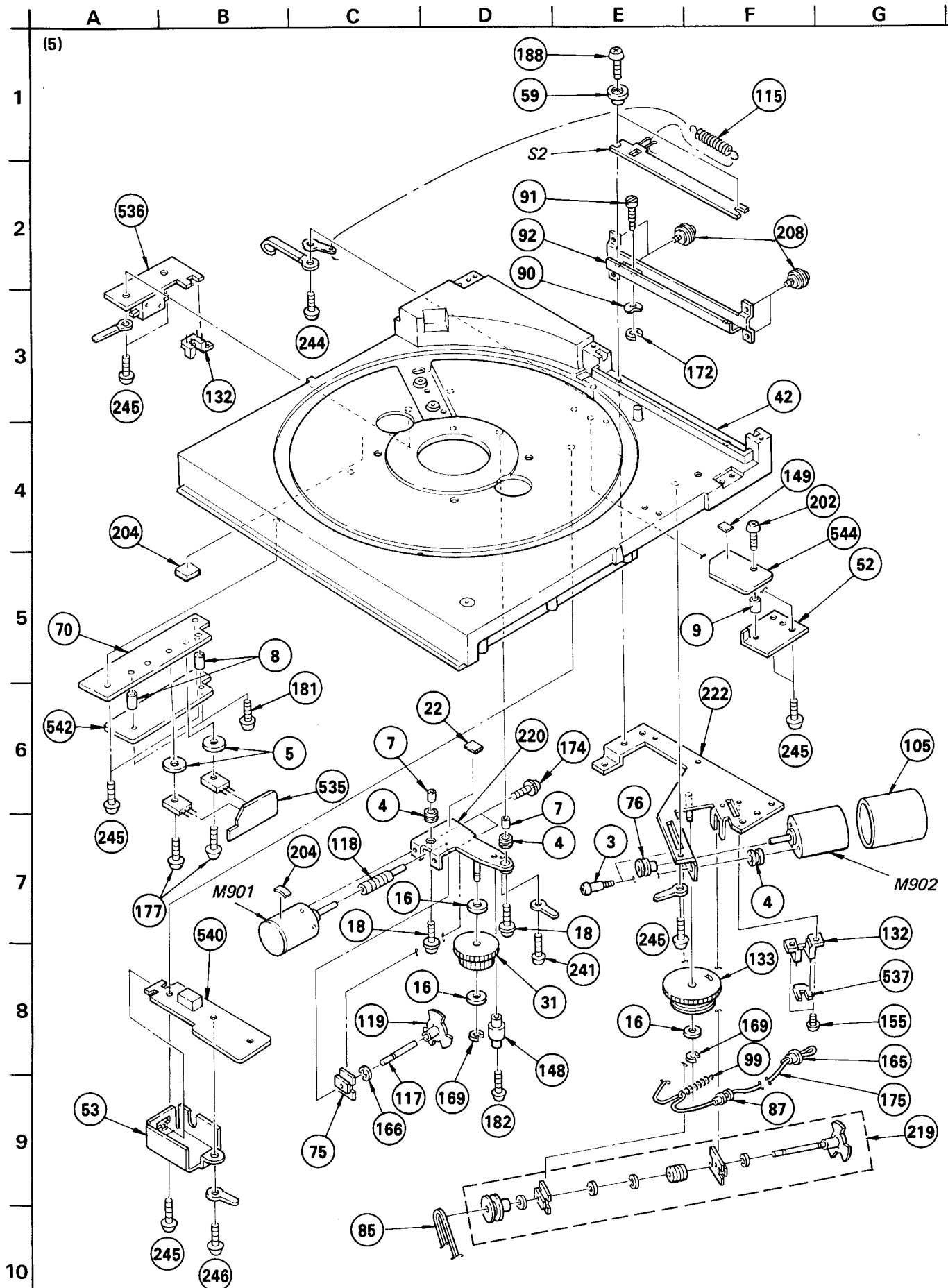


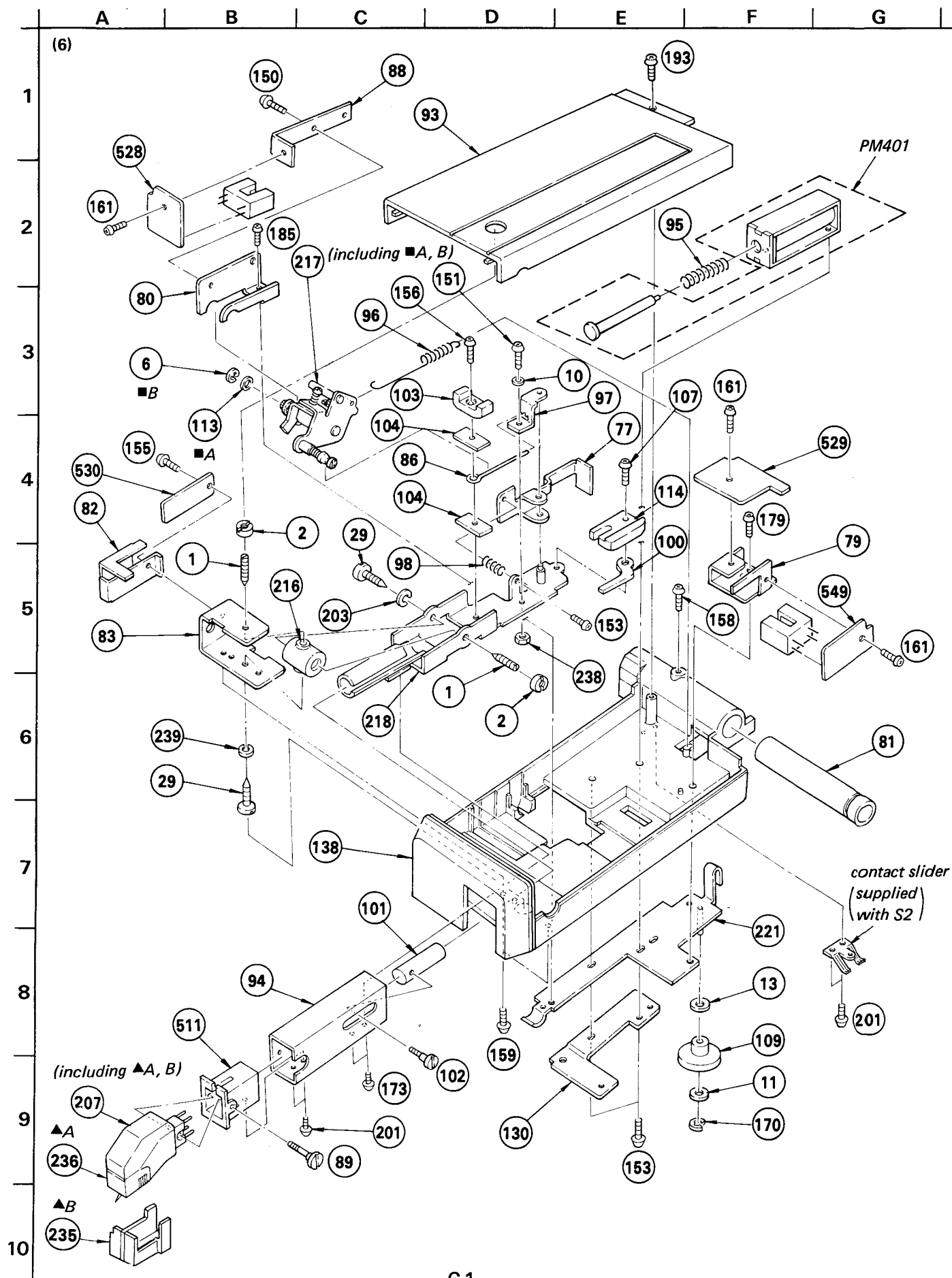
CIRCUIT BOARDS LOCATION











GENERAL SECTION

No.	Part No.	Description
1	2-203-518-61	SCREW, PIVOT
2	2-203-519-00	NUT (A), LOCK, PIVOT
3	3-570-027-00	SCREW, MOTOR
4	3-570-118-00	CUSHION, MOTOR
5	3-572-365-01	SHEET (A), INSULATING
6	3-618-189-00	RING, RETAINING
7	♣;3-654-058-00	SPACER 3X3
8	3-654-603-00	SPACER
9	3-657-842-01	SPACER (3X4)
10	3-701-437-21	WASHER
11	3-701-439-11	WASHER
12	3-701-439-21	WASHER
13	3-701-440-11	WASHER, 3.5
14	.....	
15	3-701-441-11	WASHER
16	3-701-441-21	WASHER
17	3-703-135-00	SCREW, TAPPING
18	3-703-137-00	SCREW, TAPPING
19	3-703-244-00	(AEP,UK)...BUSHING, CORD
19	3-703-571-00	(E)...BUSHING (S), CORD
20	3-703-708-01	STICKER, SONY SYMBOL (18)
21	3-831-441-11	SHEET, PROTECTION
22	3-831-441-XX	CUSHION
23	3-849-306-00	WASHER (TELESCOPIC ANTENNA)
24	0-056-028-00	WASHER, PLAIN, 14 DIA.
25	4-820-330-51	SCREW, BW, PLUS MINUS
26	4-852-007-00	RETAINER (A), THRUST
27	4-857-642-00	HOLDER, PC BOARD
28	4-874-260-01	CAP, BLIND
29	4-877-816-00	SHAFT, PIVOT
30	4-879-509-00	ROLLER (A)
31	4-879-514-00	WHEEL (A), WORM
32	♣;4-879-541-00	CAP, CENTER
33	♣;4-879-624-11	PROTECTOR (F)
34	4-879-701-00	NUT, HEXAGON
35	♣;4-879-758-00	NUT, SHAFT, MOTOR
36	4-879-775-21	HOLDER, LAMP
37	♣;4-881-629-00	PLATE (A), GROUND
38	4-881-636-11	SUPPORT (TMD), PC
39	.....	
40	4-885-502-11	TURNTABLE
41	♣;4-885-504-00	COVER, REAR
42	4-885-506-11	FRAME
43	♣;4-885-509-00	PLATE, FUNCTION, LOADING SWITCH

NOTE:

- Items with no part number and no description are not stocked because they are seldom required for routine service.
- Items marked "♣" are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.
- Due to standardization, parts with part numbers (Δ-ΔΔΔ-ΔΔΔ-XX or Δ-ΔΔΔΔ-ΔΔΔ-X) may be different from those used in the set.
- If there are two or more same circuits in a set such as a stereophonic machine, only typical circuit parts may be indicated and capacitors and resistors in other same circuits may be omitted.

CAPACITORS:

MF:μF, PF:μμF.

RESISTORS

- All resistors are in ohms.
- F : nonflammable

COILS

MMH : mH, UH : μH

SEMICONDUCTORS

In each case, U : μ, for example:

UA...: μA..., UPA...: μPA..., UPC...: μPC,

UPD...: μPD...

GENERAL SECTION

No.	Part No.	Description
44	♣;4-885-515-00	SHAFT, MOTOR
45	♣;4-885-518-00	BRACKET (RIGHT), PANEL LIFTER
46	♣;4-885-519-00	BRACKET (LEFT), PANEL LIFTER
47	4-885-520-00	ROLLER (A), GUIDE
48	♣;4-885-524-00	SHAFT (C), GUIDE ROLLER
49	♣;4-885-527-00	GUIDE (C)
50	4-885-531-00	KNOB, POWER
51	4-885-532-00	GUIDE, POWER KNOB
52	♣;4-885-535-00	SUPPORT, TRANSPORT
53	♣;4-885-549-00	PLATE, SHIELD
54	♣;4-885-550-00	BRACKET (RIGHT), ROLLER
55	4-885-552-00	SPRING, TENSION
56	4-885-553-00	SPRING, TENSION
57	♣;4-885-557-00	SHAFT (D), GUIDE ROLLER
58	♣;4-885-562-00	HEAT SINK
59	4-885-563-00	COLLAR, ARM SWITCH
60	4-885-566-00	PLATE, RACK
61	4-885-567-00	PANEL, UPPER
62	♣;4-885-568-00	REINFORCEMENT
63	♣;4-885-571-02	GUIDE (A)
64	♣;4-885-572-02	GUIDE (B)
65	♣;4-885-580-00	PLATE (RIGHT), SIDE
66	♣;4-885-581-00	PLATE (LEFT), SIDE
67	♣;4-885-583-01	(AEP,UK)...PANEL, BACK
67	♣;4-885-583-21	(E).....PANEL, BACK
68	4-885-584-00	TERMINAL BOARD, REMOTE CONTROL
69	4-885-589-00	WASHER, THRUST
70	♣;4-885-590-00	HEAT SINK
71	4-885-591-00	SPACER, SHAFT, MOTOR
72	♣;4-885-595-11	PLATE, FIXED, GUIDE BAR
73	4-885-597-00	SPRING, TENSION
74	4-885-599-00	SCREW, FITTING, REINFORCEMENT
75	4-885-703-00	GUIDE, WORM SHAFT
76	4-885-704-03	PULLEY, MOTOR
77	4-885-707-00	PLATE, ADJUSTMENT
78	4-885-709-00	BAR, GUIDE
79	♣;4-885-710-00	BRACKET, PHOTO
80	♣;4-885-712-00	RETAINER, PUSH ROD
81	4-885-717-00	SLIDER
82	♣;4-885-718-00	PLATE, SHIELD
83	♣;4-885-721-00	BRIDGE, ARM
84	4-885-727-00	SPACER
85	4-885-735-00	BELT, DRIVING
86	4-885-737-00	WIRE
87	4-885-744-00	STOPPER, WIRE
88	♣;4-885-745-00	BRACKET (D), PHOTO

GENERAL SECTION

No.	Part No.	Description
89	4-885-746-00	SCREW, FITTING, CARTRIDGE
90	4-885-747-00	WASHER (H)
91	4-885-748-00	PIN, ADJUSTMENT
92	4-885-750-00	GUIDE, ROLLER
93	4-885-753-02	COVER, ARM
94	4-885-760-02	PIPE, ARM
95	4-885-761-00	SPRING, COMPRESSION
96	4-885-762-00	SPRING, TENSION
97	4-885-765-00	RETAINER, WIRE
98	4-885-766-00	SPRING, COMPRESSION
99	4-885-767-00	SPRING, TENSION
100	4-885-768-00	WEIGHT (2)
101	4-885-770-00	WEIGHT, ADJUSTMENT
102	4-885-771-00	SCREW, ADJUSTMENT
103	4-885-773-00	WEIGHT (S)
104	4-885-774-00	BASE
105	4-885-775-00	CAP, MOTOR
106	.....	
107	4-885-799-00	SCREW, ADJUSTMENT
108	4-886-709-00	COLLAR, TERMINAL BOARD
109	4-886-714-00	ROLLER, GUIDE
110	4-886-719-00	SHEET, PROTECTION
111	4-888-958-00	COVER, INSULATING
112	4-886-722-00	SCREW, FITTING, UPPER PANEL
113	4-887-301-00	RETAINER, PUSH ROD
114	4-887-310-00	WEIGHT (A)
115	4-887-956-00	SPRING, TENSION
116	.....	
117	4-888-902-00	SHAFT (A), WORM
118	4-888-904-00	WORM (A)
119	4-888-905-00	DISK, SLIT
120	4-888-907-04	KNOB (S.R.A)
121	4-888-908-00	KNOB, TRANSPORT
122	4-888-909-00	KNOB (UPPER), PROGRAM
123	4-888-910-00	KNOB (LOWER), PROGRAM
124	4-888-911-00	KNOB, SKIP
125	4-888-912-00	KNOB (S.O)
126	4-888-913-00	PLATE, FROSTED
127	4-888-915-00	PLATE, GROUND, PANEL
128	4-888-917-00	SHEET, FROSTED
129	4-888-918-00	LABEL, SENSOR SELECTION
130	4-888-919-00	PLATE, FIXED, ARM
131	4-888-920-00	SHEET, SENSOR
132	4-888-922-00	COVER, PHOTO
133	4-888-923-11	WHEEL, WORM

GENERAL SECTION

No.	Part No.	Description
134	4-888-924-00	SHEET (A), CONTROL
135	4-888-926-02	REINFORCEMENT (UPPER)
136	4-888-927-00	REST, ARM
137	4-888-930-00	BRACKET (B), CONTROL PANEL
138	4-888-931-00	BASE, ARM
139	4-888-932-13	PANEL, CONTROL
140	4-888-933-00	PLATE, BLIND
141	4-888-934-00	WINDOW, LAMP
142	4-888-943-00	LABEL, STYLUS PRESSURE
143	4-888-944-00	LABEL, DP ADJ
144	4-888-945-00	SPRING, LEAF
145	4-888-946-00	BRACKET, SENSOR
146	4-888-948-00	SENSOR (M)
147	4-888-951-11	LABEL, SERVICE
148	4-888-952-00	GUIDE (A), RACK
149	4-888-954-00	PLATE, STOPPER
150	7-621-255-12	SCREW +P 2X3
151	7-621-255-22	SCREW +P 2X4
152	.....	
153	7-621-255-42	SCREW +P 2X6
154	.....	
155	7-621-259-25	SCREW +P 2.6X4
156	7-621-259-55	SCREW +P 2.6X8
157	7-621-284-10	SCREW +P 2.6X5
158	7-621-770-87	SCREW +P 2.6X5
159	7-621-772-08	SCREW +B 2X3
160	.....	
161	7-621-775-00	SCREW +B 2.6X3
162	7-621-775-10	SCREW +B 2.6X4
163	.....	
164	.....	
165	7-623-616-01	EYELET, 2X3
166	7-624-102-04	STOP RING 1.5, TYPE -E
167	.....	
168	7-624-105-04	STOP RING 2.3, TYPE -E
169	7-624-106-04	STOP RING 3.0, TYPE -E
170	7-624-133-04	STOP RING 3, TYPE-CE
171	7-624-133-94	STOP RING 15, TYPE-CE
172	7-624-190-81	STOP RING 2, TYPE-CS
173	7-627-553-37	SCREW, PRECISION +P 2X3
174	7-628-253-95	SCREW +PS 2.6X4
175	9-911-825-32	STRING, TETRON DIAL (0.3MM)
176	7-671-114-01	BALL 4, STEEL
177	7-682-146-01	SCREW +P 3X5
178	7-682-146-13	SCREW +P 3X5

GENERAL SECTION

No.	Part No.	Description
179	7-682-147-09	SCREW +P 3X6
180	7-682-149-13	SCREW +P 3X10
181	7-682-151-01	SCREW +P 3X14
182	7-682-152-01	SCREW +P 3X16
183	7-682-245-09	SCREW +K 3X4
184	7-682-544-04	SCREW +B 3X3
185	7-682-544-09	SCREW +B 3X3
186	7-682-545-04	SCREW +B 3X4
187	7-682-546-04	SCREW +B 3X5
188	7-682-550-09	SCREW +B 3X12
189	7-682-646-01	SCREW +PS 3X5
190	7-682-947-01	SCREW +PSW 3X6
191	7-682-948-01	SCREW +PSW 3X8
192	7-685-134-11	SCREW +BTP 2.6X8 TYPE2 NON-SLIT
193	.....	
194	.....	
195	7-685-147-21	SCREW +P 3X10 TYPE2 SLIT
196	7-685-534-19	SCREW +BTP 2.6X8 TYPE2 N-S
197	.....	
198	7-685-545-14	SCREW +BTP 3X6 TYPE2 N-S
199	7-685-647-79	SCREW +BVTP 3X10 TYPE2 SLIT
200	7-685-750-01	SCREW +PTT 3X5 (S)
201	7-685-799-04	SCREW +PTT 1.7X2.5
202	7-685-872-01	SCREW +BVTT 3X8 (S)
203	7-688-003-11	W 3, MIDDLE
204	9-911-840-XX	CUSHION
205	9-911-847-XX	CUSHION
206	9-911-863-XX	(AEP)...SHEET (B), INSULATING
207	A-4505-089-A	CARTRIDGE ASSY (XL-250G)
208	X-3701-109-0	PULLEY ASSY
209	4-885-505-0	BRACKET (LEFT) ASSY, ROLLER
210	X-4885-506-0	BEARING ASSY, MOTOR
211	X-4885-512-0	COVER ASSY, DUST
212	4-885-513-0	PLATE ASSY, BOTTOM
213	X-4885-514-0	INSULATOR ASSY
214	X-4885-515-1	ROTOR ASSY
215	X-4885-516-1	STATOR ASSY
216	X-4885-711-0	HOLDER ASSY, BEARING
217	X-4885-714-1	LIFTER ASSY
218	X-4885-715-1	JOINT ASSY
219	X-4888-902-0	WORM ASSY
220	4-888-903-0	BRACKET ASSY, GEAR, LOADING
221	X-4888-904-0	ROLLER ASSY (C), GUIDE
222	4-888-905-0	BRACKET ASSY, MOTOR
223	4-888-906-0	BRACKET (C) ASSY, GUIDE ROLLER

GENERAL SECTION

No.	Part No.	Description
224	X-4888-907-0	BRACKET (D) ASSY, GUIDE ROLLER
225	4-888-908-0	LIFTER (RIGHT) ASSY, PANEL
226	4-888-909-0	LIFTER (LEFT) ASSY, PANEL
227	X-4888-910-0	PANEL ASSY, FRONT
228	3-701-030-00	LABEL, SERIAL NUMBER
229	3-701-690-00	(UK)...LABEL (MADE IN JAPAN)
230	3-703-043-21	(UK)...LABEL, CAUTION, MAIN
231	3-703-396-00	(UK)...LABEL, CAUTION
232	4-830-092-00	WASHER, FIBER
233	4-886-724-00	(E)...COVER, SELECTION, VOLTAGE
234	4-888-935-00	(E)...LABEL, MODEL NUMBER
234	4-888-937-00	(AEP)...LABEL, MODEL NUMBER
234	4-888-938-00	(UK)...LABEL, MODEL NUMBER
235	2-231-652-00	COVER, STYLUS TIP
236	A-4587-071-B	STYLUS TIP (ND-250G)
237	7-621-255-22	SCREW +P 2X4
238	7-622-205-05	NUT, N2
239	7-623-208-22	WASHER, SW 3 TYPE2
240	7-628-146-00	SCREW +P 3X5
241	7-682-144-01	SCREW +P 3X3
242	7-682-547-09	SCREW +B 3X6
243	7-685-546-14	SCREW BTP 3X8
244	7-685-646-21	SCREW BVTP 3X8
245	7-687-647-21	SCREW BVTP 3X10
246	7-685-648-21	SCREW BVTP 3X12
247	7-685-870-01	SCREW BVTP 3X5

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- All resistors are in ohms.
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In each case, U : μ, for example:
 UA.... : μA..., UPA.... : μPA..., UPC.... : μPC,
 UPD.... : μPD...

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ACCESSORY & PACKING MATERIAL

No.	Part No.	Description
251	3-532-616-00	BAG, POLYETHYLENE
252	3-701-630-00	BAG, POLYETHYLENE
253	3-701-634-00	BAG, POLYETHYLENE
254	3-701-806-00	ADAPTOR, 45, (E)
255	3-773-390-11	MANUAL, INSTRUCTION
256	3-795-664-11	INSTRUCTION
257	4-808-459-31	SCREW (B), MOTOR LOCK
258	4-879-799-00	PLATE (A), PROTECTION
259	4-885-533-00	LOCK (A), TRANSPORT
260	4-885-596-00	HOLDER, TURNTABLE
261	4-886-703-00	SCREW, TRANSPORT
262	4-886-710-00	SHEET, PROTECTION, DUST COVER
263	4-886-725-00	PROTECTOR
264	4-888-928-00	PLATE, TRANSPORT
265	4-888-929-02	SHEET, TURNTABLE
266	4-888-940-00	CUSHION (LEFT)
267	4-888-941-00	CUSHION (RIGHT)
268	4-888-942-00	SCREWDRIVER, ADJUSTMENT
269	4-888-950-00	INDIVIDUAL CARTON

ELECTRICAL PARTS

Ref.No.	Part No.	Description
501	▲;1-508-799-00	BASE POST (U TYPE)
502	1-519-291-00	INDICATOR TUBE, FLUORESCENT
503	1-526-565-00	(E1)...AC PLUG ADAPTOR
504	▲;1-534-817-XX	(AEP)...CORD, POWER
505	▲;1-551-472-00	(E)...CORD, POWER
506	▲;1-556-562-00	(UK)...CORD, POWER
507	▲;1-535-116-00	TERMINAL
508	▲;1-535-416-00	TERMINAL
509	▲;1-552-535-00	(E)...SWITCH, POWER & VOLTAGE CHANGE
510	1-556-242-00	CORD, CONNECTION
511	1-556-552-00	CONNECTOR (PLUG IN TYPE)
512	▲;1-560-039-00	PIN, CONNECTOR
513	▲;1-560-602-00	PIN, CONNECTOR 3P
514	.....	.....
515	▲;1-560-603-00	PIN, CONNECTOR 4P
516	.....	.....
517	.....	.....
518	▲;1-560-606-00	PIN, CONNECTOR 7P
519	▲;1-560-708-00	PIN, CONNECTOR 2P
520	.....	.....
521	.....	.....
522	▲;1-560-709-00	PIN, CONNECTOR 8P
523	▲;1-564-112-21	PIN, CONNECTOR 3P
524	▲;1-564-113-11	PIN, CONNECTOR 4P
525	▲;1-564-115-00	PIN, CONNECTOR 6P
526	▲;1-564-115-21	PIN, CONNECTOR 6P
527	▲;1-608-883-00	PC BOARD, FG
528	▲;1-609-688-00	PC BOARD, INTERRUPTER (D)
529	▲;1-610-177-00	PC BOARD, TRANSLATION
530	▲;1-610-178-00	PC BOARD, PHONO (B)
531	▲;1-610-247-00	PC BOARD, POWER
532	▲;1-610-248-00	PC BOARD, JACK
533	▲;1-610-249-00	PC BOARD, REMOTE CONTROL
534	▲;1-610-251-00	PC BOARD, POWER SW
535	▲;1-610-252-00	PC BOARD, DRIVING
536	▲;1-610-253-00	PC BOARD, LOADING SENSOR
537	▲;1-610-254-00	PC BOARD, AVM SENSOR
538	▲;1-610-255-00	PC BOARD, SERVO
539	▲;1-610-256-00	PC BOARD, SYSTEM CONTROL
540	▲;1-610-259-00	PC BOARD, PHONO
541	▲;1-610-287-00	PC BOARD, CONTROL
542	▲;1-610-414-00	PC BOARD, TRANSLATION
543	▲;1-610-415-00	PC BOARD, RECORD SENSOR
544	▲;1-610-559-00	PC BOARD, SUB
545	▲;1-610-560-00	PC BOARD, HOLE SENSOR

ELECTRICAL PARTS

Ref.No.	Part No.	Description
546	A-4505-089-A	CARTRIDGE COMPLETE ASSY
547	▲;A-4619-203-A	MOUNTED PCB, SERVO
548	▲;A-4619-204-A	MOUNTED PCB, SYSTEM CONTROL
549	1-608-815-00	PC BOARD, INTERRUPTER (A)
C101	1-123-647-00	ELECT 47MF 20% 6.3V
C102	1-161-334-00	CERAMIC 0.0047MF 30% 50V
C104	1-161-494-00	CERAMIC 0.022MF 30% 25V
C105	1-130-885-00	FILM 0.15MF 5% 50V
C106	1-123-379-00	ELECT 0.47MF 20% 50V
C107	1-123-369-00	ELECT 4.7MF 20% 50V
C108	1-123-379-00	ELECT 0.47MF 20% 50V
C109	1-123-330-00	ELECT 22MF 20% 16V
C110	1-123-330-00	ELECT 22MF 20% 16V
C111	1-161-323-00	CERAMIC 0.001MF 10% 50V
C112	1-162-113-00	CERAMIC 0.01MF 30% 16V
C113	1-162-113-00	CERAMIC 0.01MF 30% 16V
C114	1-130-624-00	FILM 0.022MF 5% 50V
C115	1-130-624-00	FILM 0.022MF 5% 50V
C201	1-123-357-00	ELECT 22MF 20% 35V
C202	1-123-380-00	ELECT 1MF 20% 50V
C203	1-161-494-00	CERAMIC 0.022MF 30% 25V
C204	1-161-494-00	CERAMIC 0.022MF 30% 25V
C205	1-161-494-00	CERAMIC 0.022MF 30% 25V
C301	1-161-315-00	CERAMIC 220PF 10% 50V
C302	1-161-315-00	CERAMIC 220PF 10% 50V
C303	1-123-295-00	ELECT 100MF 20% 6.3V
C304	1-130-624-00	FILM 0.022MF 5% 50V
C305	1-161-053-00	CERAMIC 0.0015MF 30% 50V
C306	1-123-333-00	ELECT 100MF 20% 16V
C307	1-123-318-00	ELECT 33MF 20% 16V
C308	1-161-323-00	CERAMIC 0.001MF 10% 50V
C309	1-161-330-00	CERAMIC 0.01MF 30% 25V
C310	1-161-330-00	CERAMIC 0.01MF 30% 25V
C311	1-161-330-00	CERAMIC 0.01MF 30% 25V
C312	1-161-330-00	CERAMIC 0.01MF 30% 25V
C313	1-123-380-00	ELECT 1MF 20% 50V
C314	1-123-318-00	ELECT 33MF 20% 16V
C315	1-123-318-00	ELECT 33MF 20% 16V
C316	1-123-318-00	ELECT 33MF 20% 16V
C317	1-123-333-00	ELECT 100MF 20% 16V
C318	1-123-379-00	ELECT 0.47MF 20% 50V
C319	1-123-380-00	ELECT 1MF 20% 50V
C320	1-161-323-00	CERAMIC 0.001MF 10% 50V
C321	1-161-323-00	CERAMIC 0.001MF 10% 50V
C322	1-161-323-00	CERAMIC 0.001MF 10% 50V
C401	1-123-379-00	ELECT 0.47MF 20% 50V

ELECTRICAL PARTS

Ref.No.	Part No.	Description
C402	1-161-330-00	CERAMIC 0.01MF 30% 25V
C403	1-161-330-00	CERAMIC 0.01MF 30% 25V
C501	1-161-323-00	CERAMIC 0.001MF 10% 50V
C502	1-101-005-00	CERAMIC 0.022MF 50V
C601	▲;1-124-180-00	ELECT 33MF 20% 25V
C602	▲;1-123-374-00	ELECT 100MF 20% 63V
C603	▲;1-123-508-00	ELECT 1000MF 20% 35V
C604	▲;1-123-508-00	ELECT 1000MF 20% 35V
C701	1-161-330-00	CERAMIC 0.01MF 30% 25V
C702	1-161-330-00	CERAMIC 0.01MF 30% 25V
C703	1-161-330-00	CERAMIC 0.01MF 30% 25V
C705	1-161-323-00	CERAMIC 0.001MF 10% 50V
D201	8-719-815-55	DIODE 1S1555
D202	8-719-922-72	DIODE HZ27-2L
D203	8-719-910-65	DIODE HZ682L
D204	8-719-910-25	DIODE HZ1282L
D205	8-719-815055	DIODE 1S1555
D301	8-719-815-55	DIODE 1S1555
D302	8-719-815-55	DIODE 1S1555
D304	8-719-815-55	DIODE 1S1555
D305	8-719-815-55	DIODE 1S1555
D306	8-719-815-55	DIODE 1S1555
D307	8-719-815-55	DIODE 1S1555
D308	8-719-815-55	DIODE 1S1555
D309	8-719-815-55	DIODE 1S1555
D310	8-719-815-55	DIODE 1S1555
D311	8-719-815-55	DIODE 1S1555
D312	8-719-815-55	DIODE 1S1555
D313	8-719-815-55	DIODE 1S1555
D314	8-719-815-55	DIODE 1S1555
D315	8-719-815-55	DIODE 1S1555
D316	8-719-815-55	DIODE 1S1555
D317	8-719-815-55	DIODE 1S1555
D318	8-719-815-55	DIODE 1S1555
D319	8-719-815-55	DIODE 1S1555
D320	8-719-815-55	DIODE 1S1555
D321	8-719-815-55	DIODE 1S1555
D322	8-719-815-55	DIODE 1S1555
D323	8-719-815-55	DIODE 1S1555
D324	8-719-815-55	DIODE 1S1555
D325	8-719-815-55	DIODE 1S1555
D326	8-719-815-55	DIODE 1S1555
D327	8-719-815-55	DIODE 1S1555
D328	8-719-815-55	DIODE 1S1555
D329	8-719-815-55	DIODE 1S1555

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The components identified by shading and mark ▲ are critical for safety. Replace only with part number specified.

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D401	8-719-902-96	DIODE GL-430
D402	8-719-902-96	DIODE GL-430
D403	8-719-815-55	DIODE 1S1555
D404	8-719-815-55	DIODE 1S1555
D405	8-719-815-55	DIODE 1S1555
D406	8-719-815-55	DIODE 1S1555
D407	8-719-815-55	DIODE 1S1555
D408	8-719-815-55	DIODE 1S1555
D409	8-719-815-55	DIODE 1S1555
D410	8-719-815-55	DIODE 1S1555
D411	8-719-815-55	DIODE 1S1555
D501	8-719-906-58	DIODE GL-5HD21
D502	8-719-906-58	DIODE GL-5HD21
D503	8-719-906-58	DIODE GL-5HD21
D504	8-719-906-58	DIODE GL-5HD21
D506	8-719-815-55	DIODE 1S1555
D507	8-719-815-55	DIODE 1S1555
D508	8-719-815-55	DIODE 1S1555
D509	8-719-815-55	DIODE 1S1555
D601	▲ 8-719-200-02	DIODE 10E-2
D602	▲ 8-719-200-02	DIODE 10E-2
D603	▲ 8-719-510-01	DIODE 1SRBA10
D701	8-719-815-55	DIODE 1S1555
D702	8-719-815-55	DIODE 1S1555
D703	8-719-815-55	DIODE 1S1555
D704	8-719-815-55	DIODE 1S1555
D705	8-719-815-55	DIODE 1S1555
D706	8-719-815-55	DIODE 1S1555
D707	8-719-815-55	DIODE 1S1555
D708	8-719-815-55	DIODE 1S1555
D709	8-719-815-55	DIODE 1S1555
D710	8-719-815-55	DIODE 1S1555
D711	8-719-815-55	DIODE 1S1555
D712	8-719-815-55	DIODE 1S1555
D713	8-719-815-55	DIODE 1S1555
D714	8-719-815-55	DIODE 1S1555
D715	8-719-815-55	DIODE 1S1555
D716	8-719-815-55	DIODE 1S1555
D717	8-719-815-55	DIODE 1S1555
H101	8-719-800-17	DIODE THS102A
H102	8-719-800-17	DIODE THS102A
H401	8-719-800-17	DIODE THS102A

ELECTRICAL PARTS

Ref.No.	Part No.	Description
IC101	8-759-602-65	IC CX-065B
IC102	8-759-145-58	IC UPC4558C
IC103	8-759-145-58	IC UPC4558C
IC301	8-759-800-22	IC LM6402H-194
IC302	8-759-145-58	IC UPC4558C
IC303	8-759-145-58	IC UPC4558C
IC304	8-759-145-58	IC UPC4558C
IC305	8-759-145-58	IC UPC4558C
IC401	8-759-145-58	IC UPC4558C
IC501	8-759-600-35	IC M54940P
IC701	8-759-140-17	IC UPD4017BC
IC702	8-759-240-01	IC TC4001BP
IC703	8-759-240-01	IC TC4001BP
J901	1-507-813-00	JACK
M901	1-541-219-00	MOTOR, LOADING
M902	1-541-218-00	MOTOR, ARM
PM401	1-454-344-00	SOLENOID, PLUNGER; ARM UP/DOWN
Q101	8-729-701-52	TRANSISTOR 2SA1025
Q102	8-729-245-83	TRANSISTOR 2SC2458
Q103	8-729-141-43	TRANSISTOR 2SD414
Q104	8-729-154-83	TRANSISTOR 2SB548
Q105	8-729-141-43	TRANSISTOR 2SD414
Q106	8-729-154-83	TRANSISTOR 2SB548
Q201	8-729-141-43	TRANSISTOR 2SD414
Q202	8-729-141-43	TRANSISTOR 2SD414
Q203	8-729-900-30	TRANSISTOR DTA144EF
Q204	8-729-802-34	TRANSISTOR 2SD1388
Q205	8-729-245-83	TRANSISTOR 2SC2458
Q206	8-729-141-43	TRANSISTOR 2SD414
Q207	8-729-245-83	TRANSISTOR 2SC2458
Q208	8-729-245-83	TRANSISTOR 2SC2458
Q209	8-729-900-33	TRANSISTOR DTC144EF
Q210	8-729-154-83	TRANSISTOR 2SB548
Q211	8-729-154-83	TRANSISTOR 2SB548
Q301	8-729-201-52	TRANSISTOR 2SA1015
Q302	8-729-900-33	TRANSISTOR DTC144EF
Q303	8-729-802-22	TRANSISTOR 2SB1014
Q304	8-729-900-33	TRANSISTOR DTC144EF
Q305	8-729-900-33	TRANSISTOR DTC144EF
Q306	8-729-900-33	TRANSISTOR DTC144EF
Q307	8-729-141-43	TRANSISTOR 2SD414
Q308	8-729-154-83	TRANSISTOR 2SB548
Q309	8-729-141-43	TRANSISTOR 2SD414
Q310	8-729-154-83	TRANSISTOR 2SB548

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ELECTRICAL PARTS

Ref.No.	Part No.	Description
Q311	8-729-900-30	TRANSISTOR DTA144EF
Q312	8-729-201-52	TRANSISTOR 2SA1015
Q313	8-729-900-30	TRANSISTOR DTA144EF
Q314	8-729-201-52	TRANSISTOR 2SA1015
Q315	8-729-224-61	TRANSISTOR 2SK246
Q319	8-729-900-33	TRANSISTOR DTC144EF
Q401	8-729-900-78	TRANSISTOR PT-430
Q402	8-729-900-78	TRANSISTOR PT-430
Q403	8-719-907-32	DIODE GP-1L04
Q404	8-719-411-28	DIODE ON1128
Q405	1-806-664-11	PHOTO COUPLER (REFLECTION TYPE)
Q406	8-729-201-53	TRANSISTOR 2SA1015
Q407	8-729-201-53	TRANSISTOR 2SA1015
Q408	8-729-201-53	TRANSISTOR 2SA1015
Q409	8-729-245-83	TRANSISTOR 2SC2458
Q410	8-729-900-33	TRANSISTOR DTC144EF
Q411	8-729-245-83	TRANSISTOR 2SC2458
Q412	8-729-245-83	TRANSISTOR 2SC2458
Q701	8-729-900-33	TRANSISTOR DTC144EF
Q702	8-729-245-83	TRANSISTOR 2SC2458
Q703	8-729-900-33	TRANSISTOR DTC144EF
Q704	8-729-900-33	TRANSISTOR DTC144EF
Q705	8-729-900-33	TRANSISTOR DTC144EF
R101	1-247-807-00	CARBON 100 5% 1/6W
R102	1-247-887-00	CARBON 220K 5% 1/6W
R103	1-247-825-00	CARBON 560 5% 1/6W
R104	1-247-825-00	CARBON 560 5% 1/6W
R105	1-247-869-00	CARBON 39K 5% 1/6W
R106	1-247-855-00	CARBON 10K 5% 1/6W
R107	1-214-767-00	METAL 39K 1% 1/4W
R108	1-214-779-00	METAL 120K 1% 1/4W
R109	1-247-855-00	CARBON 10K 5% 1/6W
R110	1-247-847-00	CARBON 4.7K 5% 1/6W
R111	1-247-847-00	CARBON 4.7K 5% 1/6W
R112	1-247-855-00	CARBON 10K 5% 1/6W
R113	1-247-815-00	CARBON 220 5% 1/6W
R114	1-247-843-00	CARBON 3.3K 5% 1/6W
R115	1-247-893-00	CARBON 390K 5% 1/6W
R116	1-247-843-00	CARBON 3.3K 5% 1/6W
R117	1-247-895-00	CARBON 470K 5% 1/6W
R118	1-247-895-00	CARBON 470K 5% 1/6W
R119	1-247-843-00	CARBON 3.3K 5% 1/6W
R120	1-247-893-00	CARBON 390K 5% 1/6W
R121	1-247-843-00	CARBON 3.3K 5% 1/6W

ELECTRICAL PARTS

Ref.No.	Part No.	Description
R122	1-247-895-00	CARBON 470K 5% 1/6W
R123	1-247-815-00	CARBON 220 5% 1/6W
R124	1-247-815-00	CARBON 220 5% 1/6W
R125	1-247-895-00	CARBON 470K 5% 1/6W
R126	1-247-903-00	CARBON 1M 5% 1/6W
R127	1-247-881-00	CARBON 120K 5% 1/6W
R201	1-212-849-00	FUSIBLE 4.7 5% 1/4W F
R202	1-217-399-00	FUSIBLE 100 5% 1/4W F
R203	1-212-867-00	FUSIBLE 27 5% 1/4W F
R204	1-212-876-00	FUSIBLE 62 5% 1/4W F
R205	1-247-833-00	CARBON 1.2K 5% 1/6W
R206	1-247-783-00	CARBON 10 5% 1/6W
R207	1-247-855-00	CARBON 10K 5% 1/6W
R208	1-247-787-00	CARBON 15 5% 1/6W
R209	1-247-853-00	CARBON 8.2K 5% 1/6W
R210	1-247-855-00	CARBON 10K 5% 1/6W
R211	1-247-847-00	CARBON 4.7K 5% 1/6W
R212	1-247-855-00	CARBON 10K 5% 1/6W
R213	1-247-855-00	CARBON 10K 5% 1/6W
R214	1-247-867-00	CARBON 33K 5% 1/6W
R215	1-247-843-00	CARBON 3.3K 5% 1/6W
R216	1-246-475-00	CARBON 1.2K 5% 1/4W
R217	1-212-876-00	FUSIBLE 62 5% 1/4W F
R218	1-212-867-00	FUSIBLE 27 5% 1/4W F
R219	1-247-785-00	CARBON 12 5% 1/6W
R220	1-212-849-00	FUSIBLE 4.7 5% 1/4W F
R301	1-247-903-00	CARBON 1M 5% 1/6W
R302	1-247-891-00	CARBON 330K 5% 1/6W
R303	1-247-903-00	CARBON 1M 5% 1/6W
R304	1-247-903-00	CARBON 1M 5% 1/6W
R305	1-247-847-00	CARBON 4.7K 5% 1/6W
R306	1-247-851-00	CARBON 6.8K 5% 1/6W
R307	1-247-807-00	CARBON 100 5% 1/6W
R308	1-247-867-00	CARBON 33K 5% 1/6W
R309	1-247-848-00	CARBON 5.1K 5% 1/6W
R310	1-247-855-00	CARBON 10K 5% 1/6W
R311	1-247-855-00	CARBON 10K 5% 1/6W
R312	1-247-903-00	CARBON 1M 5% 1/6W
R313	1-247-867-00	CARBON 33K 5% 1/6W
R315	1-247-855-00	CARBON 10K 5% 1/6W
R316	1-247-851-00	CARBON 6.8K 5% 1/6W
R317	1-247-807-00	CARBON 100 5% 1/6W
R318	1-247-879-00	CARBON 100K 5% 1/6W
R319	1-247-847-00	CARBON 4.7K 5% 1/6W
R320	1-247-847-00	CARBON 4.7K 5% 1/6W
R321	1-244-849-00	CARBON 100 5% 1/2W

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CAPACITORS:

MF:μF, PF:μμF.

RESISTORS

- All resistors are in ohms.
- F : nonflammable

COILS

MMH : mH, UH : μH

SEMICONDUCTORS

In each case, U : μ, for example:

UA... : μA..., UPA... : μPA..., UPC... : μPC,

UPD... : μPD...

The components identified by shading and mark ▲ are critical for safety. Replace only with part number specified.

ELECTRICAL PARTS

Ref.No.	Part No.	Description			
R322	1-247-852-00	CARBON	7.5K	5%	1/6W
R323	1-247-857-00	CARBON	12K	5%	1/6W
R324	1-247-855-00	CARBON	10K	5%	1/6W
R325	1-247-877-00	CARBON	82K	5%	1/6W
R326	1-247-855-00	CARBON	10K	5%	1/6W
R327	1-247-879-00	CARBON	100K	5%	1/6W
R328	1-247-889-00	CARBON	270K	5%	1/6W
R329	1-247-889-00	CARBON	270K	5%	1/6W
R330	1-247-855-00	CARBON	10K	5%	1/6W
R331	1-247-891-00	CARBON	330K	5%	1/6W
R332	1-247-855-00	CARBON	10K	5%	1/6W
R333	1-247-891-00	CARBON	330K	5%	1/6W
R334	1-247-887-00	CARBON	220K	5%	1/6W
R335	1-247-815-00	CARBON	220	5%	1/6W
R336	1-247-815-00	CARBON	220	5%	1/6W
R337	1-247-884-00	CARBON	160K	5%	1/6W
R338	1-212-849-00	FUSIBLE	4.7	5%	1/4W F
R339	1-212-875-00	FUSIBLE	56	5%	1/4W F
R340	1-212-849-00	FUSIBLE	4.7	5%	1/4W F
R341	1-212-875-00	FUSIBLE	56	5%	1/4W F
R343	1-247-879-00	CARBON	100K	5%	1/6W
R344	1-247-887-00	CARBON	220K	5%	1/6W
R345	1-247-887-00	CARBON	220K	5%	1/6W
R346	1-247-855-00	CARBON	10K	5%	1/6W
R347	1-247-855-00	CARBON	10K	5%	1/6W
R348	1-247-879-00	CARBON	100K	5%	1/6W
R349	1-247-867-00	CARBON	33K	5%	1/6W
R350	1-247-833-00	CARBON	1.2K	5%	1/6W
R351	1-247-867-00	CARBON	33K	5%	1/6W
R352	1-247-865-00	CARBON	27K	5%	1/6W
R353	1-247-867-00	CARBON	33K	5%	1/6W
R354	1-247-879-00	CARBON	100K	5%	1/6W
R355	1-247-855-00	CARBON	10K	5%	1/6W
R356	1-247-855-00	CARBON	10K	5%	1/6W
R357	1-247-855-00	CARBON	10K	5%	1/6W
R358	1-247-855-00	CARBON	10K	5%	1/6W
R359	1-247-855-00	CARBON	10K	5%	1/6W
R360	1-247-867-00	CARBON	33K	5%	1/6W
R361	1-247-865-00	CARBON	27K	5%	1/6W
R362	1-247-879-00	CARBON	100K	5%	1/6W
R363	1-247-861-00	CARBON	18K	5%	1/6W
R364	1-247-861-00	CARBON	18K	5%	1/6W
R365	1-247-861-00	CARBON	18K	5%	1/6W
R366	1-247-847-00	CARBON	4.7K	5%	1/6W
R367	1-247-847-00	CARBON	4.7K	5%	1/6W

ELECTRICAL PARTS

Ref.No.	Part No.	Description			
R368	1-247-847-00	CARBON	4.7K	5%	1/6W
R369	1-247-825-00	CARBON	560	5%	1/6W
R370	1-247-813-00	CARBON	180	5%	1/6W
R371	1-247-810-00	CARBON	130	5%	1/6W
R372	1-247-822-00	CARBON	430	5%	1/6W
R373	1-247-861-00	CARBON	18K	5%	1/6W
R374	1-247-855-00	CARBON	10K	5%	1/6W
R375	1-247-855-00	CARBON	10K	5%	1/6W
R376	1-247-825-00	CARBON	560	5%	1/6W
R377	1-247-825-00	CARBON	560	5%	1/6W
R378	1-247-825-00	CARBON	560	5%	1/6W
R379	1-247-825-00	CARBON	560	5%	1/6W
R381	1-247-831-00	CARBON	1K	5%	1/6W
R382	1-247-831-00	CARBON	1K	5%	1/6W
R383	1-247-831-00	CARBON	1K	5%	1/6W
R384	1-247-831-00	CARBON	1K	5%	1/6W
R385	1-247-831-00	CARBON	1K	5%	1/6W
R386	1-247-815-00	CARBON	1K	5%	1/6W
R387	1-247-815-00	CARBON	220	5%	1/6W
R388	1-247-815-00	CARBON	220	5%	1/6W
R389	1-247-815-00	CARBON	220	5%	1/6W
R390	1-247-831-00	CARBON	1K	5%	1/6W
R391	1-247-815-00	CARBON	220	5%	1/6W
R392	1-247-815-00	CARBON	220	5%	1/6W
R393	1-247-815-00	CARBON	220	5%	1/6W
R394	1-247-815-00	CARBON	220	5%	1/6W
R395	1-247-847-00	CARBON	4.7K	5%	1/6W
R396	1-247-852-00	CARBON	7.5K	5%	1/6W
R397	1-247-865-00	CARBON	27K	5%	1/6W
R398	1-247-810-00	CARBON	130	5%	1/6W
R399	1-247-881-00	CARBON	120K	5%	1/6W
R401	1-247-823-00	CARBON	470	5%	1/6W
R402	1-247-855-00	CARBON	10K	5%	1/6W
R403	1-247-861-00	CARBON	18K	5%	1/6W
R404	1-247-857-00	CARBON	12K	5%	1/6W
R405	1-247-879-00	CARBON	100K	5%	1/6W
R406	1-247-879-00	CARBON	100K	5%	1/6W
R407	1-247-879-00	CARBON	100K	5%	1/6W
R408	1-244-852-00	CARBON	130	5%	1/2W
R409	1-247-834-00	CARBON	1.3K	5%	1/6W
R410	1-247-833-00	CARBON	1.2K	5%	1/6W
R411	1-247-855-00	CARBON	10K	5%	1/6W
R412	1-247-887-00	CARBON	220K	5%	1/6W
R413	1-247-867-00	CARBON	33K	5%	1/6W
R414	1-247-847-00	CARBON	4.7K	5%	1/6W

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CAPACITORS:

MF:μF, PF:μμF.

RESISTORS

- All resistors are in ohms.
- F : nonflammable

COILS

- MMH : mH, UH : μH

SEMICONDUCTORS

In each case, U : μ, for example:

UA... : μA..., UPA... : μPA..., UPC... : μPC,

UPD... : μPD...

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ELECTRICAL PARTS

Ref.No.	Part No.	Description			
R415	1-247-843-00	CARBON	3.3K	5%	1/6W
R416	1-247-843-00	CARBON	3.3K	5%	1/6W
R417	1-247-839-00	CARBON	2.2K	5%	1/6W
R418	1-247-839-00	CARBON	2.2K	5%	1/6W
R419	1-247-891-00	CARBON	330K	5%	1/6W
R420	1-247-854-00	CARBON	9.1K	5%	1/6W
R421	1-247-855-00	CARBON	10K	5%	1/6W
R422	1-247-855-00	CARBON	10K	5%	1/6W
R423	1-247-867-00	CARBON	33K	5%	1/6W
R424	1-247-853-00	CARBON	8.2K	5%	1/6W
R425	1-247-879-00	CARBON	100K	5%	1/6W
R426	1-247-851-00	CARBON	6.8K	5%	1/6W
R427	1-247-867-00	CARBON	33K	5%	1/6W
R501	1-246-509-00	CARBON	33K	5%	1/4W
R502	1-246-509-00	CARBON	33K	5%	1/4W
R503	1-246-449-00	CARBON	100	5%	1/4W
R701	1-247-863-00	CARBON	22K	5%	1/6W
R702	1-247-867-00	CARBON	33K	5%	1/6W
R703	1-247-867-00	CARBON	33K	5%	1/6W
R704	1-247-855-00	CARBON	10K	5%	1/6W
R705	1-247-867-00	CARBON	33K	5%	1/6W
R706	1-247-855-00	CARBON	10K	5%	1/6W
R707	1-247-863-00	CARBON	22K	5%	1/6W
R708	1-247-855-00	CARBON	10K	5%	1/6W
R709	1-247-887-00	CARBON	220K	5%	1/6W
R710	1-247-867-00	CARBON	33K	5%	1/6W
R711	1-247-867-00	CARBON	33K	5%	1/6W
R712	1-247-887-00	CARBON	220K	5%	1/6W
R713	1-247-887-00	CARBON	220K	5%	1/6W
RV101	1-228-238-00	RES, ADJ, METAL GLAZE 20K			
RV102	1-228-239-00	RES, ADJ, METAL GLAZE 50K			
RV103	1-226-234-00	RES, ADJ, CARBON 2K			
RV104	1-226-234-00	RES, ADJ, CARBON 2K			
RV105	1-226-235-00	RES, ADJ, CARBON 5K			
RV106	1-226-235-00	RES, ADJ, CARBON 5K			
RV301	1-224-134-XX	RES, ADJ, METAL GLAZE 470K			
RV302	1-224-256-XX	RES, ADJ, METAL GLAZE 220K			
RY401	1-515-323-00	RELAY			

ELECTRICAL PARTS

Ref.No.	Part No.	Description
S1	1-553-909-00	SWITCH, PUSH, POWER
S2	1-554-483-00	SWITCH, ARM REST
S3	1-554-205-00	SWITCH, PUSH, OPEN
S4	1-554-205-00	SWITCH, PUSH, CLOSE
S5	1-553-324-00	SWITCH, ROTARY, DP ADJUST
S6	1-552-915-00	SWITCH, SLIDE, SENSITIVITY
S501	1-554-303-00	SWITCH, KEY BOARD
S502	1-554-303-00	SWITCH, KEY BOARD
S503	1-554-303-00	SWITCH, KEY BOARD
S504	1-554-303-00	SWITCH, KEY BOARD
S505	1-554-303-00	SWITCH, KEY BOARD
S506	1-554-303-00	SWITCH, KEY BOARD
S507	1-554-303-00	SWITCH, KEY BOARD
S508	1-554-303-00	SWITCH, KEY BOARD
S509	1-554-303-00	SWITCH, KEY BOARD
S510	1-554-303-00	SWITCH, KEY BOARD
S511	1-554-303-00	SWITCH, KEY BOARD
S512	1-554-303-00	SWITCH, KEY BOARD
S513	1-554-303-00	SWITCH, KEY BOARD
S514	1-554-303-00	SWITCH, KEY BOARD
S515	1-554-303-00	SWITCH, KEY BOARD
S516	1-554-303-00	SWITCH, KEY BOARD
S517	1-554-303-00	SWITCH, KEY BOARD
S518	1-554-303-00	SWITCH, KEY BOARD
T901	1-446-851-00	(E).....TRANSFORMER, POWER
T901	1-447-124-00	(AEP,UK)....TRANSFORMER, POWER
X301	1-527-895-00	OSCILLATOR, CERAMIC

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COILS

MMH : mH, UH : μH

SEMICONDUCTORS

In each case, U : μ, for example:
 UA.... : μA...., UPA.... : μPA...., UPC.... : μPC,
 UPD.... : μPD....

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