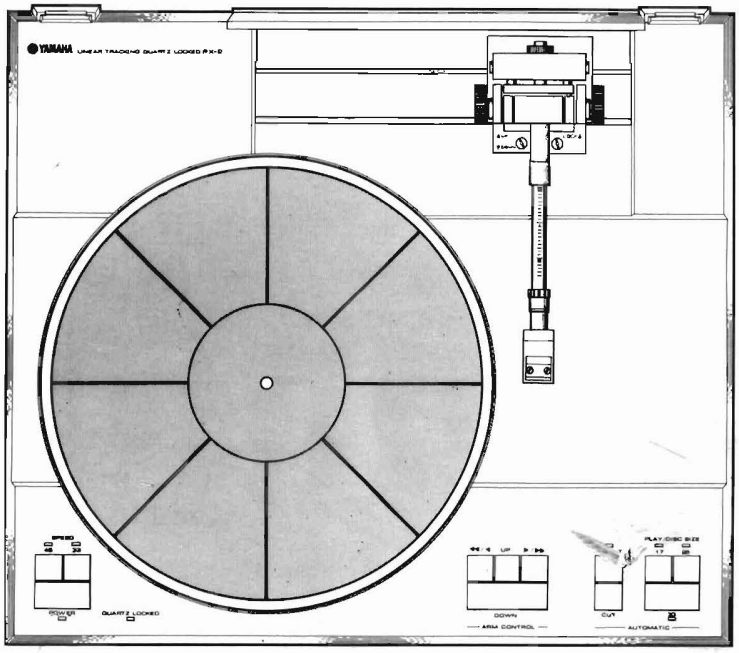
PX-2

SERVICE MANUAL



CONTENTS

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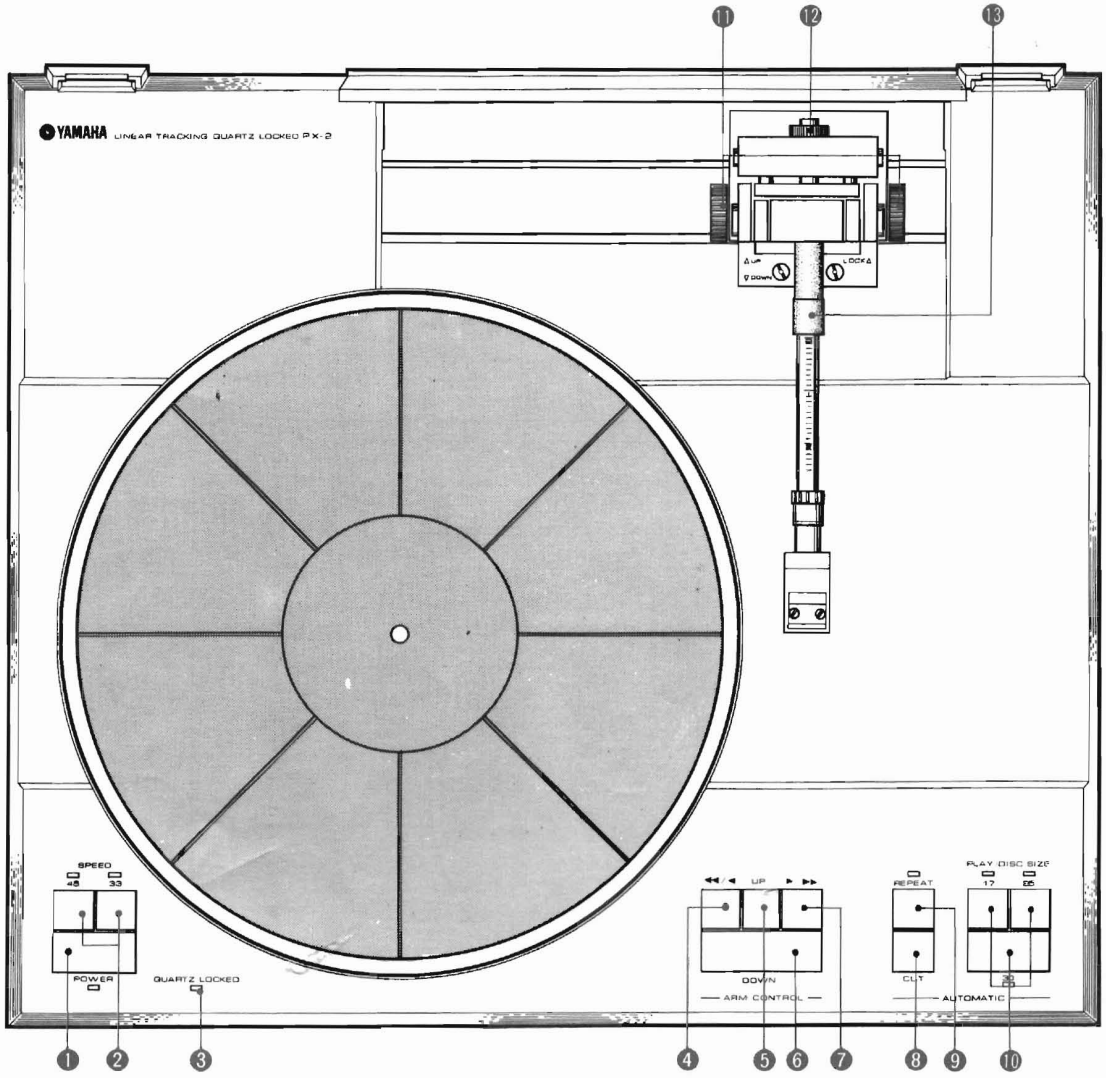
YAMAHA

'80.5 2.4K K.T Printed in Japan

■PANEL OPERATION



❶ POWER (Power Switch)
❷ SPEED (Speed Changing Switch)
❸ QUARTZ LOCKED (Quartz Locked Indicator)

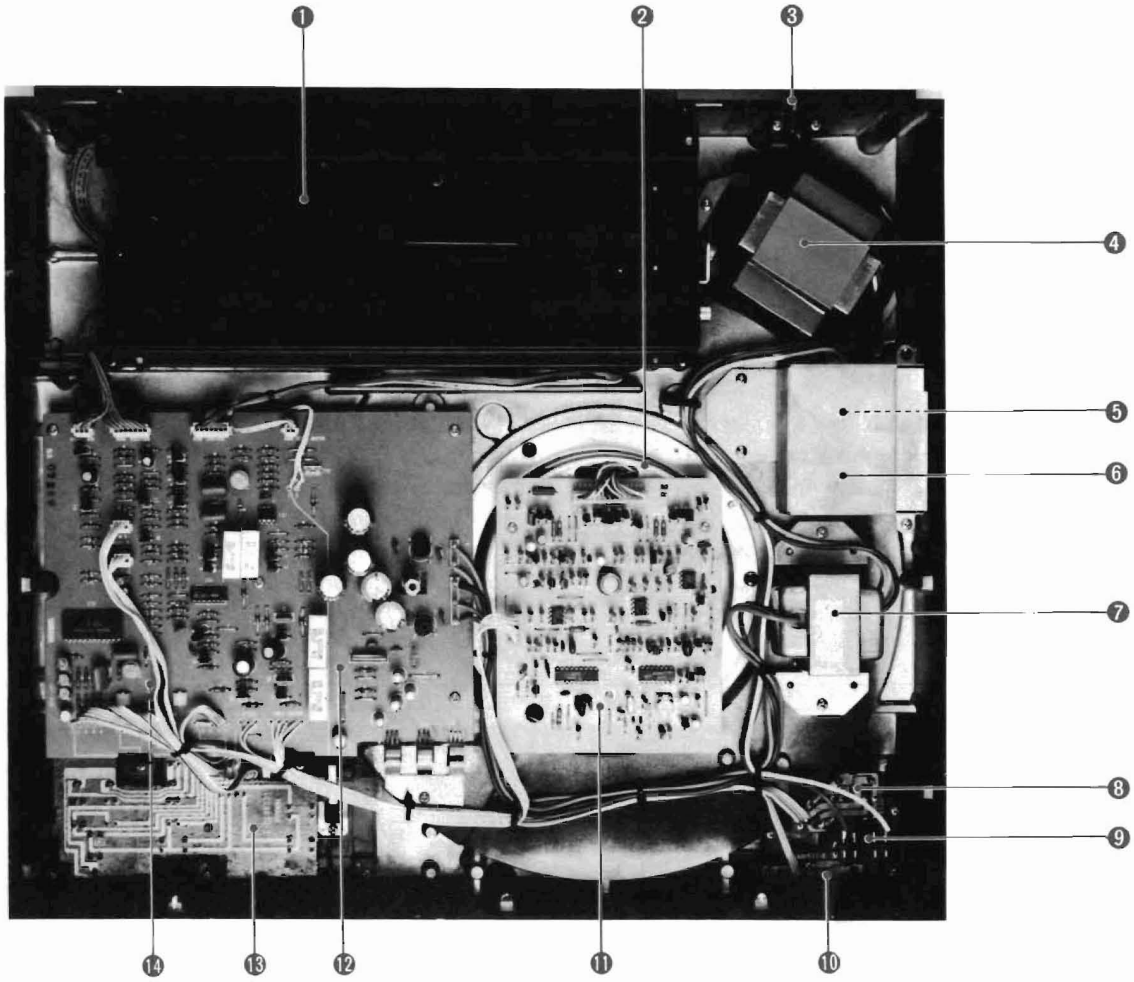
ARM CONTROL (MANUAL)

❹ ◀◀ / ◀ (Leftward Feed Switch for Tonearm)
❺ UP (Cueing-UP Switch)
❻ DOWN (Cueing Down Switch)
❼ ▶ / ▶▶ (Rightward Feed Switch for Tonearm)

AUTOMATIC PLAY

❽ CUT (Play Discontinuing Switch)
❾ REPEAT (Repeat Switch)
❿ PLAY/DISC SIZE (Disc Size Switch)
⓫ Arm Height Adjusting Knob
⓬ Main Weight & Balance Control Knob
⓭ Tracking Force Adjusting Weight

■INTERNAL VIEW



1. Tonearm Unit (SS06019)
2. Motor (JC00048)
3. Power Cord
4. Power Transformer-L
   - U.S. & Canadian Models: GA6272
   - N.European Model: GA6273
   - Australian & British Models: GA6284
   - General Model: GA6274
5. Fuse C. Board
6. Fuse Cover
7. Power Transformer-S
   - U.S. & Canadian Models: GA6276
   - N.European Model: GA6277
   - Australian & British Models: GA6279
   - General Model: GA6278
8. r.p.m. SW C. Board
9. Power Switch
10. Power Indicator C. Board
11. Motor Servo C. Board
12. Control C. Board
13. Tonearm Control SW C. Board
14. Tonearm Speed VR C. Board

■DISASSEMBLY PROCEDURE

Before disassembly, remove the turntable and lift up the rear side of the unit and turn the unit over. If the unit is lifted from its side, the tonearm may slide causing possible damage to the unit. Place the unit in such a way that it is level, using magazines or similar materials to level and stabilize the unit, thereby preventing possible damage to the tonearm, center spindle and operation switches.

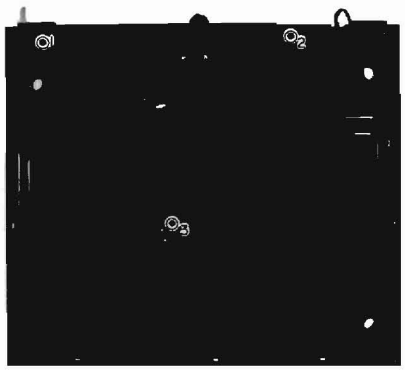


Photo 1

Disassembly of Main Unit

1. Removal of bottom cover

Turn over the unit, remove the bottom cover by loosening screws ① to ③ shown in Photo1.

2. Removal of tonearm unit

Remove the rear cover by loosening screws ① and ② shown in Photo 2. And then, after disconnecting the connectors, loosen screws ③ to ⑥ shown in Photo 2, lift up and remove the tonearm unit. Remember, the headshell must be removed prior to removal of the tonearm unit.

3. Removal of control circuit board

Disconnect the connectors and wires, loosen screws ⑦ to ⑪ shown in Photo 2, gently work the control circuit board free and remove it from the unit.

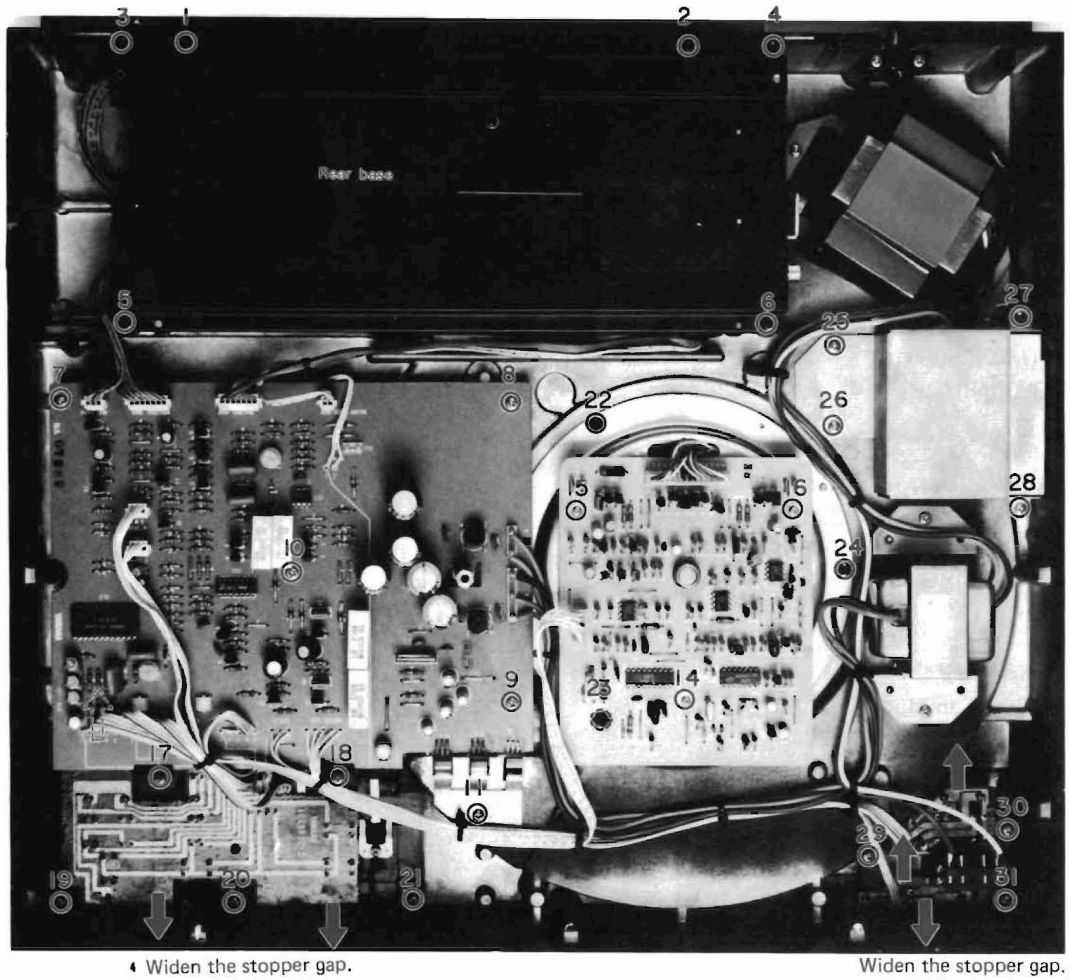


Photo 2

4. **Removal of motor servo circuit board**
   Disconnect the connectors, loosen screws ⑭ to ⑯ shown in Photo 2.

5. **Removal of tonearm SW (switch) base and control SW base**
   Remove the control circuit board (refer to step 3). And then loosen screws ⑰ to ㉑ shown in Photo 2 to remove both bases. The tonearm control SW circuit board can be removed by widening the stopper gap.

6. **Removal of phonomotor**
   Disconnect the control circuit board connectors, and loosen screws ㉒ to ㉔ shown in Photo 2 to remove the phonomotor.

7. **Removal of fuse circuit board**
   Remove the fuse cover by loosening screws ㉕ to ㉘ shown in Photo 2. And then, disconnect the wiring and loosen screws ① to ③ shown in Photo 3. When assembling the board, wind the wire around the terminal post, and solder it to insure a good connection.

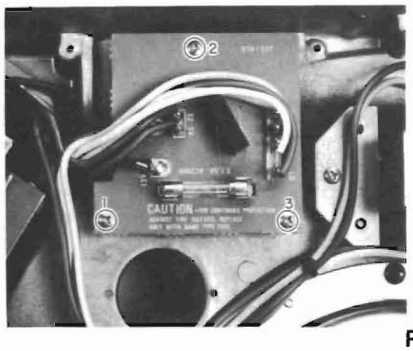


Photo 3

8. **Removal of power switch base**
   Loosen screws ㉙ to ㉛ shown in Photo 2 and remove the power switch base.

Disassembly of Tonearm Assembly

Before disassembling, remove the tonearm unit (Refer to step 2).

1. **Removal of tonearm**
   Loosen screws ① and ② shown in Photo 4 and remove the pulley bearing support in order to loosen the flat belt. And then, disconnect the tension two springs and the connectors in Photo 4. Remove the tonearm from the rear base by sliding it in the direction of the arrow (➡).

2. **Removal of drive motor**
   Remove the square belt, loosen screws ③ and ④ shown in Photo 4 to remove the motor cover and the drive motor.

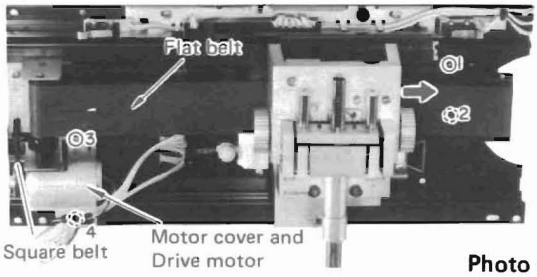


Photo 4

■ADJUSTMENT

Before adjustment, check the following items.

1. Place the PX-2 at a level position. Adjustment of the unit may be affected if it is in an in inclined or tilted position.
2. Temperature and humidity during normal adjustment conditions should be 18 to 22°C and 60 to 70%, respectively. In the event that no problem exists, adjustments can still be made even though the temperature ranges from 5 to 35°C or the humidity is less than 85%.
3. Adjustment of the phonomotor should be made with the turntable on the unit. (Do not keep the phonomotor rotating for a long period of time without the turntable on the unit.)

Specifications

1. Wow and flutter:
   Less than 0.05% WRMS.
2. Turntable acceleration time:
   0 to 33-1/3r.p.m., within 2 seconds (at rated voltage).
3. Turntable vibrations should be less than 0.1mm horizontally, and less than 0.2mm vertically (when an outer dimension of the turntable is measured).
4. A standard cartridge with a tracking force of 1.5g (Shure 75EMII, EDII) is used.

- Confirm that each switch operation operates in accordance with the owners manual and other related material.

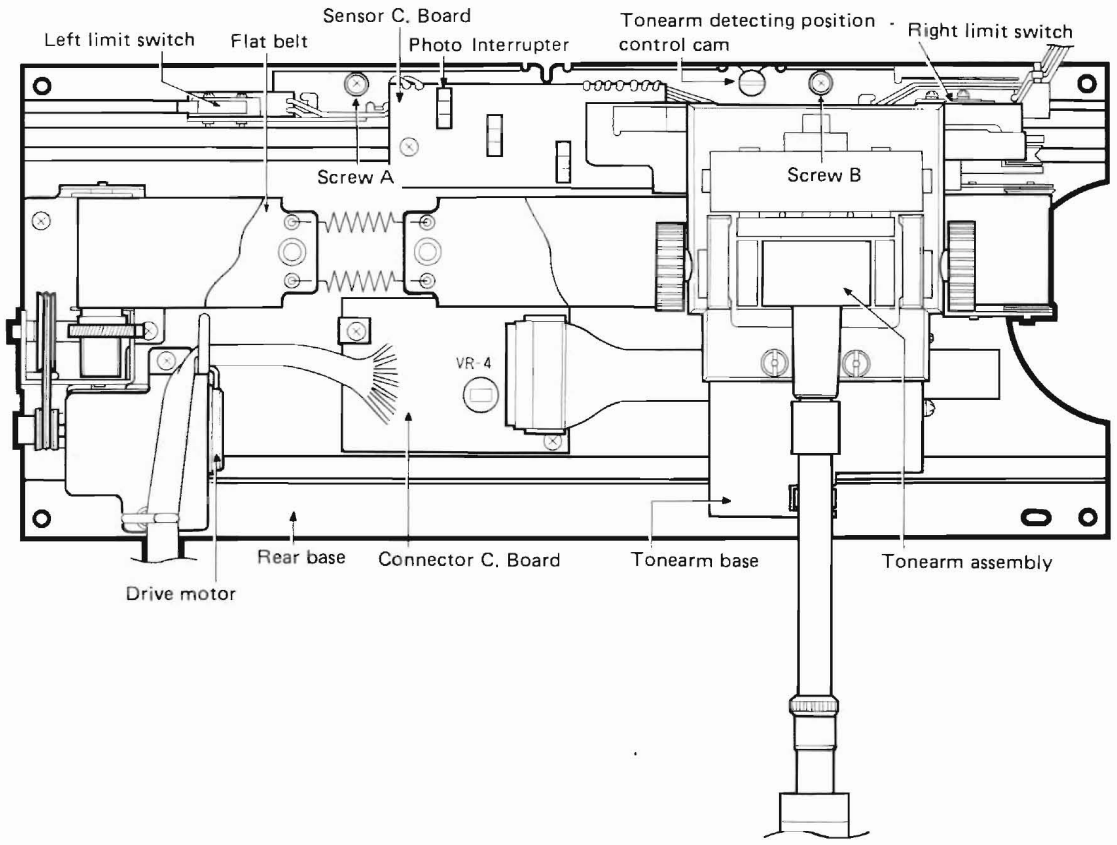


Fig. 1

Adjustment of phonomotor synchronization

1. Adjustment of quartz synchronization

1) As in Fig. 2, connect the buffer amplifier to the motor servo circuit board.
2) Set the speed selector switch at 45 r.p.m.
3) Connect an oscilloscope set at 10 kohms resistance level, to both terminals of the source in the buffer amplifier. Adjust the VR 1 so that "t" of the saw tooth wave is 14±1ms as in Fig. 2.

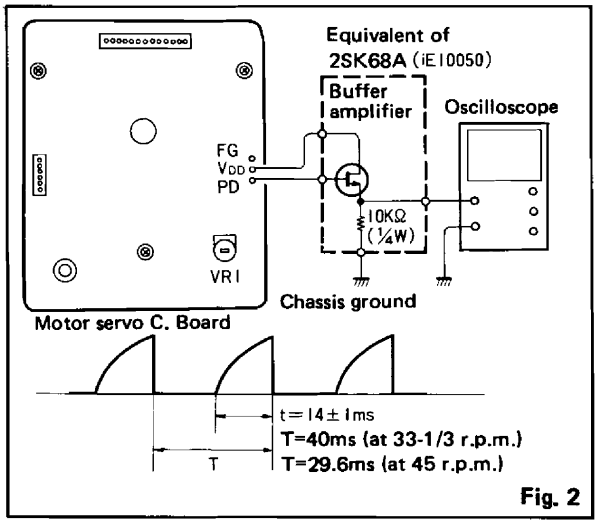


Fig. 2

Adjustment of control circuit board and tonearm unit

- For adjustment of the control circuit board and the tonearm unit section, remove the bottom cover and rear cover of the PX-2.

Tonearm angle adjustment

The following adjustments should be made when the tonearm angle takes a diagonal attitude or it sways.

1. Adjustment when the tonearm is in the raised position

1) As in Fig. 3, set the tonearm mechanically at the center when it is in the ratised position, turn the power switch to "ON".
2) Connect a digital voltmeter or a similar test meter to the test points TP 1 and TP 2 in the control circuit board. And adjust the volume of VR2 (2.2 k ohms) to set at 0V±50mV (see Fig. 3).

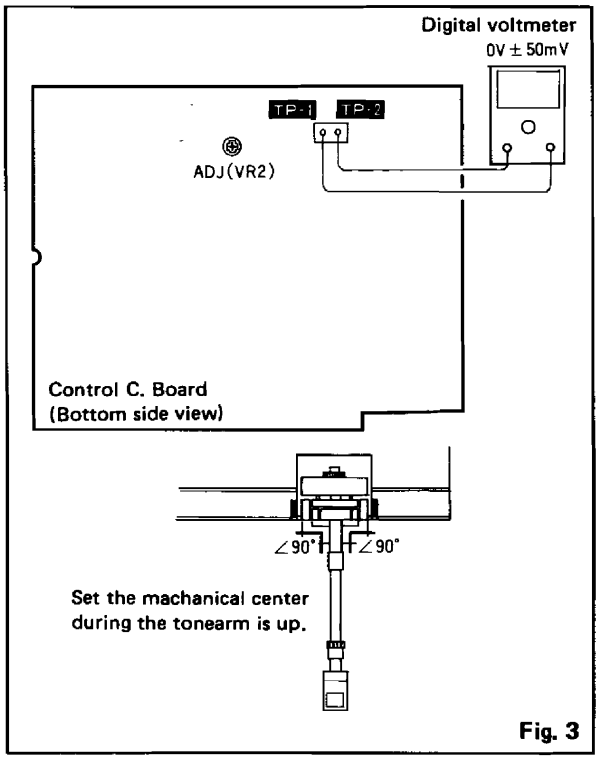


Fig. 3

2. Adjustment when the tonearm is the lowered position

1) As in Fig. 4, set the tonearm down to the position less than 7mm from the tonearm rest by the Down SW.
2) Connect a digital voltmeter or a similar test meter to the test points TP 1 and TP 2 in the control circuit board and adjust the volume of VR4(4.7 k ohms) to 0V±50mV.
3) Confirm that the meter keeps showing 0V±50mV by repeatedly raising and lowering the tonearm.

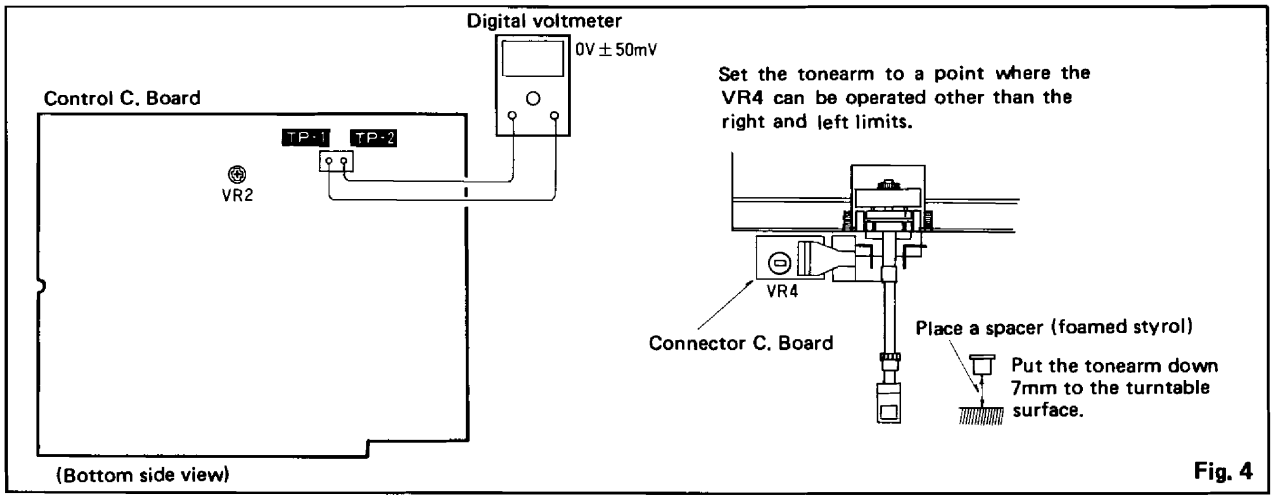


Fig. 4

Tonearm position detecting adjustment

Adjustment should be made when the arm detects incorrect positions. (After selecting the record size, whether it is 30, 25 or17cm, the tonearm comes down and may slip out of place.) Loosen screws A and B shown in Fig. 5 and turn the adjustment cam with a ⊖ screw driver if either 30, 25 or 17 position slips out of place.

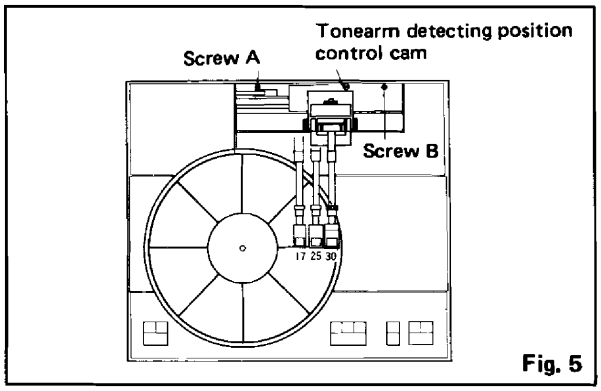


Fig. 5

Adjustment of auto-up at the tonearm lead-out groove

When the tonearm enters the lead-out groove of the record, it is detected according to the intervals (speed) of the lead-out grooves. This may cause the auto-up mechanism to not work according to the record played. In such cases, the following adjustments should be made.

1. As in Fig. 6, connect a frequency counter and an oscilloscope to the 24th pin of IC3 in order to confirm that the frequency is at 128Hz±1Hz, and that the waveform is a saw tooth wave (regard these as standard conditions).
2. When the auto-up mechanism does not work in accordance with the record played, the value can be varied to suit the record (raised the frequency when the pitch of the lead-out grooves is narrow).

Note: For tests of the auto-up mechanism use NEC's ES-1008 record. For the tonearm to be automatically raised, confirm that it works within 21 counts when the pitch is 3mm at 33-1/3 r.p.m., and does not work within 21 counts when the pitch is 1mm at 45 r.p.m.(under standard conditions).

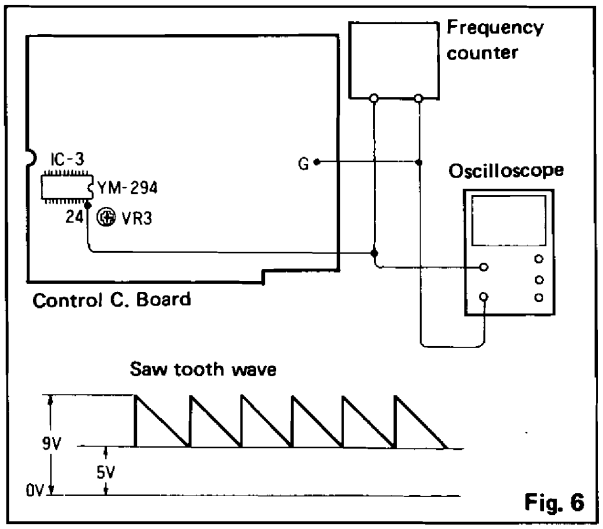


Fig. 6

Tonearm driving speed adjustment

There are cases where the tonearm speed is slow to slide to either side (movement towards the determined record size position), when the disc size select/ start switch is set to either 30, 25 or 17, or when the tonearm driving switch ◀◀/◀ or ▶/▶▶ is depressed. In these case, the following adjustments should be made.

1. As in Fig. 7, adjustments should be made along with the tonearm's movement (moving speed). However, there is a case where the tonearm does not operated due to the adjustment position when the tonearm driving switch ◀◀/◀ or ▶/▶▶ as set to LOW (the switch is being softly depressed). Check the operation when this adjustment is made.

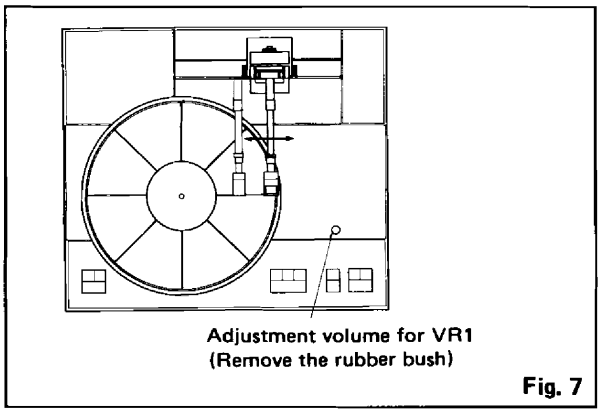


Fig. 7

2. Normal tonearm driving speed adjustment

1) Connect a digital voltmeter to the 1st pin of the connector No. 1 in the control circuit board as in Fig. 8, and adjust VR 1 so that the voltages display the values shown in Fig. 8 when the tonearm is driven to move right and left (this means FAST) by, depressing each 30, 25 or 17 of the record size selector, or the tonearm is driven to move"FAST" in both directions (the switch is being strongly depressed).
2) Confirm that the voltage displays the value at SLOW mode shown in Fig. 8 when the tonearm driving ◀◀/◀ or ▶/▶▶ switch is set to SLOW mode (the switch is being softly depressed).

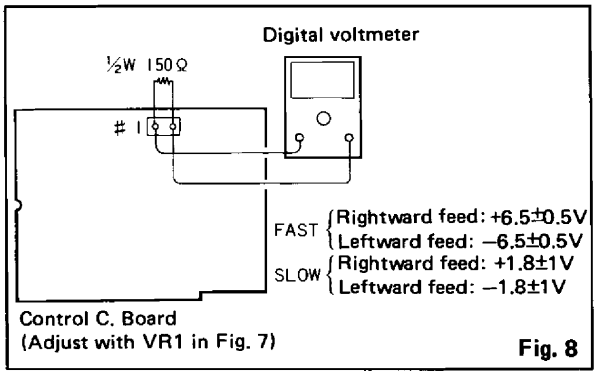
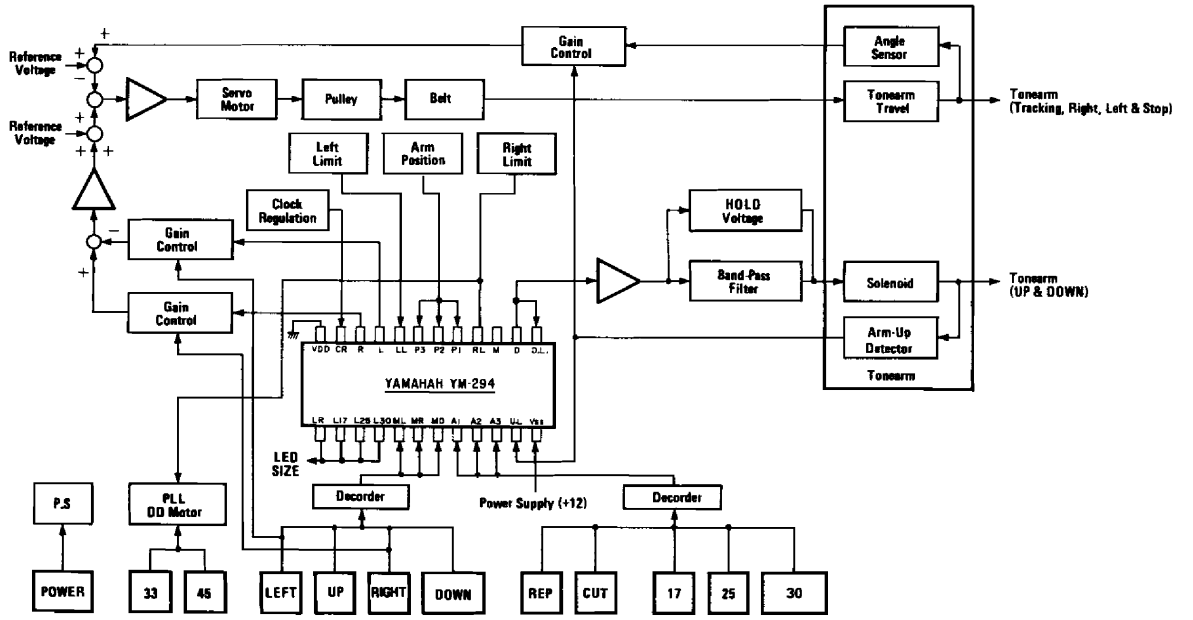


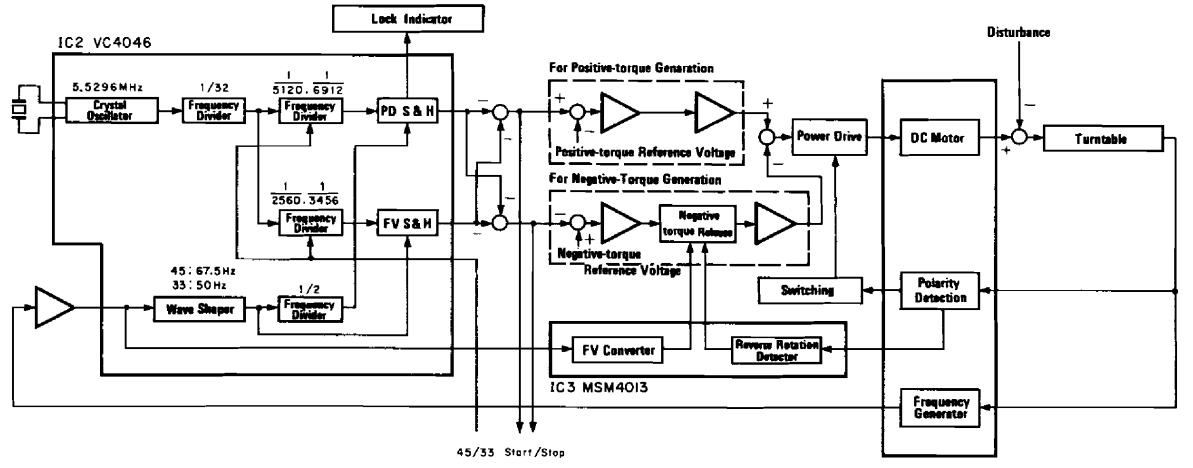
Fig. 8

■BLOCK DIAGRAM

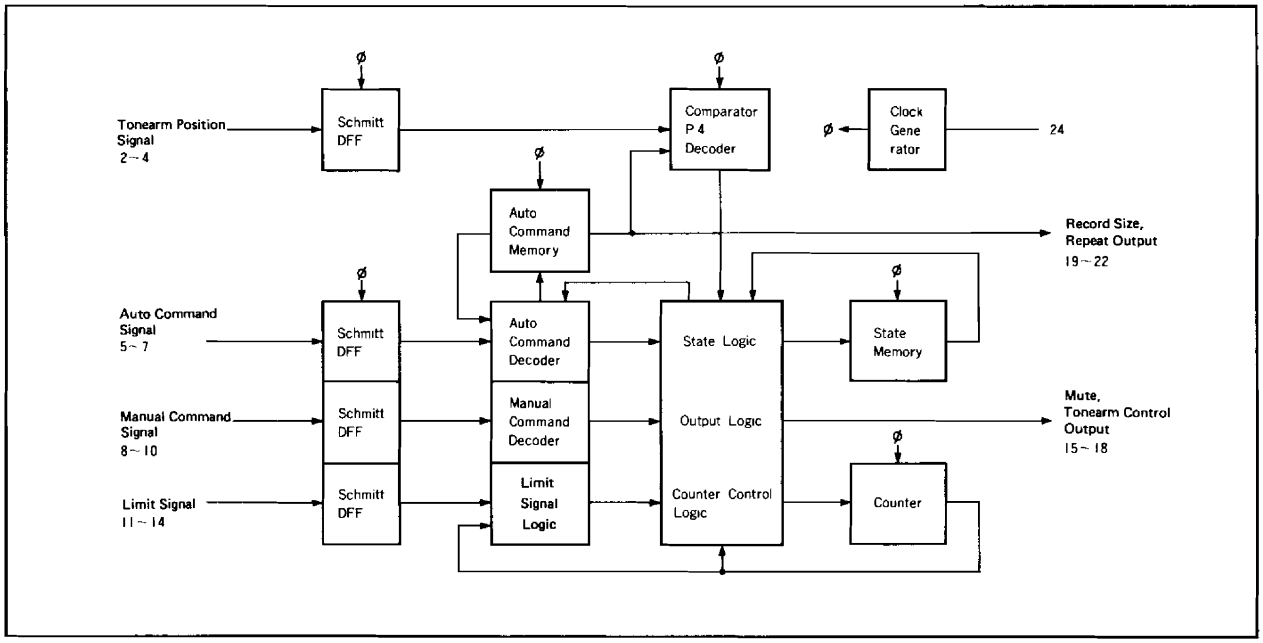
Tonearm Control Circuit



DC Motor Servo Circuit



■LOGIC CONTROL IC : YM-294



Pin arrangement

Power voltage +12V	1	VSS	CR	24	Clock (Input/Output)
	2	P1	VDD	23	Ground
	3	P2	L30	22	
	4	P3	L25	21	
	5	A1	L17	20	
	6	A2	LR	19	
Input	7	A3	M	18	Output
	8	MD	R	17	
	9	ML	L	16	
	10	MR	D	15	
	11	UL	LL	14	
	12	DL	RL	13	Input

Input Signal

1. Limit Signal: Highest priority signal in logic operation.
   Pin 11; UL. . .UP Limit
   Pin 12; DL. . .Down Limit
   *Arm vartical position signal. Determined by position of lead switch.
   Pin 13; RL. . .Right Limit
   Pin 14; LL. . .Left Limit
   *Arm lateral position signal.

Note: Due to the arrangement of the circuit, the above signals cannot be input simultaneously.

2. Manual Command Signal: This signal has second priority after the limit signal. When one of these signals appears, the auto command signal will be inhibited and cancelled.
   Pin 8; MD . . .Manual Down
   Pin 9; ML. . . .Manual Left
   Pin 10; MR. . .Manual Right

Input			Output		
MD	ML	MR	L	R	Operations
0	0	0	0	0	No Operation
0	0	1	0	1	Manual Right
0	1	0	1	0	Manual Left
0	1	1	1	1	Manual Up/Initial Clear
1	0	0	0	0	Manual Down
1	0	1	0	1	Manual Right
1	1	0	1	0	Manual Left
1	1	1	0	0	Manual Up

3. Auto Command Signal: These are command signals which automatically operate the arm. This signal is inhibit by the Manual Command Signal.
   Pin 5 to 7

A logic table without manual command signal.

A3	A2	A1	Operations	Output
0	0	0	No Operation	
0	0	1	Memorize the record size 30cm	L30=1
0	1	0	Memorize the record size 25cm	L25=1
0	1	1	Memorize the record size 17cm	L17=1
1	0	0	* Reverse the repeat memory	LR reverse
1	0	1	No Operation	
1	1	0	No Operation	
1	1	1	Cut command	

* Reverse operation is performed only when L30=1, L25=1 and L17=1.

4. Tonearm Position Signal: A signal that indicates the tonearm position in both directions. It indicates the posit on where a play starts at the full automatic mode or the tonearm returns to the tonearm rest at the full- or semi-auto mode.
   Pin 2 to 4

P3	P2	P1	Meaning
0	0	0	Arm position: Outer periphery
0	0	1	" 30cm lead-in
0	1	1	" 30cm to 25cm
0	1	0	" 25cm lead-in
1	1	0	" 25cm to 17cm
1	1	1	" 17cm lead-in
1	0	1	" Less than 17cm *
1	0	0	" Inner periphery *

*In inner-most grooves, the operation repeats in a 2mm pitch so that the tonearm moving speed can be detected.

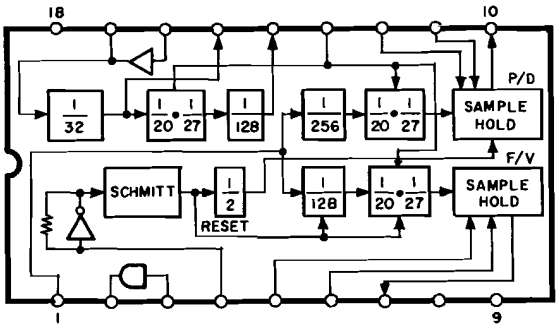
Output Signal

Output signals come to all output terminals synchronizing to the clock.

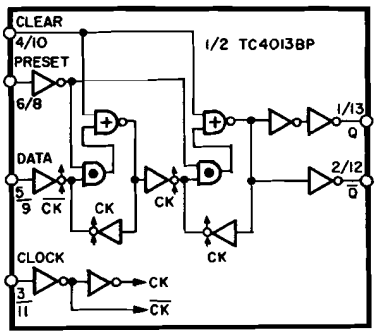
1. Tonearm Control Signal: The signal designates the arm's up and down, and right and left movements in all modes such as full auto, semi-auto and manual operations.
2. Mute Signal: As the signal generated when the arm is raised and lowered in all mode such as full auto, semi-auto and manual operations, it can be used for muting of audio signals.
3. Record Side, Repeat Signal: At the full auto mode, the signal drives LEDs so that they can display the record size and repeat operation, corresponding to the auto command signal.
   Pin 19; LR . . .LED Repeat
   Pin 20; L17 . .LED•17cm Record
   Pin 21; L25 . .LED 25cm Record
   Pin 22; L30 . .LED 30cm Record

■IC FUNCTIONAL BLOCK DIAGRAM

VC4046 (IC2: Motor servo C. Board)



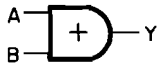
TC4013BP (IC2: Control C. Board)



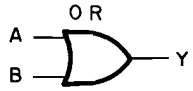
※: Don't Care
△: Level Change
●: No Change

INPUTS				OUTPUTS	
CL	PR	D	CP △	Qn+1	$\overline{Qn+1}$
L	H	※	※	H	L
H	L	※	※	L	H
H	H	※	※	L	H
L	L	L	↑	L	H
L	L	H	↑	H	L
L	L	※	↓	Qn*	$\overline{Qn}$*

●LOGIC SYMBOL

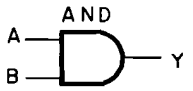
Function	LOGIC SYMBOL	
	MIL	YAMAHA
OR		
AND		
NOT (INVERTER)		
NOR		
NAND		

OR



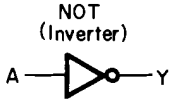
A	B	Y
L	L	L
H	L	H
L	H	H
H	H	H

AND



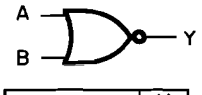
A	B	Y
L	L	L
H	L	L
L	H	L
H	H	H

NOT (Inverter)



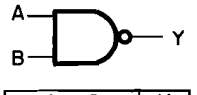
A	Y
L	H
H	L

NOR



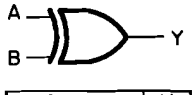
A	B	Y
L	L	H
H	L	L
L	H	L
H	H	L

NAND



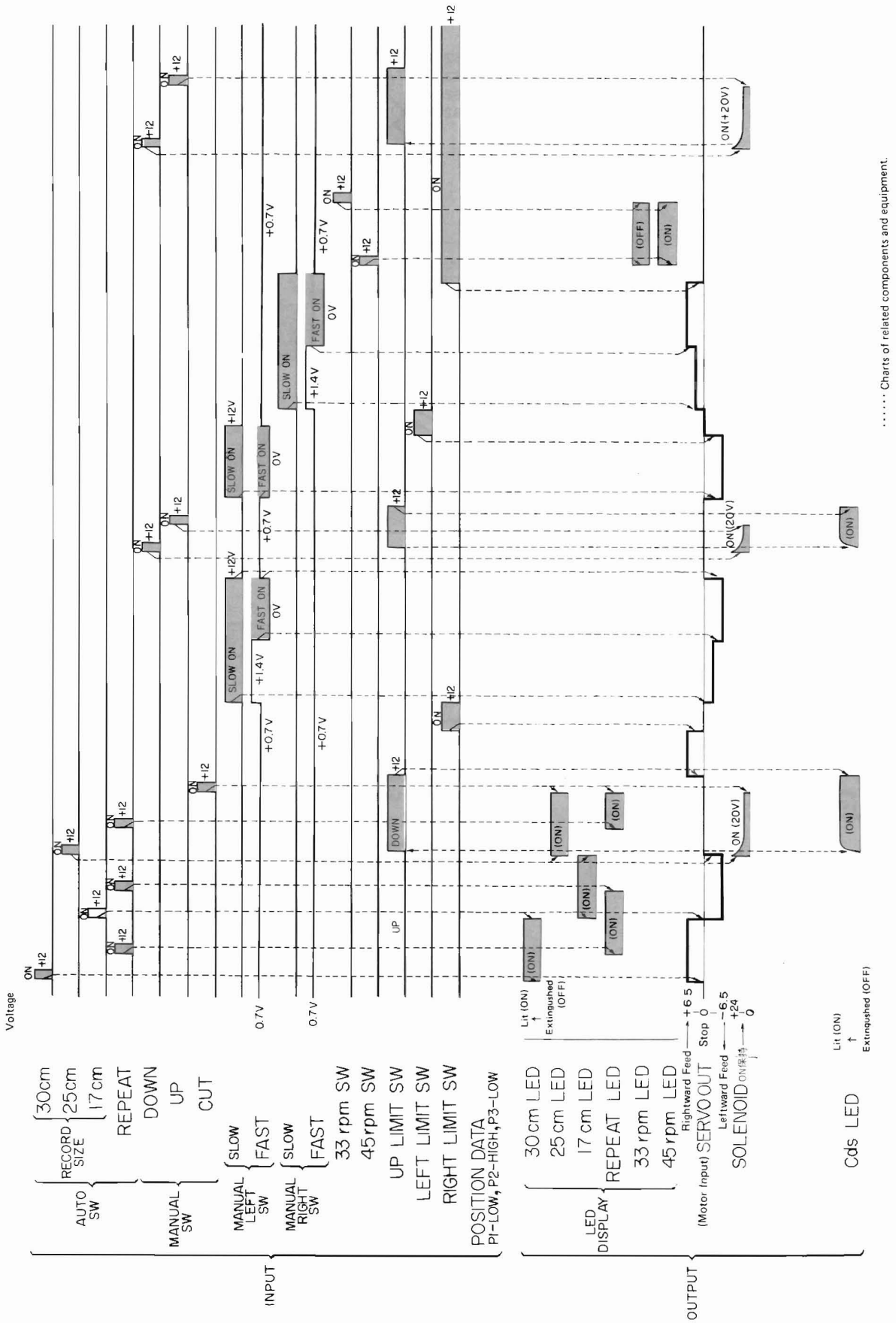
A	B	Y
L	L	H
H	L	H
L	H	H
H	H	L

Exclusive OR



A	B	Y
L	L	L
H	L	H
L	H	H
H	H	L

■TIMING CHART



■SPECIFICATIONS

TONEARM SECTION

Arm type . . . . . Linear tracking arm
Servo system . . . . . Photo-electric tracking sensor plus servo motor
Total length . . . . . 236 mm (9-9/32")
Effective length . . . . . 190 mm (7-15/32")
Tracking force device . . . . . Static balance type sliding weight system 0 to 2.5 g, in 0.1 g steps
Effective mass . . . . . Proporional type to tracking force
(In cartridge-less state) 1.0 g (Tracking force) . . . . . 16.5 g
1.5 g (Tracking force) . . . . . 17.0 g
2.0 g (Tracking force) . . . . . 17.5 g
Applicable cartridge weight fange . . . . . 5 to 11 g, (Using sub-weights) 10 to 16 g
Maximum horizontal tracking error angle . . . . . ±0.15°, at stylus tip ±0.5 mm
Arm lifter . . . . . Oil damp type cueing
Adjustable range of arm height . . . . . ±4.0 mm
Head shell . . . . . Pure, forged aluminum, weight: 8.0 g, Plug-in type conforming to EIA Standards
PU Cable . . . . . NEGLEX 2496, Low-impedance, double cylindrical cord
Capacitance: 130pF
Resistance: 1Ω
Cartridge (Not provided) . . . . . Replaceable

ROTARY SECTION

Motor . . . . . DC, 4-phase, 8-pole coreless Hall motor
Starting torque . . . . . 1 kg-cm, or more
Drive system . . . . . Direct drive
Servo sytem . . . . . Quartz PLL, Negative/positive two-direction servo
Locking torque 450g-cm
F.G. . . . . . Total circumference integrating type
Speed (With Lock Indicator) . . . . . 33-1/3 r.p.m., 45 r.p.m.
Platter . . . . . 31 cm (12-1/4") diameter, aluminum die-cast, Weight: 2.1 kg (4.62 lbs) (Including rubber mat)
Moment of inertia . . . . . 270 kg·cm^2 (Including rubber mat)

EXTERNAL DESIGN

Cabinet . . . . . Alumimum, die-cast, 5 mm thick black enamel coating
Dust cover . . . . . Acrylic, Resins, 5 mm thick, weighting 1.3 kg, Front operating type
Hinges . . . . . Free stop, detachable type
Insulator . . . . . Combination of spring-and-rubber type with height adjustment

CONTROL SECTION

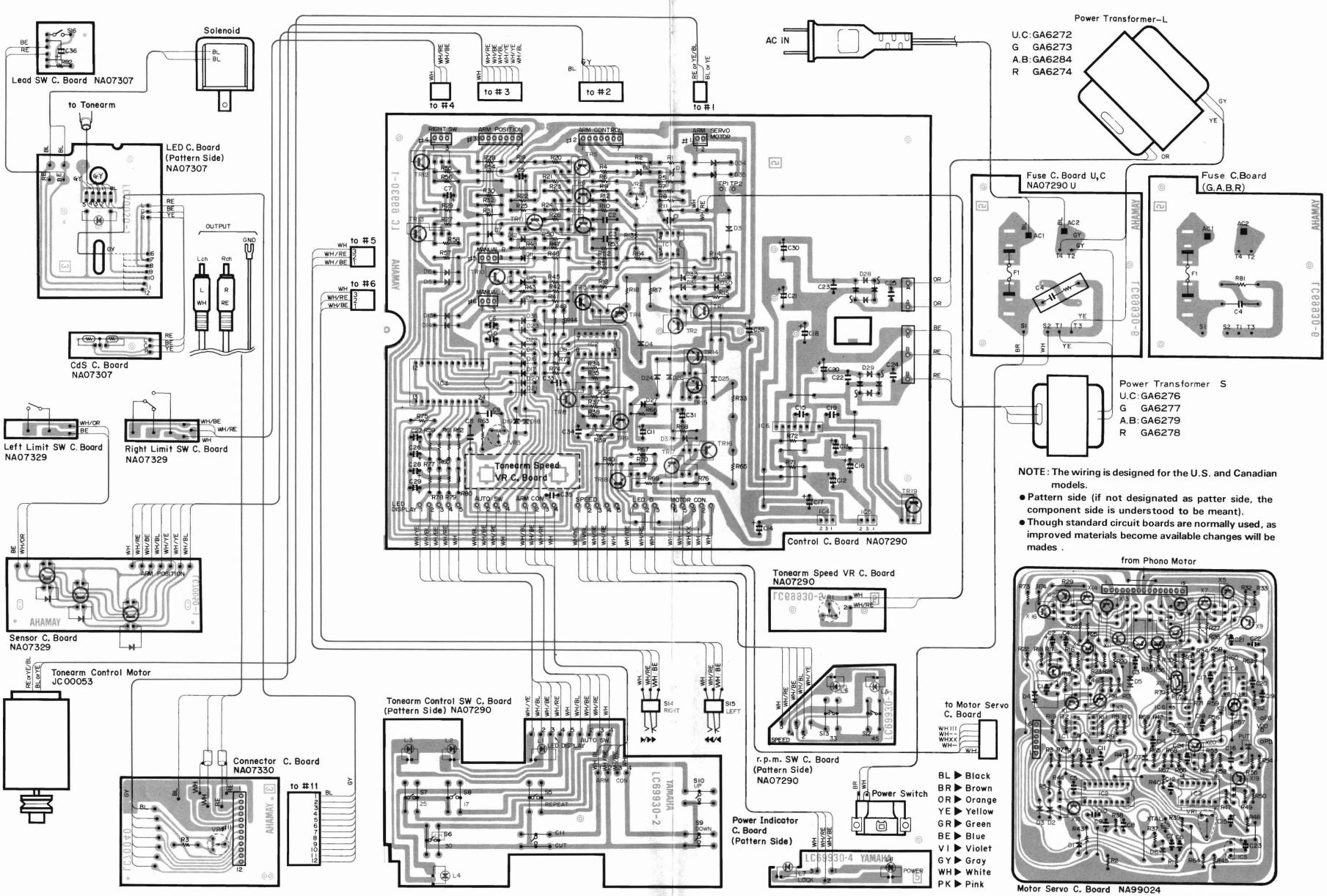
Automatic functions . . . . . AUTO-LEAD-IN/ AUTO-RETURN/ REPEAT/ AUTO-UP (During Power-OFF)
Size selector . . . . . 17 / 25 / 30 cm (7" / 10" / 12")
Manual functions . . . . . ARM-UP/ ARM-DOWN/ LEFTWARD & RIGHTWARD 2-speed feeding/ CUT
Speed . . . . . 33-1/3 r.p.m. and 45 r.p.m.
Others . . . . . Power switch

GENERAL

Signal to Noise ratio . . . . . 80 dB (IEC 98A Weighted)
Wow and flutter . . . . . 0.01 % WRMS (FG direct)
Power supply and consumption
U.S. and Canadian Models . . . . . 120V AC, 60Hz, 25W
European Model . . . . . 220V AC, 50Hz, 25W
Australian and British Models . . . . . 240V AC, 50Hz, 25W
General Model . . . . . 110/120/130/220/230/240V AC, 50/60Hz, 22W
Dimensions (W x H x D) . . . . . 493 x 156 x 428 mm (19-7/16" x 6-5/32" x 16-27/32")
Total weight . . . . . 17 kg (37.4 lb)

Specifications are subject to change without notice.

■WIRING



NOTE: The wiring is designed for the U.S. and Canadian models.

- Pattern side (if not designated as patter side, the component side is understood to be meant).
- Though standard circuit boards are normally used, as improved materials become available changes will be mades .

■SCHEMATIC DIAGRAM