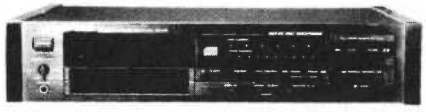
PIONEER

Service Manual

REPAIR & ADJUSTMENTS



ORDER NO.
ARP-985-0

COMPACT DISC PLAYER

PD-M6(BK)

MODEL PD-M6 (BK) COMES IN SEVEN VERSIONS DISTINGUISHED AS FOLLOWS:

Type	Power requirement	Destination
KU	AC120V only	U.S.A.
KC	AC120V only	Canada
HEM	AC220V	European continent
HB	AC240V	United Kingdom
HP	AC240V	Australia
S	AC110V, 120V, 220V, 240V (switchable)	General market
S/G	AC110V, 120V, 220V, 240V (switchable)	U.S. Military

This service manual is applicable to the KU, KC, HEM, HB, HP, S and S/G types.
As to the KC, HEM, HB, HP, S and S/G types, please refer to pages 81.
As to the circuit and mechanism descriptions, please refer to the PD-9010X (BK) service manual (ARP-883) and PD-M6 (BK) service manual (ARP-984).
Ce manuel d'instruction se refère au mode de réglage en français.
Este manual de servicio trata del método ajuste escrito en español.

CONTENTS

1. SAFETY INFORMATION

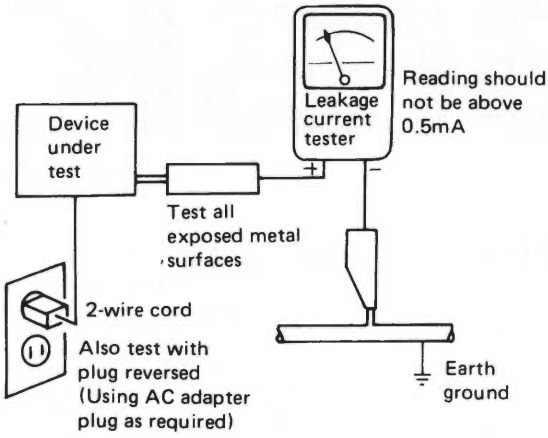
(FOR MODEL KU ONLY)

1. SAFETY PRECAUTIONS

The following check should be performed for the continued protection of the customer and service technician.

LEAKAGE CURRENT CHECK

Measure leakage current to a known earth ground (water pipe, conduit, etc.) by connecting a leakage current tester such as Simpson Model 229-2 or equivalent between the earth ground and all exposed metal parts of the appliance (input/output terminals, screwheads, metal overlays, control shaft, etc.). Plug the AC line cord of the appliance directly into a 120V AC 60Hz outlet and turn the AC power switch on. Any current measured must not exceed 0.5mA.



AC Leakage Test

ANY MEASUREMENTS NOT WITHIN THE LIMITS OUTLINED ABOVE ARE INDICATIVE OF A POTENTIAL SHOCK HAZARD AND MUST BE CORRECTED BEFORE RETURNING THE APPLIANCE TO THE CUSTOMER.

2. PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in the appliance have special safety related characteristics. These are often not evident from visual inspection nor the protection afforded by them necessarily can be obtained by using replacement components rated for voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this Service Manual.

Electrical components having such features are identified by marking with a ⚠ on the schematics and on the parts list in this Service Manual.

The use of a substitute replacement component which does not have the same safety characteristics as the PIONEER recommended replacement one, shown in the parts list in this Service Manual, may create shock, fire, or other hazards.

Product Safety is continuously under review and new instructions are issued from time to time. For the latest information, always consult the current PIONEER Service Manual. A subscription to, or additional copies of, PIONEER Service Manual may be obtained at a nominal charge from PIONEER.

(FOR MODEL HEM & HB ONLY)

VAROITUS!

LAITE SISÄLTÄÄ LASERDIODIN, JOKA LÄHETTÄÄ NÄKYMÄTÖNTÄ, SILMILLE VAARALLISTA INFRAPUNASÄTEILYÄ LAITTEEN SISÄLLÄ ON LASERDIODIN LÄHEISYYDESSÄ KUVAN 1. MUKAINEN VAROITUSMERKKI.

LASER
Kuva 1
Lasersateilyn varoitusmerkki

WARNING!

DEVICE INCLUDES LASER DIODE WHICH EMITS INVISIBLE INFRARED RADIATION WHICH IS DANGEROUS TO EYES. THERE IS A WARNING SIGN ACCORDING TO PICTURE 1 INSIDE THE DEVICE CLOSE TO THE LASER DIODE.

LASER
Picture 1
Warning sign for laser radiation

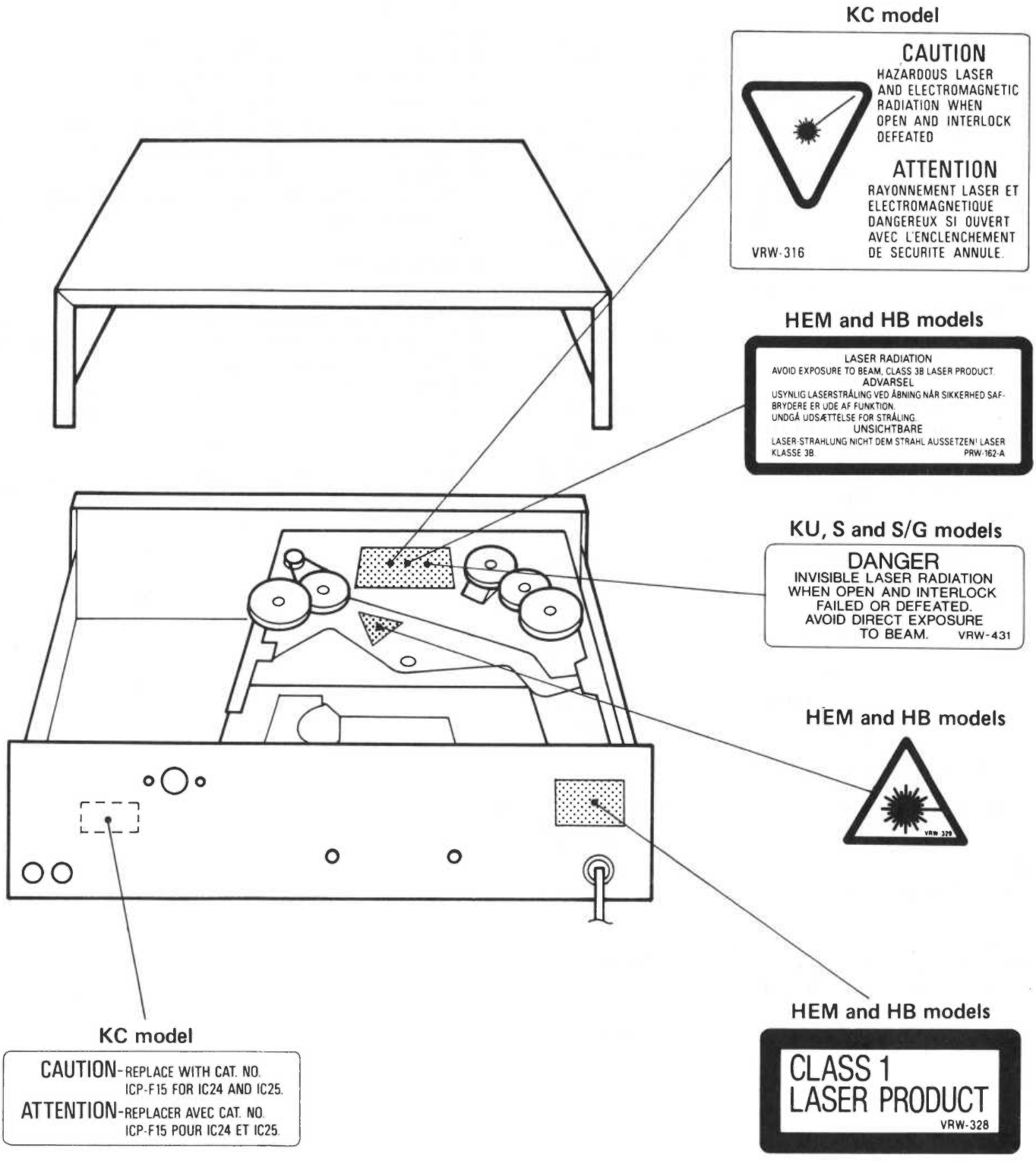
ADVERSEL:

USYNLIG LASERSTRÅLING VED ÅBNING NÅR SIKKERHEDSAFBRYDERE ER UDE AF FUNKTION UNDGÅ UDSAETTELSE FOR STRÅLING.

IMPORTANT

PIONEER COMPACT DISC PLAYER APPARATUS CONTAINS LASER OF HIGHER CLASS THAN 1. ALL OPERATION OF THE APPARATUS SHOULD BE DONE BY A SPECIALLY INSTRUCTED PERSON.

LABEL CHECK



Attached inside of the rear panel.

2. SPECIFICATIONS

1. General

Type.....Compact disc digital audio system
Usable discs .....Diameter 120 mm
Thickness 1.2 mm
Linear speed: 1.2 - 1.4 m/sec
Rotation direction (signal side): Counterclockwise
Signal format.....Sampling frequency: 44.1 kHz
Sampling bit number: 16 bit linear
Transmission bit rate: 4.3218 Mbit/sec.
Modulation system: EFM
Error correction system: CIRC
Preemphasis: 50/15 μ sec (during use)
Laser used Semiconductor laser: wavelength 780 nm
Power requirement
HEM model .....AC 220 V, 50/60 Hz
HB,HP model.....AC 240 V, 50/60 Hz
KU,KC model .....AC 120 V, 60 Hz
S,S/G model .....AC 110/120/220/240 V (switchable) 50/60 Hz
Power consumption
HEM,HB,HP,KU,KC model .....23 W
S,S/G model.....16 W
Operating temperature.....+5 °C — +35 °C
Weight
HEM,HB,HP,KU,KC,S model.....5.9 kg (13 lb)
S/G model .....6.7 kg (14 lb 12oz)
External dimensions
HEM,HB,HP,KU,KC,S model .....
420(W) x 315(D) x99(H) mm
16-9/16(W) x 12-7/16(D) x 3-15/16(H) in
S/G model.....457(W) x 315(D) x 100(H) mm
18(W) x 12-7/16(D) x 3-15/16(H) in

2. Audio section

Frequency response .....4 Hz - 20 kHz
(+0.5 dB)(-1.0 dB) (EIAJ)
S/N ratio .....more than 98 dB (EIAJ)
Dynamic range.....more than 94 dB (EIAJ)
Channel separation .....more than 92 dB (EIAJ)
Harmonic distortion .....less than 0.005 % (EIAJ)
Output voltage .....2.0 V ±0.5 V (EIAJ)
Wow and flutter .....less than (±0.001 %W.PEAK) (below measurable level)(EIAJ)
Output headphone ..... 30 mW(32 Ω)
Channels.....2-channel (stereo)

3. Functions

- Play
- Pause
- Manual search
- Track search
- Random playback
- Pause program
- All track repeat
- One-tune repeat
- One-disc repeat
- Programmed playback
- Programmed repeat
- Direct programming
- Initial play from selected track

The above functions can be operated with the remote control unit.

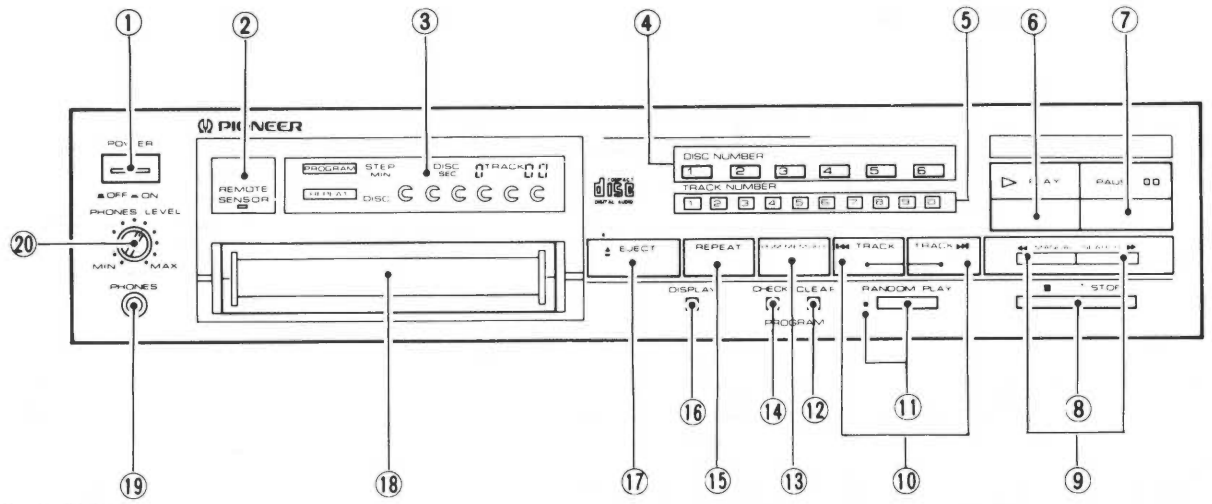
4. Accessories

- Remote control unit 1
- AAA/RO3 dry batteries.....2
- Six-compact-disc magazine.....1
- Single-compact-disc magazine.....1
- Output cable 1
- Operating instructions 1

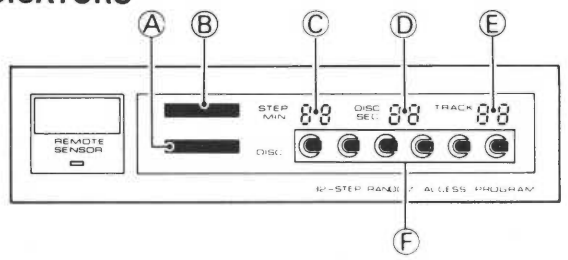
NOTE:
Specifications and design subject to possible modification without notice, due to improvements.

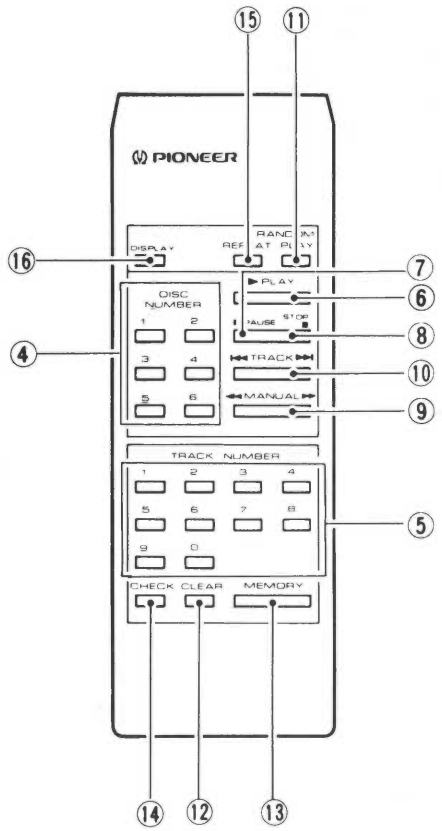
3. PANEL FACILITIES

FRONT PANEL AND REMOTE CONTROL UNIT



INDICATORS





① POWER switch

Press to turn power to the unit ON and OFF.

② REMOTE SENSOR and indicator

③ Indicators

- **Ⓐ REPEAT** : Lights during repeat play.
- **Ⓑ PROGRAM** : Lights after programming (after program has been memorized).
- **Ⓒ STEP/MIN** : Indicates program step (01 - 32) during play or search, or indicates time minute units.
- **Ⓓ DISC/SEC** : Indicates disc number (1 - 6) during play or search, or indicates time second units.
- **Ⓔ TRACK** : Indicates track number (01 - 99) during play or search.
- **Ⓕ DISC** : Indicates the disc during play or search.

④ DISC NO. keys (DISC NUMBER 1 - 6)

Use to select disc numbers for playback or programming.

⑤ TRACK NO. keys (TRACK NUMBER 1 - 0)

Use to select track numbers (track 1 - track 99) for playback or programming.

⑥ PLAY key and indicator

Press to begin playback, and to release the player from the pause mode.

⑦ PAUSE key and indicator

Press to temporarily interrupt playback. When pressed again, the player is released from the pause mode.

⑧ STOP

Press to stop playback. When pressed all operations stop.

⑨ MANUAL SEARCH keys

When the player is in play or pause modes, these keys are pressed to perform fast forward or fast backward operations, to allow manual searching. These operations are only carried out during the time either key is pressed. If pressed for more than 2 seconds, the speed increases.

- [►►] : Fast forward operation (If fast forward operation is performed to the end of the disc, END will be indicated and the player will enter pause mode)
- [◄◄] : Fast backward operation (If fast backward operation is performed to the beginning of the disc, the player will enter pause mode.) If these operations are performed during programmed play mode, the player will enter pause mode just before transferring to the next (or previous) step.

⑩ TRACK SEARCH keys

When the player is in the normal play, programmed play or pause modes, these keys are pressed to search for a desired track When pressed, the player will advance to the beginning of the next track on the disc, or reverse to the beginning of the current or previous track.

- [►►] : When pressed once, the disk playback advances to the beginning of the next track on the disc; when pressed continuously, the disk playback moves to the beginning of succeeding tracks on the disc. (During programmed playback, it moves to the beginning of the next programmed track.)
- [◄◄] : When pressed once, the disk playback returns to the beginning of the currently playing track; when pressed continuously, the disk playback moves further in reverse to the beginning of previous tracks on the disc. (During programmed playback it returns to the beginning of the previously programmed

⑪ RANDOM PLAY key and indicator

Press to begin random playback.

⑫ CLEAR key

Press to clear program.

⑬ PGM MEMORY key

Use to program a sequence of tracks.

- Press this key after selecting a desired disc and track with disc and track number keys. Tunes will be added to the program in the order in which they are specified.
- If only a disc number key is pressed, all tracks on the specified disc will be added to the program. The letters AL will appear on the indicator.

⑭ CHECK key

Press to check the contents of the program. Pressing this key when the player is stopped, will cause each successive program step and programmed disc number and track number to be displayed by the indicators, each time the CHECK key is pressed.

⑮ REPEAT key

Press to perform repeat playback

- If pressed during normal playback mode, all tracks on the disc will be played back repeatedly.
- If pressed during programmed playback, the programmed tracks will be repeatedly played back in the programmed order.

⑯ DISPLAY key

Changes the indicator displays.

- If pressed once during playback or pause mode, the display of elapsed playback time will be replaced with a display of the total playback time of a single disc and the total number of tracks. (The original display will be restored after 3.5 seconds.)
- If pressed twice in succession during playback or pause modes, the display will be replaced with a display of the disc number and track number. Pressing once again will restore the original display.

⑰ EJECT key

Press to eject a magazine or the disc tray. When pressed, any magazine (in case of single magazine, the disc tray) inside is expelled forward.

⑱ Magazine insertion slot

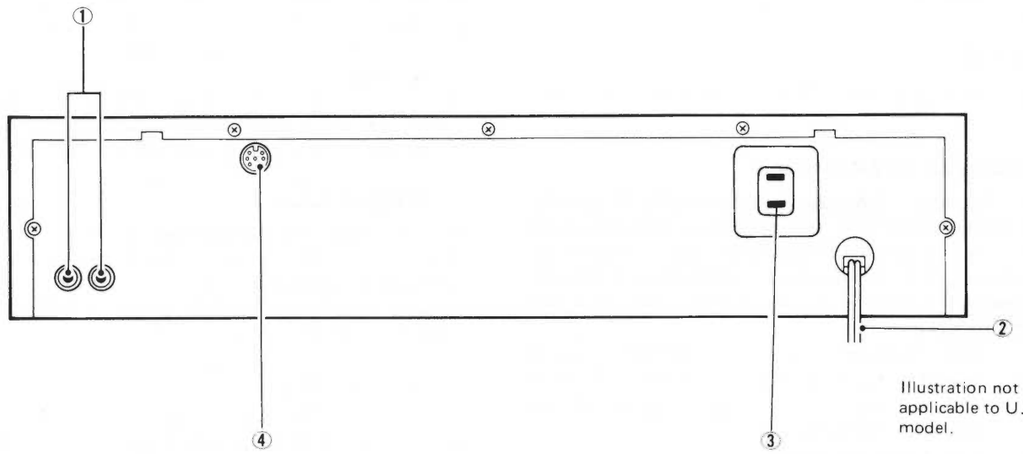
⑲ PHONES (headphones) jack

When using headphones, insert the plug for the headphones into the headphones jack.

⑳ PHONES LEVEL control knob

Use to adjust the level of sound when using headphones. Turning to the right causes the sound to become louder.

REAR PANEL



① AUDIO OUT terminals

② Power cord

③ AC OUTLET (UNSWITCHED, MAX. 100 W)

Power flows continually to this outlet, regardless of whether this equipment is switched ON or OFF. Electrical power consumption of the connected equipment should not exceed 100 W.

The equipment should be disconnected by removing the mains plug from the wall socket when not in regular use, e.g. when on vacation.

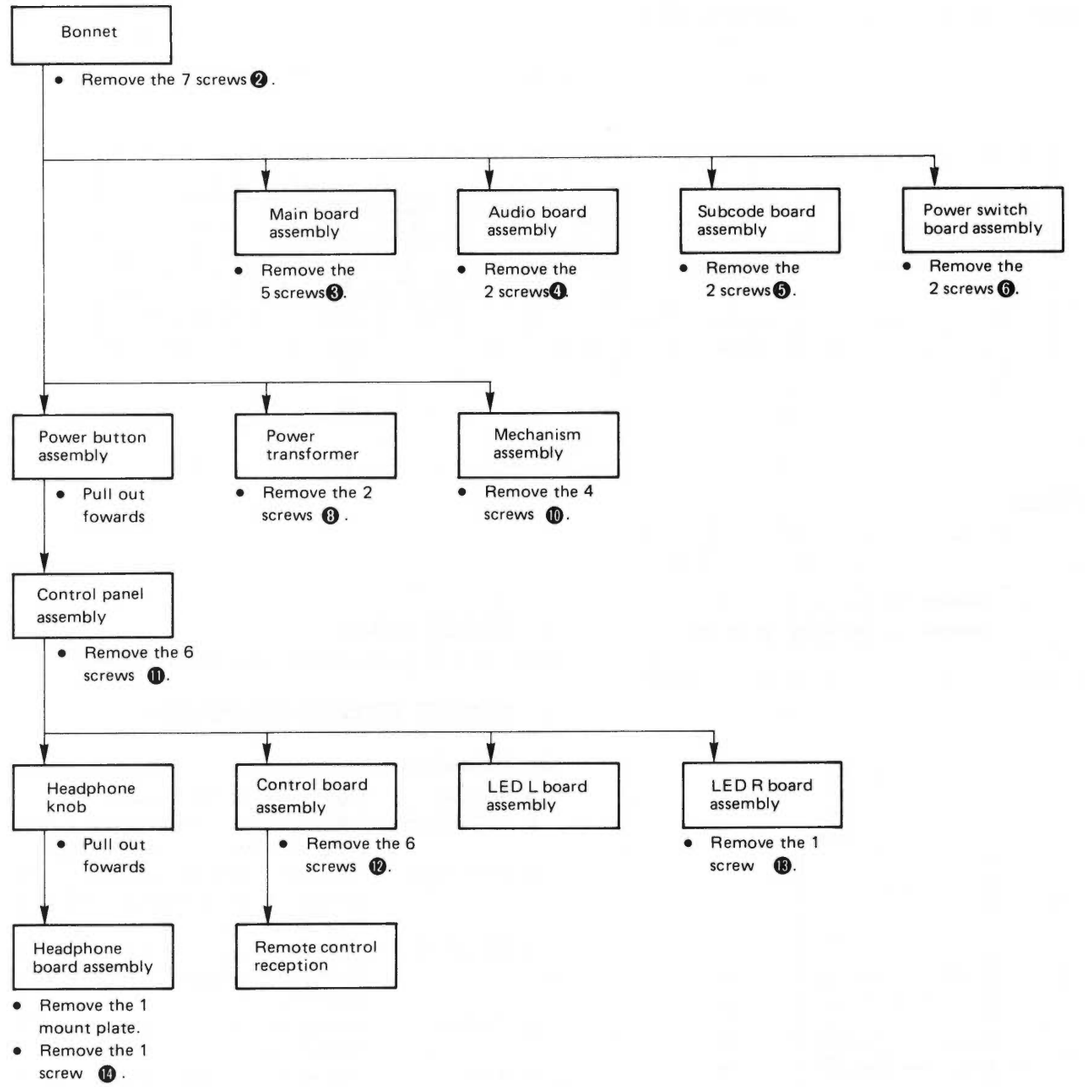
NOTE:
Do not connect appliances with high power consumption such as heaters, irons, or television sets to the AC OUTLETS in order to avoid overheating or fire risk.
This can cause this equipment to malfunction.

The HP model does not have this AC OUTLET.

④ SUBCODE OUT terminal

This terminal will be used for outputting subcodes (data recordable on compact discs together with audio signals) in future audio applications.

4. DISASSEMBLY



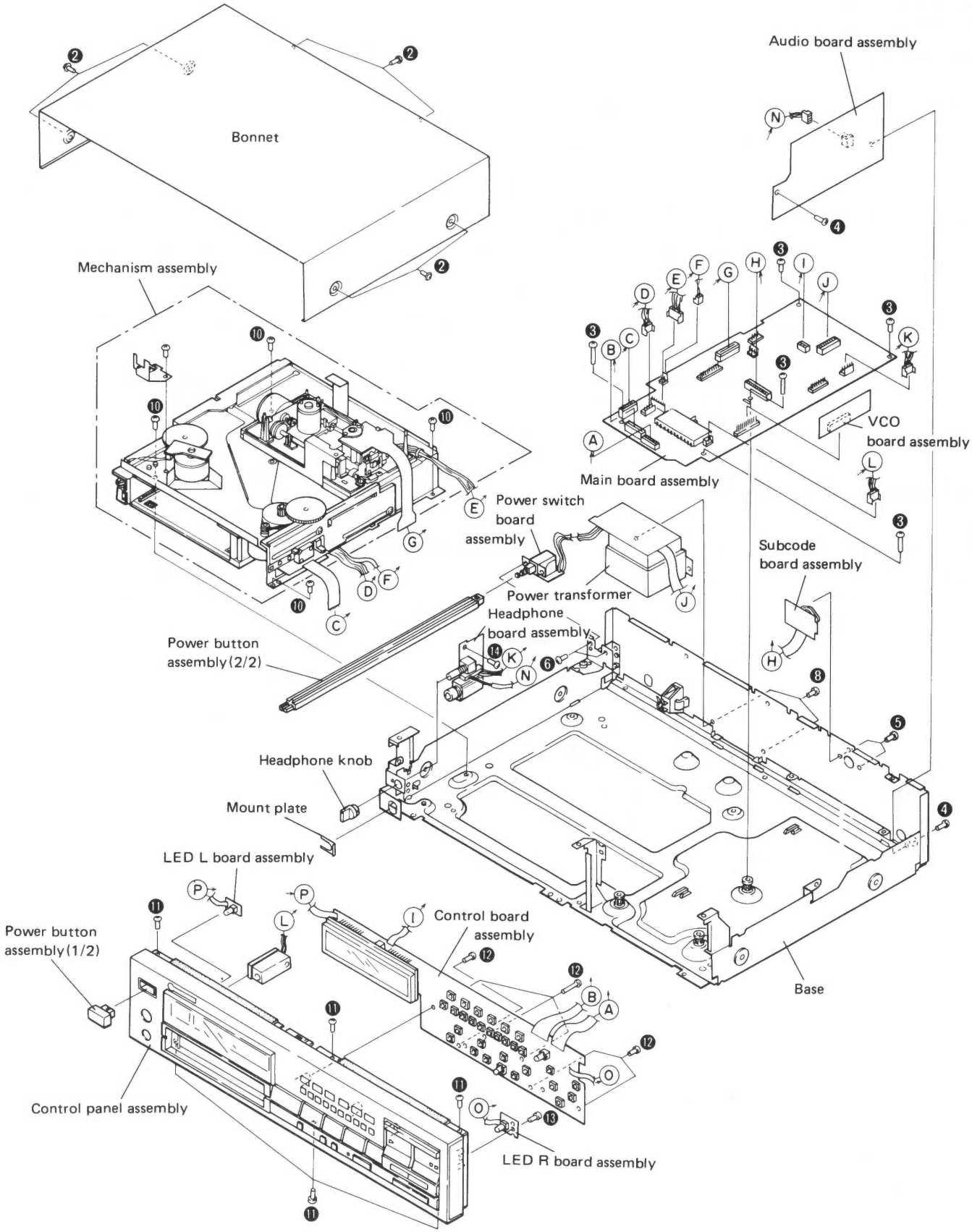
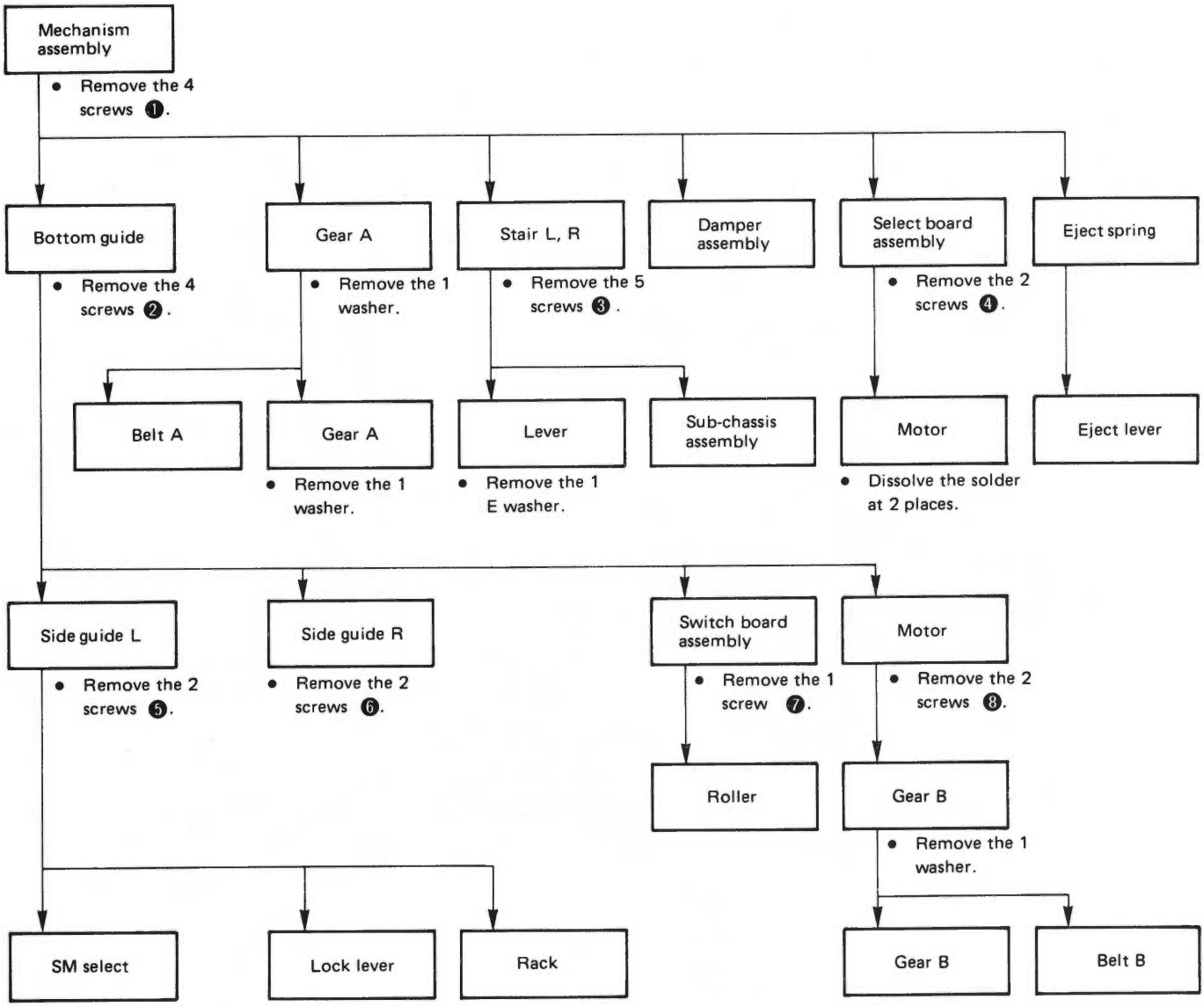


Fig. 4-1 Disassembly


Mechanism assembly
• Remove the 4 screws ❶.
Bottom guide
• Remove the 4 screws ❷.
Gear A
• Remove the 1 washer.
Stair L, R
• Remove the 5 screws ❸.
Damper assembly
Select board assembly
• Remove the 2 screws ❹.
Eject spring
Belt A
Gear A
• Remove the 1 washer.
Lever
• Remove the 1 E washer.
Sub-chassis assembly
Motor
• Dissolve the solder at 2 places.
Eject lever
Side guide L
• Remove the 2 screws ❺.
Side guide R
• Remove the 2 screws ❻.
Switch board assembly
• Remove the 1 screw ❼.
Motor
• Remove the 2 screws ❽.
Roller
Gear B
• Remove the 1 washer.
SM select
Lock lever
Rack
Gear B
Belt B

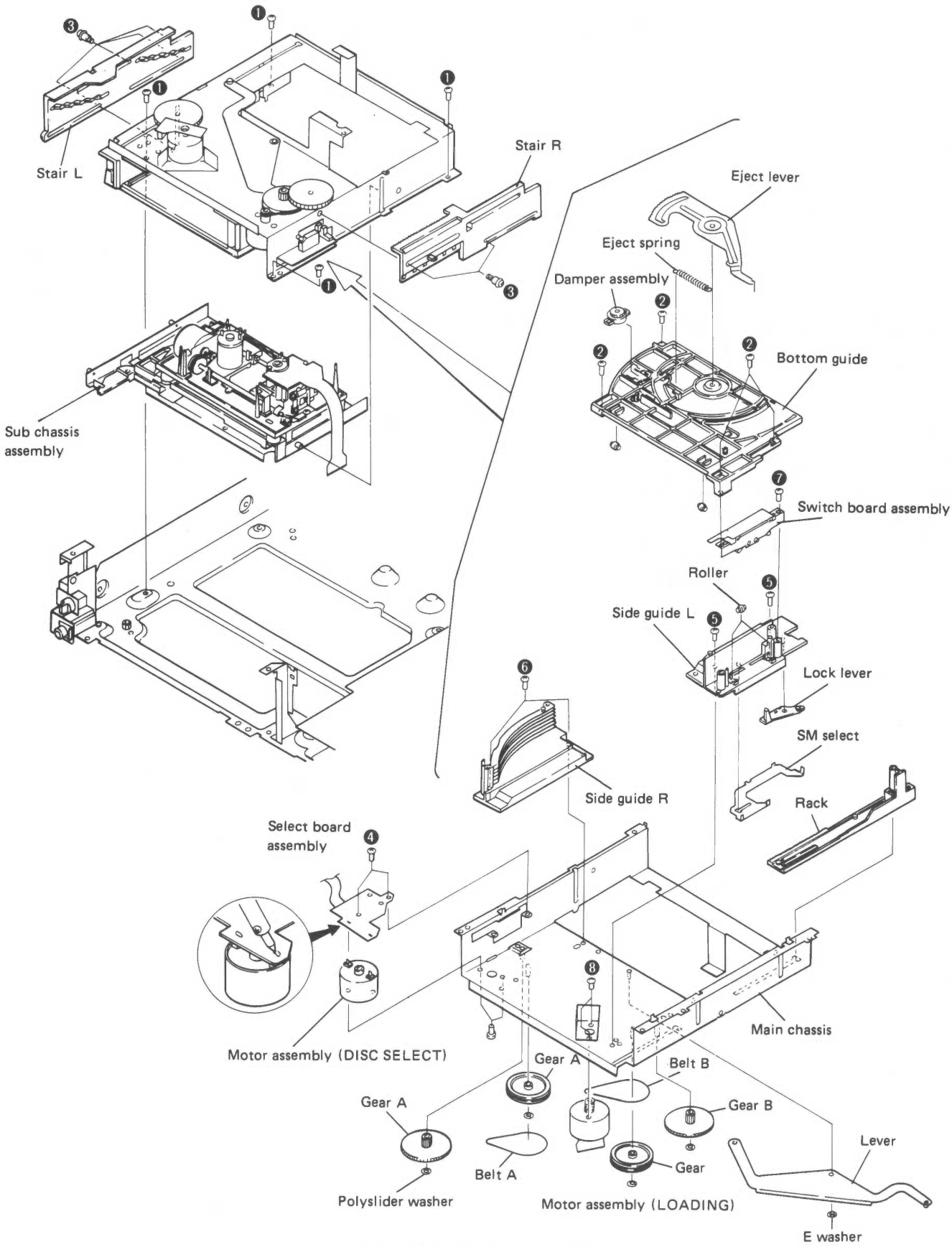
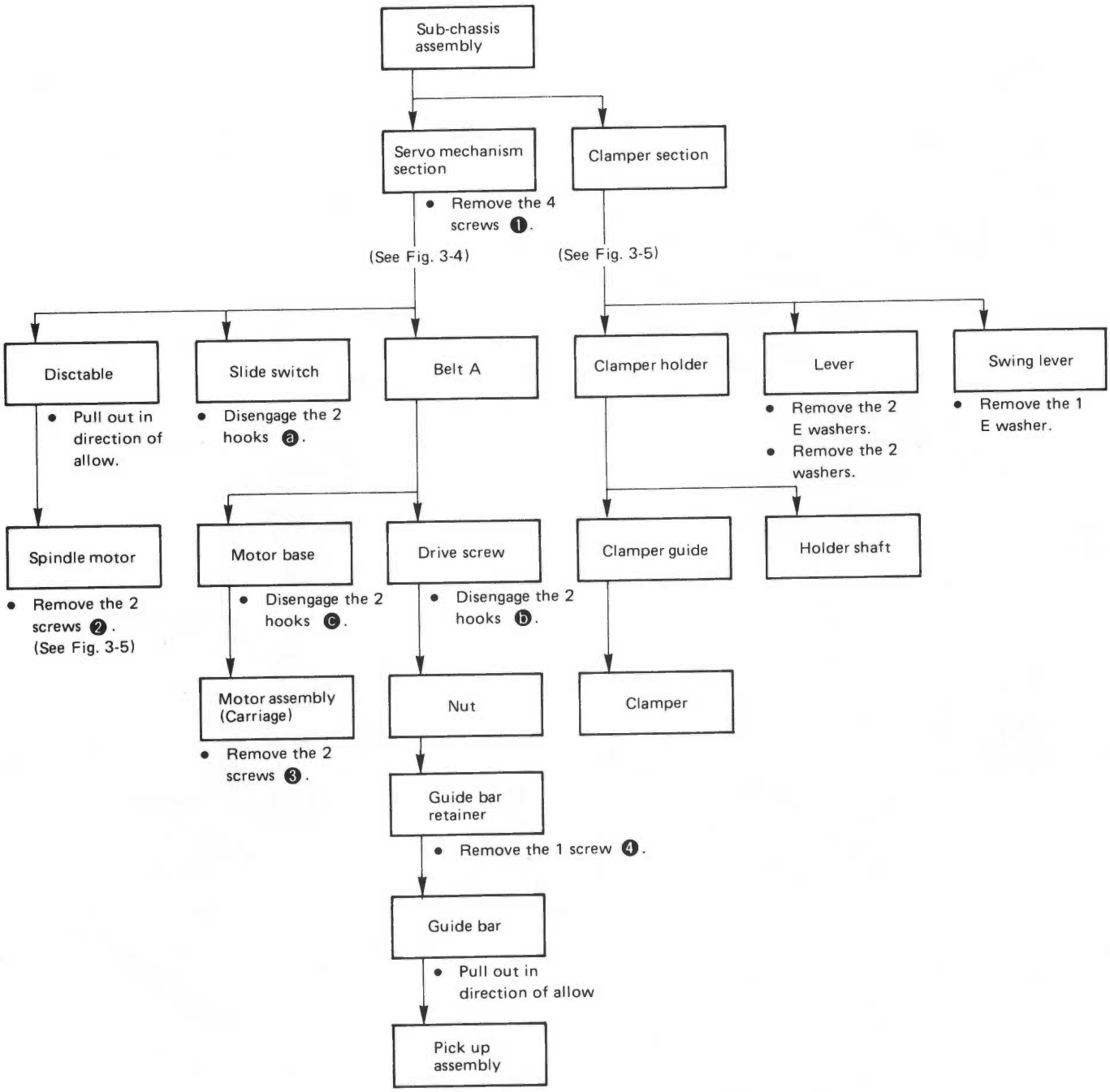


Fig. 4-2 Mechanism assembly



• Disc Table Assembly Procedures

When Disc table or Spindle motor has to be replaced, the height of the Disc table should be adjusted as shown in Fig. 4-3.

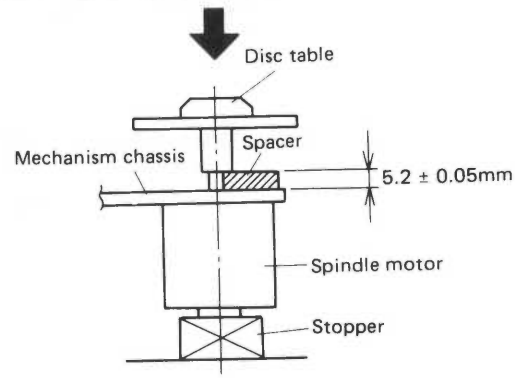


Fig. 4-3 Disc table assembly

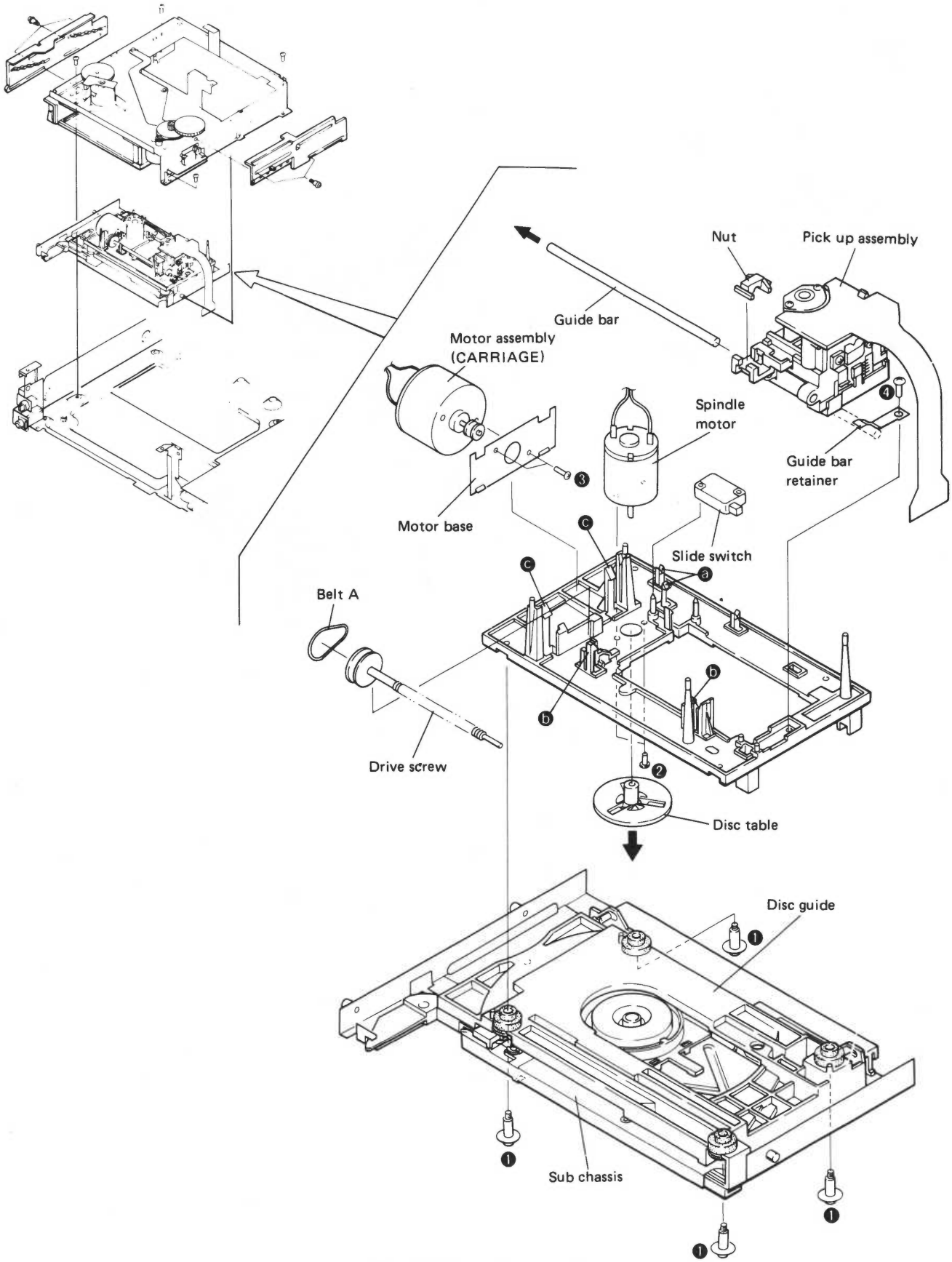


Fig. 4-3 Disc table assembly

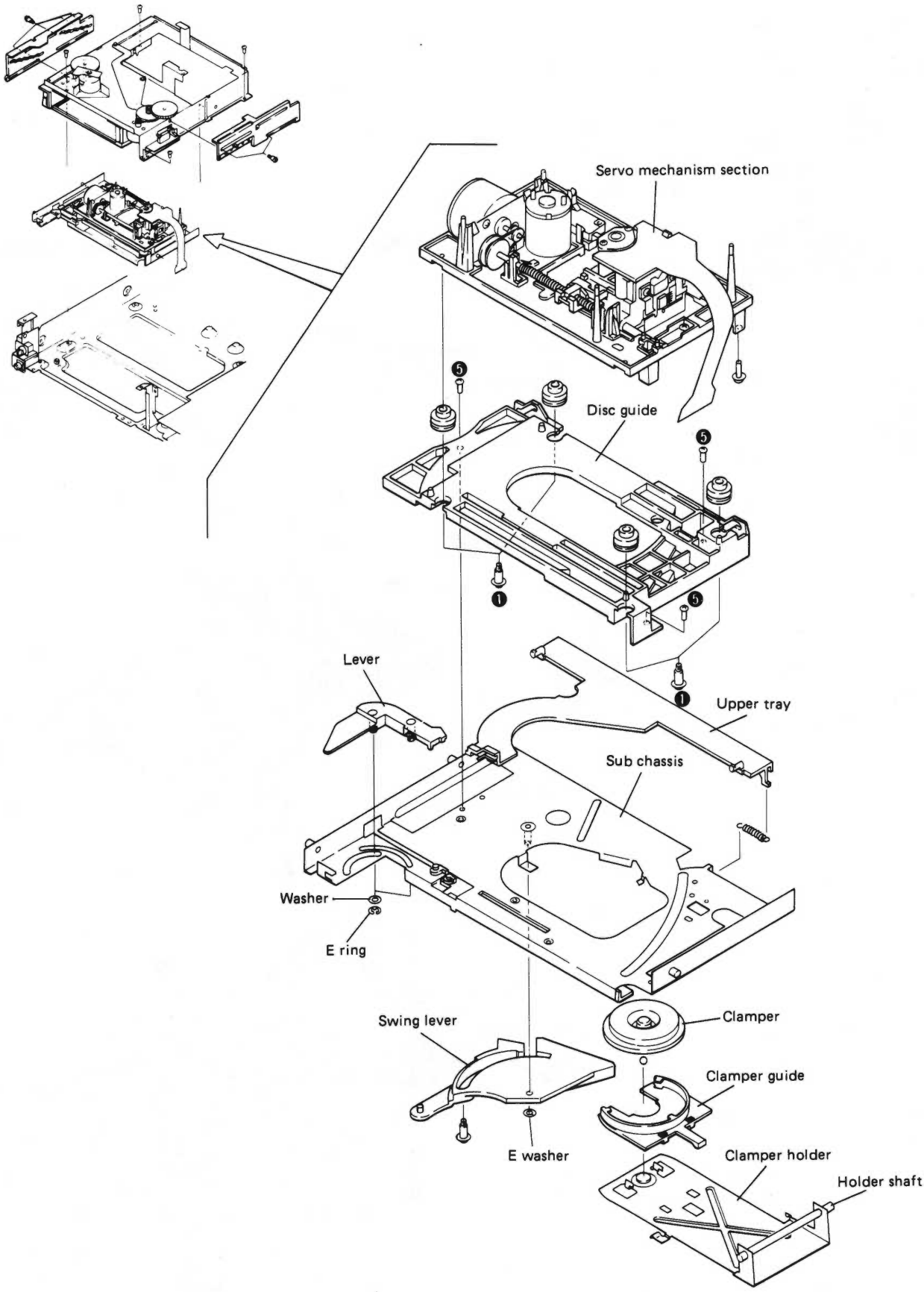

Servo mechanism section
Disc guide
Lever
Upper tray
Sub chassis
Washer
E ring
Swing lever
Clamper
Clamper guide
E washer
Clamper holder
Holder shaft

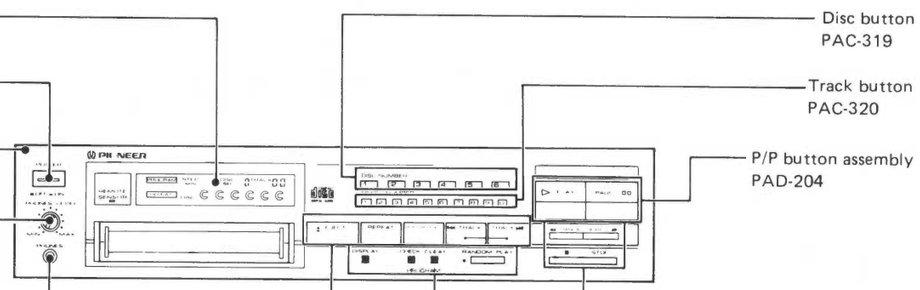
Fig. 4-5

5. PARTS LOCATIONS

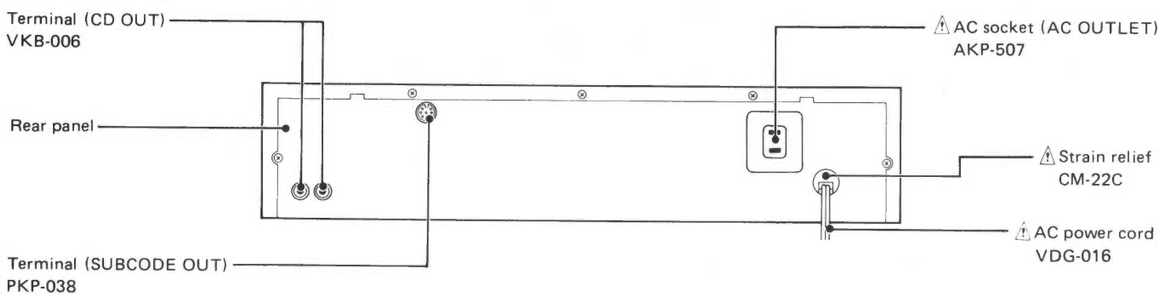
NOTES:

- *The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.*
- *For your parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.*
  ★★ GENERALLY MOVES FASTER THAN ★
  This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.
- *Parts marked by "◉" are not always kept in stock. Their delivery time may be longer than usual or they may be unavailable.*

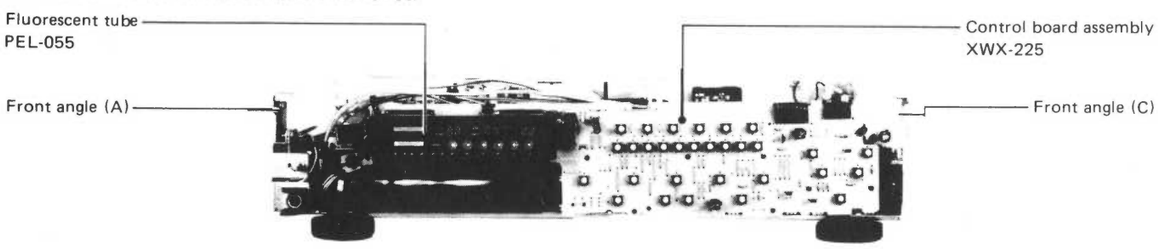
Front Panel View



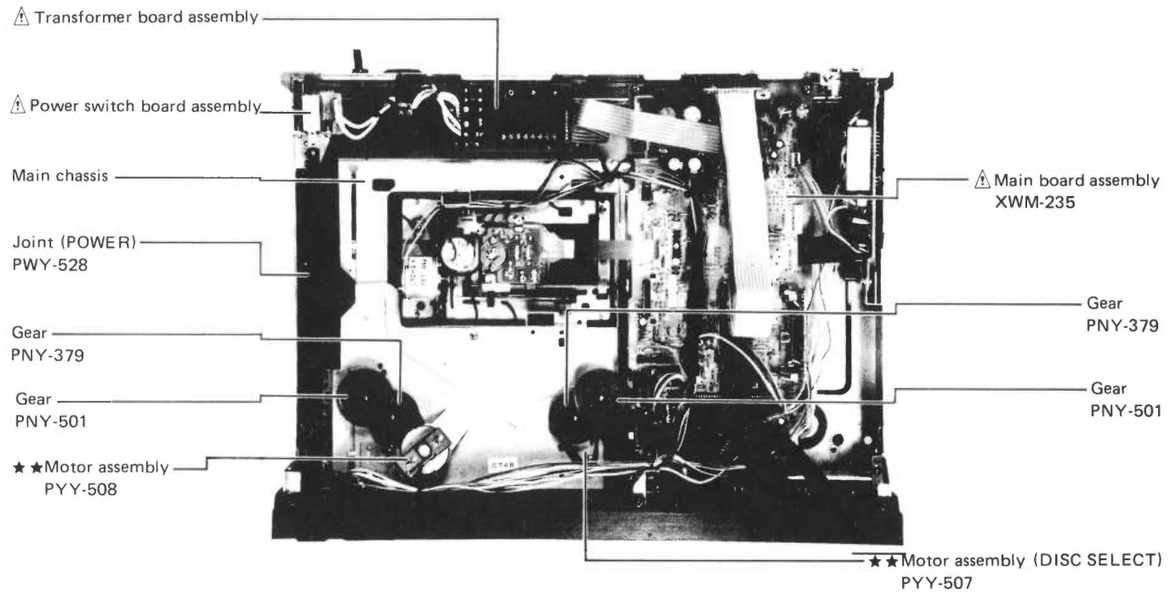
Rear Panel View



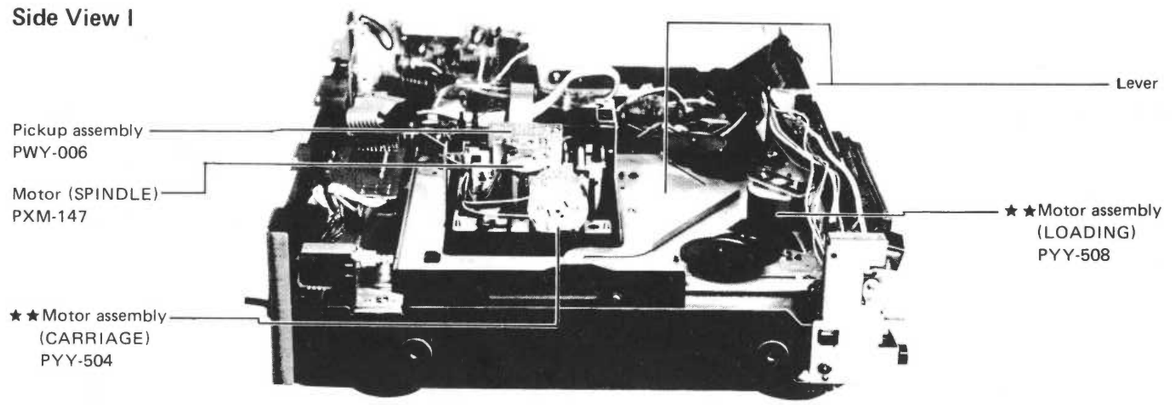
Front View with Front Panel Removed



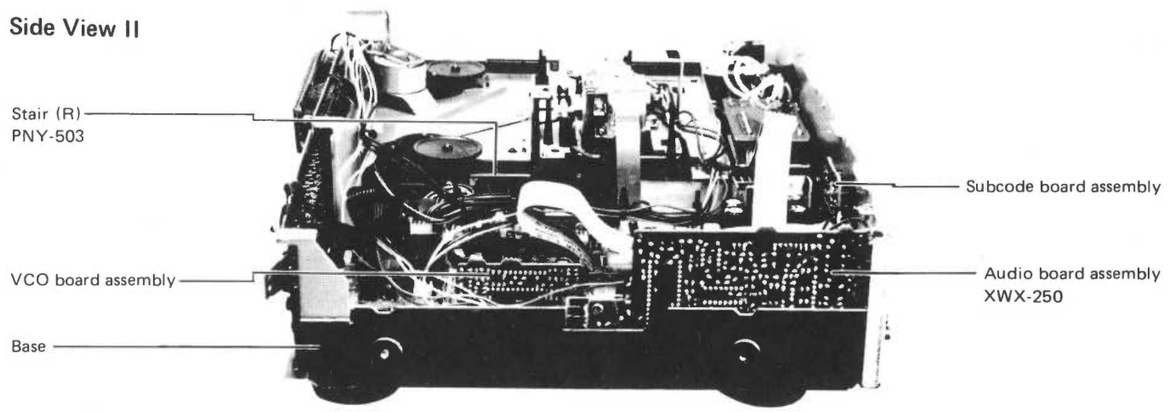
Top View



Side View I

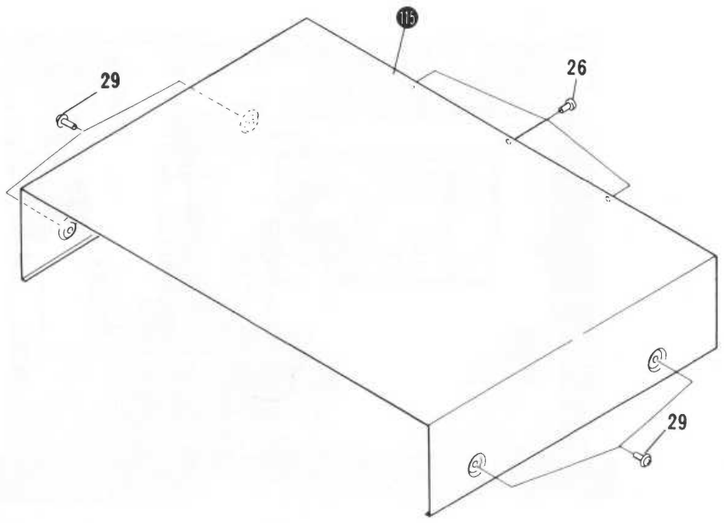


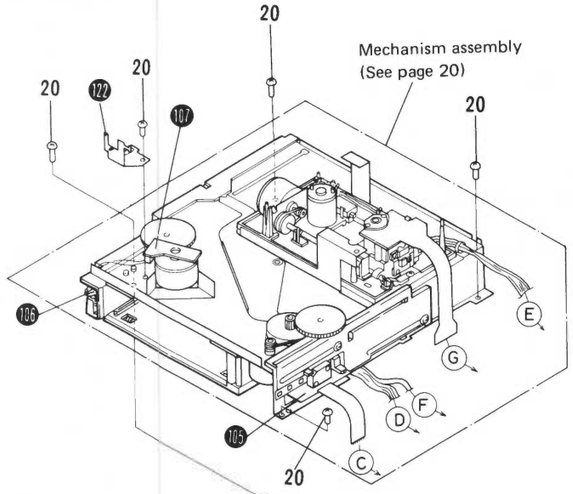
Side View II

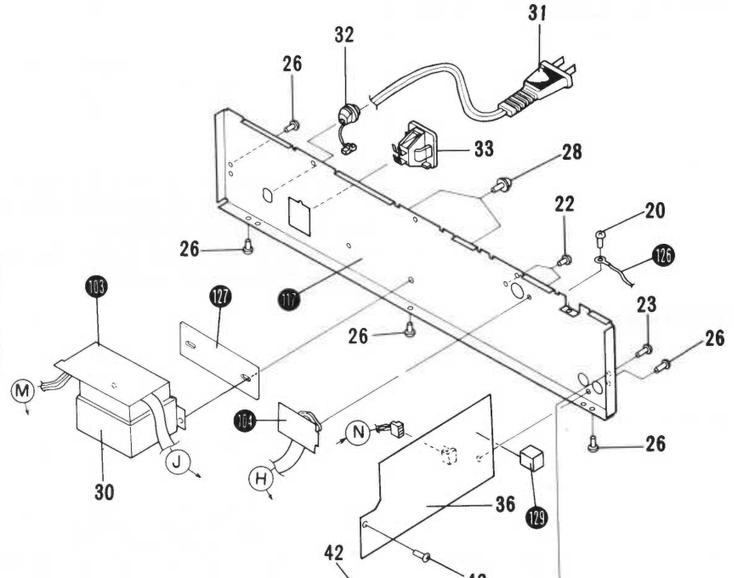


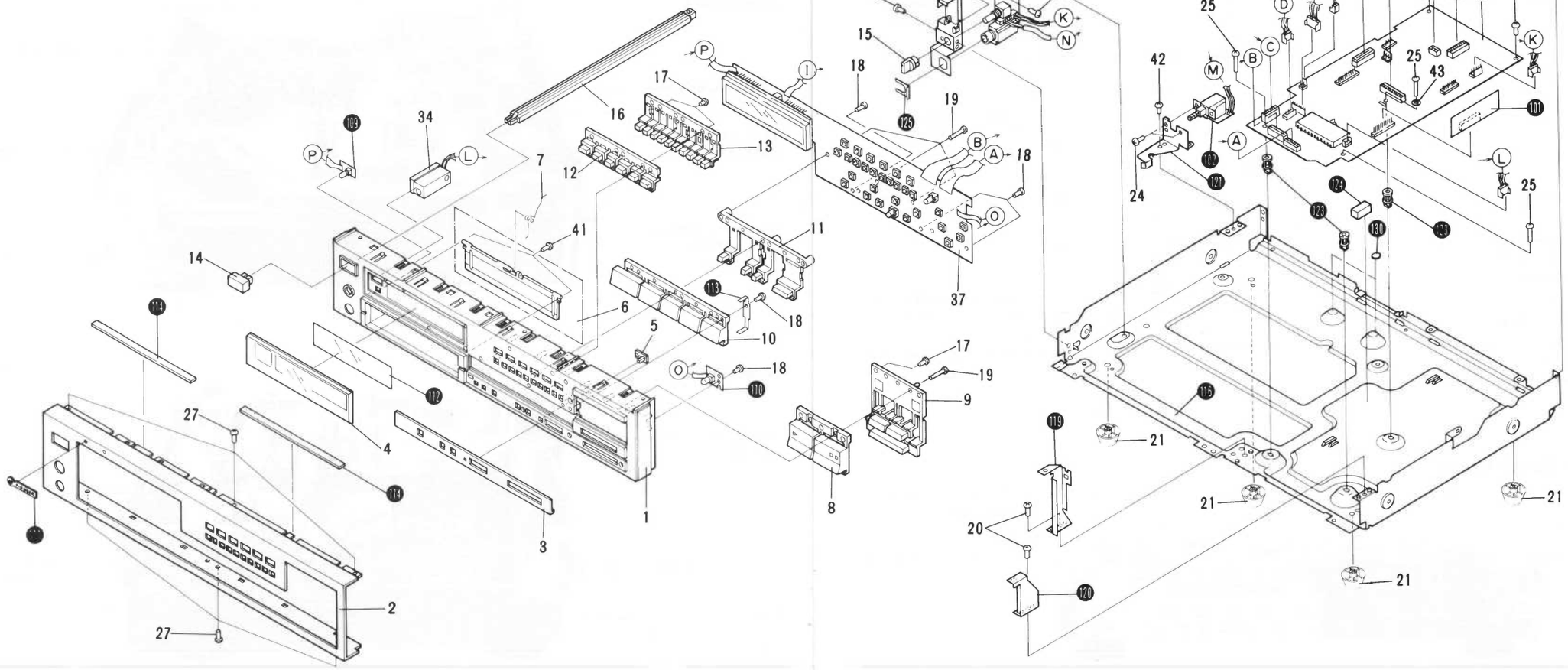
6. EXPLODED VIEWS AND PARTS LIST

6.1 EXTERIOR









NOTES:

- *Parts without part number cannot be supplied.*
- *The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.*
- *For your parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.*
  ★★ GENERALLY MOVES FASTER THAN ★
  This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.
- *Parts marked by "◉" are not always kept in stock. Their delivery time may be longer than usual or they may be unavailable.*

Parts List of Exterior

Mark	No.	Part No.	Description
	1.	PNY-524	Control panel
	2.	PAN-134	Front panel
	3.	PAN-135	Name plate
	4.	PAM-187	Window
	5.	PNY-583	Lens
	6.	PYY-509	Door assembly
	7.	PBH-456	Door spring
	8.	PAD-204	P/P button assembly
	9.	PAC-316	Stop button
	10.	PAC-317	Function button
	11.	PAC-318	Mode button
	12.	PAC-319	Disc button
	13.	PAC-320	Track button
	14.	PAC-321	Power button
	15.	PAC-266	Head phone knob
	16.	PWY-528	Power SW joint
	17.	PPZ30P120FMC	Screw
	18.	PPZ30P080FMC	Screw
	19.	PPZ30P220FMC	Screw
	20.	BBZ30P060FMC	Screw
	21.	REC-369	Foot assembly
	22.	PPZ26P060FZK	Screw
	23.	PPZ30P080FZK	Screw
	24.	PMZ30P060FMC	Screw
	25.	iBZ30P150FMC	Screw
	26.	BBZ30P060FZK	Screw
	27.	.....	.....
	28.	PMA40P080FZK	Screw
	29.	FBT40P080FZK	Screw
⚠ ★	30.	PTT-248	Power transformer
⚠	31.	VDG-016	AC power cord
⚠	32.	CM-22C	Strain relief
⚠	33.	AKP-507	AC outlet
	34.	PWX-109	Remote control reception
⚠◉	35.	XWM-235	Main board assembly
◉	36.	XWX-250	Audio board assembly
◉	37.	XWX-225	Control board assembly
	38.	PBA-093	Screw
	39.	.....	
	40.	.....	

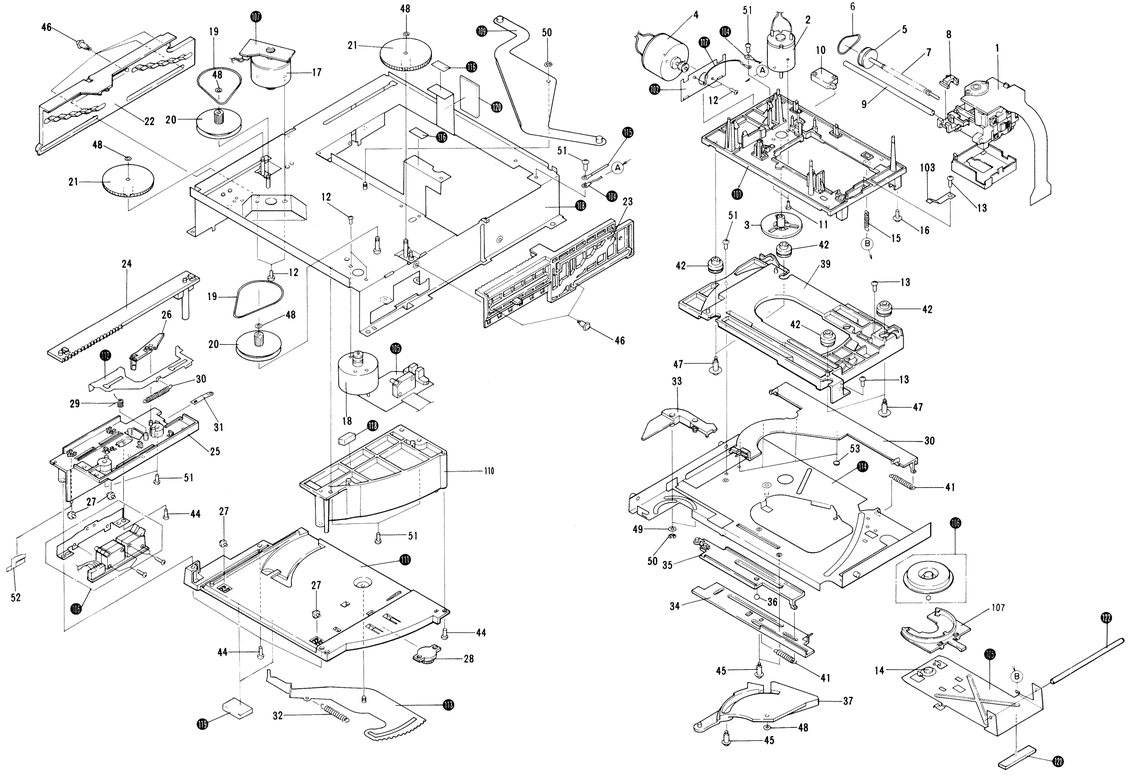
Mark	No.	Part No.	Description
	41.	iPZ30P060FZK	Screw
	42.	BBZ30P060FMC	Screw
	101.		VCO board assembly
⚠	102.		Power switch board assembly
⚠	103.		Transformer board assembly
	104.		Subcode board assembly
	105.		Select board assembly
	106.		Mechanism board assembly
	107.		Loading board assembly
	108.		Headphone board assembly
	109.		LED board assembly (L)
	110.		LED board assembly (R)
	111.		Friction board
	112.		FL filter
	113.		GND plate
	114.		Insulating sheet
	115.		Bonnet BD
	116.		Base
	117.		Rear panel
	118.		Front angle (A)
	119.		Front angle (B)
	120.		Front angle (C)
	121.		Switch angle
	122.		Reception angle
	123.		P.C.B. spacer
	124.		Spacer
	125.		Mount plate
	126.		Lead unit (GND)
	127.		Sheet
	128.		.....
	129.		Spacer
	130.		Spacer

6.2 MECHANISM ASSEMBLY

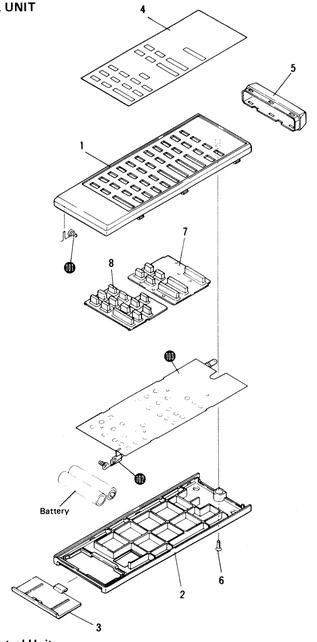
Parts List of Mechanism Assembly

Mark	No.	Part No.	Description
	1.	PWY-006	Pickup assembly
	2.	PXM-147	Spindle motor
	3.	PNY-272	Disc table
★★	4.	PYY-504	Motor assembly (CARRIAGE)
	5.	PNY-499	Pulley
	6.	PEB-314	Belt
	7.	PLB-282	Driver screw
	8.	PNY-500	Nut
	9.	PLB-272	Guide bar
★★	10.	PSH-007	Slide switch
	11.	PMZ20P030FMC	Screw
	12.	PMZ26P040FMC	Screw
	13.	BBZ30P060FMC	Screw
	14.	VNL-268	Receptacle
	15.	PBH-436	Clamper spring
	16.	iPZ30P080FMC	Screw
★★	17.	PYY-508	Motor assembly (LOADING)
★★	18.	PYY-507	Motor assembly (DISC SELECT)
	19.	PEB-315	Belt
	20.	PNY-379	Gear
	21.	PNY-501	Gear
	22.	PNY-502	Stair (L)
	23.	PNY-503	Stair (R)
	24.	PNY-504	Rack
	25.	PNY-505	Side guide (L)
	26.	PNY-585	Lock lever
	27.	PNY-386	Roller
	28.	PXC-016	Damper assembly
	29.	PBH-437	Twist spring
	30.	PBH-438	Multi spring
	31.	PBK-087	Press spring
	32.	PBH-439	Eject spring
	33.	PNY-509	Lever
	34.	PNY-510	Differential lever
	35.	PNY-511	Drive lever
	36.	PBP-001	Steel ball
	37.	PNY-512	Swing lever
	38.		
	39.	PNY-514	Disc guide
	40.	PNY-515	Upper tray

Mark	No.	Part No.	Description
	41.	PBH-466	Spring
	42.	PEB-316	Float rubber
	43.	BBZ30P060FZK	Screw
	44.	PPZ30P080FMC	Screw
	45.	PBA-112	Screw
	46.	PBA-125	Screw
	47.	PBA-188	Screw
	48.	WT25D047D025	Washer
	49.	WA31D054D025	Washer
	50.	YE25F	Washer
	51.	BBZ30P060	Screw
	52.	PBK-101	Side spring
	53.	PED-049	Cushion
	101.		Mechanism chassis
	102.		Motor base
	103.	PBK-086	Guide bar retainer
	104.		GND lead unit
	105.		Clumper holder
	106.		Clumper
	107.	PNY-498	Clumper guide
	108.		Main chassis
	109.		Lever
	110.	PNY-506	Side guide R
	111.		Bottom guide
	112.		SM select
	113.		Eject lever
	114.		Sub chassis
	115.		Cord retainer
	116.		Felt
	117.		Armor lead unit
	118.		BS spacer
	119.		Sheet
	120.		LPF damper
	121.		LPF damper
	122.		Holder axis



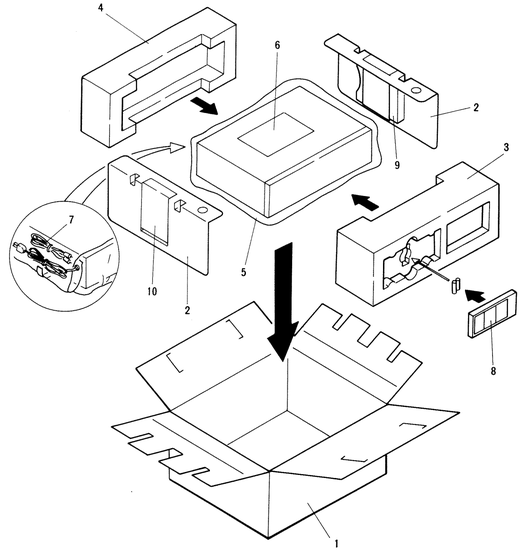
6.3 REMOTE CONTROL UNIT



Parts List of Remote Control Unit

Mark	No.	Part No.	Description
	1.	PNY-546	Case (A)
	2.	PNY-435	Case (B)
	3.	VNK-548	Cover
	4.	PAN-121	Plate
	5.	PNY-436	Filter
	6.	CRZ20P080FZK	Screw
	7.	PEB-325	Rubber sheet
	8.	PEB-324	Rubber sheet
	101.		Spring
	102.		Terminal
	103.		P.C. board

7. PACKING

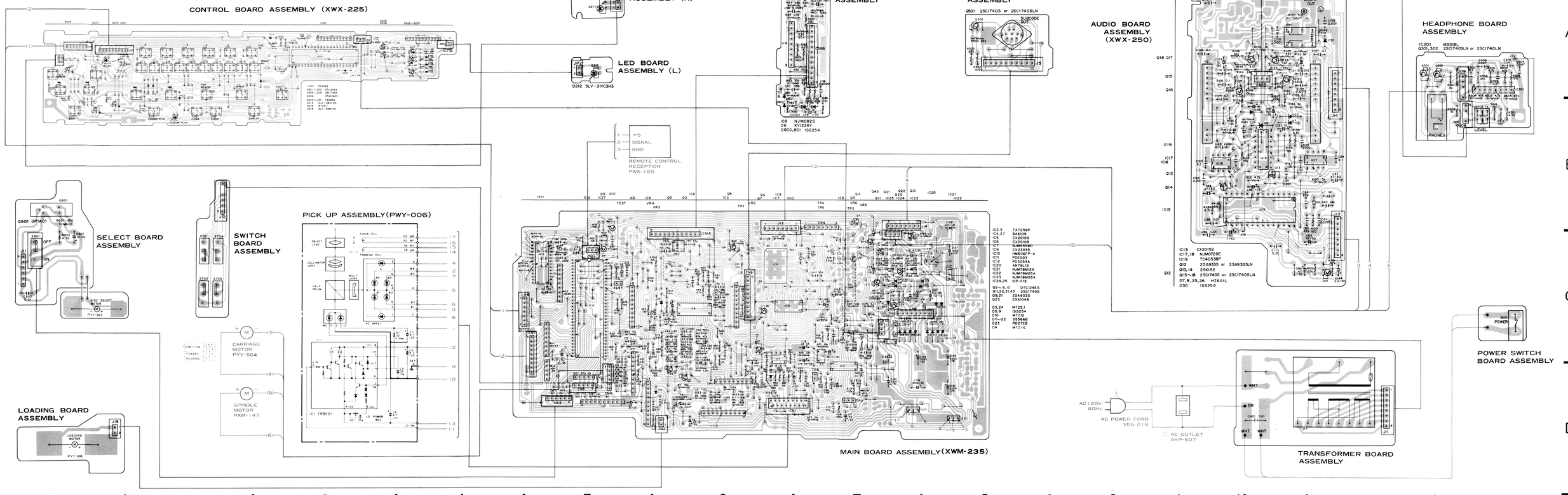


Parts List of Packing

Mark	No.	Part No.	Description
	1.	PHH-325	Packing case
	2.	PHC-119	Magazine holder
	3.	PHA-204	Protector (F)
	4.	PHA-205	Protector (R)
	5.	Z23-007	Mirror mat
	6.	PRB-303	Operating instructions
	7.	PDE-321	Connection instructions
	8.	PWW-004	Remote control unit
	9.	PXC-027	Magazine assembly
	10.	PXC-028	Single magazine assembly

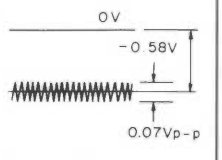
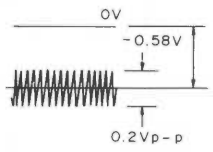
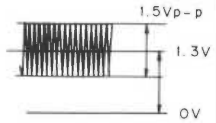
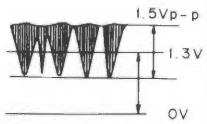
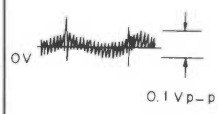
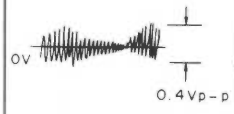
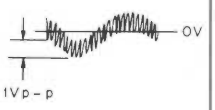
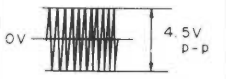
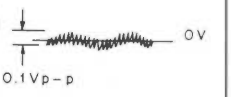
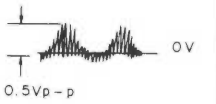
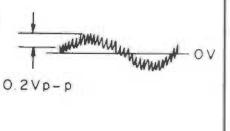
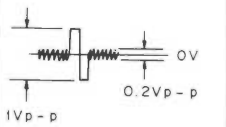
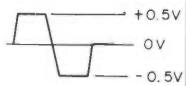
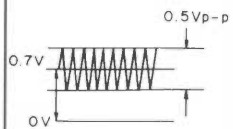
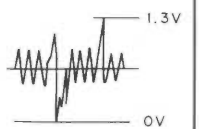
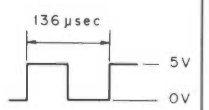
8. SCHEMATIC DIAGRAM AND P.C. BOARD PATTERNS

8.1 P.C. BOARDS CONNECTION DIAGRAM



• Wave Forms

Note: The waveform voltage and time values are general guides only.

	PLAY	SEARCH
①		
②		
③		
④		
⑤		
⑥		
⑦		
⑧		
⑨		

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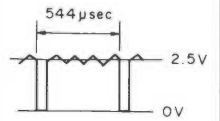
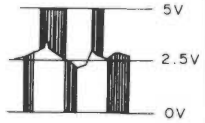
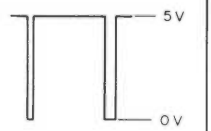
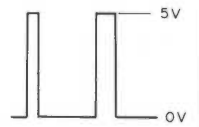
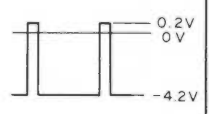
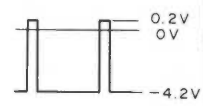
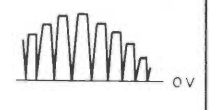
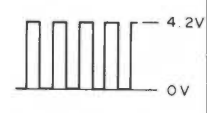
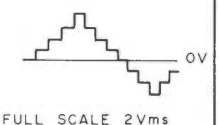
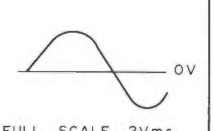
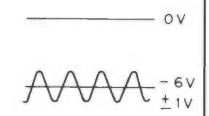
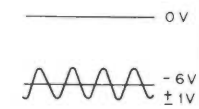
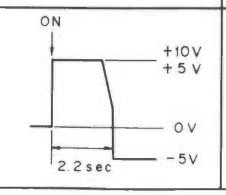
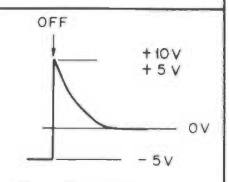
⑩		
⑪		
⑫		
⑬		
⑭		
⑮		
⑯		

	POWER ON	POWER OFF
⑰		

8.2 SCHEMATIC DIAGRAM

NOTE:

1. RESISTORS.
   Indicated in Ω, ¼W, ⅛ W.±5% tolerance unless otherwise noted k; kΩ, M; MΩ, (F); ±1%, (G); ±2%, (K); ±10%, (M); ±20% tolerance

2. CAPACITORS:
   Indicated in capacity (μF)/voltage (V) unless otherwise noted p; pF. Indication without voltage is 50V except electrolytic capacitor.

3. VOLTAGE
   ⌐¬; DC voltage (V) at no input signal

4. OTHERS:
   ➡ ; Signal route.
   ⊘ ; Adjusting point.
   The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.
   ✱ marked capacitors and resistors have parts numbers.

SWITCHES:

OUTSIDE OF P. C. BOARD ASSEMBLY
S101 : INSIDE ON - OFF

FUNCTION BOARD ASSEMBLY
S201 : 3 (DISC No)
S202 : 6 (DISC No)
S203 : RANDOM PLAY
S204 : DISPLAY
S205 : 2 (DISC No)
S206 : 7 (TRACK No)
S207 : PGM MEMORY
S208 : CHECK
S209 : CLEAR
S210 : REPEAT
S211 : TRACK SEARCH (⏭)
S212 : TRACK SEARCH (⏮)
S213 : 5 (DISC No)
S214 : 4 (DISC No)
S215 : PLAY
S216 : PAUSE
S217 : STOP
S218 : EJECT
S219 : 8 (TRACK No)
S220 : 9 (TRACK No)
S221 : MANUAL SEARCH (▶▶)
S222 : MANUAL SEARCH (◀◀)
S223 : 1 (DISC No)
S224 : 6 (TRACK No)
S225 : 5 (TRACK No)
S226 : 4 (TRACK No)
S227 : 3 (TRACK No)
S228 : 2 (TRACK No)
S229 : 1 (TRACK No)
S230 : 0 (TRACK No)

POWER SWITCH BOARD ASSEMBLY
S401 : POWER ON - OFF

SELECT BOARD ASSEMBLY
S601 : DISC SELECTOR ON - OFF
(HOME POSITION SW) (HOME POSITION – OUTSIDE OF HOME POSITION)

MECHANISM BOARD ASSEMBLY
S701 (LPS 1) :
S702 (LPS 2) : } LOAD POSITION SW

	STOP	During the loading	Clamp condition PLAY	during the eject
S701	ON (H)	OFF (L)	OFF (L)	ON (H)
S702	ON (H)	ON (H)	OFF (L)	OFF (L)

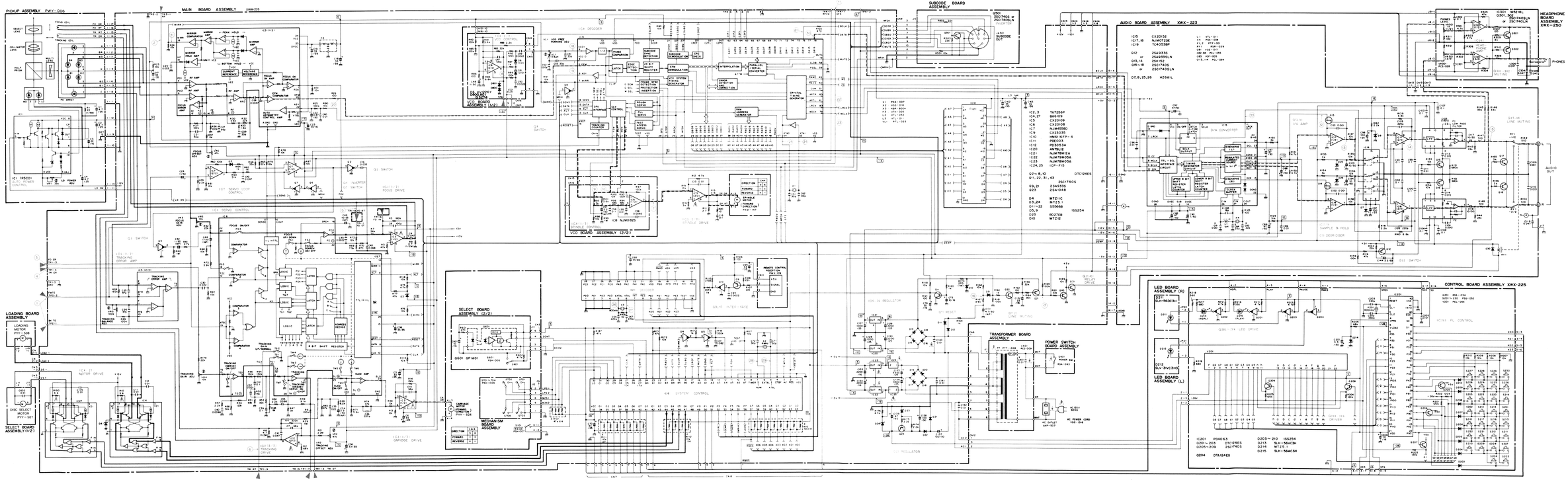
S703 (MZS 2) :
S704 (MZS 1) : } MAGAZINE DISCRIMINATE SW

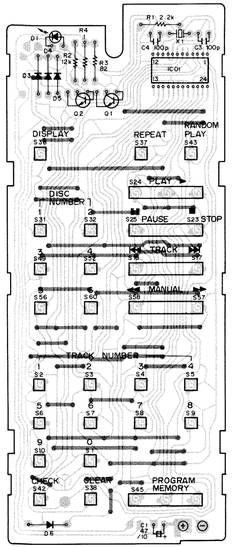
	NO MAGAZINE	SIX MAGAZINE	SINGLE
S703	ON (H)	OFF (L)	OFF (L)
S704	OFF (L)	ON (H)	OFF (L)

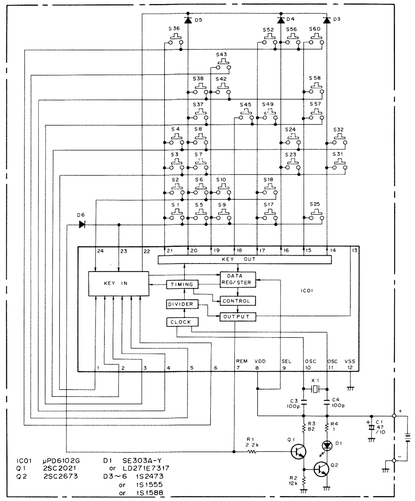
The underlined indicates the switch position.

——————— Focus servo loop line
- - - - - - - - - - - - - - - - Signal route
——————— Tracking servo loop line
- - - - - - - - - - - - - - - - Carriage servo line
——————— Loading motor route
- - - - - - - - - - - - - - - - Spindle motor route
——————— Disc select motor route

▶ Measurement point


PICKUP ASSEMBLY PWY-005
MAIN BOARD ASSEMBLY XWM-225
SUBCODE BOARD ASSEMBLY
AUDIO BOARD ASSEMBLY XWX-223
HEADPHONE BOARD ASSEMBLY XWX-250
CONTROL BOARD ASSEMBLY XWX-225
LED BOARD ASSEMBLY (R)
LED BOARD ASSEMBLY (L)
LOADING BOARD ASSEMBLY
SELECT BOARD ASSEMBLY (1/2)
SELECT BOARD ASSEMBLY (2/2)
MECHANISM BOARD ASSEMBLY
VCO BOARD ASSEMBLY (2/2)
TRANSFORMER BOARD ASSEMBLY
POWER SWITCH BOARD ASSEMBLY
PHONES
AUDIO OUT
AC INLET
AC POWER CORD





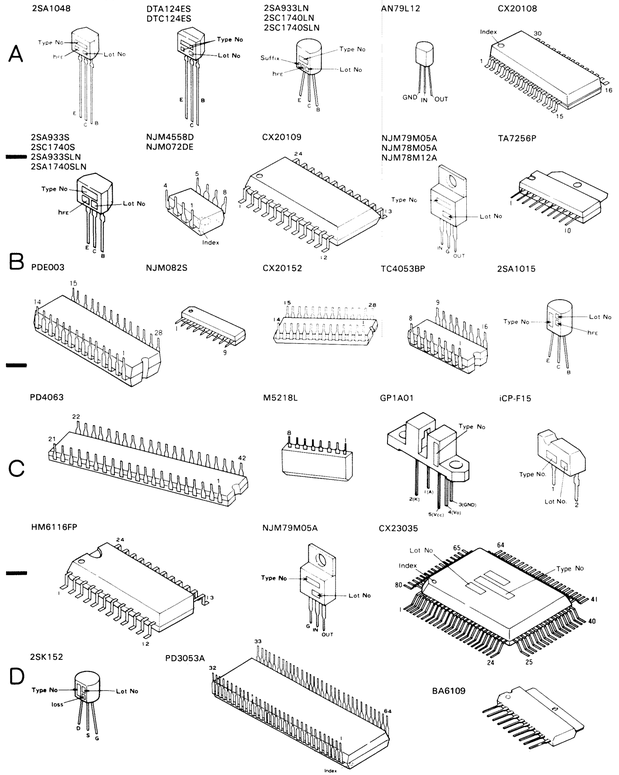
1. RESISTORS:
Indicated in Ω, ¼W, ½W:±5% tolerance unless otherwise noted k; kΩ, M; MΩ. (F); ±1%, (G); ±2%, (K); ±10%, (M); ±20% tolerance

2. CAPACITORS:
Indicated in capacity (μF)/voltage (V) unless otherwise noted p; pF. Indication without voltage is 50V except electrolytic capacitor.

3. OTHERS:
➡ Signal route.
Ⓐ Adjusting point.
The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.
✱ marked capacitors and resistors have parts numbers.

SWITCHES:
S1 : 0
S2 : 1
S3 : 2
S4 : 3
S5 : 4
S6 : 5
S7 : 6
S8 : 7
S9 : 8
S10 : 9
S17 : TRACK ⏭
S18 : TRACK ⏮
S23 : STOP ■
S24 : PLAY ▶
S25 : PAUSE ❚❚
S31 : 1
S32 : 2 } (DISC NUMBER
S36 : DISPLAY
S37 : REPEAT
S38 : CLEAR
S42 : CHECK
S43 : RANDOM PLAY
S45 : PROGRAM MEMORY
S49 : 3
S52 : 4 } (DISC NUMBER)
S56 : 5
S57 : MANUAL ⏩
S58 : MANUAL ⏪
S60 : 6 (DISC NUMBER)
(TRACK NUMBER)

● External Appearance of Transistors and ICs



8.4 LIST OF SYMBOLS

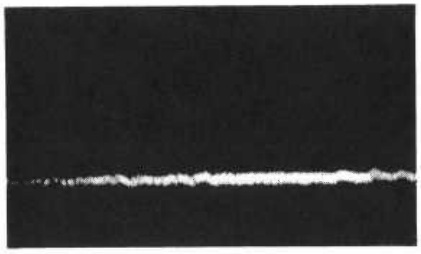
Symbol	Signal Source	Signal Name	Function
A			Tracking signal lead code detector
A0~A10	IC9-38~48	Address line	
APCG	IC1-6	APC GND	
B1~B4			Output from 1/4 divider detectors used to detect RF and focus signals
BCLK	IC9-76	Bit clock	
C			Tracking signal end code detector
C-OUT	IC6-6	Counter out	Track count signal pulse
C1F1	IC9-62	Error flag	Flags indicating when decoder LSI is correcting errors
C1F2	IC9-63	Error flag	
C2F1	IC9-64	Error flag	
C2F2	IC9-65	Error flag	
CA-DR	IC3-2	Carriage drive	Carriage motor drive output
CLK	IC12-27	Clock	IC6 and IC9 control data (serial) clock (MHz)
CRCF	IC9-20		Sub-code Q error detection result output (synchronized with SCOR signal)
$\overline{CS}$	IC9-50	Chip select	RAM activator control signal
D1~D8	IC9-37~34 32~29	Data line	RAM data line
DATA	IC9-78	Data	DAC playback signal data (serial)
$\overline{DEMP}$	IC12-53	De-emphasis	De-emphasis on/off signal (L: de-emphasis ON)
DIRC	IC12-52	Direct	Control signal involved in single track jumping (control only while signal is at L level)
EXCK	IC9-21	External clock	External clock input
$\overline{FG\ DW}$	IC12-54	Focus gain down	Control signal for reducing focus servo gain
FO-DR	IC2-2	Focus drive	Focus actuator drive signal
FO-ER	IC5-16	Focus error	Focus error signal
FO-IN	TP1-6	Focus loop in	Focus servo gain adjustment input
FO-OT	TP1-1	Focus loop out	Focus servo gain adjustment output
FO-RT	TR1-8	Return	Focus actuator drive current detector
FOK	IC5-1	Focus OK	H level output to indicate that "in focus" status is set when RF signal is obtained
GFS	IC9-28	GFS	Frame sync lock status output (H: locked)
GND		GND	
$\overline{INSD}$	S101	Inside	Detector signal indicating that pick-up has reached inside track
K			
KD0~KD5	IC11 9~12 15, 17	Key data	Key on/off matrix encoded data
$\overline{KS}$	IC201-11	Key strobe	Output indicating that key has been pressed (L output when key is ON)
L-IN	IC12-44	Loading in	Loading-in control signal
L-OUT	IC12-45	Loading out	Loading-out control signal
LD ON	IC12-56	Laser diode on	Laser diode switching signal (H: diode ON)
LOAD +	IC4-10		Loading motor drive voltage output
LOAD −	IC4-2		
LRCK	IC9-80	LR clock	Clock (MHz) for switching decoder (DAC) left/right channels

Symbol	Signal Source	Signal Name	Function
MIRR	IC5-18	Mirror	Pitless side (mirror surface) detector signal (pitless side: H)
MRIH	IC12-55	Mirror inhibit	Control signal which inhibits transfer of MIRR signal from IC5 to IC9
MUTE	IC12-16	Muting	IC9 digital mute control signal
RA0V	IC9-57	RAM overflow	Output signal generated when RAM area overflow occurs (overflow: H)
$\overline{\text{RESET}}$	Q11-C	Reset	Power ON reset signal
RFCK	TP4-7(IC9, 25)	Read frame clock	Standard frame clock signal (7.35kHz)
$\overline{\text{RMKS}}$	IC12-57	Remote control key	Remote control key strobe passed from remote control decoder (IC11) to main microprocessor (IC12)
SBS0	IC9-22		Sub-code serial output
SCK	IC12-41	Serial clock	FL display data transfer clock (MHz)
SCLK	IC13-4	System clock	Audio playback system clock (MHz)
SC0R	IC9-24		Sub-code sync
SD	IC12-42	Serial data	Control signal passed to FL control CPU
SENS	IC6-5		Detector output bus from IC6 & IC9
SP·DR	CN4-5	Spindle drive	Spindle motor drive output
SP·RT	CN4-6	Spindle return	Spindle motor drive current detector
SRES	IC12-23	Sub reser	Key/display/microprocessor reset signal
STS	IC201-21	Status	Display data "ready to send"
SUBO	IC9-23	Sub-code Q	Sub-code Q output (address and other data)
TR·DR	IC2-8	Tracking drive	Tracking actuator drive signal
TR·ER	IC5-17	Tracking error	Tracking servo error output
TR·IN	TP1-7	Tracking loop in	Tracking servo gain adjustment input
TR·OT	TP1-2	Tracking loop out	Tracking servo gain adjustment output
TR·RT	TP1-9	Tracking return	Tracking actuator drive current detector
WCLK	IC13-21		Digital filter 88.2kHz strobe signal input
WDCK	IC9-79		Digital filter 88.2kHz strobe signal output
$\overline{\text{WE}}$	IC9-49	Write enable	RAM write enable
WFCK	IC9-25	Write from clock	Frame clock signal made from data (frame sync. lock: 7.35kHz)
$\overline{\text{XLT}}$	IC12-14		Servo and decode IC serial data latch clock pulse signal
DCNT	IC12-24	DISC COUNT	Count pulse input to detect DISC SELECT
DCHM	IC12-26	DISC HOME	DISC SELECT home position detection SW input
LPS1	IC12-28	Loading position	Loading position detection SW input
LPS2	IC-29	Loading position	Loading position detection SW input
MZS1	IC12-30	MAGAZINE DC-TEG	Magazine and its kind detection SW input
MZS2	IC12-31	MAGAZINE DC-TEG	Magazine and its kind detection SW input
DSUP	IC12-46	DISC SELECT UP	DISC SELECT motor drive output
DSDW	IC12-47	DISC SELECT DOWN	DISC SELECT motor drive output

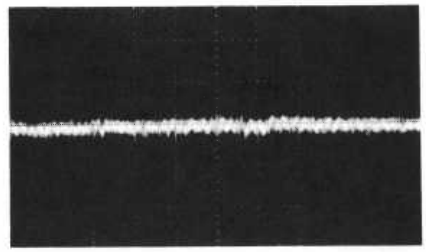
8.5 WAVE FORMS

NOTE: The encircled numbers denote measuring points in the circuit and pattern diagrams.

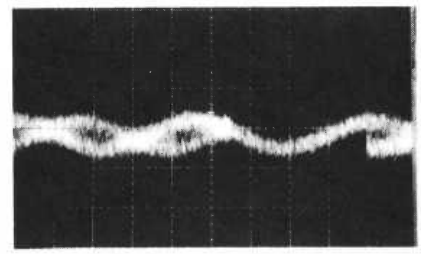
① TP2-2 MODE : PLAY
V: 200mV/div H: 2m sec/div



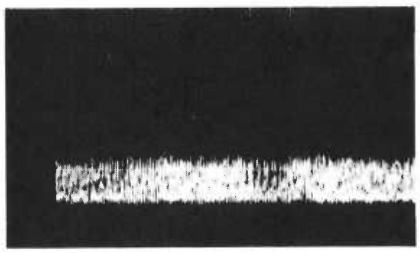
③ TP1-2 MODE : SEARCH
V: 500mV/div H: 5m sec/div



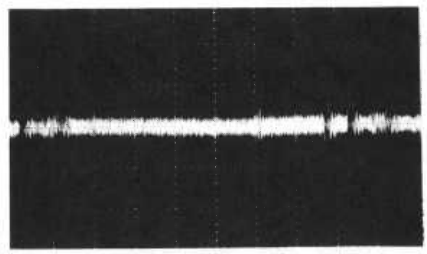
6 TP1-9 MODE : PLAY
V: 500mV/div H: 10m sec/div



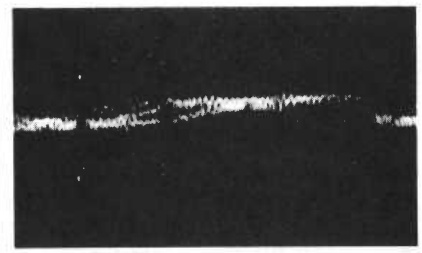
① TP2-2 MODE : SEARCH
V: 200mV/div H:2m sec/div



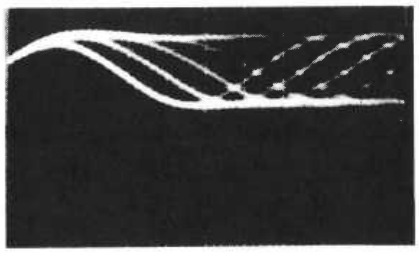
④ TP1-4 MODE : PLAY
V· 2V/div H: 20m sec/div



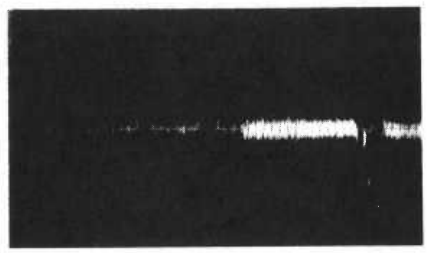
6 TP1-9 MODE : SEARCH
V: 500mV/div H: 10m sec/div



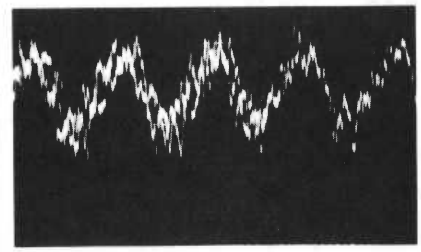
② TP5-1 MODE : PLAY
V: 1V/div H: 200n sec/div



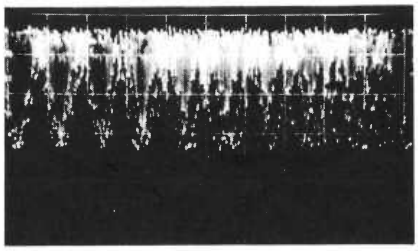
④ TP1-4 MODE : SEARCH
V: 2V/div H: 20m sec/div



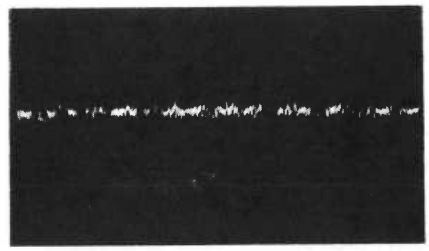
⑦ IC8-2 MODE : PLAY
V: 200mV/div H: 50m sec/div



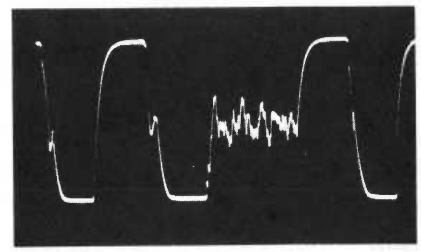
② TP5-1 MODE: SEARCH
V: 500mV/div H: 100μsec/div



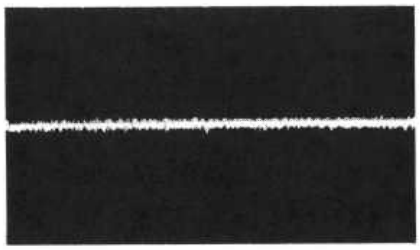
⑤ TP1-8 MODE : PLAY
V: 500mV/div H: 10m sec/div



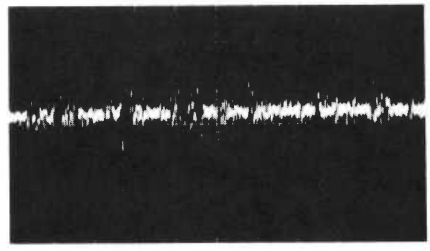
⑦ IC8-2 MODE : SEARCH
V: 2V/div H: 200m sec/div



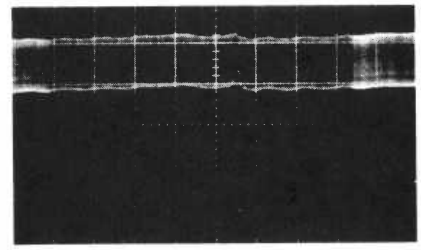
③ TP1-3 MODE : PLAY
V: 500mV/div H: 5m sec/div



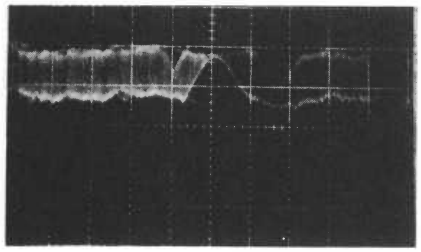
⑤ TP1-8 MODE : SEARCH
V: 500mV/div H: 10m sec/div



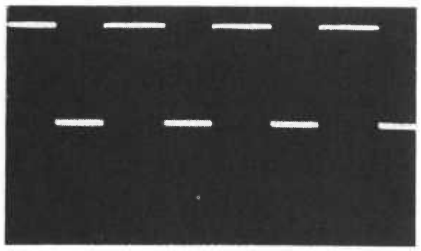
⑧ IC8-8 MODE : PLAY
V: 500mV/div H: 20m sec/div



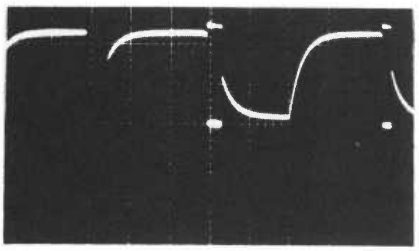
⑧ IC8-8 MODE : SEARCH
V : 500mV/div H : 20m sec/div



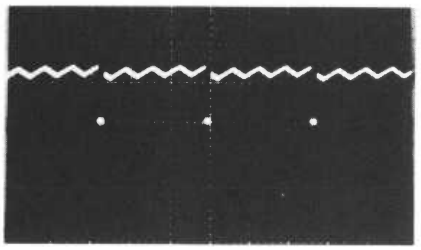
⑨ IC9-4 MODE : PLAY
V : 2V/div H : 50μsec/div



⑨ IC9-4 MODE : SEARCH
V : 2V/div H : 100m sec/div

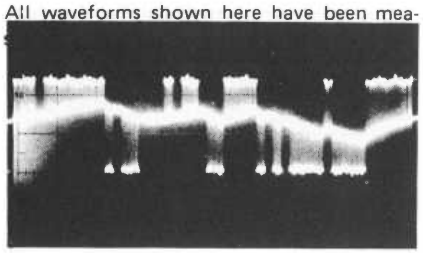


⑩ IC9-3 MODE : PLAY
V : 2V/div H : 200μsec/div

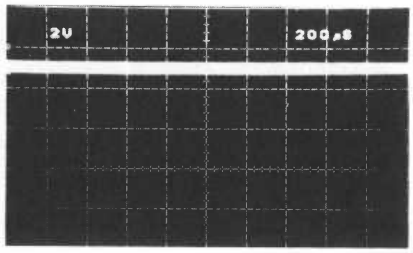


⑩ IC9-3 MODE : SEARCH
V : 2V/div H : 10m sec/div

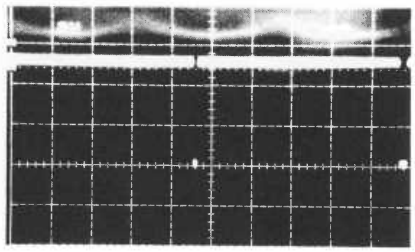
All waveforms shown here have been mea-



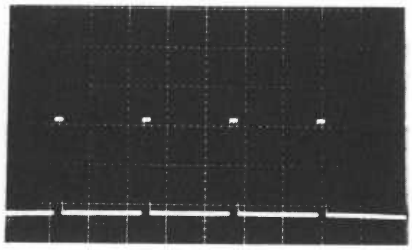
⑪ TP4-1 MODE : PLAY
V : 2V/div H : 20m sec/div



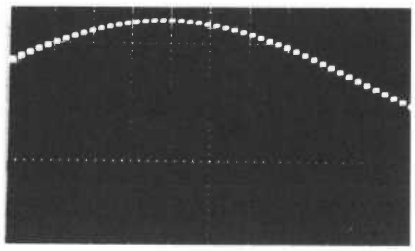
⑪ TP4-1 MODE : SEARCH
V : 2V/div H : 200μsec/div



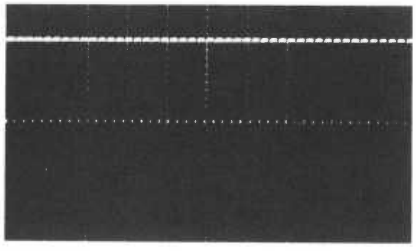
⑫ IC15-23 MODE : PLAY or SEARCH
V : 2V/div H : 5μsec/div



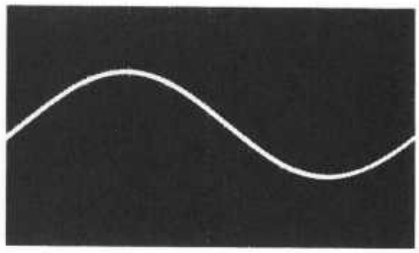
⑬ IC17-1 MODE : PLAY
V : 2V/div H : 50μsec/div



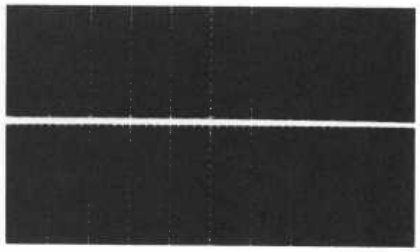
⑬ IC17-1 MODE : SEARCH
V : 2V/div H : 50μsec/div



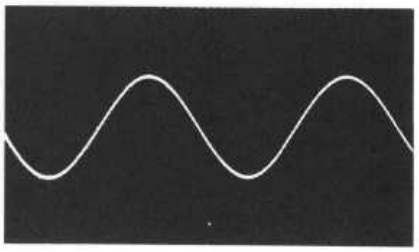
⑭ IC17-7 MODE : PLAY
V : 2V/div H : 100μsec/div



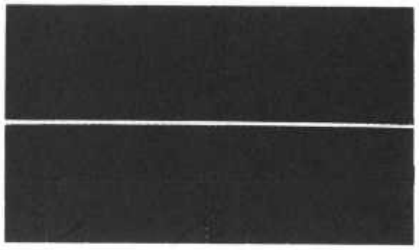
⑭ IC17-7 MODE : SEARCH
V : 2V/div H : 100μsec/div



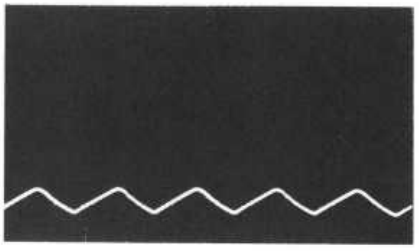
⑮ OUT L MODE : PLAY
V : 2V/div H : 200μsec/div



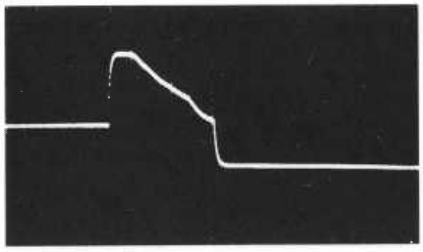
⑮ OUT L MODE : SEARCH
V : 2V/div H : 200μsec/div



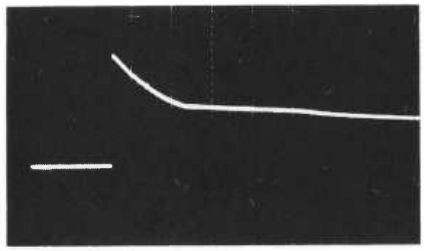
⑯ D9-anode MODE : PLAY or SEARCH
V : 2V/div H : 5m sec/div



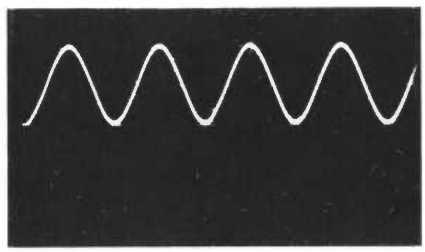
17 Q21-C POWER ON
V: 5V/div H: 1 sec/div



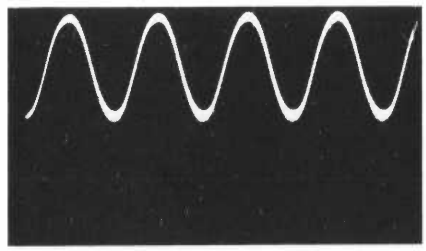
17 Q21-C POWER OFF
V: 5V/div H: 500m sec/div



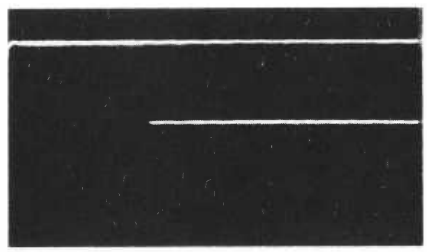
18 IC9-9 MODE : STOP
V: 2V/div H: 50m sec/div



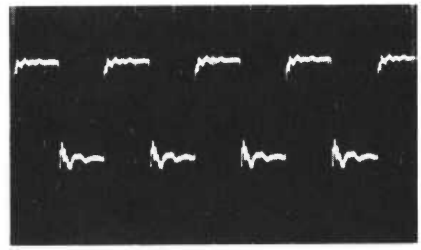
19 IC9-8 MODE : STOP
V: 1V/div H: 50m sec/div



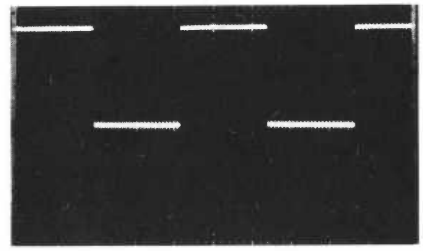
20 IC9-5 MODE : PLAY
V: 2V/div H: 200 sec/div



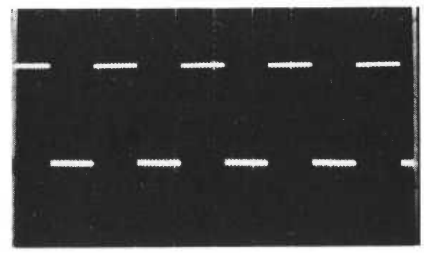
21 IC9-76 MODE : STOP
V: 2V/div H: 200m sec/div



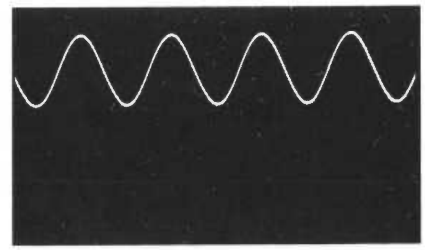
22 IC9-80 MODE : STOP
V: 2V/div H: 5μsec/div



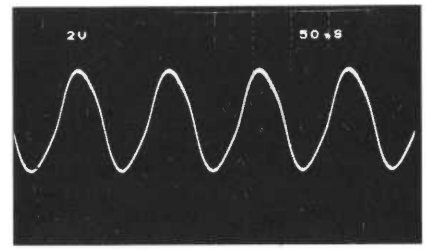
23 IC9-79 MODE : STOP
V: 2V/div H: 5μsec/div



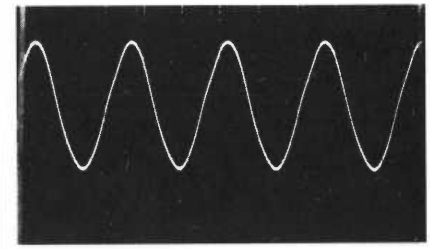
24 IC9-53 MODE : STOP
V: 2V/div H: 50n sec/div



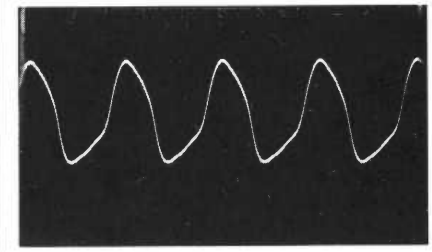
25 IC9-54 MODE : STOP
V: 2V/div H: 50n sec/div



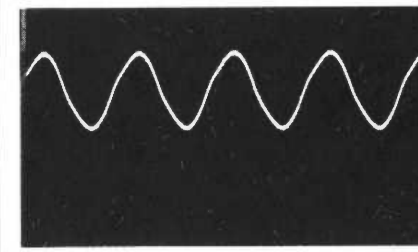
26 IC11-5 MODE : STOP
V: 2V/div H: 500n sec/div



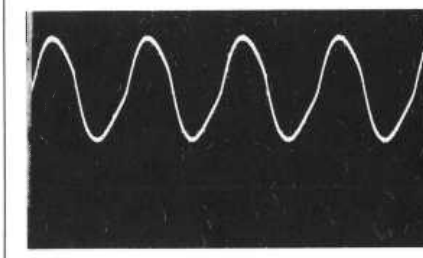
27 IC11-6 MODE : STOP
V: 2V/div H: 500n sec/div



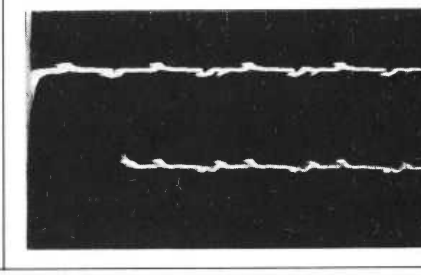
28 IC12-6 MODE : STOP
V: 2V/div H: 100n sec/div



29 IC12-5 MODE : STOP
V: 2V/div H: 100n sec/div



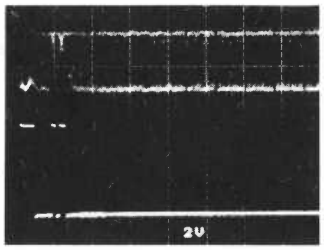
30 IC15-10 MODE : PLAY
V: 2V/div H: 200n sec/div



㉛ IC5-18 MODE : PLAY
V : 2V/div H : 200n sec/div

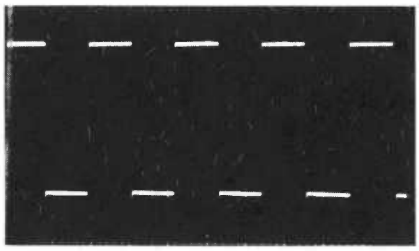
IC5-3 →
(RF)

IC5-18 →
(MIRR)



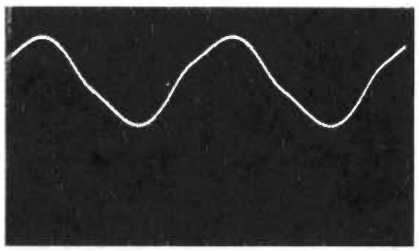
㉜

㉝ IC15-11 MODE : STOP
V : 2V/div H : 5μsec/div

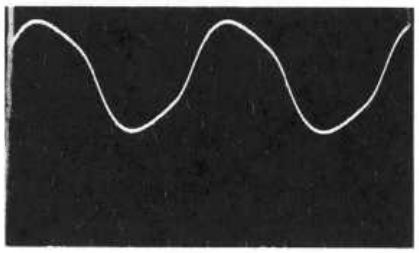


㉞

㉟ IC201-2 MODE : STOP
V : 2V/div H : 500n sec/div



㊱ IC201-3 MODE : STOP
V : 2V/div H : 500n sec/div



9. ELECTRICAL PARTS LIST

NOTES:

- *When ordering resistors, first convert resistance values into code form as shown in the following examples.*

  Ex. 1 When there are 2 effective digits (any digit apart from 0), such as 560 ohm and 47k ohm (tolerance is shown by J = 5%, and K = 10%).

560Ω	*56 × 10¹*	*561*	*RD1/4PS 5 6 1 J*
47kΩ	*47 × 10³*	*473*	*RD1/4PS 4 7 3 J*
0.5Ω	*0R5*		*RN2H 0 R 5 K*
1Ω	*010*		*RS1P 0 1 0 K*

  Ex. 2 When there are 3 effective digits (such as in high precision metal film resistors).

5.62kΩ	*562 × 10¹*		*RN1/4SR 5 6 2 1 F*

- *The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.*
- *For your parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.*
  ★★ GENERALLY MOVES FASTER THAN ★
  This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.
- *Parts marked by "◉" are not always kept in stock. Their delivery time may be longer than usual or they may be unavailable.*

MISCELLANEOUS

Mark	Symbol & Description	Part No.
⚠◉	Main board assembly	XWM-235
◉	Audio board assembly	XWX-250
◉	Control board assembly	XWX-225
	VCO board assembly	
⚠	Power switch board assembly	
	Transformer board assembly	
⚠	Sub cord board assembly	
	Select board assembly	
	Mechanism board assembly	
	Loading board assembly	
	Headphone board assembly	
	LED board assembly (L)	
	LED board assembly (R)	
★★	Motor assembly (CARRIAGE)	PYY-504
★★	Motor assembly (LOADING)	PYY-508
★★	Spindle motor	PXM-147
★★	Motor assembly (DISC SELECT)	PYY-507
⚠ ★	Power transformer	PTT-248
⚠	AC power cord	VDG-016
⚠	Strain relief	CM-22C
⚠	AC outlet	AKP-507
	Remote control unit	PWW-004

Main Board Assembly (XWM-225)

SEMICONDUCTORS

Mark	Symbol & Description	Part No.
★★	IC9	CX23035
★★	IC6	CX20108
★★	IC5	CX20109
★★	IC12	PD3053A
★★	IC10	HM6116FP
★★	IC11	PDE003
⚠ ★★	IC24, IC25	ICP-F15
★★	IC4, IC27	BA6109
★★	IC21	NJM78M12A
⚠ ★★	IC23	NJM78M05A
★★	IC20	NJM79L12A
⚠ ★★	IC22	NJM79M05A
★★	IC7	NJM4558D
⚠ ★★	IC2, IC3	TA7256P
★★	Q2, Q3, Q6 – Q8, Q10	DTC124ES
★★	Q9, Q21	2SA933S
★★	Q11, Q22, Q31, Q43	2SC1740SLN (2SC1740LN)
★★	Q23	2SA1048 (2SA1015)
★	D5, D9	1SS254
★	D10	MTZ12B/C
★	D3, D24	MTZ5, 1B/C (RD5.1EB2/B3)
★	D23	RD27EB2/B3
★	D11 – D22	S5566B

COILS AND FILTER

Mark	Symbol & Description	Part No.
	VL1 VCO coil 3.8μH (8.6436MHz)	PTL-023
	L3 OSC coil 1μH	VTL-011
	F3 EMI filter	VTH-005

CAPACITORS

Mark	Symbol & Description	Part No.
	C22	CEASR47M50
	C24	CEAS010M50
	C74, C132	CEAS220M16
	C17 – C19, C23, C36, C38, C64, C68, C70, C162, C163	CEAS330M35
	C5, C6	CEAS330M25
	C73	CEAS100M16
	C139	CEAS470M50
	C137, C138	CEAS101M50
	C127, C128	CEAS102M25

Mark	Symbol & Description	Part No.
	C129, C130	CEAS222M25
	C133, C134	CEAS222M16
	C135, C136	CEAS332M25
	C32, C44	CEANP010M50
	C131	CEANP4R7M50
	C34	CEANP3R3M50
	C49	CEANP100M25
	C37	CQMA102J50
	C45, C65	CQMA222J50
	C28	CQMA472J50
	C40	CQMA682J50
	C60	CQMA103J50
	C30	CQMA223J50
	C16, C20	CQMA333J50
	C42	CQMA473J50
	C35, C43	CQMA683J50
	C15, C39, C41	CQMA104K50
	C33	CQMA224J50
	C61, C62	CCDCH300J50
	C29	CCDCH330J50
	C71, C72	CCDSL300J50
	C25, C26	CCDSL470J50
	C14, C21, C27	CCDSL560J50
	C8	CCDSL101J50
	C46, C66, C67	CCDSL221J50
	C51, C53	CCDUJ330J50
	C52	CCDUJ221J50
⚠	C140	CKDYF103Z50
	C141, C142	CKDYF103Z50
	C11 – C13, C115	CKDYF103Z50
	C10	CKDYF473Z50
	C9	CKDYX473M25

RESISTORS

NOTE: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Symbol & Description	Part No.
★	VR3, VR4 Semi-fixed 10kΩ	VRTB6VS103
★	VR2, VR6 Semi-fixed 47kΩ	VRTB6VS473
★	VR5 Semi-fixed 100kΩ	VRTB6VS104
	R170	RS1PMF271J
	R113	RA8S103J
	R112	RA4S103J
	R111	RA7S103J
	R101	RA4S473J
	Other resistors	RD1/6PM□□□J

OTHERS

Mark	Symbol & Description	Part No.
★	X3 Ceramic resonator (800KHz)	KBR-800H
★	X2 Ceramic resonator	VSS-018
★	X1 Crystal rsonator (8.4672MHz)	PSS-007

Audio Board Assembly (XWX-250)

SEMICONDUCTORS

Mark	Symbol & Description	Part No.
★★	IC15	CX20152
★★	IC17, IC18	NJM072DE
★★	IC19	TC4053BP
★★	Q15 – Q18	2SC1740SLN (2SC1740LN)
★★	Q12	2SA933SLN (2SA933LN)
★★	Q13, Q14	2SK152
★	D7, D8, D25, D26	HZ6A1L/2L
★	D30	1SS254

RELAY

Mark	Symbol & Description	Part No.
★★	RY1 Miniature relay	RSR-039

COIL AND FILTERS

Mark	Symbol & Description	Part No.
	L1 OSC coil 1μH	VTL-011
	F1, F2 Low pass filter	PTF-001

CAPACITORS

Mark	Symbol & Description	Part No.
	C88, C90	CEAS010M50
	C144	CEAS2R2M50
	C117, C118, C123, C124	CEAS100M50
	C85, C87, C89, C92	CEAS470M50
	C97, C98	CEAS101M25
	C99 – C104, C107, C108	CQMA104K50
	C86	CQMA103K50
	C96, C111	CKDYF103Z50
	C119	CKDYF473Z50
	C109, C110	CQSF102J125
	C125, C126	CQSF221J125
	C121, C122	CQSF102J125
	C105, C106	CQSF122J125
	C113, C114	PCL-054
	C82, C84	PCL-055
	C81	VCE-017
	C83	VCF-005

RESISTORS

NOTE: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Symbol & Description	Part No.
	R129, R143, R144, R147 – R150	RDR1/4PM□□□J
	Other resistors	RD1/6PM□□□J

OTHERS

Mark	Symbol & Description	Part No.
	JA1 2P pin jack	VKB-006
★	X4 Crystal resonator (35.002MHz)	PSS-008

VCO Board Assembly

SEMICONDUCTORS

Mark	Symbol & Description	Part No.
★★	IC8	NJM082S
★	D6	KV1226Y

CAPACITORS

Mark	Symbol & Description	Part No.
	C57	CEANP2R2M50
	C48	CEANL010M50
	C47	CCDSL101J50
	C50, C59	CQMA222J50
	C58	CQMA822J50
	C55	CQMA103J50
	C56	CQMA104J50

RESISTORS

NOTE: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Symbol & Description	Part No.
	R81, R82, R84, R85	RN1/6PQ□□□□F
	Other resistors	RD1/6PM□□□J

Control Board Assembly (XWX-225)

SEMICONDUCTORS

Mark	Symbol & Description	Part No.
★★	IC201	PD4063
★★	Q201 – Q203	DTC124ES
★★	Q205 – Q209	2SC1740S
★★	Q204	DTA124ES
★	D203 – D210	1SS254
★	D214	MTZ5.1B/C (RD5.1EB2/B3)
★	D215	SLH-56MC3H
★	D213	SLH-56VC3H

SWITCHES

Mark	Symbol & Description	Part No.
	S201 – S230	PSG-052

CAPACITORS

Mark	Symbol & Description	Part No.
	C201	CEAL3R3M50
	C204	CEAL100M16
	C202, C203	CCDSL331J50
	C205	CKDYF103Z50

RESISTORS

NOTE: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Symbol & Description	Part No.
	All resistors	RD1/6PM□□□J

OTHERS

Mark	Symbol & Description	Part No.
★	X201 Ceramic resonator	RSS-034
	FL spacer	PEB-319
★	V201 Fluorescent tube	PEL-055

Headphone Board Assembly

SEMICONDUCTORS

Mark	Symbol & Description	Part No.
★★	IC301	M5218L
★★	Q301, Q302	2SC1740SLN (2SC1740LN)

CAPACITORS

Mark	Symbol & Description	Part No.
	C301, C302	CQMA104K50
	C304 – C306	CKDYF473Z50

RESISTORS

NOTE: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Symbol & Description	Part No.
★	VR301 Volume	PCS-028
	Other resistors	RD1/6PM□□□J

OTHERS

Mark	Symbol & Description	Part No.
	JA301 Jack	PKN-004

Power switch P.C. Board Assembly

SWITCH

Mark	Symbol & Description	Part No.
⚠ ★★	S401 Power switch	RSA-063

Transformer Board Assembly

CAPACITORS

Mark	Symbol & Description	Part No.
⚠	C401 Power capacitor	PCG-009 (VCG-044) (VCG-033)

Sub cord Board Assembly

SEMICONDUCTOR

Mark	Symbol & Description	Part No.
★★	Q501	2SC1740SLN

RESISTORS

NOTE: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Symbol & Description	Part No.
	All resistors	RD1/6□□□J

OTHERS

Mark	Symbol & Description	Part No.
	JA501 Socket	PKP-038

Select Board Assembly

SEMICONDUCTOR

Mark	Symbol & Description	Part No.
★★	Q601 Photo interupter	GP1A01

SWITCH

Mark	Symbol & Description	Part No.
★★	S601 Slide switch	PSH-006

CAPACITORS

Mark	Symbol & Description	Part No.
	C601	CEAS100M16
	C602	CKDYF103Z50

RESISTORS

NOTE: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Symbol & Description	Part No.
	All resistor	RD1/6PM□□□J

Mechanism Board Assembly

SWITCHES

Mark	Symbol & Description	Part No.
★★	S701 – S704 Slide switch	PSH-006

LED Board Assembly (R)

SEMICONDUCTOR

Mark	Symbol & Description	Part No.
★	D211	SLH-56DC3H

LED Board Assembly (L)

SEMICONDUCTOR

Mark	Symbol & Description	Part No.
★	D212	SLH-56VC3H

Remote Control Unit (PWW-004)

SEMICONDUCTORS

Mark	Symbol & Description	Part No.
★★	IC1	μPD6102G
★★	Q1	2SC2021
★★	Q2	2SC2673
★	D1	SE303A-Y
★	D3 – D6	1S2473 (1S1555) (1S1588)

CAPACITORS

Mark	Symbol & Description	Part No.
	C1	CEAS470M10
	C2, C3	CCDCH101J50

RESISTORS

NOTE: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Symbol & Description	Part No.
	R1 – R4	RD1/4PM □□□J

OTHERS

Mark	Symbol & Description	Part No.
★	X1 Ceramic resonator	CSB500EBL (KBR500BTL)

10. ADJUSTMENT

• Adjustment Items

1. LD (Laser Diode) output power verification
2. Tracking offset and focus offset adjustments
3. Focus lock and spindle lock verification
4. Grating adjustment
5. Tracking balance adjustment
6. Tangential adjustment
7. Focus gain adjustment
8. Tracking gain adjustment
9. VCO free-run frequency adjustment

• Measuring Equipment

1. Dual trace oscilloscope
2. Laser power meter (LPM-8000)
3. Test disc (YEDS-7)
4. AF oscillator
5. Grating driver (R-882)

• Test Mode

All the adjustments should be performed in Test Mode.

Test Mode setting and cancellation procedures

(1)To set the Test Mode, turn the Power switch of the player (S401) ON shorting the TEST MODE TERMINALs.
(2)To cancel the Test Mode, simply turn the POWER switch of the player OFF.

The various key functions in the Test Mode are listed in Table 10-1.

• Adjusting points

VR2: Tracking offset (TR.OF)
VR3: Focus gain (FO.GA)
VR4: Tracking gain (TR.GA)
VR5: Tracking Balance (TR.BL)
VR6: Focus offset (FO.OF)
VL1: VCO free-run frequency

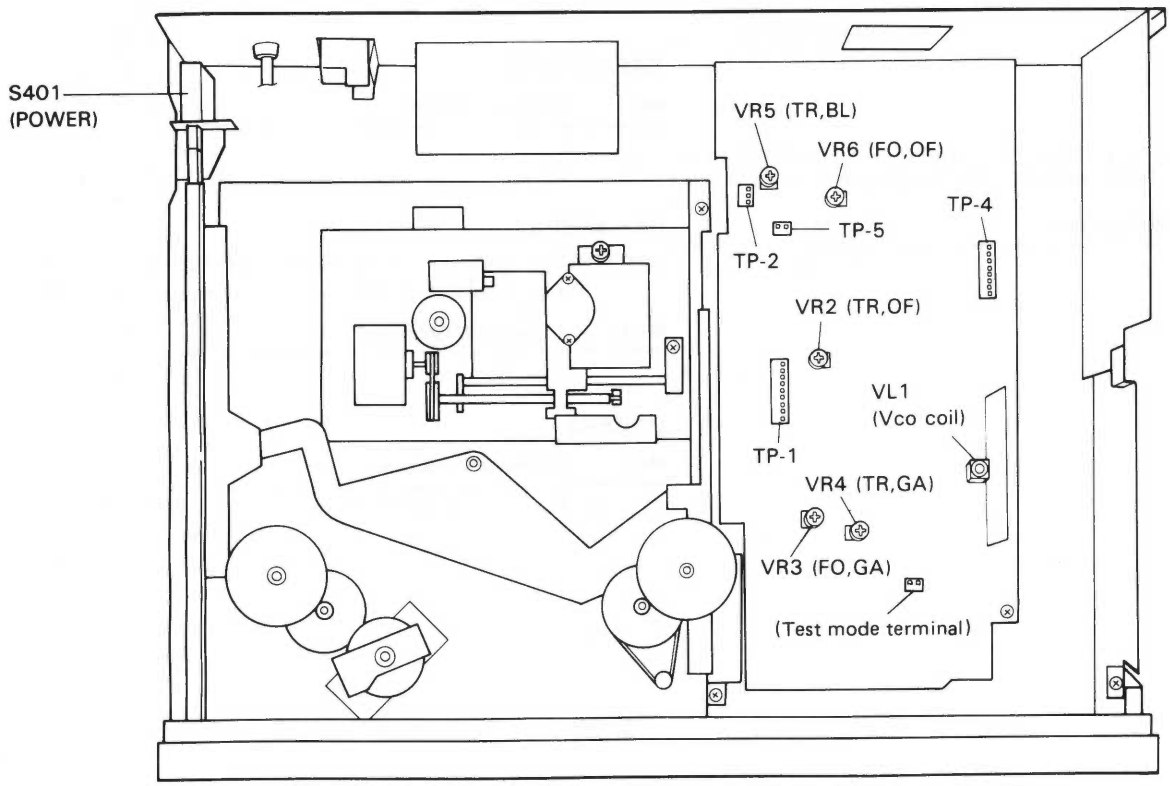
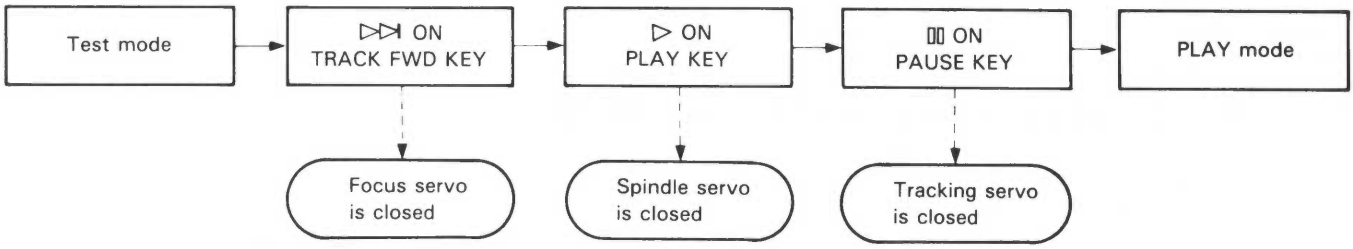


Fig. 10-1 Adjustment Points

In the Test Mode, each servo circuit can be closed and opened by separate operations. Consequently, each servo must be closed one at a time (in serial sequence) to set PLAY mode.

Note that PLAY mode is not activated by simply pressing the PLAY key in the Test Mode.
While a disc is being selected or loaded, do not try to perform other operations.

Example: Switching from STOP to PLAY mode.



- The servo mechanisms operate in a serial sequence in the Test Mode.

• Key Functions in Test Mode

Symbol	Key	Function during test mode	Description
⊲⊲|	TRACK BACK	Laser diode tuned ON.	Laser diode lights up.
⊳⊳|	TRACK FWD	Focus servo is closed.	Disc is loaded from magazine and clamped. Laser diode lights up. Actuator is moved up/down, then focus servo is closed.
⊳	PLAY	Spindle servo is closed.	Spindle starts to rotate and the servo is closed when the revolution reaches to the optimum speed.
⏸	PAUSE	Tracking servo is closed/opened.	Tracking servo is closed by pressing the key once, PAUSE indicator lights up and the player is switch to PLAY mode with the elapsed time indicated on fluorescent display. Focus and spindle servos must be closed at this time. When the key is pressed again, tracking servo is opened.
⊲⊲	MANUAL SEARCH REV	Carriage moves reverse direction. (towards disc center)	Carriage is moved towards disc center at a fast speed of about 1cm/sec. Since there is no safety mechanism to stop the carriage, release the key when the carriage reaches the end.
⊳⊳	MANUAL SEARCH FWD	Carriage moves forward direction. (towards disc end)	Carriage is moved towards disc end at a fast speed of about 1cm/sec. Since there is no safety mechanism to stop the carriage, release the key when the carriage reaches the end.
▭	REPEAT	Lens is moved up/down.	Disc is loaded from magazine and clamped. Laser diode lights up. Actuator is moved up and down twice, then the disc is returned into magazine. Focus servo is not closed.
□	STOP	STOP	All servos are opened.
⏏	EJECT	Magazine is ejected.	Magazine is ejected. However, Pickup does not return the park position.
1-6	DISC 1-6 KEY	Disc is selected.	A disc can be selected in the six-disc system. If TRACK FWD key or REPEAT key is pressed without selecting a disc, the player automatically selects the first disc.

Table 10-1

NOTE:
1) The following adjustment should be performed in the Test Mode.
   Refer to page 49 to set the player in Test Mode.
2) The following adjustment except [1. LD OUTPUT POWER VERIFICATION] should be performed with a Test Disc (YEDS-7).
   Place the Test Disc recorded side up in a magazine and load the magazine in the player.
3) The description of the following adjustments starts form "STOP".

Step No.	Oscilloscope Setting V	Oscilloscope Setting H	Test Points	Adjusting Points	Check items/ Adjustment specifications	Adjustment procedure
1	**LD (LASER DIODE) OUTPUT POWER VERIFICATION** *NOTE:* *This item can be skipped under normal service. It should be verified only when the laser power seems to be weak or the laser diode seems to be defective.*					
				VR1	0.26mW ± 0.02mW	To verify the laser output power, the pickup has to be removed from Mechanism Chassis in the following procedure. (Refer to page 13) • Turn Power switch off. • Unbelt Belt A. • Remove Guide bar retainer. • Unhook Drive screw. • Slowly lift Pickup assembly upside down keeping Flat cable connected. Be careful not to short the P.C. board on the pickup to chassis. • Set the player to test mode. • Place the senser of Laser Power Meter (LPM-8000) above the objective lens. • Press TRACK REV key to turn the laser on. • Verify that the laser output power is within the specified range (0.26 ± 0.02mW). If not, adjust VR1 on the pickup to satisfy the specification. • Turn Power switch off. • Reassembly the parts.
2	**TRACKING OFFSET AND FOCUS OFFSET ADJUSTMENT**					
	20mV /div	1mS /div	TP1 pin9 (TR.RT)	VR2 (TR.OF)	OV ± 10mV	• Connect Oscilloscope or Volt meter to TP1 pin9 TR.RT (Tracking Return). Adjust VR2 TR.OF (Tracking Offset) so that the voltage at TP1 pin9 becomes OV ± 10mV.
	20mV /div	1mS /div	TP1 pin3 (FO.ER)	VR6 (FO.OF)	OV ± 10mV	• Connect Oscilloscope or Volt meter to TP1 pin3 FO.ER (Focus Error). Adjust VR6 FO.OF (Focus Offset) so that the voltage at TP1 pin3 becomes OV ± 10mV.

Step No.	Oscilloscope Setting V	Oscilloscope Setting H	Test Points	Adjusting Points	Check items/ Adjustment specifications	Adjustment procedure
3	**FOCUS LOCK AND SPINDLE LOCK VERIFICATION**					
	0.2V /div	10μS /div	TP5 pin1 (RF)		RF signal is generated	• Press MANUAL SEARCH FWD key to move the pick-up close to the midway of the disc. Note that this step must be performed. • Connect Oscilloscope to TP5 pin1 RF (RF output) and verify that an RF signal is generated when the TRACK FWD key is pressed (when the Focus servo is closed).
					Counterclockwise rotation	• Press PLAY key and check that the disc rotates at an optimum speed (about 300rpm on the midway of the disc) in the counterclockwise direction.
4	**GRATING ADJUSTMENT**					
	1V /div	10mS /div	TP1 pin4 (TR.ER)	Grating	NULL point (Small and smooth envelope)	• Press TRACK FWD key and PLAY key by turns to close the focus and spindle servos (leaving the tracking servo open). • Connect Oscilloscope to TP1 pin4 TR.ER (tracking error) through a 4kHz L.P.F. as shown in Fig. 10-2. • Insert Grating driver into the adjusting hole of the pick-up as shown in Fig. 10-3. Slowly turn it and find the NULL point. (see photograph 10-1) Note: If the pickup is raised by the Grating driver during the adjustment, hold the pickup down slightly.
					Maximum amplitude	• Turn the Grating driver clockwise slowly from the NULL point and stop it at the point where the Tracking error signal waveform first reaches the maximum. (see photograph 10-3)
	CH-1 50mV /div	X-Y mode	CH-1 TP2 pin1 (BKTE)			• Connect Oscilloscope CH-1 to TP2 pin1 (BKTE) and CH-2 to TP2 pin2 (FWTE). Set AC-GND-DC switch of Oscilloscope to AC and mode to X-Y.
	CH-2 50mV /div		CH-2 TP2 pin2 (FWTE)		Straight line of 45 degrees	• While observing the Lissajous figure (see photograph 10-4), finely adjust the Grating to the point where the Lissajous becomes a slender line in 45 degrees. (see photograph 10-5).
	AC-coupling					

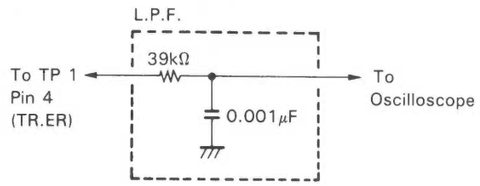


Fig. 10-2 4kHz L.P.F.

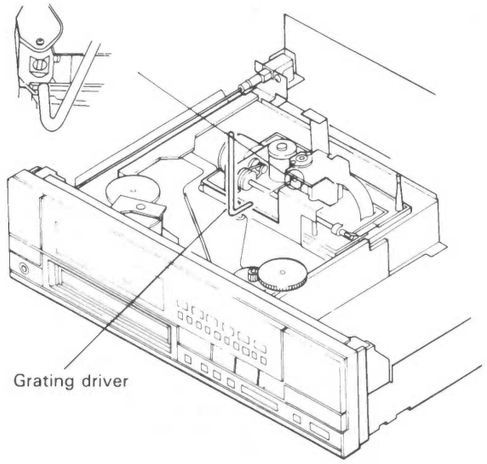
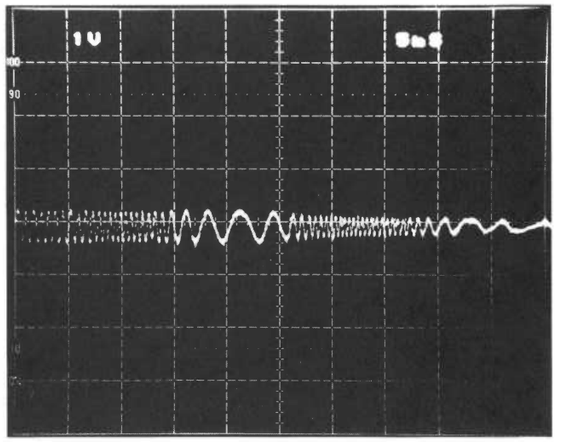
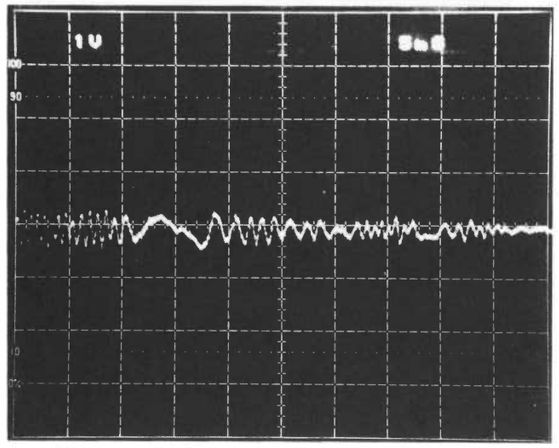


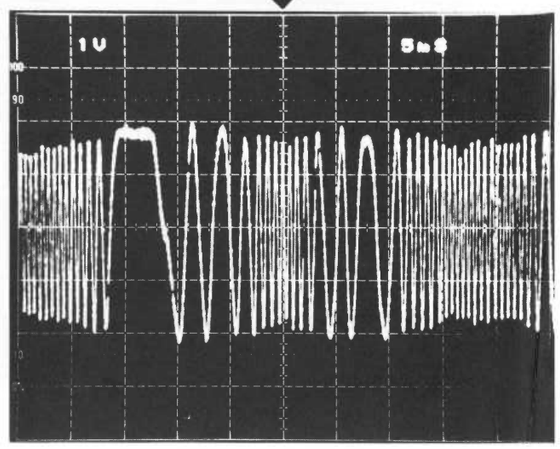
Fig. 10-3 Grating adjustment



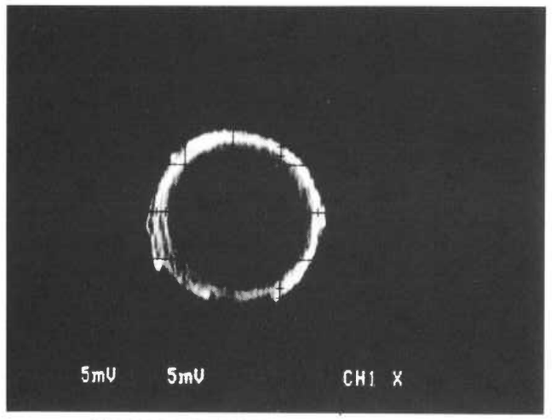
Photograph 10-1
Small and smooth envelope (NULL point)



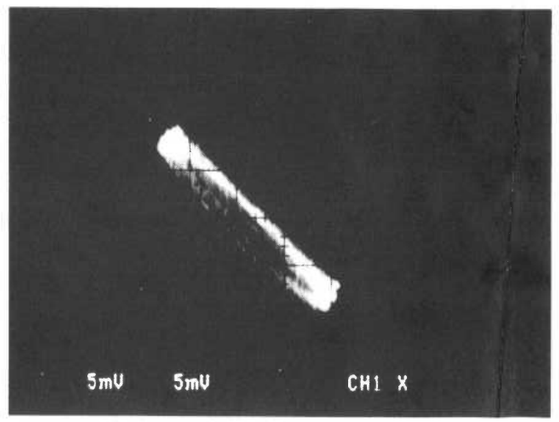
Photograph 10-2
Small but rough envelope (not NULL point)



Photograph 10-3
Maximum amplitude

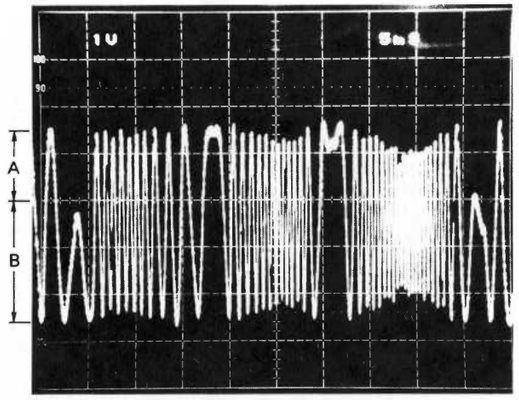


Photograph 10-4
Lissajous figures (before adjustment)

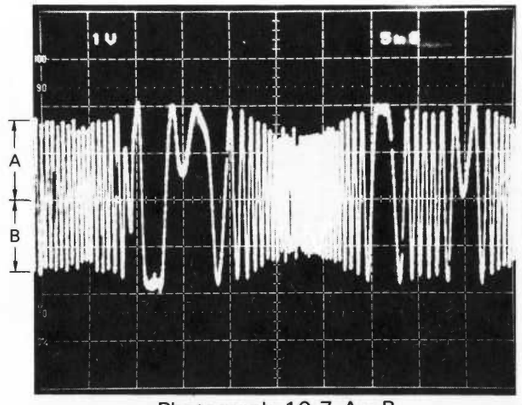


Photograph 10-5
Lissajous figures (after adjustment)

Step No.	Oscilloscope Setting V	Oscilloscope Setting H	Test Points	Adjusting Points	Check items/ Adjustment specifications	Adjustment procedure
5	**TRACKING BALANCE ADJUSTMENT**					
	1V /div	10mS /div	TP1 pin4 (TR.ER)	VR 5 (TR.BL)	Equal positive & negative amplitude (A = B)	• Press MANUAL SEARCH FWD key to move the pick-up close to the midway of the disc. • Press TRACK FWD key and PLAY key by turns to start turning the disc. • Set GND level of Oscilloscope at the center. • Connect Oscilloscope to TP1 pin4 TR.ER (Tracking Error) through a L.P.F. shown in Fig. 10-2. Adjust VR5 TR.BL (Tracking Balance) so that the positive and negative amplitude of the waveform becomes equal as photograph 10-7.
6	**PICKUP ANGLE ADJUSTMENT**					
	0.2V /div AC-coupling	0.2μS /div	TP5 pin1 (RF)	Pickup angle adjustment screw	Best eye pattern	• Press TRACK FWD key, PLAY key and PAUSE key by turns to close all servos. (The PAUSE indicator should be light up) • Connect oscilloscope to TP5 pin1 RF (RF output) through a 10k-ohm resistor. Use a 5k-ohm resistor instead if the waveform is not clear. • Adjust Pickup angle adjustment screw to obtain the clearest eye pattern as photograph 10-8. The optimum point of the adjustment is in the midway between the two points from where the eye pattern starts to deteriorate when the Pickup angle adjustment screw is turned clockwise or counter-clockwise.



Photograph 10-6 A < B



Photograph 10-7 A = B

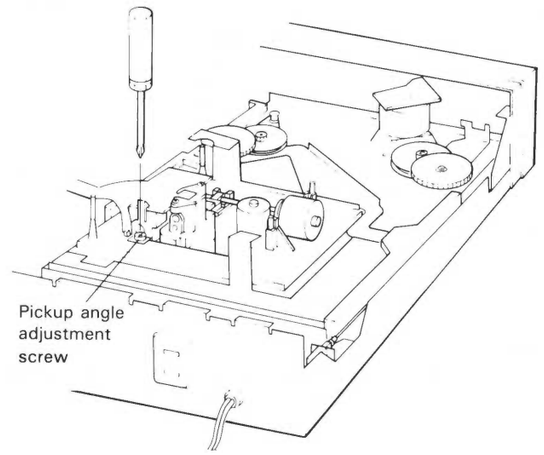
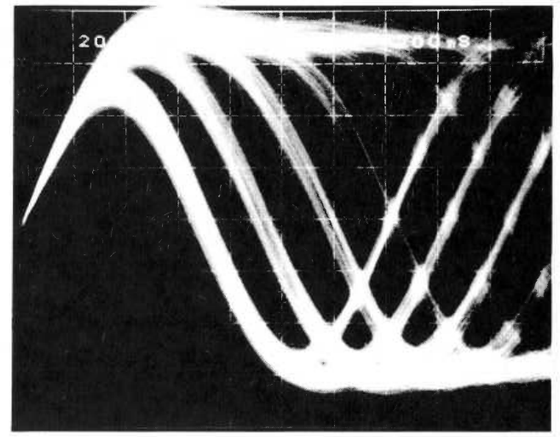
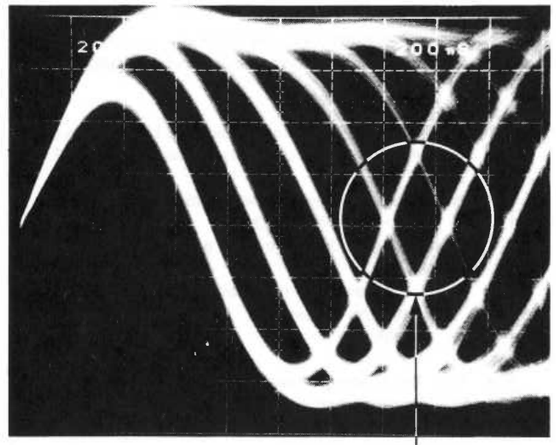


Fig. 10-5 Pickup Angle Adjustment



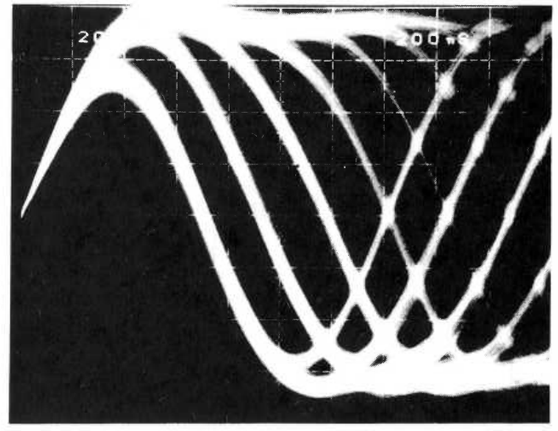
Photograph 10-9



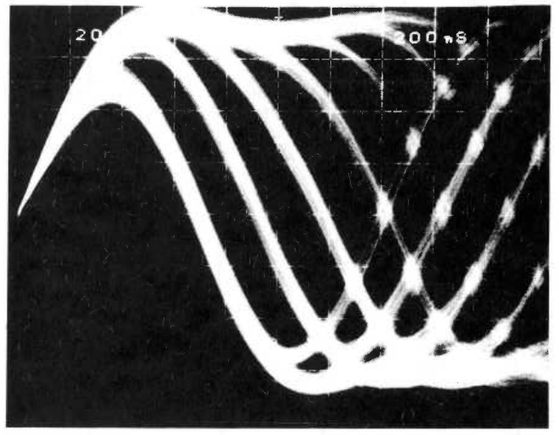
Part to be observed

Not optimum Optimum Not optimum

Photograph 10-8



Photograph 10-10



Photograph 10-11

Step No.	Oscilloscope Setting V	Oscilloscope Setting H	Test Points	Adjusting Points	Check items/ Adjustment specifications	Adjustment procedure
7	**FOCUS GAIN ADJUSTMENT (WITHOUT USING AN FTG ADJUSTER)** *Note: If you have an FTG Adjuster, skip this step and see Page 57.*					
	50mV /div	0.5mS /div	AF Osc. output terminal	AF Osc. output control	880Hz 0.2Vp-p	• Connect Oscilloscope to the output terminal of AF oscillator and adjust it's output to 880Hz and 0.2Vp-p. (The AF oscillator output should be adjusted before the connection described below.) • Press TRACK FWD key, PLAY key and PAUSE key by turns to close all servos.
	CH-1 20mV /div CH-2 50mV /div	X-Y mode	CH-1 TP1 pin6 (FO.IN) and AF Osc. output CH-2 TP1 pin1 (FO.OT)	VR3 (FO.GA)	Symmetrical lissajous figures	• Connect Oscilloscope, AF oscillator and a resistor to the player as shown in Fig. 10-6. Set Oscilloscope to X-Y mode. • Adjust VR3 FO.GA (Focus Gain) so that the Lissajous figures become symmetrical. (see photograph 10-13)

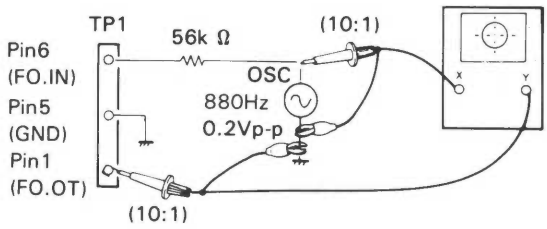
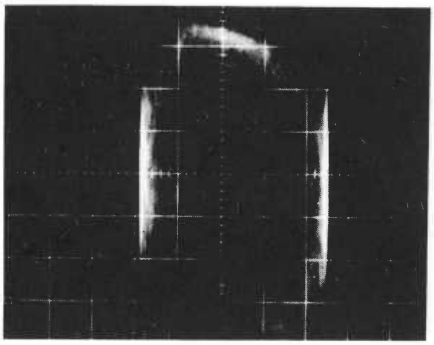
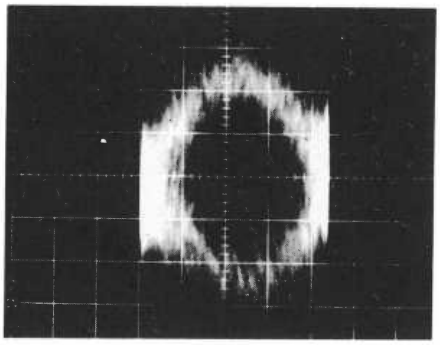


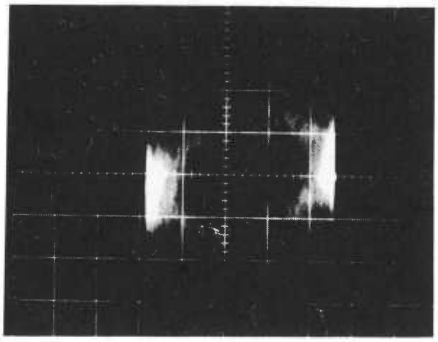
Fig. 10-6



Photograph 10-12
Low gain



Photograph 10-13
Optimum Gain



Photograph 10-14
High gain

Step No.	Oscilloscope Setting V	Oscilloscope Setting H	Test Points	Adjusting Points	Check items/ Adjustment specifications	Adjustment procedure
8	**TRACKING GAIN ADJUSTMENT (WITHOUT USING AN FTG ADJUSTER)** *Note: If you have FTG Adjuster, skip this step and see Page 57.*					
	0.1V /div	0.5mS /div	AF Osc. output terminal	AF Osc. output control	1130Hz 0.4Vp-p	• Connect Oscilloscope to the output terminal of AF oscillator and adjust it's output to 1130Hz and 0.4Vp-p. (The oscillator output should be adjusted before the connection described below.) • Press the TRACK FWD key, PLAY key and PAUSE key by turns to close all servos.
	CH-1 50mV /div CH-2 50mV /div	X-Y mode	CH-1 TP 1 pin7 (TR.IN) and AF Osc. output CH-2 TP1 pin2 (TR.OT)	VR4 (TR.GA)	Symmetrical lissajous figures	• Connect Oscilloscope, AF oscillator and a resistor to the player as shown in Fig. 10-7. Set Oscilloscope to X-Y mode. • Adjust VR4 TR.GA (Tracking Gain) so that the Lissajous figures become symmetrical (see photograph 10-16)

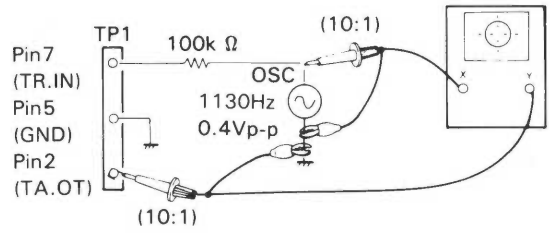
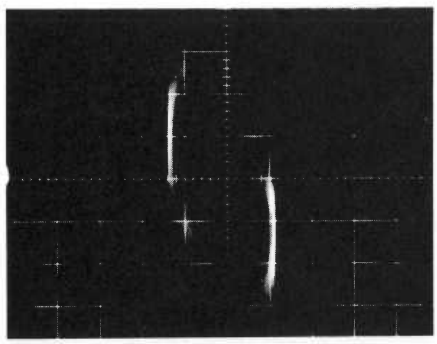
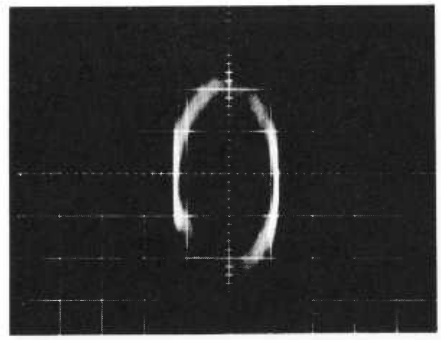


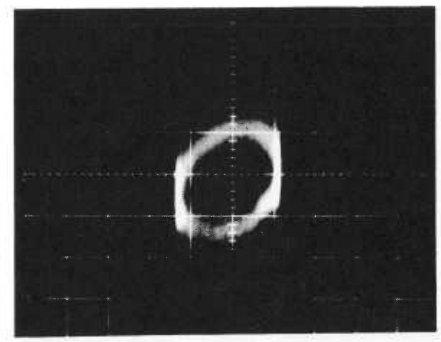
Fig. 10-7



Photograph 10-15
Low gain

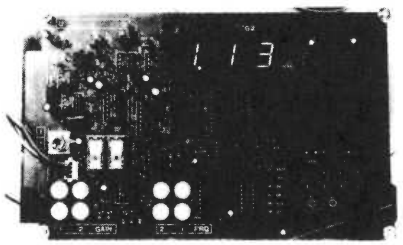


Photograph 10-16
Optimum Gain



Photograph 10-17
High gain

Step No.	Oscilloscope Setting V	Oscilloscope Setting H	Test Points	Adjusting Points	Check items/ Adjustment specifications	Adjustment procedure
9	**FOCUS AND TRACKING GAIN ADJUSTMENT USING AN FTG ADJUSTER** *Note: If you have adjusted Focus and Tracking gains at step 7 and 8, skip this step and see Page 58.*					
						• Turn Power switch of FTG Adjuster on. The Power switch is located on the right side of the adjuster. Turn the Selector switch of the FTG Adjuster to 1. The Selector switch is located on the left side of the panel.
						• Connect Oscilloscope to TP (Test Point) of FTG Adjuster. The TP is located on the right side of Selector switch.
				FREQ-1 Pots of FTG-adjuster		• Adjust two FREQ-1 potentiometers of the FTG Adjuster so that the output frequency becomes 880Hz. The frequency is indicated by three 7-segment LEDs on the FTG Adjuster.
	50mV /div	0.5mS /div	TP of FTG-adjuster	GAIN-1 Pots of FTG-adjuster		• Adjust two GAIN-1 potentiometers of the FTG adjuster so that the amplitude of the output signal becomes 0.2Vp-p.
						• Turn the Selector switch of FTG adjuster to 2.
				FREQ-2 Pots of FTG-adjuster		• Adjust two FREQ-2 potentiometers of the FTG Adjuster so that the output frequency becomes 1130Hz.
	0.1V /div	0.5mS /div	TP of FTG-adjuster	GAIN-2 Pots of FTG-adjsuter		• Adjust two GAIN-2 potentiometers of the FTG Adjuster so that the amplitude of the output signal becomes 0.4Vp-p.
						• Turn the Selector switch to the neutral position (center).
						• Connect Orange wire of FTG adjuster to TP1 pin6 (FO.in) of the player, Brown wire to TP1 pin1 (FO.OT), Yellow wire to TP1 pin 7 (TR.IN), Red wire to TP1 pin 2 (TR.OT) and Black wire to chassis.
						• Press the TRACK FWD key, PLAY key and PAUSE key by turns to close all servos.
				VR3 (FO.GA)	Green LED (JUST) on	• Turn the Selector switch to 1. Adjust VR3 FO.GA (Focus Gain) so that a green LED (JUST) comes on.
				VR4 (TR.GA)	Green LED (JUST) on	• Turn the Selector switch of FTG Adjuster to 2. Adjust VR4 TR.GA (Tracking Gain) so that the green LED (JUST) comes on.



Photograph 10-18
FTG Adjuster

Step No.	Oscilloscope Setting V	Oscilloscope Setting H	Test Points	Adjusting Points	Check items/ Adjustment specifications	Adjustment procedure
10	**VCO FREE-RUN FREQUENCY ADJUSTMENT**					
	0.5V /div	0.1μS /div	Lead of C47 of VCO board assembly or Test pin			• Connect Oscilloscope to the lead of C47 or Test pin of VCO board assembly. (see Fig. 10-9)
						• Press TRACK FWD key and PLAY key by turns to close the focus and spindle servos.
						• Turn AC-GND-DC switch of Oscilloscopoe to DC.
					Waveform is positioned at the center	• Adjust vertical position of Oscilloscope so that the waveform is positioned at the center. Note: It is not necessary to set the GND level at the center of the oscilloscope in this adjustment. Simply position the waveform at the center of the oscilloscope with the vertical position control.
						• Press PAUSE key to close the Tracking servo.
				VL1	Waveform is positioned at the center	• Adjust VL1 (VCO coil) with a core driver so that the waveform is positioned at the center.
					DC level of the waveforms is not changed	• Open and close the Tracking servo by depressing PAUSE key a few times and verify that the DC level of the waveforms is not changed.

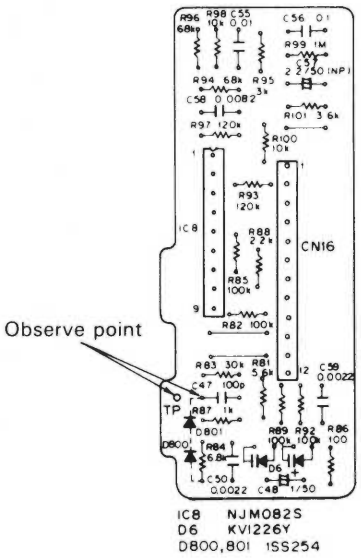


Fig. 9-8 VCO board assembly

10. RÉGLAGE

• Points de réglage

1. Vérification de puissance de sortie de diode laser (LD)
2. Réglages de décalage d'alignement et de décalage de mise au point
3. Vérification de verrouillage de mise au point et d'axe
4. Réglage de quadrillage
5. Réglage d'équilibre d'alignement
6. Réglage tangentiel
7. Réglage de gain de mise au point
8. Réglage de gain d'alignement
9. Réglage de fréquence de fonctionnement libre VCO

• Equipements de mesure

1. Oscilloscope double tracé
2. Indicateur de puissance laser (LPM-8000)
3. Disque d'essai (YEDS-7)
4. Oscillateur AF
5. Tournevis de quadrillage (R-882)

• Mode d'essai

Tous les ajustements doivent être effectués en mode d'essai.

Procédures de mise en service et annulation du mode d'essai

(1)Pour passer en mode d'essai, allumer l'interrupteur d'alimentation (POWER) (S401) du lecteur en établissant un court-circuit entre les bornes TEST MODE.

(2)Pour annuler le mode d'essai, il suffit de ramener sur OFF l'interrupteur d'alimentation (POWER) du lecteur.

Les diverses fonctions des touches en mode d'essai sont reprises dans le Tableau 10-1.

• Points de réglage

VR2: Décalage d'alignement (TR.OF)
VR3: Gain de mise au point (FO.GA)
VR4: Gain d'alignement (TR.GA)
VR5: Equilibre d'alignement (TR.BL)
VR6: Décalage de mise au point (FO.OF)
VL1: Fréquence de fonctionnement libre VCO

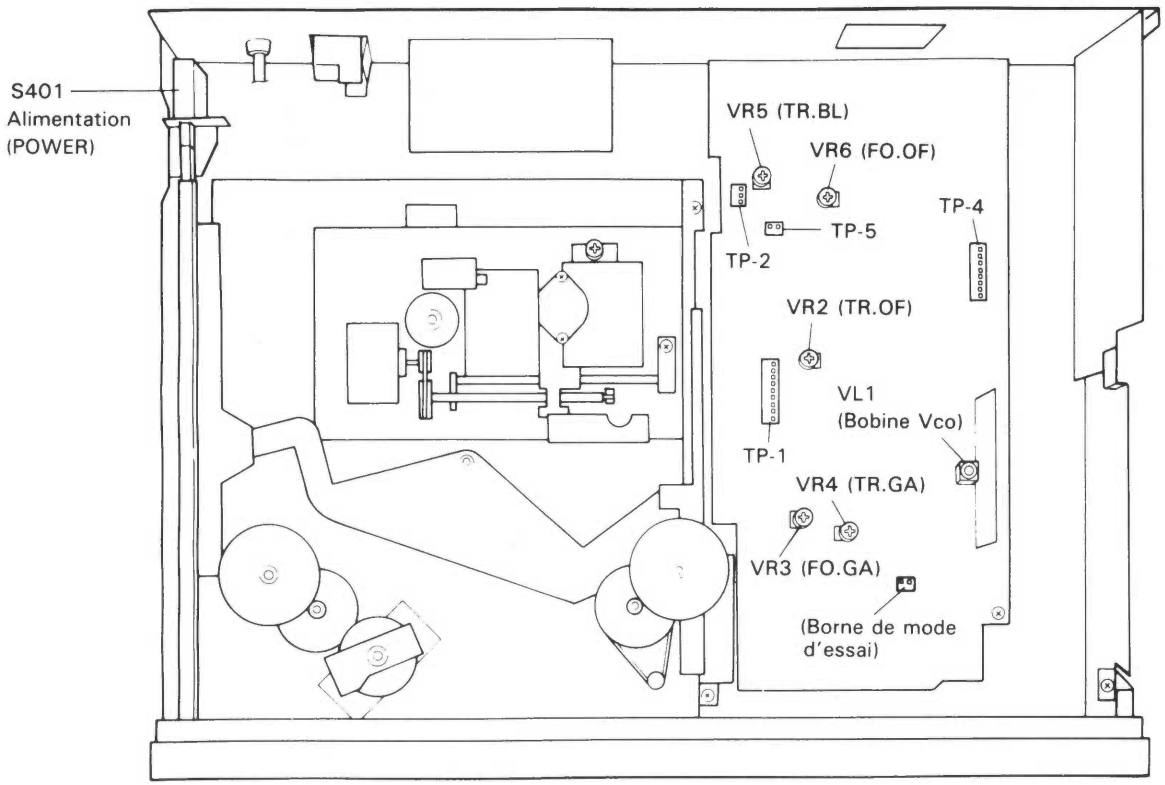
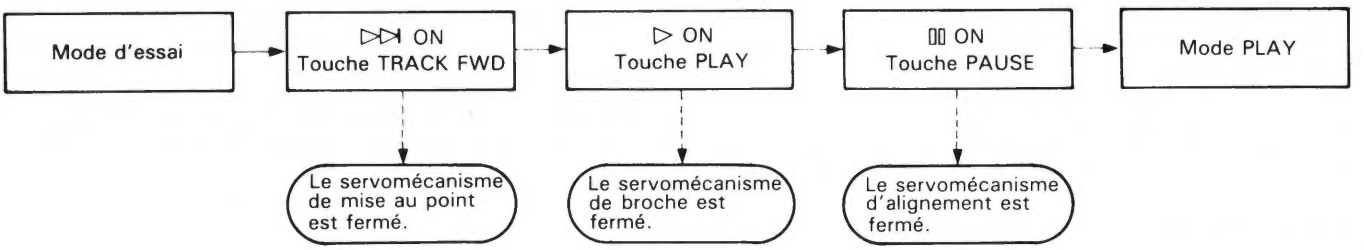


Fig. 10-1 Points de réglage

En mode d'essai, chaque servomécanisme peut être fermé et ouvert par des démarches distinctes. Part conséquent, chacun devra être fermé un à la fois (en séquence sérielle) pour passer au mode de lecture (PLAY).

Exemple: Passage du mode d'arrêt (STOP) au mode de lecture (PLAY).



- En mode d'essai, les servomécanismes fonctionnent en séquence sérielle.

Remarquer que le mode PLAY n'est pas actualisé par simple poussée sur la touche PLAY en mode d'essai. Pendant la sélection ou le chargement d'un disque, ne pas tenter d'effectuer d'autres opérations.

• Fonctions des touches en mode d'essai

Symbole	Touche	Fonction en mode d'essai	Description
⏮	TRACK BACK	Diode laser allumée.	La diode laser s'allume.
⏭	TRACK FWD	Servomécanisme de mise au point fermé.	Le disque est logé depuis le magasin et immobilisé. La diode laser s'allume. L'actuateur se déplace à la verticale, puis le servomécanisme de mise au point est fermà.
▷	PLAY	Le servomécanisme d'axe est fermé.	L'axe commence à tourner et le servomécanisme est fermé quand la rotation atteint la vitesse optimale.
⏸	PAUSE	Le servomécanisme d'alignement est fermé/ouvert.	Le servomécanisme est fermé en appuyant une fois sur la touche; le témoin PAUSE s'allume et le lecteur passe en mode PLAY tandis que la durée écoulée est indiquée sur l'affichage fluorescent. Les servomécanismes de mise au point et d'axe doivent être fermés à ce stade. Quand la touche est de nouveau actionnée, le servomécanisme d'alignement est ouvert.
◁◁	MANUAL SEARCH REV	Déplacement arrière du chariot (vers le centre du disque)	Le chariot est déplacé vers le centre du disque à vitesse rapide d'environ 1 cm/sec. Comme il n'existe pas de mécanisme de sécurité pour arrêter le chariot, relâcher la touche avant qu'il n'arrive à la fin du disque.
▷▷	MANUAL SEARCH FWD	Déplacement avant du chariot (vers le bord du disque)	Le chariot est déplacé vers la fin du disque à vitesse rapide d'environ 1 cm/sec. Comme il n'existe pas de mécanisme de sécurité pour arrêter le chariot, relâcher la touche avant qu'il n'arrive au bord du disque.
▭	REPEAT	Déplacement verticale (haut/bas) de l'objectif	Le disque est chargé depuis le magasin et immobilisé. La dlode laser s'allume. L'actuateur se déplace deux fois vers le haut et le bas, puis le disque est ramené dans le magasin. Le servomécanisme de mise au point n'est pas fermé.
□	STOP	STOP	Tous les servomécanismes sont ouverts.
⏏	EJECT	Le magasin est éjecté.	Le magasin ressort. Cependant, le capteur ne revient pas à la position de repos.
1-6	DISC 1-6 KEY	Sélection du disque	Un disque peut être choisi dans le système six-disques. Si la touche TRACK FWD ou REPEAT est actionnée sans sélection d'un disque, le lecteur choisit automatiquement le premier disque.

Tableau 10-1

REMARQUES:
1) Le réglage suivant doit être effectué en mode d'essai. Consulter la page 49 pour placer le lecteur en mode d'essai.
2) Le réglage suivant, sauf (1. Vérification de puissance de sortie de LD) doit être effectué avec un disque d'essai (YEDS-7).
   Placer le disque d'essai avec sa face enregistrée vers le haut dans un magasin et installer celui-ci dans le lecteur.
3) La description des réglages suivants commence à partir de l'état "STOP".

N°. de paso	Ajuste del osciloscopio V	Ajuste del osciloscopio H	Puntos deprueba	Puntos de ajuste	Itemes de comprobación/ Especificaciones de ajuste	Procedimiento de ajuste
1	**VERIFICATION DE PUISSANCE DE SORTIE DE DIODE LASER (LD)** *Remarque:* *Ce point peut être ignoré lors d'un entretien normal. On ne fera cette vérification que si la puissance semble faible ou si la diode laser semble défectueuse.*					
				VR1	0,26 mW ± 0,02 mW	Pour vérifier la puissance de sortie du laser, le capteur doit être retiré du châssis du mécanisme par les démarches suivantes.(Voir en page 13.) • Couper l'interrupteur d'alimentation. • Enlever la courroie A. • Déposer la fixation de barre de guidage. • Desserrer la vis de commande. • Soulever lentement l'ensemble du capteur en laissant le câble plat connecté. Prendre soin de ne pas établir un court-circuit entre la plaquette de circuit imprimé sur la capteur et le châssis. • Régler le lecteur en mode d'essai. • Placer le senseur de d'indicateur de puissance de laser (LPM-8000) sur l'objectif. • Appuyer sur la touche TRACK REV pour mettre le laser en service. • Vérifier que la puissance de sortie du laser respecte la plage spécifiée (0,26 ± 0,02 mW). Dans la négative, ajuster VR1 sur le capteur pour convenir à la spécification. • Couper l'interrupteur d'alimentation. • Réassembler les pièces déposées.
2	**REGLAGE DE DECALAGE D'ALIGNEMENT ET DE MISE AU POINT**					
	20mV /div	1 mS /div	TP1 broche 9 (TR.RT)	VR2 (TR.OF)	0V ± 10mV	• Raccorder un oscillateur ou un voltmètre sur TP1 broche 9 TR-RT (retour alignement). Ajuster VR2 TR.OF (décalage alignement) de sorte que la tension à la broche 9 de TP1 devienne 0V ± 10 mV.
	20 mV /div	1 mS /div	TP1 broche 3 (FO.ER)	VR6 (FO.OF)	0V ± 10 mV	• Raccorder un oscillateur ou un voltmètre sur la broche 3 de TP1 FO.ER (erreur de mise au point). Ajuster VR6 FO.OF (décalage de mise au point) de sorte que la tension à la broche 3 de TP1 devienne 0V ± 10 mV.

N°. de paso	Ajuste del osciloscopio V	Ajuste del osciloscopio H	Puntos deprueba	Puntos de ajuste	Itemes de comprobación/ Especificaciones de ajuste	Procedimiento de ajuste
3	**VERIFICATION DU VERROUILLAGE DE MISE AU POINT ET D'AXE**					
	0,2 V /DIV	10 μS /DIV	Broche 1 TP5 (RF)		Un signal RF est produit.	• Appuyer sur la touche MANUAL SEARCH FWD pour amener le capteur vers le milieu du disque. Remarquer que cette démarche doit être accomplie. • Raccorder l'oscilloscope à TP5 broche 1 RF (sortie RF) et vérifier que le signal haute fréquence est produit quand la touche TRACK FWD est actionnée (quand le servomécanisme de mise au point est fermé). • Appuyer sur la touche PLAY et vérifier que le disque tourne à la vitesse optimale (environ 300 tr/mn au milieu de disque) dans le sens anti-horaire.
					Rotation anti-horaire	
4	**REGLAGE DU QUADRILLAGE**					
	1V /DIV	10mS /div	TP1 broche 4 (TR.ER)	Quadrillage	Point NUL (enveloppe petite et douce	• Appuyer sur les touches TRACK FWD et PLAY pour fermer les servomécanismes de mise au point et d'axe (en laissant ouvert le servomécanisme d'alignement). • Raccorder l'oscilloscope sur TP1 broche 4 TR.ER (erreur d'alignement) par un L.R.F. de 4 kHz comme indiqué sur la Fig. 10-2. • Insérer le tournevis dans l'orifice de réglage du capteur comme indiqué à la Fig. 10-3. Le tourner lentement et trouver le point NUL. (Voir photo 10-1.) Remarque: Si le capteur est levé par le tournevis pendant ce réglage, abaisser légèrement le capteur. • Tourner lentement le tournevis dans le sens des aiguilles à partir du point NUL et arrêter au point où la forme d'onde du signal d'erreur d'alignement atteint le maximum (voir photo 10-3).
	CH-1 50mV/div	mode X-Y	CH-1 TP2 broche 1 (BKTE)			• Raccorder l'oscilloscope CH-1 sur TP2 broche 1 (BKTE) et CH-2 à TP2 broche 2 (FWTE). Régler l'interrupteur AC-GND-DS de l'oscilloscope sur AC et le mode sur X-Y.
	CH-2 50mV/div Couplage CA		CH-2 TP2 broche 2 (FWTE)		Ligne droite de 45 degrés	• Tout en observant la figure Lissajous (voir photo 10-4), ajuster le quadrillage avec précision jusqu'au point où le Lissajous devient une ligne oblique p 45 degrés. (Voir photo 10-5)

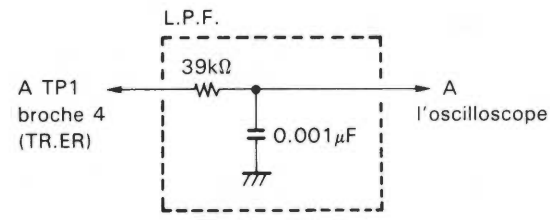


Fig. 10-2 4kHz L.P.F.

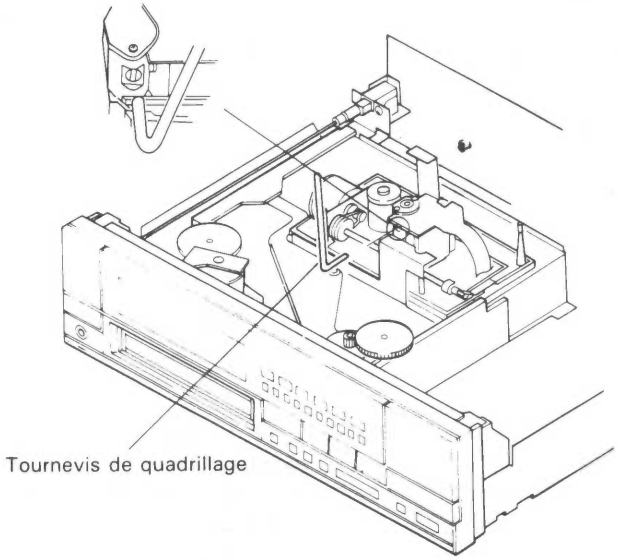


Fig. 10-3 Réglage de quadrillage

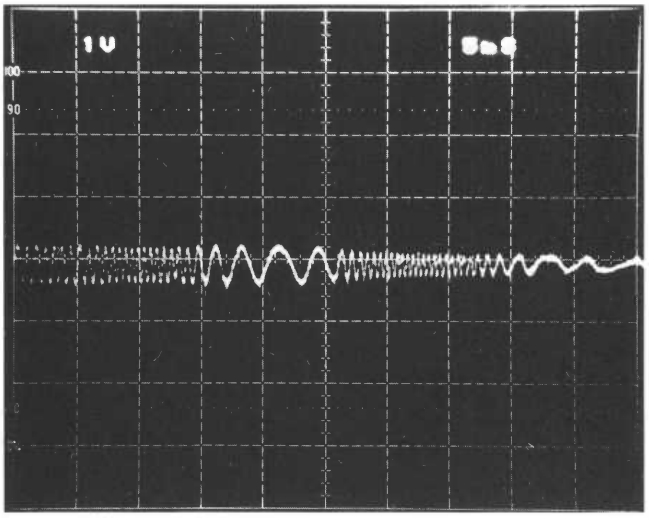


Photo 10-1
Enveloppe petite et douce (point NUL)

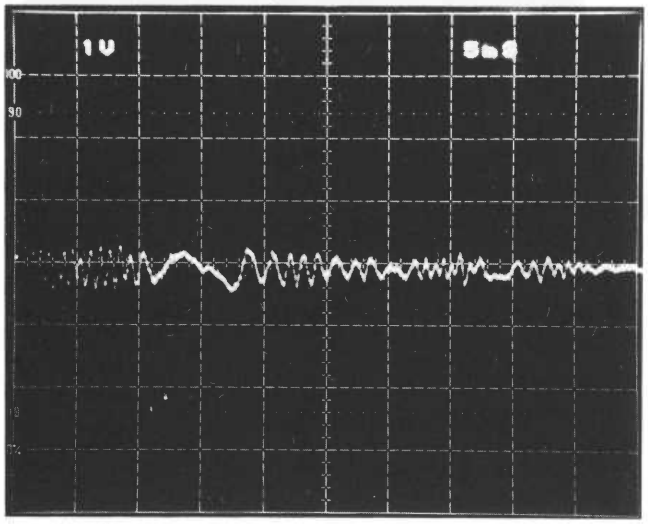


Photo 10-2
Enveloppe petite mais grossière (pas le point NUL)

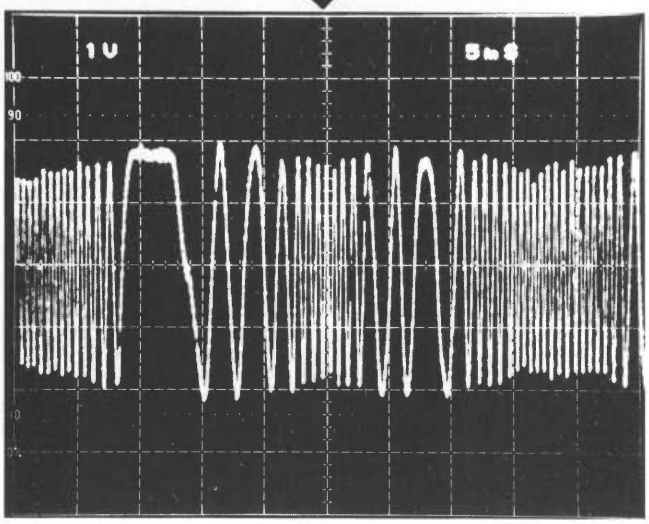


Photo 10-3 Amplitude maximum

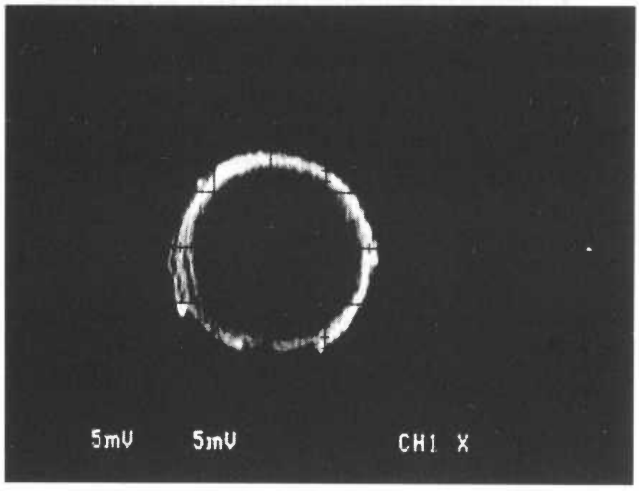


Photo 10-4 Figures Lissajous (avant réglage)

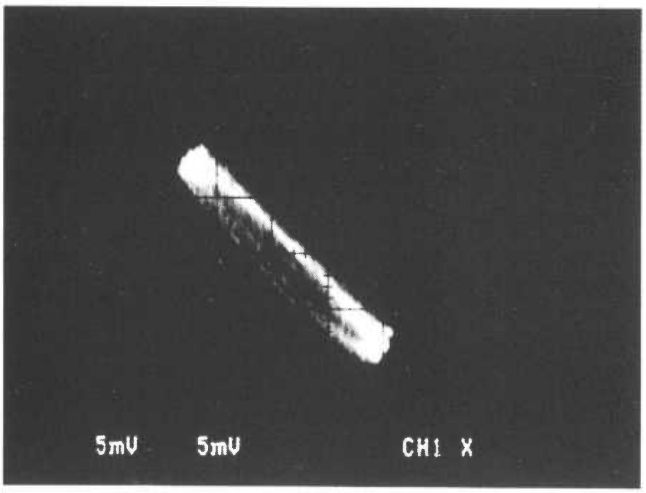


Photo 10-5 Figures Lissajous (après réglage)

N° d' étape	Réglage d'oscilloscope V	Réglage d'oscilloscope H	Points d'essai	Points de réglage	Postes de contrôle/ Spécifications de réglage	Procédure de réglage
5	**REGLAGE D'EQUILIBRE D'ALIGNEMENT**					
	1 V /div	10 mS /div	TP1 broche 4 (TR.ER)	VR5 (TR.BL)	Amplitude positive et négative égale (A = B)	• Appuyer sur la touche MANUAL SEARCH FWD pour déplacer la capteur près du milieu du disque. • Appuyer sur la touche TRACK FWD et PLAY pour lancer la ratation du disque. • Régler le niveau GND de l'oscilloscope au centre. • Raccorder l'oscilloscope à TP1 broche 4 TR.ER (erreur d'alignement) par un L.P.F. indiqué sur la Fig. 10-2. Ajuster VR5 TR.BL (equilibre d'alignement) de sorte que l'amplitude positive et négative de la forme d'onde soit égale, comme sur la photo 10-7.
6	**REGLAGE PICK UP ANGLE**					
	0,2 V /DIV	0,2 μS /DIV	TP5 broche 1 (RF)	Pick up angle réglage tangentiel	Meilleur modèle de vue	• Appuyer sur les touches TRACK FWD, PLAY et PAUSE pour fermer tous les servomécanismes. (Le témoin PAUSE doit être allumé.) • Raccorder l'oscilloscope sur TP5 broche 1 RF (sortie haute fréquence) par une résistance de 10 k-ohms. Utiliser une résistance de 5 k-ohms si la forme d'onde n'est pas claire. • Ajuster la vis de réglage pick up pour obtenir le modèle le plus clair possible comme sur la photo 10-8. Le point de réglage optimal se trouve à mi-course entre les deux points à partie duquel le modèle commence à se détériorer quand la vis de réglage pick up est tournée dans le sens horaire ou anti-horaire.

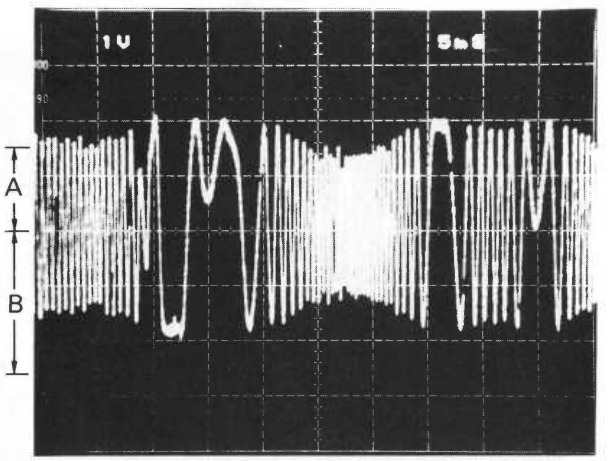


Photo 10-6 A < B

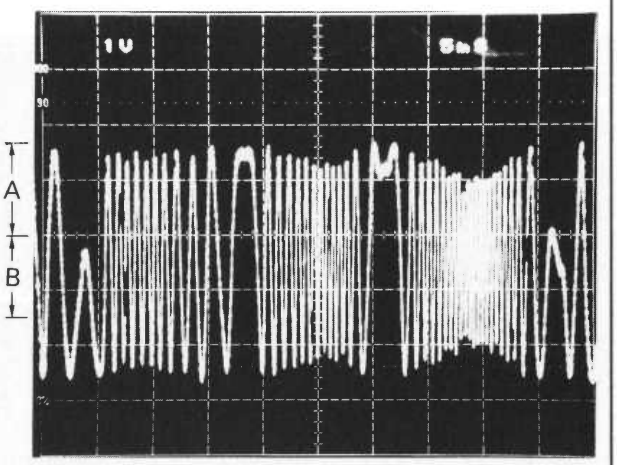


Photo 10-7 A = B

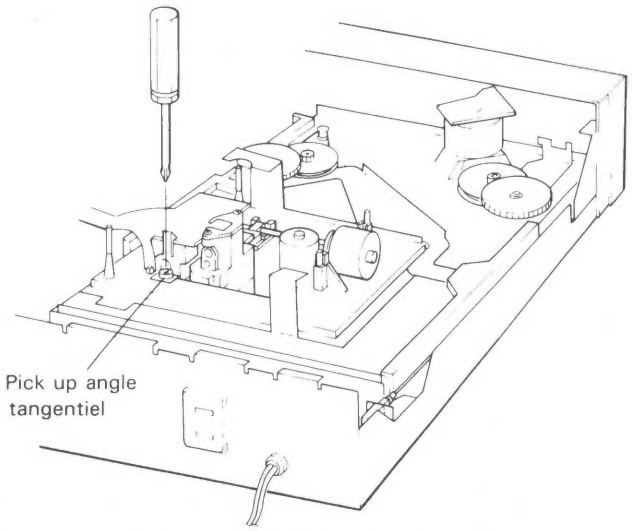


Fig. 10-5 Réglage pick up angle

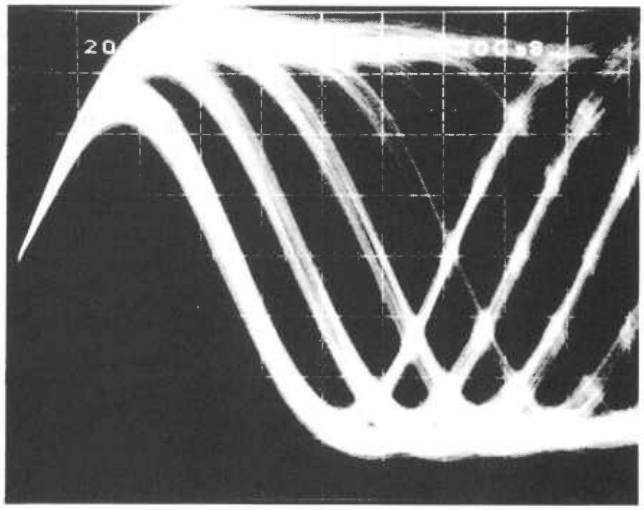
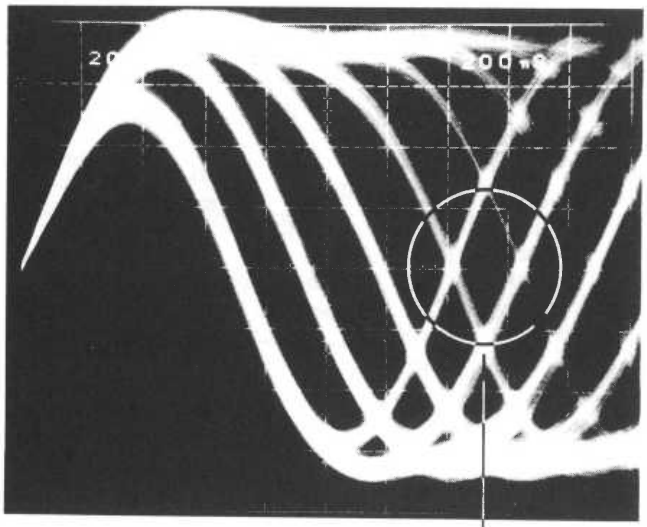


Photo 10-9



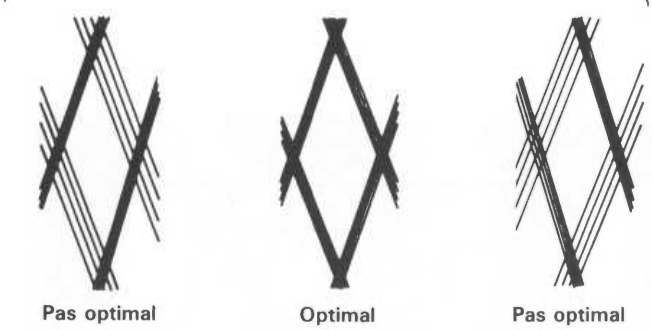


Photo 10-8

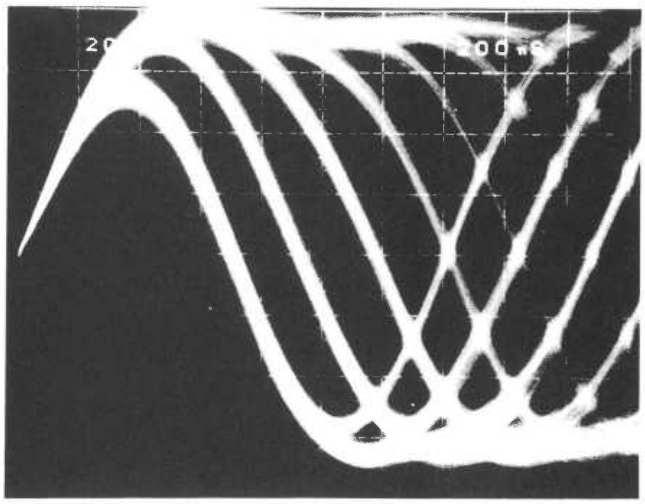


Photo 10-10

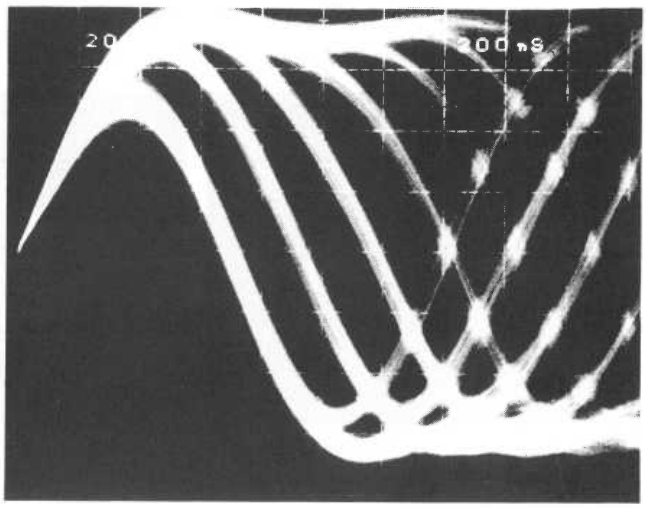
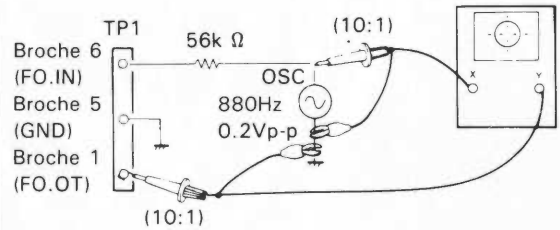


Photo 10-11

N° d' étape	Réglage d'oscilloscope V	Réglage d'oscilloscope H	Points d'essai	Points de réglage	Postes de contrôle/ Spécifications de réglage	Procédure de réglage
7	**REGLAGE DE GAIN DE MISE AU POINT (SANS UTILISATION D'UN AJUSTEUR FTG)** *Remarque: Si l'on a un ajusteur FTG, sauter cette démarche et passer en page 57.*					
	50 mV /div	0,5 mS /div	Borne de sortie Osc. AF	Réglage de sortie Osc. AF	880Hz 0,2Vp-p	• Raccorder l'oscilloscope à la borne de sortie de l'oscilloscope AF et ajuster sa sortie à 880 Hz et 0,2 Vc-c. (La sortie d'oscillateur AF doit être ajustée avant la connexion décrite ci-après.) • Appuyer tour à tour sur les touches TRACK FWD, PLAY et PAUSE pour fermer tous les servomécanismes.
	Ch-1 20 mV /div CH-2 50 mV /div	Mode X-Y	CH-1 TP1 broche 6 (FO. IN et sortie Osc. AF) CH-2 TP1 broche 1 (FO.OT)	VR3 (FO.GA)	Figures Lissajous symétriques	• Raccorder l'oscilloscope, un oscillateur AF et une résistance au lecteur comme indiqué sur la Fig. 10-6. Régler l'oscilloscope en mode X-Y. • Ajuster VR3 FO.GA (gain de mise au point) de sorte que les figures Lissajous deviennent symétriques. (Voir photo 10-13)



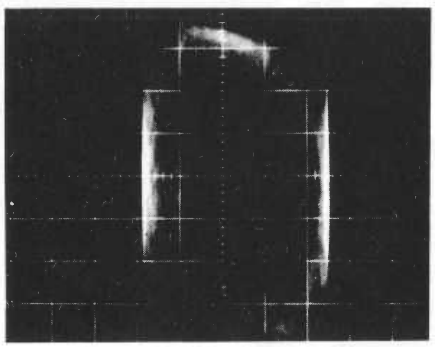


Photo 10-12 Gain faible

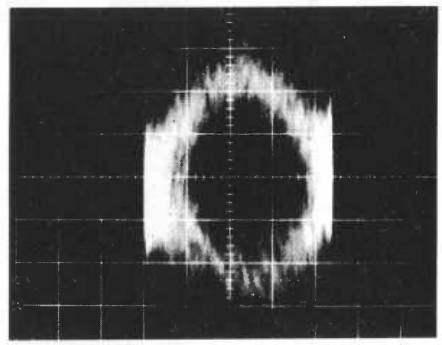


Photo 10-13 Gain optimal

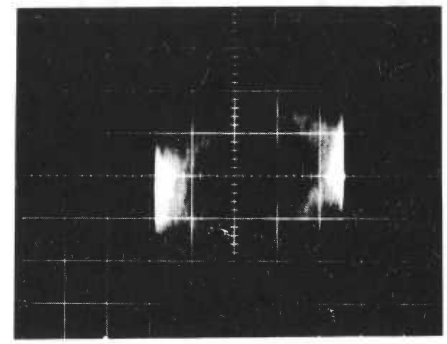
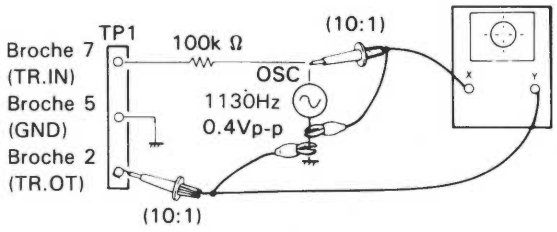


Photo 10-14 Gain élevé

N° d' étape	Réglage d'oscilloscope V	Réglage d'oscilloscope H	Points d'essai	Points de réglage	Postes de contrôle/ Spécifications de réglage	Procédure de réglage
8	**REGLAGE DE GAIN D'ALIGNEMENT (SANS UTILISATION D'UN AJUSTEUR FRG)** *Remarque: Si l'on a un ajusteur FTG, sauter cette démarche et voir en page 57.*					
	0,1V /div	0,5 mS /div	Borne de sortie Osc. AF	Réglage de sortie Osc. AF	1130Hz 0,4Vc-c	• Raccorder l'oscilloscope à la borne de sortie de l'oscillateur AF et ajuster sa sortie à 1130 Hz et 0,4 Vc-c. (La sortie d'oscillateur doit être ajustée avant la connexion décrite ci-après.) • Appuyer tour à tour sur les touches TRACK FWD, PLAY et PAUSE pour fermer tous les servomécanismes.
	CH-1 50mV /div CH-2 50mV /div	Mode X-Y	CH-1 TP1 broche 7 (TR.IN et sortie OSC. AF) CH-2 TP1 broche 2 (TR.OP)	VR4 (TR.GA)	Figures Lissajous symétriques	• Raccorder l'oscilloscope, l'oscillateur AF et une résistance au lecteur comme illustré sur la Fig. 10-7. Régler l'oscilloscope en mode X-Y. • Ajuster VR4 TR.GO (gain d'alignement de sorte que les figures Lissajous soient symétriques. (Voir photo 10-16)



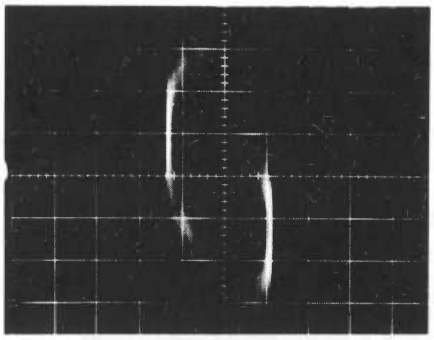


Photo 10-15 Gain faible

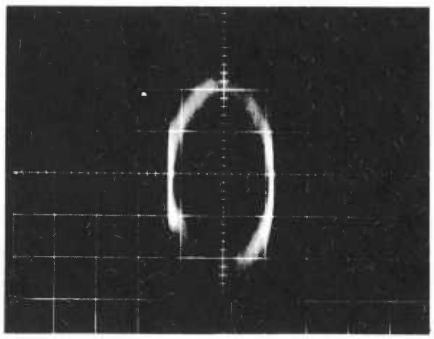


Photo 10-16 Gain optimal

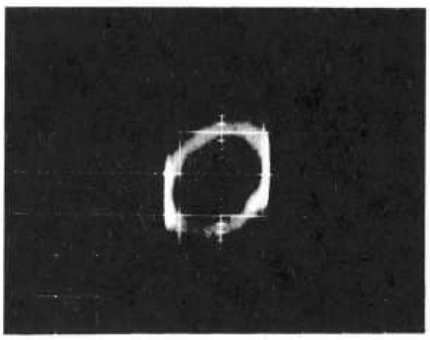


Photo 10-17 Gain élevé

N° d' étape	Réglage d'oscilloscope V	Réglage d'oscilloscope H	Points d'essai	Points de réglage	Postes de contrôle/ Spécifications de réglage	Procédure de réglage
9	**REGLAGE DE GAIN DE MISE AU POINT ET D'ALIGNEMENT AVEC UTILISATION D'UN AJUSTEUR FTG** *Remarque: Si l'on a ajusté les gains de mise au point et d'alignement aux démarches 7 et 8, ignorer cette étape et passer en page 58.*					
						• Allumer l'interrupteur POWER qui se trouve sur le flanc droit de l'ajusteur FTG. Tourner sur 1 le sélecteur de l'ajusteur FTG, situé sur le côté gauche du panneau.
						• Raccorder l'oscilloscope sur TP (point d'essai) de l'ajusteur FTG. Le point TP est situé sur le côté droit du sélecteur.
				Potentiomètres FREQ-1 d'ajusteur FTG		• Ajuster les potentiomètres FREQ-1 de l'ajusteur FTG de sorte que la fréquence de sortie devienne 880 Hz. La fréquence est indiquée par trois diodes LED à 7 segments sur l'ajusteur FTG.
	50 mV /div	0,5 mS /div	TP d'ajusteur TFG	Potentiomètres GAIN-1 d'ajusteur FTG		• Ajuster les 2 potentiomètres GAIN-1 de l'ajusteur FTG de sorte que l'amplitude du signal de sortie devienne 0.2 Vc-c.
						• Tourner sur 2 le sélecteur de l'ajusteur FTG.
				Potentiomètres FREQ-2 d'ajusteur FTG		• Ajuster les deux potentiomètres FREQ-2 de l'ajusteur FTG de sorte que la fréquence de sortie devienne 1130Hz.
	0,1V /div	0,5 mV /div	TP d'ajusteur FTG	Potentiomètres GAIN-2 d'ajusteur FTG		• Ajuster les deux potentiomètres GAIN-2 de l'ajusteur FTG de sorte que l'amplitude du signal de sortie devienne 0,4 Vc-c.
						• Tourner le Sélecteur à la position neutre (centre).
						• Raccorder le fil orange de l'ajusteur FTG sur TP1 broche 6 (FO.IN) du lecteur, le fil brun sur TP1 broche 1 (FO.OT), le fil jaune sur TP1 broche 7 (TR.IN), le fil rouge sur TP1 broche 2 (TR.OT) et le fil noir au châssis.
						• Appuyer tour à tour sur les touches TRACK FWD, PLAY et PAUSE pour fermer tous les servomécanismes.
				VR3 (FO.GA)	Diode LED verte (JUST) allumée	• Tourner à 1 le Sélecteur. Ajuster VR3 FO.GAI (gain de mise au point) de sorte que s'allume la diode LED verte (JUST).
				VR4 (TR.GA)	Diode LED verte (JUST) allumée	• Tourner à le Sélecteur de l'ajusteur FTG. Ajuster VR4 TR.GO (gain d'alignement) de sorte que s'allume la diode LED verte (JUST).

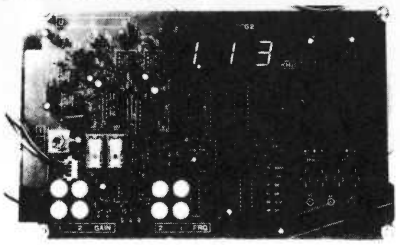


Photo 10-18 Ajusteur FTG

N° d' étape	Réglage d'oscilloscope V	Réglage d'oscilloscope H	Points d'essai	Points de réglage	Postes de contrôle/ Spécifications de réglage	Procedimiento de ajuste
10	**REGLAGE DE FREQUENCE DE FONCTIONNEMENT LIBRE VCO**					
	0,5V /DIV	0,1 μS /DIV	Conducteur de C47 d'ensemble plaquette VCO ou broche d'essai			• Raccorder l'oscillateur au conducteur de C47 ou broche d'essai, de la plaquette VCO. (Voir Fig. 10-9) • Appuyer tour à tour sur les touches TRACK FWD et PLAY pour fermer les servomécanismes de mise au point et d'axe. • Tourner sur DC le sélecteur AC-GND-DC de l'oscilloscope.
					Forme d'onde positionnée au centre	• Ajuster la position verticale de l'oscilloscope de sorte que la forme d'onde soit positionnée au centre. Remarque: Il n'est pas nécessaire de régler le niveau GND au centre de l'oscilloscope au cours de ce réglage. Positionner simplement la forme d'onde au centre de l'oscilloscope par le réglage de position verticale.
						• Appuyer sur la touche PAUSE pour fermer le servomécanisme d'alignement.
				VL1	Forme d'onde positionnée au centre Le niveau CC des formes d'onde n'est pas changé.	• Ajuster VL1 (bobine VCO) avec un tournevis de sorte que la forme d'onde soit positionnée au centre. • Ouvrir et fermer le servomécanisme d'alignement par quelques poussées sur la touche PAUSE et vérifier que le niveau DC des formes d'ondes n'est pas changé.

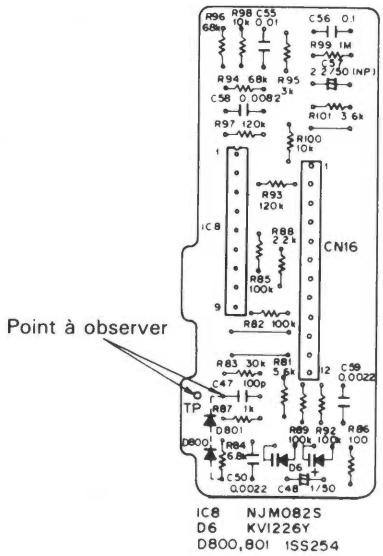


Fig. 10-8 Ensemble de plaquette VCO

10. AJUSTE

- **Tipos de ajustes**

1. Verificación de la energía de salida del LD (diodo de láser)
2. Ajustes del descentramiento de seguimiento y del descentramiento del enfoque
3. Verificación de bloqueo del enfoque y de bloqueo del pivote
4. Ajuste de la rejilla
5. Ajuste de equilibrio de seguimiento
6. Ajuste tangencial
7. Ajuste de ganancia de enfoque
8. Ajuste de ganancia de seguimiento
9. Ajuste de la frecuencia de funcionamiento libre del VCO.

- **Equipos de medición**

1. Osciloscopio de trazado doble
2. Medidor de energía de láser (LPM-8000)
3. Disco de prueba (YEDS-7)
4. Oscilador de AF
5. Excitador de rejilla (R-882)

- **Mode de prueba**

Todos los ajustes deben efectuarse en el modo de prueba.

Ajuste del modo de prueba y procedimientos de cancelación

(1)Para ajustar el modo de prueba conecte (ON) el interruptor de alimentación (POWER) del reproductor (S401) cortocircuitando los terminales del mode de prueba (TEST MODE TERMINAL).
(2)Para cancelar el mode de prueba, desconecte (OFF) simplemente el interruptor de alimentación (POWER) del reproductor.

Las funciones de las diversas teclas en el modo de prueba se enumeran en la tala 10-1.

- **Puntos de ajuste**

VR2: Descentramiento de seguimiento (TR.OF)
VR3: Ganancia de enfoque (FO.GA)
VR4: Ganancia de seguimiento (TR.GA)
VR5: Equilibrio de seguimiento (TR.BL)
VR6: Descentramiento de enfoque (FO.OF)
VL1: Frecuencia de funcionamiento libre del VCO.

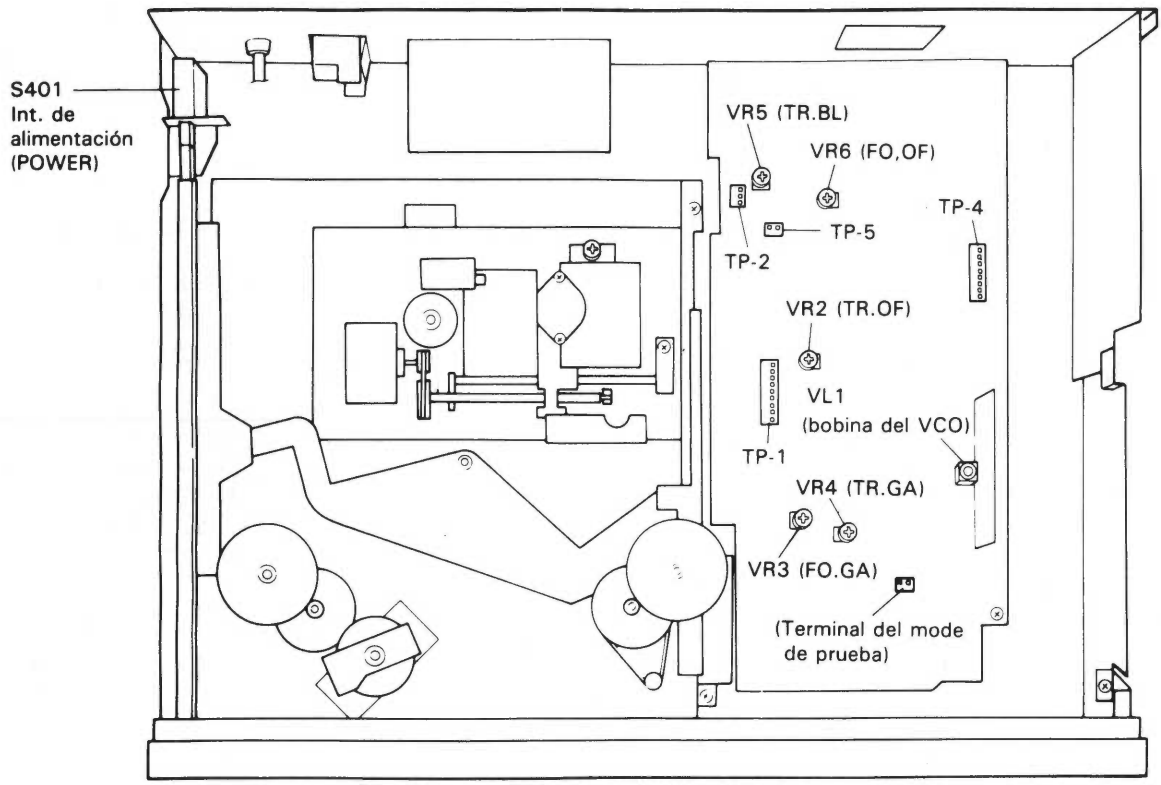
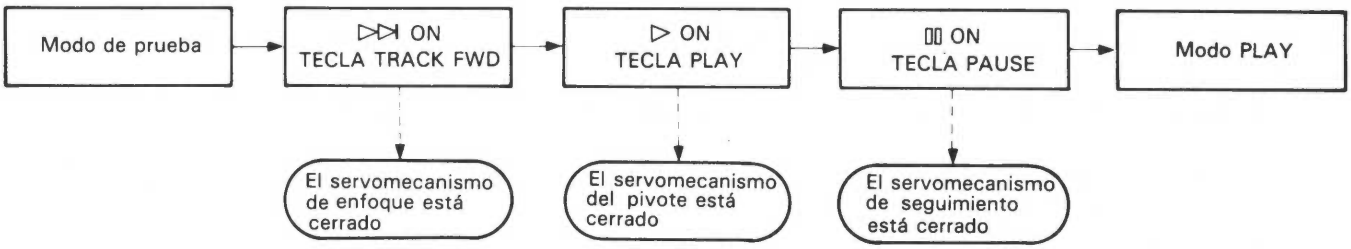


Fig. 10-1 Puntos de ajuste

En el modo de prueba, cada servocircuito puede cerrarse y abrirse mediante operaciones independientes. Consecuentemente, cada servocircuito debe estar cerrado en cierto momento (secuencia en serie) para establecer el modo de reproducción (PLAY).

Tenga presente que el modo de reproducción (PLAY) no se activa presionando simplemente la tecla de reproducción (PLAY) en el modo de prueba.
Mientras se selecciona o carga un disco, no intente efectuar otras operaciones.

Ejemplo: Conmutación del modo del parada (STOP) al de reproducción (PLAY)



- Los servomecanismos operan en secuencia en serie durante el modo de prueba.

• Funciones de las teclas en el modo de prueba

Símbolo	Tecla	Función durante el modo de prueba	Descripción
⏮	TRACK BACK	Diodo láser activado (ON).	Se enciende el diodo láser.
⏭	TRACK FWD	El servomecanismo de enfoque está cerrado.	Se carga el disco desde el compartimiento y se enclava. Se enciende el diodo láser. El accionador se mueve hacia arriba y abajo y luego se cierra el servomecanismo de enfoque.
▷	PLAY	El servomecanismo del pivote está cerrado.	El pivote empieza a girar y el servomecanismo se cierra cuando las revoluciones alcanzan la velocidad óptima.
▯▯	PAUSE	El servomecanismo de seguimiento está cerrado/abierto.	El servomecanismo de seguimiento se cierra presionando una vez la tecla, se enciende el indicador de pausa (PAUSE) y el reproductor se establece en el modo de reproducción (PLAY) con el tiempo transcurrido indicado en el visualizador fluorescente. Los servomecanismo de enfoque y de pivote deben estar cerrados en este momento. Cuando se presiona de nuevo la tecla, se abre el servomecanismo de seguimiento.
◁◁	MANUAL SEARCH REV	El carro se mueve hacia atrás (hacia el centro del disco)	El carro se mueve hacia el centro del disco a rápida velocidad de aprox. 1 cm/s. Puesto que no hay mecanismo de seguridad para detener el carro, suelte la tecla cuando el carro llegue al final.
▷▷	MANUAL SEARCH FWD	El carro se mueve hacia adelante (hacia el extremo del disco)	El carro se mueve hacia el extremo del disco a rápida velocidad de aprox. 1 cm/s. Puesto que no hay mecanismo de seguridad para detener el carro, suelte la tecla cuando el carro llegue al final.
▭	REPEAT	El objetivo se mueve hacia arriba y abajo.	El disco se carga desde el compartimiento y se enclava. Se enciende el diodo láser. El accionador se mueve hacia arriba y abajo dos veces y el disco se repone en el compartimiento. El servomecanismo de enfoque no se cierra.
□	STOP	Parada (STOP)	Se abren todos los servomecanismos.
⏏	EJECT	Sale expulsado el compartimiento..	El compartimiento sale expulsado. Sin embargo, el fonocaptor no retorna a la posición de reposo.
1-6	DISC 1-6 KEY	Se selecciona el disco	Puede seleccionarse un disco del sistema de seis discos. Si se presionan las teclas de avance de canciones (TRACK FWD) o de repetición (REPEAT) sin haber seleccionado un disco, el reproductor selecciona automáticamente el primer disco.

Tabla 10-1

NOTAS:
1) Los ajustes siguientes deben efectuarse en el modo de prueba. Consulte la página 49 para establecer el reproductor en el modo de prueba.
2) El ajuste siguiente, excepto [1. VERIFICACION DE LA ENERGIA DE SALIDA DEL DIODO LASER] debe efectuarse con un disco de prueba (YEDS-7). Ponga el disco de prueba grabado en la parte de arriba en el compartimiento e inserte el compartimiento en el reproductor.
3) La descripción de los ajustes siguientes empieza por "STOP".

N°. de paso	Ajuste del osciloscopio V	Ajuste del osciloscopio H	Puntos de prueba	Puntos de ajuste	Itemes de comprobación/ Especificaciones de ajuste	Procedimiento de ajuste
1	**VERIFICACION DE LA ENERGIA DE SALIDA DEL DIODO DE LASER** *NOTE:* *Este ítem puede saltarse bajo el servicio normal. Debe verificarse sólo cuando la energía de láser parezca ser débil o cuando el diodo láser parezca estar defectuoso.*					
				VR1	0,26 mw ±0,02 mW	Para verificar la energía de salida de láser, debe sacarse el foocaptor del clasis del mecanismo en elprocedimiento siguiente. (Consulte la página 13) • Desconecte el interruptor de alimentación. • Libere la correa A. • Saque el retenedor de la barra guía. • Afloje el tornillo de fijación. • Levante lentamente el conjunto del fonocaptor al revés manteniendo el cable plano conectado. Tenga cuidado en no cortocircuitar la tajerta de circuito impreso del fonocaptor con el chasis. • Ajuste el reproductor al modo de prueba. • Ponga el sensor del medidor de energía de láser (LPM-8000) encima del objetivo. • Presione la tecla TRACK REV para activar el láser. • Verifique que la energía de salida de láser esté dentro del margen especificado (0,26 ±0,02 mW). Si no es así, ajuste VR1 del fonocaptor para satisfacer las especificaciones. • Desconecte el interruptor de alimentación. • Vuelva a montar las partes.
2	**AJUSTE DEL DESCENTRAMIENTO DE SEGUIMIENTI Y DESCENTRAMIENTO DE ENFOQUE**					
	20 mV /div	1 ms /div	Patilla 9 de TP1 (TR.RT)	VR2 (TR.OF)	0V ±10 mV	• Conecte el osciloscopio o voltímetro a la patilla 9 de TP1 TR.RT (retorno de seguimiento). Ajuste VR2 TR.OF (descentramiento de seguimiento) de modo que la tensión en la patilla 9 de TP1 pase a ser de 0 V ±10mW.
	20 mV /div	1 ms /div	Patilla 3 de TP1 (FO.ER)	VR6 (FO.OF)	0V ±10 mV	• Conecte el osciloscopio o voltímetro a la patilla 3 de TP1 FO.ER (error de enfoque). Ajuste VR6 FO.OF (descentramiento de enfoque) de modo que la tensión en la patilla 3 de TP1 pase a ser de 0 V ±10 mW.

N°. de paso	Ajuste del osciloscopio V	Ajuste del osciloscopio H	Puntos de prueba	Puntos de ajuste	Itemes de comprobación/ Especificaciones de ajuste	Procedimiento de ajuste
3	**VERIFICACION DE BLOQUEO DE ENFOQUE Y BLOQUEO DE PIVOTE**					
	0,2V /div	10 μs /div	Patilla 1 de TP5 (RF)		Se genera la señal de RF	• Presione la tecla MANUAL SEARCH FWD para mover el fonocaptor más cerca de la parte intermedia del disco. Tenga presente que este paso debe realizarse. • Conecte el osciloscopio a 1 apatilla 1 de TP5 RF (salida RF) y verifique que se genera la señal de RF cuando se presiona la tecla TRACK FWD (cuando se cierra el servomecanismo de enfoque).
					Rotación hacia la izquierda	• Presione la tecla PLAY y compruebe que gire el disco a la velocidad óptima (unas 300 rpm en la mitad del disco) en la dirección hacia la izquierda.
4	**AJUSTE DE LA REJILLA**					
	1V /div	10 ms /div	Patilla 4 de TP1 (TR.ER)	Rejilla	Punto NULL (envolvente pequeña y uniforme)	• Presione las teclas TRACK FWD y PLAY por turnos para cerrar los servomecanismos de enfoque y del pivote (dejando el servomecanismo de seguimiento abierto). • Conecte el osciloscopio a la patilla 4 de TP1 TR.ER (error de seguimiento) a través de L.P.F. de 4 kHz como se muestra en la Fig. 10-2. • Inserte el excitador de rejila en elorificio de ajuste del fonocaptor como se muestra en la Fig. 10-3. Gírelo lentamente y busque el punto nulo (NULL) (vea la fotografía 10-1). Nota: Si se levanta el fonocaptor con el excitador de rejilla durante el ajuste, retenga un poco bajado el fonocaptor.
					Amplitud máxima	• Gire el excitador de rejilla lentamente hacia la derecha desde el punto NULL y párelo en el punto en que la forma de onda de la señal de error de seguimiento llegue primero al punto máximo. (Vea la fotografía 10-3).
	Canal 1 50 mV/div Canal 2 50 mV/div Acoplamiento de CA	Modo X-Y	Canal 1 Patilla 1 de TP2 (BKTE) Canal 2 Patilla 2 de TP2 (FWTE)		Línea recta de 45 grados	• Conecte el canal 1 del osciloscopio a la patilla 1 de TP2 (BKTE) y el canal 2 a la patilla 2 de TP2 (FWTE). Ajuste el interruptor AC-GND-DC del oscilloscopio a AC y el modo a X-Y. • Mientras observa el patrón de Lissajous (veala fotografía 10-4), ajuste con precisión la rejilla al punto en el que el patrón de Lissajous pase a ser una línea fina en 45 grados (vea la fotografía 10-5).

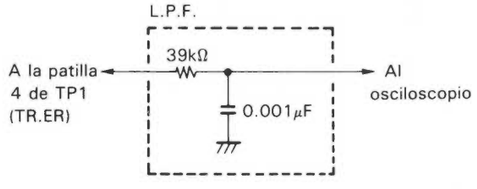


Fig. 10-2 L.P.F. de 4 kHz

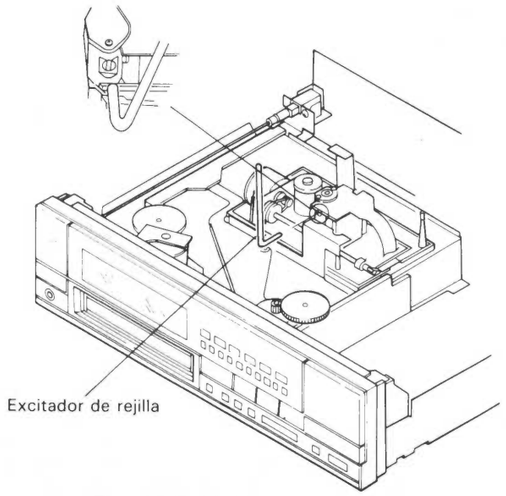
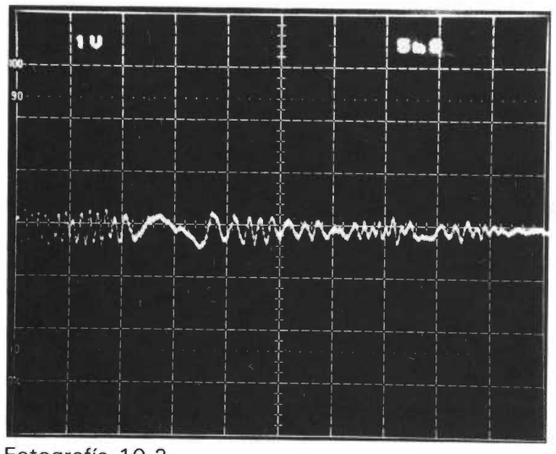
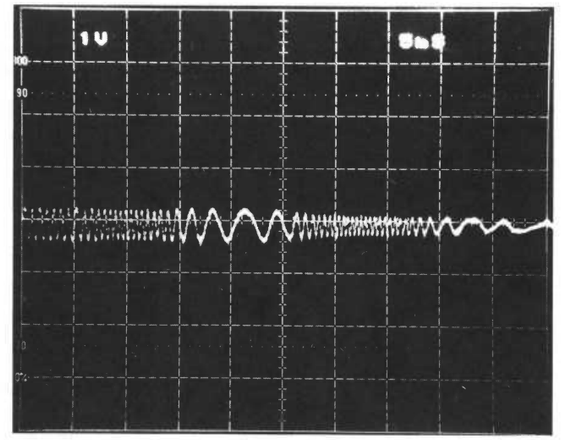


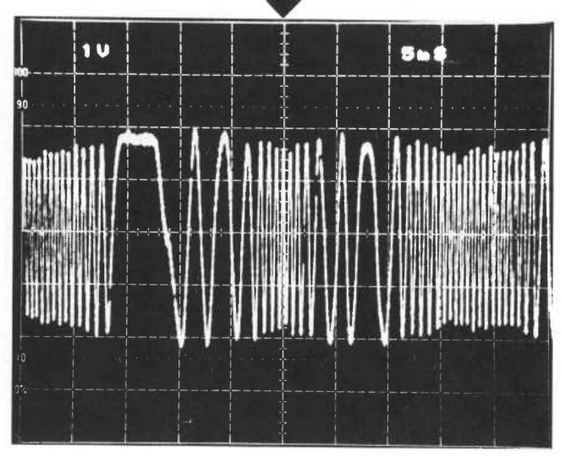
Fig. 10-3 Ajuste de la rejilla



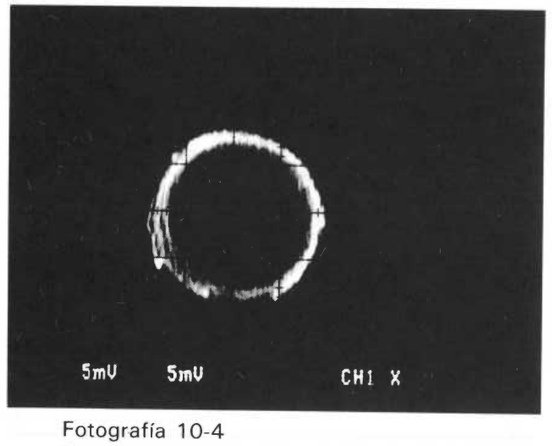
Fotografía 10-2
Envolvente pequeña pero gruesa (no el punto NULL)



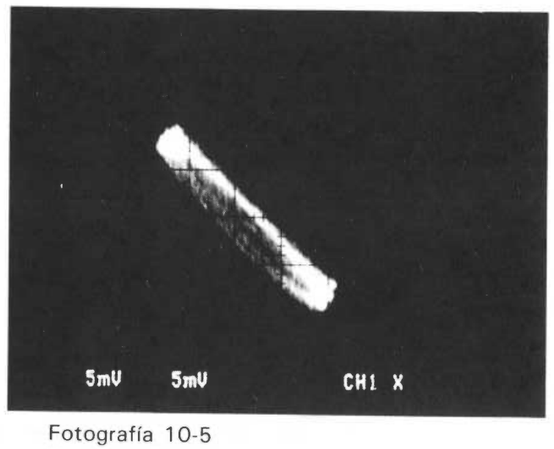
Fotografía 10-1
Envolvente pequeña y uniforme (punto NULL)



Fotografía 10-3
Amplitud máxima

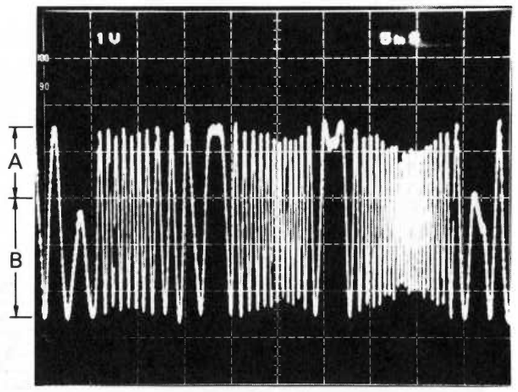


Fotografía 10-4
Patrones de Lissajous (antes del ajuste)

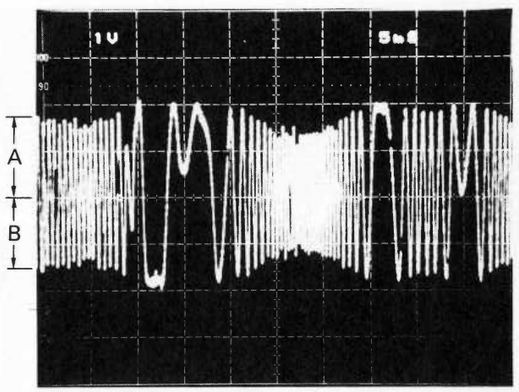


Fotografía 10-5
Patrones de Lissajous (después del ajuste)

N°. de paso	Ajuste del osciloscopio V	Ajuste del osciloscopio H	Puntos de prueba	Puntos de ajuste	Itemes de comprobación/ Especificaciones de ajuste	Procedimiento de ajuste
5	**AJUSTE DEL EQUILIBRIO DE SEGUIMIENTO**					
	1V /div	10 ms /div	Patilla 4 de TP1 (TR.ER)	VR5 (TB.BL)	Amplitud positiva y negativa iguales (A = B)	• Presione la tecla MANUAL SEARCH FWD para mover el fonocaptor más cerca de la parte intermedia del disco. • Presione las teclas TRACK FWD y PLAY por turnos para iniciar las vueltas del disco. • Ajuste el nivel de tierra (GND) del osciloscopio en el centro. • Conecte el osciloscopio a la patilla 4 de TP1 TR.ER (error de seguimiento) a través de L.P.F. mostrado en la Fig. 10-2. Ajuste VR5 TR.BL (equilibrio de seguimiento) de modo que la amplitud positiva y negativa de la forma de onda sean iguales que en la fotografía 10-7.



Fotografía 10-6 A < B



Fotografía 10-7 A = B

6	**AJUSTE PICK UP ÁNGULO**					
	0,2V/div Acoplamiento de CA	0,2 μs /div	Patilla 1 de TP5 (RF)	pick up ángulo ajuste tangencial	Mejor patrón de vista	• Presione las teclas TRACK FWD, PLAY y PAUSE por turnos para cerrar todos los ervomecanismos. (El indicador PAUSE deberá encenderse.) • Conecte el osciloscopio a la patilla 1 de TP5 RF (salida de RF) a través de un resistor de 50 kohmios si la forma de onda no es clara. • Ajuste el tornillo de ajuste pick up ángulo para obtener el mejor patrón de vista como en la fotografía 10-8. El punto óptimo de ajuste está en un punto intermedio entre los dos puntos desde donde empieza a deteriorarse el patrón de vista cuando el tornillo de ajuste tangencial se gira hacia la derecha o hacia la izquierda. Tornillo de ajuste ángulo

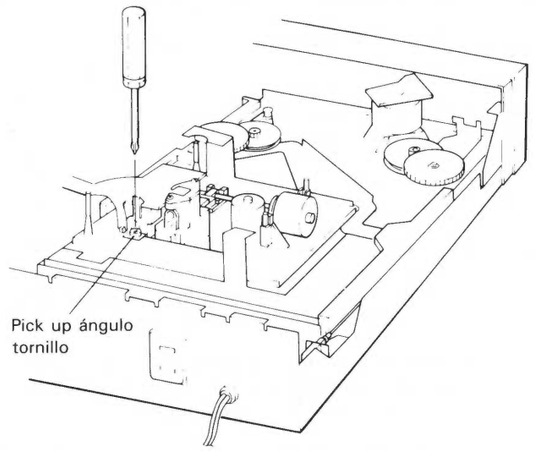
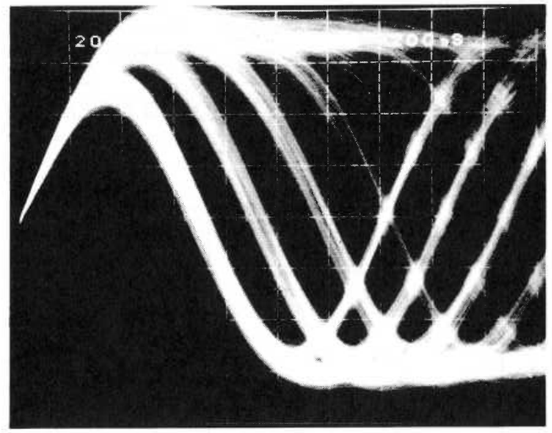
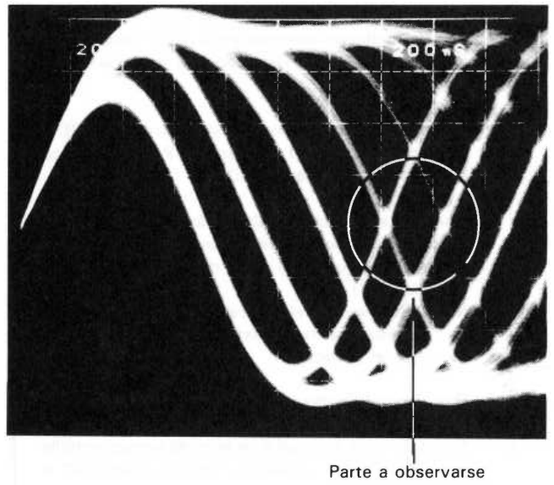
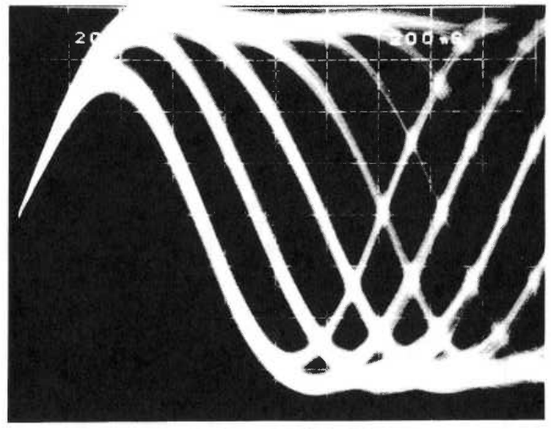


Fig. 10-5 Ajuste pick up ángulo



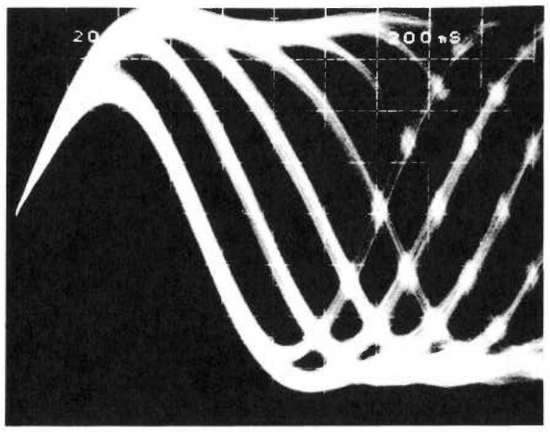
Fotografía 10-9





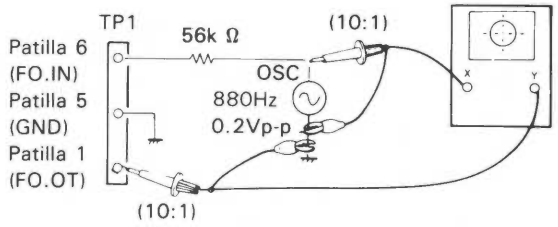
Fotografía 10-10

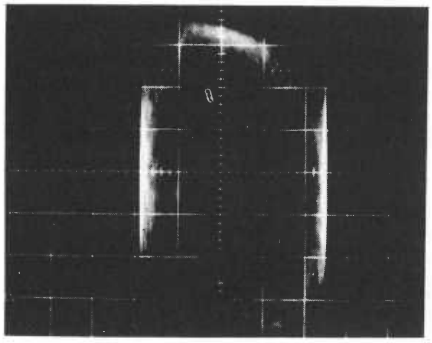
Fotografía 10-8



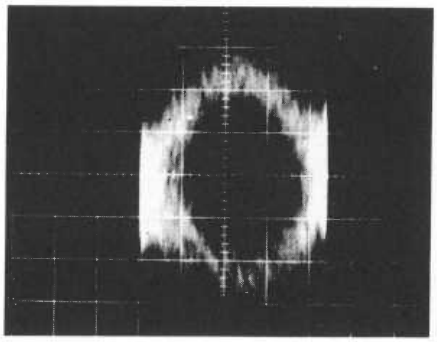
Fotografía 10-11

N°. de paso	Ajuste del osciloscopio V	Ajuste del osciloscopio H	Puntos de prueba	Puntos de ajuste	Itemes de comprobación/ Especificaciones de ajuste	Procedimiento de ajuste
7	**AJUSTE DE LA GANANCIA DE ENFOQUE (SIN EMPLEAR UN AJUSTADOR FTG)** *Nota: Si dispone de un ajustador FTG, salte este paso y consulte la página 57.*					
	50 mV /div	0,5 ms /div	Terminal de salida del osc. de AF	Control de salida del osc. de AF	880Hz 0,2Vp-p	• Conecte unosciloscopio al terminal de salida del oscilador de AF y ajuste su salida a 880 Hz y 0,2 Vp-p. (La salida del oscilador de AF debe ajustarse antes de la conexión descrita a continuación.) • Presione las teclas TRACK FWD, PLAY y PAUSE por turnos para cerrar todos los servomecanismos.
	Canal 1 20 mV /div Canal 2 50 mV /div	Modo X-Y	Canal 1 Patilla 6 de TP1 (FO.IN) y salida del osc. de AF Canal 2 Patilla 1 de TP1 (FO.OT)	VR3 (FO.GA)	Patrones de Lissajous simétricos	• Conecte el osciloscopio, oscilador de AF y un resistor al reproductor como se muestra en la Fig. 10-6. Ajuste el osciloscopo al modo X-Y. • Ajuste VR3 (FO.GA) (ganancia de enfoque) de modo que los patrones de Lissajous sean simétricos (vea la fotografía 10-13).

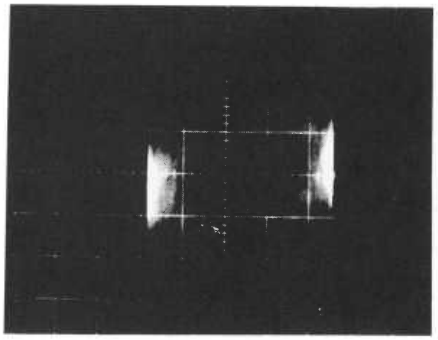




Fotografía 10-12
Baja ganancia

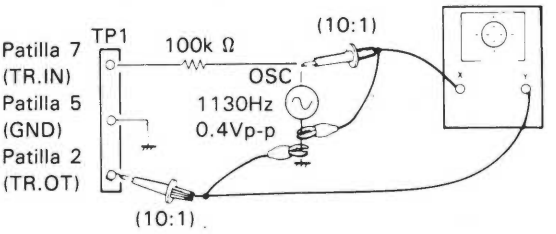


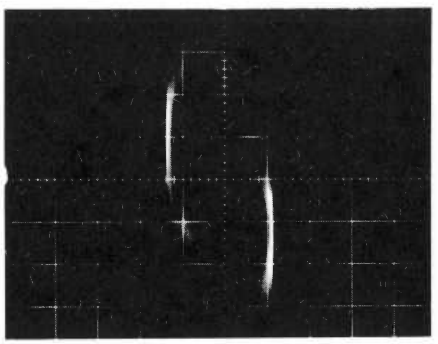
Fotografía 10-13
Ganancia óptima



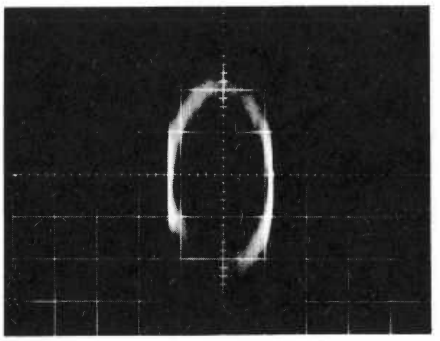
Fotografía 10-14
Alta ganancia

N°. de paso	Ajuste del osciloscopio V	Ajuste del osciloscopio H	Puntos de prueba	Puntos de ajuste	Itemes de comprobación/ Especificaciones de ajuste	Procedimiento de ajuste
8	**AJUSTE DE LA GANANCIA DE SEGUIMIENTO (SIN EMPLEAR UN AJUSTADOR FTG)** *Nota: Si dispone de un ajustador FTG, salte este paso y consulte la página 57.*					
	0,1 V /div	0,5 ms /div	Terminal de salida del osc. de AF	Control de salida del osc. de AF	1130Hz 0.4Vp-p	• Conecte un osciloscopio al terminal de salida del oscilador de AF y ajuste su salida a 1130 Hz y 0,4 Vp-p. (La salida del oscilador de AF debe ajustarse antes de la conexión descrita a continuación.) • Presione las teclas TRACK FWD, PLAY y PAUSE por turnos para cerrar todos los servomecanismos.
	Canal 1 50 mV /div Canal 2 50 mV /div	Modo X-Y	Canal 1 Patilla 7 de TP1 (TR.IN) y salida del osc. de AF Canal 2 Patilla 2 de TP1 (TR.OT)	VR4 (TR.GA)	Patrones de Lissajous simétricos	• Conecte el osciloscopio, oscilador de AF y un resistor al reproductor como se muestra en la Fig. 10-7. Ajuste el osciloscopo al modo X-Y. • Ajuste VR4 TR.GA (ganancia de seguimiento) de modo que los patrones de Lissajous sean simétricos (vea la fotografía 10-16.

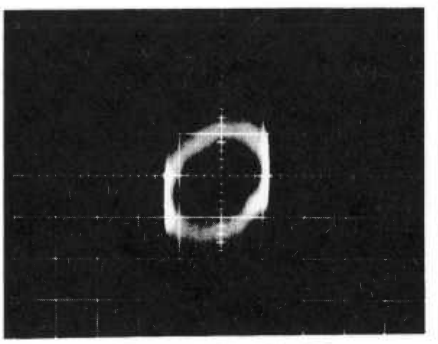




Fotografía 10-15
Baja ganancia

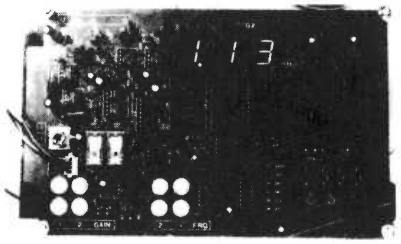


Fotografía 10-16
Ganancia óptima



Fotografía 10-17
Alta ganancia

N°. de paso	Ajuste del osciloscopio V	Ajuste del osciloscopio H	Puntos de prueba	Puntos de ajuste	Itemes de comprobación/ Especificaciones de ajuste	Procedimiento de ajuste
9	**AJUSTE DE LA GANANCIA DE ENFOQUE Y DE SEGUIMIENTO EMPLEANDO UN AJUSTADOR FTG** *Nota: Si usted ha ajustado las ganancias de enque y seguimiento en los pasos 7 y 8, sale este paso y vea la página 58.*					
						• Conecte el interruptor de alimentación del ajustador FTG. EL interruptor está situado a la derecha del ajustador. Gire el selector del ajustador FTG a 1. El selector está situado a la izquierda del panel.
						• Conecte el osciloscopio a TP (punto de prueba) del ajustador FTG. El TP está situado a la derecha del selector.
				Potenc. de FREQ-1 del ajustador FTG		• Ajuste dos potenciómetros de FREQ-1 del ajustador FTG de modo que la frecuencia de salida pase a ser de 880 Hz. La frecuencia se indica con LEDs de 7 segmentos en el ajustador FTG.
	50 mV /div	0,5 ms /div	TP del ajustador FTG	Potenc. de GAIN-1 del ajustador FTG		• Ajuste dos potenciómetros de GAIN-1 del ajustador FTG de modo que la amplitud de la señal de salida sea de 0,2 Vp-p.
						• Gire el Selector del ajustador FTG a 2.
				Potenc. de FREQ-2 del ajustador FTG		• Ajuste dos potenciómetros de FREQ-2 del ajustador FTG de modo que la frecuencia de salida pase a ser de 1130 Hz.
	0,1 V /div	0,5 ms /div	TP del ajustador FTG	Potenc. de GAIN-2 del ajustador FTG		• Ajuste dos potenciómetros de GAIN-2 del ajustador FTG de modo que la amplitud de la señal de salida sea de 0,4 Vp-p.
						• Gire el Selector a la posición neutra (centro).
						• Conecte el conductor naranja del ajustador FTG a la patilla 6 de TP1 (FO.IN) del reproductor, el conductor marrón a la patilla 1 de TP1 (FO.OT), el conductor amarillo a la patilla 7 de TP 1 (TR.IN), el conductor rojo a la patilla 2 de TP1 (TR.OT), y el conductor negro al chasis.
						• Presione las teclas TRACK FWD, PLAY y PAUSE por turnos para cerrar todos los servocircuitos.
				VR3 (FO.GA)	LED verde (JUST) encendido	• Gire el Selector a 1. Ajuste VR3 FO.GA (ganancia de enfoque) de modo que se encienda un LED verde (JUST).
				VR4 (TR.GA)	LED verde (JUST) encendido	• Gire el Selector del ajustador FTG a 2. Ajuste VR4 TR.GA (ganancia de seguimiento) de modo que se encienda el LED verde (JUST).



Fotografía 10-18 Ajustador FTG

N°. de paso	Ajuste del osciloscopio V	Ajuste del osciloscopio H	Puntos de prueba	Puntos de ajuste	Itemes de comprobación/ Especificaciones de ajuste	Procédure de réglage
10	**AJUSTE DE LA FRECUENCIA DE FUNCIONAMIENTO LIBRE DE VCO**					
	0,5 V /div	0,1 μs /div	Conductor de C47 del conjunto del tablero de VCO o patilla de prueba			• Conecte un osciloscopio al conductor de C47 o patilla de prueba del conjunto del tablero de VCO. (Consulte la Fig. 10-9)
						• Presione las teclas TRACK FWD y PLAY por turnos para cerrar los servocircuitos de enfoque y del pivote.
						• Gire el selector AC-GND-DC del osciloscopio a DC.
					La forma de onda se sitúa en el centro	• Ajuste la posición vertical del osciloscopio de modo que la forma de onda quede situada en el centro. Nota: No es necesario ajustar el nivel de GND en el centro del osciloscopio en este ajuste. Sitúe simplemente la forma de onda en el centro del osciloscopio con el control de posición vertical.
						• Presione la tecla PAUSE para cerrar el servomecanismo de seguimiento.
				VL1	La forma de onda se sitúa en el centro	• Ajuste VL1 (bobina de VCO) con un excitador de núcleo de modo que la forma de onda quede situada en el centro.
					El nivel de CC de las formas de ondas no cambia	• Abra y cierre el servomecanismo de seguimiento presionando la tecla PAUSE algunas veces y verifique que el nivel de CC de las formas de ondas no haya cambiado.

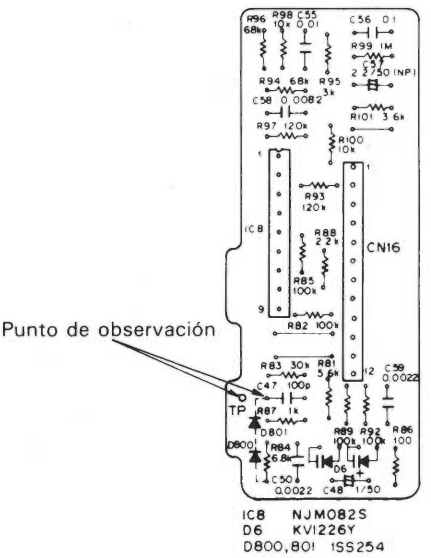


Fig. 10-8 Conjunto del tablero de VCO

11. FOR KC, HEM, HB, HP, S AND S/G TYPES

Model PD-M6/KC, HEM, HB, HP, S and S/G are the same as the PD-M6/KU with the exception of this supplements.

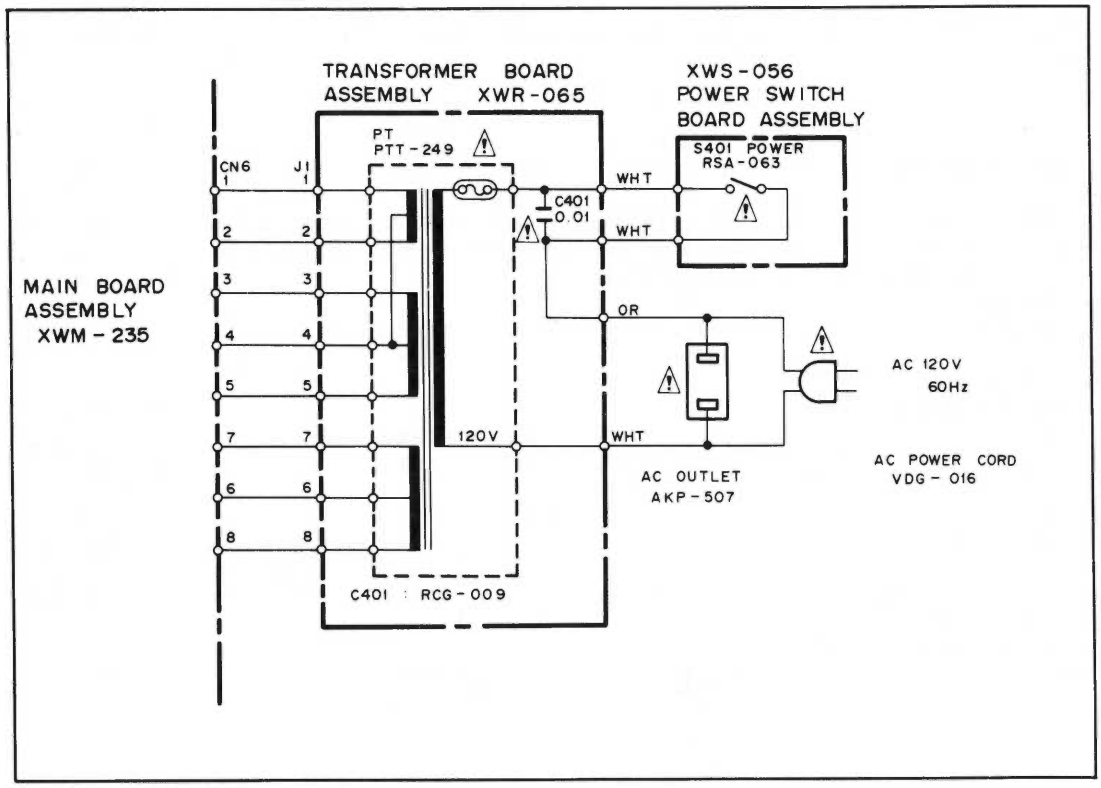
Mark	Symbol & Description	Parts List							Remarks
		KU	KC	HEM	HB	HP	S	S/G	
⚠◉	Main board assembly	XWM-235	XWM-235	XWM-225	XWM-225	XWM-235	XWM-235	XWM-235	
◉	Audio board assembly	Non supply	Non supply	Non supply	Non supply	Non supply	Non supply	Non supply	
⚠ ★	Power transformer (AC120V)	PTT-248	PTT-249	. . .	. . .	. . .	. . .	. . .	
⚠ ★	Power transformer (AC220V/240V)	. . .	. . .	PTT-250	PTT-250	PTT-250	. . .	. . .	
⚠ ★	Power transformer (AC110V/120V/220V/240V)	. . .	. . .	. . .	. . .	. . .	PTT-251	PTT-251	
⚠	AC power cord	VDG-016	VDG-016	PDG-037	PDG-062	PDG-039	PDG-044	PDG-044	
⚠	Strain relief	CM-22C	CM-22C	CM-22B	CM-22B	CM-22B	CM-22	CM-22	
⚠	AC outlet	AKP-507	AKP-507	AKP-508	AKP-509	. . .	AKP-506	AKP-506	
⚠ ★★	Line voltage selector	. . .	. . .	. . .	. . .	. . .	PSB-016	PSB-016	
	Pakcing case	PHH-325	PHH-326	PHH-326	PHH-326	PHH-326	PHH-326	PHH-327	
	Operating instructions (English)	PRB-303	PEB-303	. . .	PRB-303	PRB303	PRB-303	PRB-303	
	Operating instructions (English/German/French/Italian)	. . .	. . .	PRE-050	. . .	. . .	. . .	. . .	

The Main board assembly (XWM-235) is the same as the Main board assembly (XWM-235).

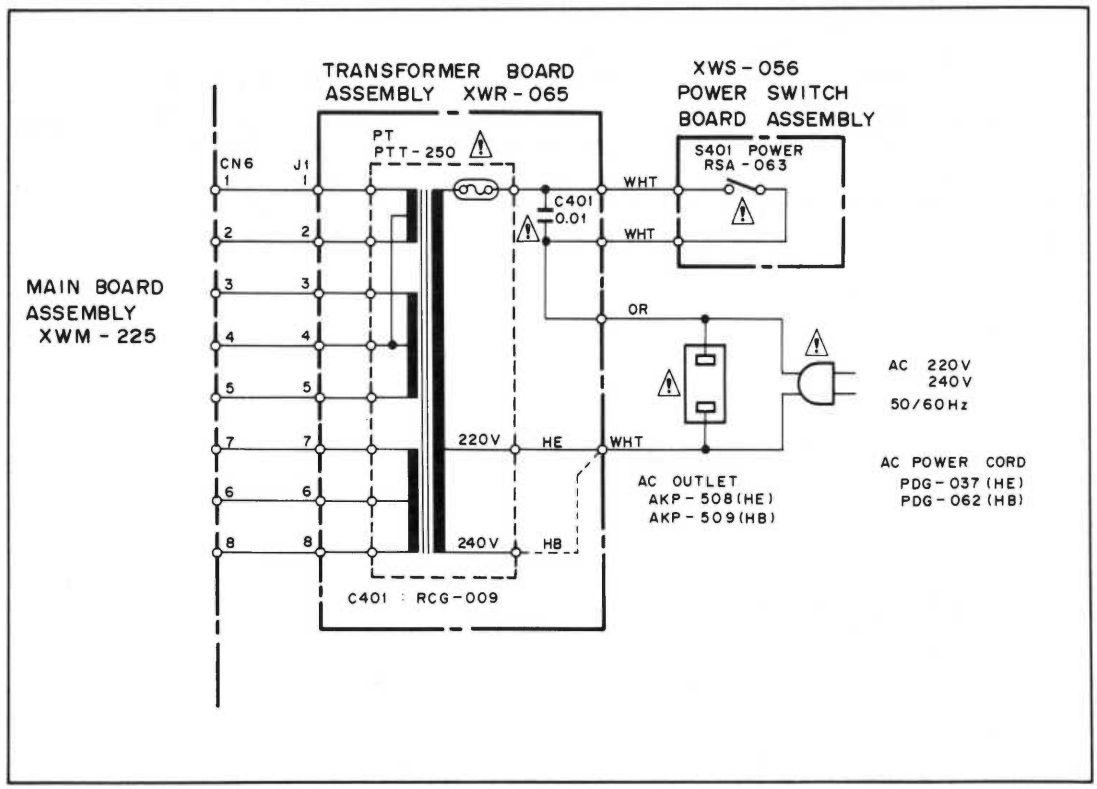
The Audio board assembly (for KU, HEM and HB types) is the same as the Audio board assembly (for KC, S and S/G types) with the exception of the following sections.

Mark	Symbol & Description	Part No.		Remarks
		KU, HEM and HB types	KC, S, and S/G types	
	C88 Capacitor	CEAS010M50	CFTXA105J50	

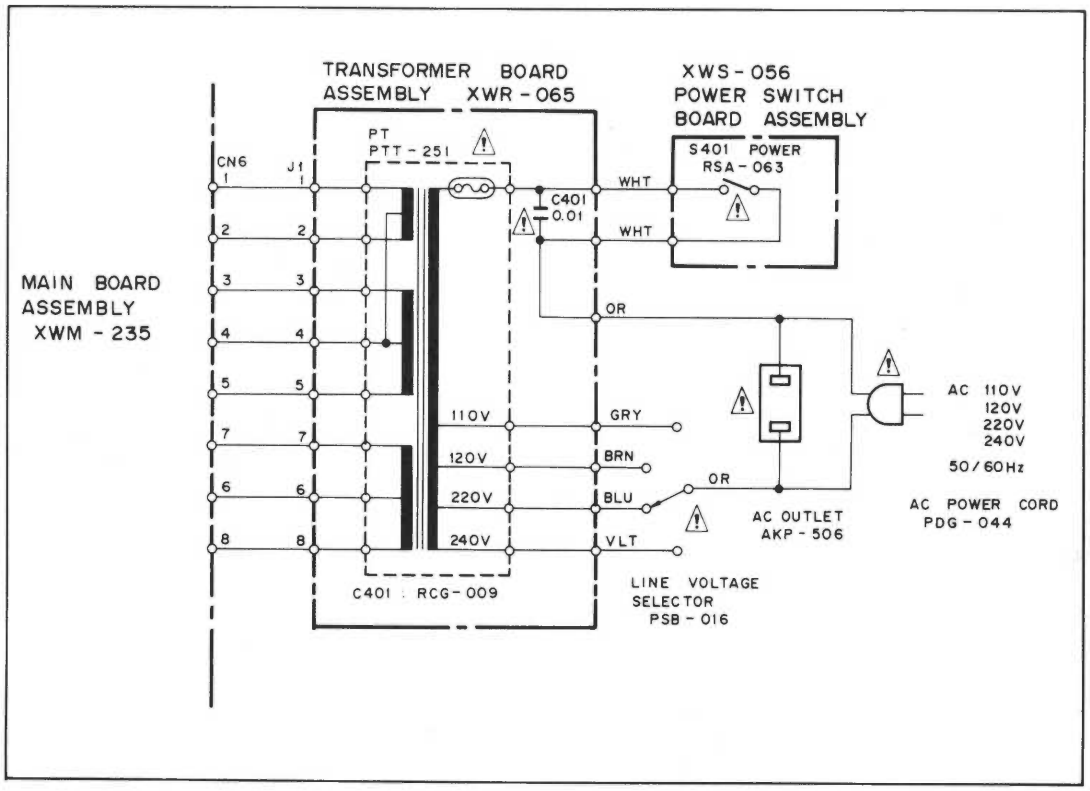
- For KC Type



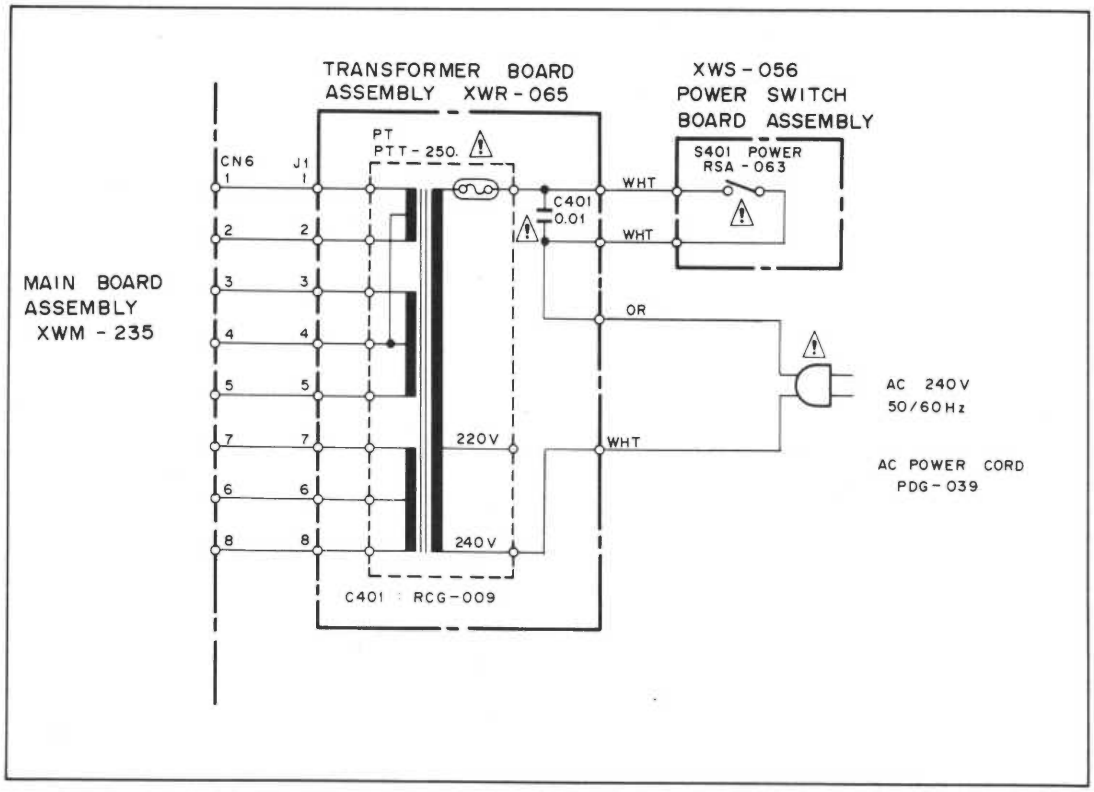
- For HEM and HB Types



- For S and S/G Types



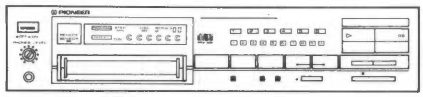
- For HP Type



PIONEER®

Service Manual

CIRCUIT & MECHANISM DESCRIPTIONS



ORDER NO.
ARP-984-A

COMPACT DISC PLAYER

PD-M6(BK)

- This service manual is applicable to the KU, HEM, HB, S S/G, HP and KC types.

CONTENTS

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PIONEER ELECTRONICS AUSTRALIA PTY. LTD. 178-184 Boundary Road, Braeside, Victoria 3195, Australia TEL: (03) 580-9911

1. IC DATA

1. 1 PD3053A

System control C-MOS IC

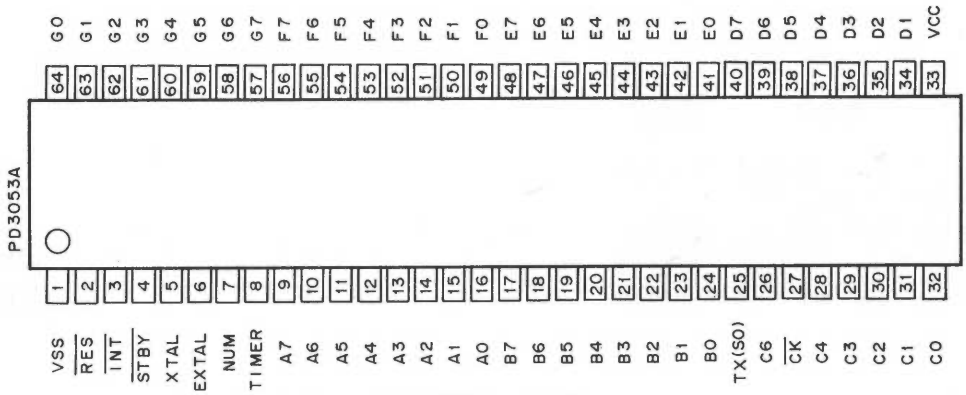


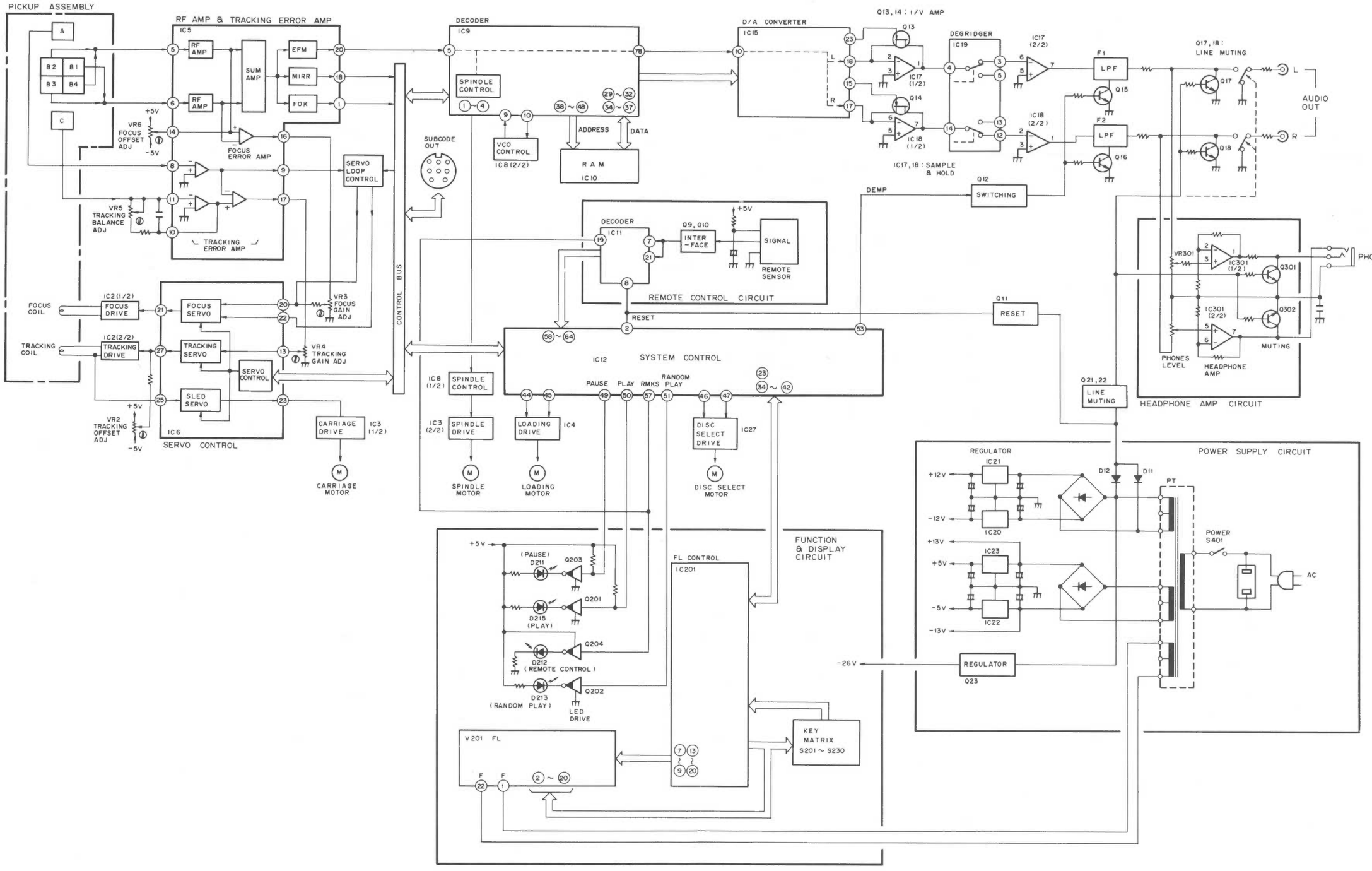
Fig.1-1 Pin layout

Table 1 Pin functions

Pin No.	Pin Name	I/O	Function	Pin No.	Pin Name	I/O	Function
1	—	—	GND	33	—		+5V
2	—	I	CPU reset input (Reset / RUN)	34	KD0	I	(LSB) Main unit key code inputs (MSB)
3	WFCK	I		35	KD1	I	
4	—	I	+5V (CPU standby input) (Standby / RUN)	36	KD2	I	
5	—	—	X'TAL input for built-in clock generator	37	KD3	I	
6	—	—		38	KD4	I	
7	—	I	GND	39	$\overline{KS}$	I	Front panel key strobe input (ON / OFF)
8	—	I	Not used (connected to SENS)	40	STS	I	Display data transfer enable input (DISABLE / ENABLE)
9	$\overline{TEST}$	I	Test mode selector input (Test / Normal)	41	SCK	O	Display data serial transfer clock
10	$\overline{ADCK}$	I	Last address memory ON / OFF (ON / OFF)	42	SD	O	Display data serial output
11	FOK	I	Focus OK input (NG / OK)	43	(LDLK)	O	LD digital lock output (option) (ANALOG / DIGITAL)
12	MIRR	I	Program/mirror area detector signal input (ON track / Mirror surface)	44	L IN	O	Disc loading IN/OUT outputs (IN / BRAKE; OUT)
13	($\overline{SQIN}$)	I	LDD squelch signal input (option) (SQ ON / SQ OFF)	45	L OUT	O	
14	$\overline{XLT}$	O	LSI control data latch pulse output (Latch)	46	DSUP	O	Disc selector UP/DOWN outputs (UP / BRAKE; DOWN)
15	SENS	I	LSI operational status multi-mode input	47	DSDW	O	
16	MUTE	O	Muting output (OFF / ON)	48	(LDCR)	O	LDD/CD selector output (option) (CD / LDD)
17	CRCF	I	Sub-code Q CRCC check input (NG / OK)	49	PAUS	O	Pause LED output (OFF / ON)
18	SUBQ	I	Sub-code Q data input	50	PLAY	O	Play LED output (OFF / ON)
19	SCOR	I	Sub-code sync input (Sync)	51	RDPL	O	Random play LED output (OFF / ON)
20	GFS	I	Frame sync lock input (NG / LOCK)	52	DIRC	O	Track jump direction reverter output (REVERSE / CLOSE)
21	RAOV	I	Jitter absorber RAM overflow input (OK / OVER)	53	$\overline{DEMP}$	O	De-emphasis ON/OFF output (ON / OFF)
22	($\overline{LDSW}$)	I	CD/LDD selector switch input (option) (LDD / CD)	54	(DKSY)	O	Deck synchro output (option) (STOP / PLAY)
23	SRES	O	FL control microcomputer reset output (RUN / RESET)	55	MRIH	O	Mirror signal inhibit output (ENABLE / DISABLE)
24	DCNT	I	Disc count pulse input (1 … 6)	56	LDON	O	Laser diode ON/OFF output (OFF / ON)
25	DATA	O	LSI control data serial output (0 1 2 3 4 5 6 7)	57	$\overline{RMKS}$	I	Remote control key strobe input (ON / OFF)
26	DCHM	I	Disc selector HOME switch input (NOT / HOME)	58	RKD6	I	(MSB) Remote control key code inputs (LSB)
27	CLK	O	Serial transfer clock	59	RKD5	I	
28	LPS1	I	Looding status (CLAMP / HOME; LOAD / EJECT)	60	RKD4	I	
29	LPS2	I		61	RKD3	I	
30	MZS1	I	Magazine status (MAGAZINE IN / EJECT; 6 DISCS / 1 DISC)	62	RKD2	I	
31	MZS2	I		63	RKD1	I	
32	$\overline{INSD}$	I	Slider inside switch input (INSIDE / NOT)	64	RKD0	I	

2. BLOCK DIAGRAMS AND FLOW CHARTS

2.1 GENERAL BLOCK DIAGRAM



2. 2 OPERATIONAL FLOW CHART

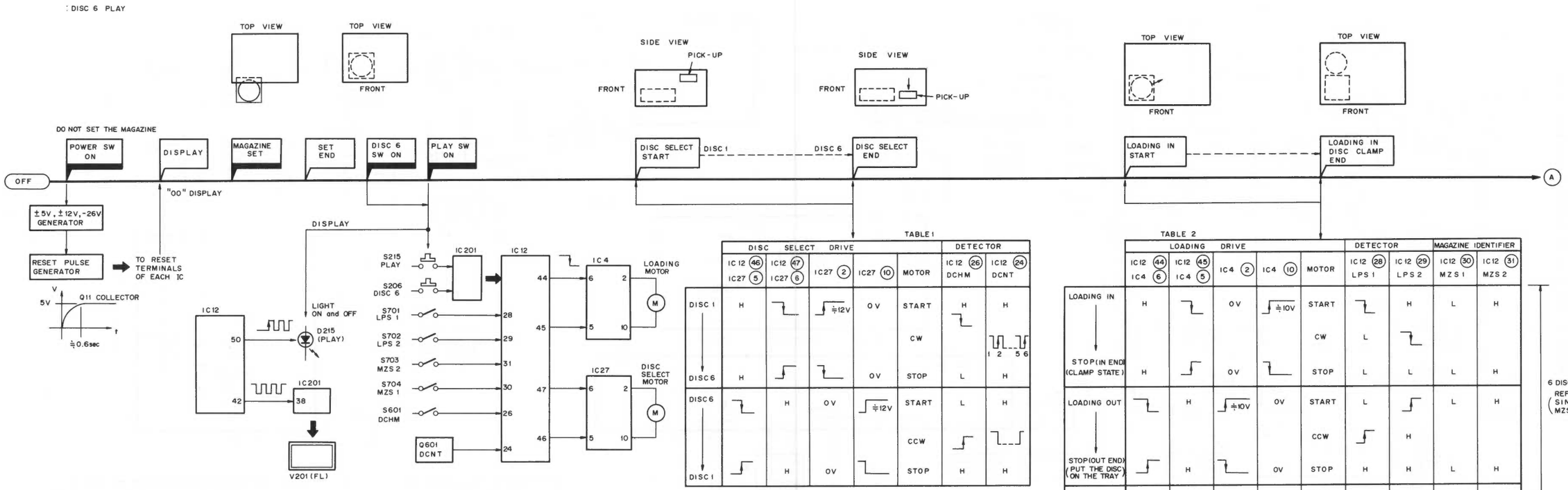


TABLE 1

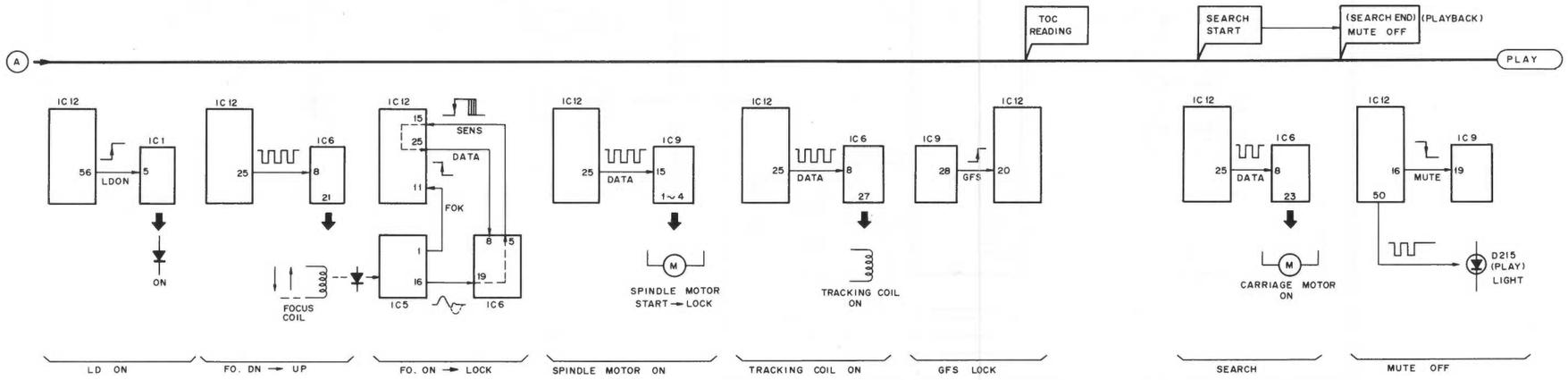
	DISC SELECT DRIVE					DETECTOR	
	IC12 (46) IC27 (5)	IC12 (47) IC27 (6)	IC27 (2)	IC27 (10)	MOTOR	IC12 (26) DCHM	IC12 (24) DCNT
DISC 1	H		≒12V	0V	START	H	H
↓					CW		1 2 5 6
DISC 6	H			0V	STOP	L	H
DISC 6		H	0V	≒12V	START	L	H
↓					CCW		
DISC 1		H	0V		STOP	H	H

TABLE 2

	LOADING DRIVE					DETECTOR		MAGAZINE IDENTIFIER	
	IC12 (44) IC4 (6)	IC12 (45) IC4 (5)	IC4 (2)	IC4 (10)	MOTOR	IC12 (28) LPS 1	IC12 (29) LPS 2	IC12 (30) MZS 1	IC12 (31) MZS 2
LOADING IN	H		0V	≒10V	START		H	L	H
↓					CW	L			
STOP(IN END) (CLAMP STATE)	H		0V		STOP	L	L	L	H
LOADING OUT		H	≒10V	0V	START	L		L	H
↓					CCW		H		
STOP(OUT END) (PUT THE DISC ON THE TRAY)		H		0V	STOP	H	H	L	H
EJECT		H	≒10V	0V	START CCW	H		L	H
↓						H	L		
(EJECT END)				≒10V	CW	H	L	H	L
↓						H	H	H	L
STOP	H		0V		STOP	H	H	H	L

6 DISC MAGAZINE REFFERENCE (SINGLE MZS 1 = MZS 2 = L)

NO MAGAZINE



3. MECHANICAL STRUCTURE

3. 1 OUTLINE

PD-M6(BK) is a magazine type CD player. The major mechanical stages include:

1. Status detector
2. Disc selector
3. Disc counter
4. Loading mechanism

These major stages are outlined in the following blockdiagram.

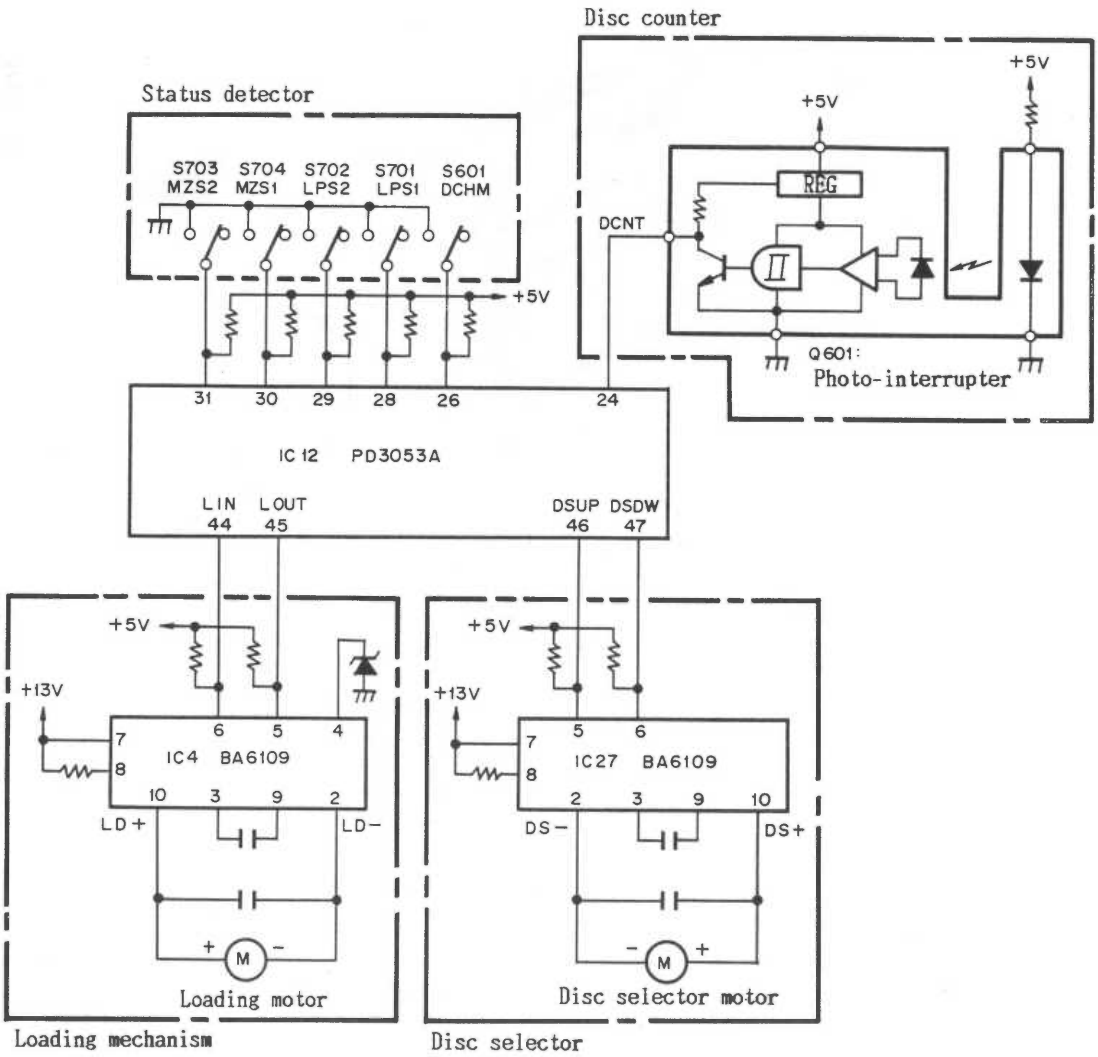


Fig.3-1 Block diagram

Each of these blocks is described below.

3. 2 MAGAZINE LOADING

The presence of a magazine, and whether the magazine is a single or six-disc magazine is detected by S704 (MZS1), S703 (MZS2), and SM selector. The detector output is passed to an input port of the system control IC (IC12).

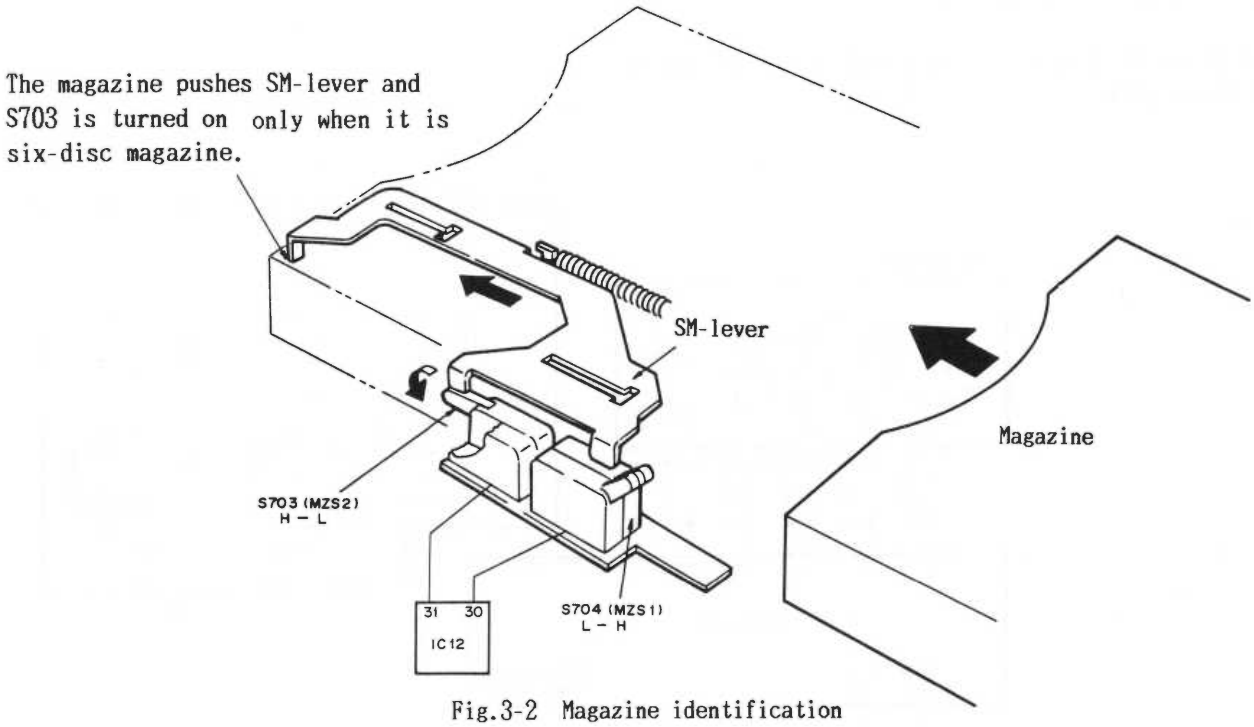


Fig.3-2 Magazine identification

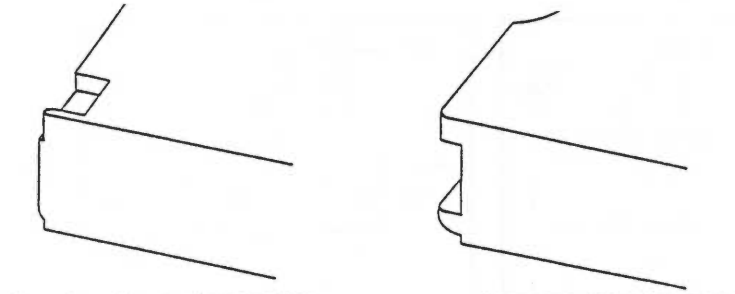


Fig.3-3

The condition of S704 and S703 depend on the Magazine loaded.

	No magazine	Single-disc magazine	SiX-disc magazine
S704 (MZS1)	H (ON)	L (OFF)	L (OFF)
S703 (MZS2)	L (OFF)	L (OFF)	H (ON)

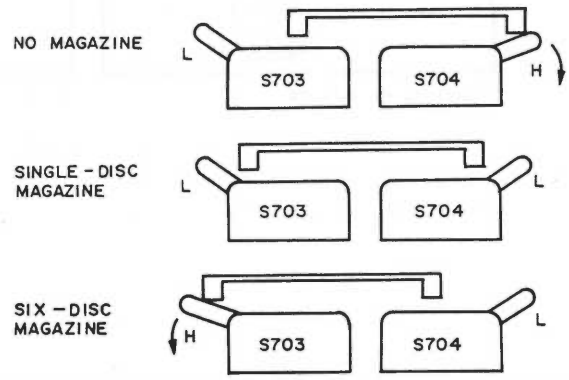


Fig.3-4

3. 3 DISC SELECTOR

In addition to a motor drive IC (IC27) and system control IC (IC12), the disc selector consists of a disc selector motor which raises and lowers the servo stage to different tray positions (this being necessary to enable any disc to be selected from the magazine). Forward operation is defined as servo movement from disc 1 thru disc 6 of the magazine, and reverse operation is defined as the movement in the reverse direction.

	Motor forward	Motor reverse	Stop
DSUP (IC12, pin 46)	H	L	H
DSDW (IC12, pin 47)	L	H	H
DS+ (IC27, pin 10)	L	+Vcc	L
DS- (IC27, pin 2)	+Vcc	L	L

・+Vcc : Motor control voltage

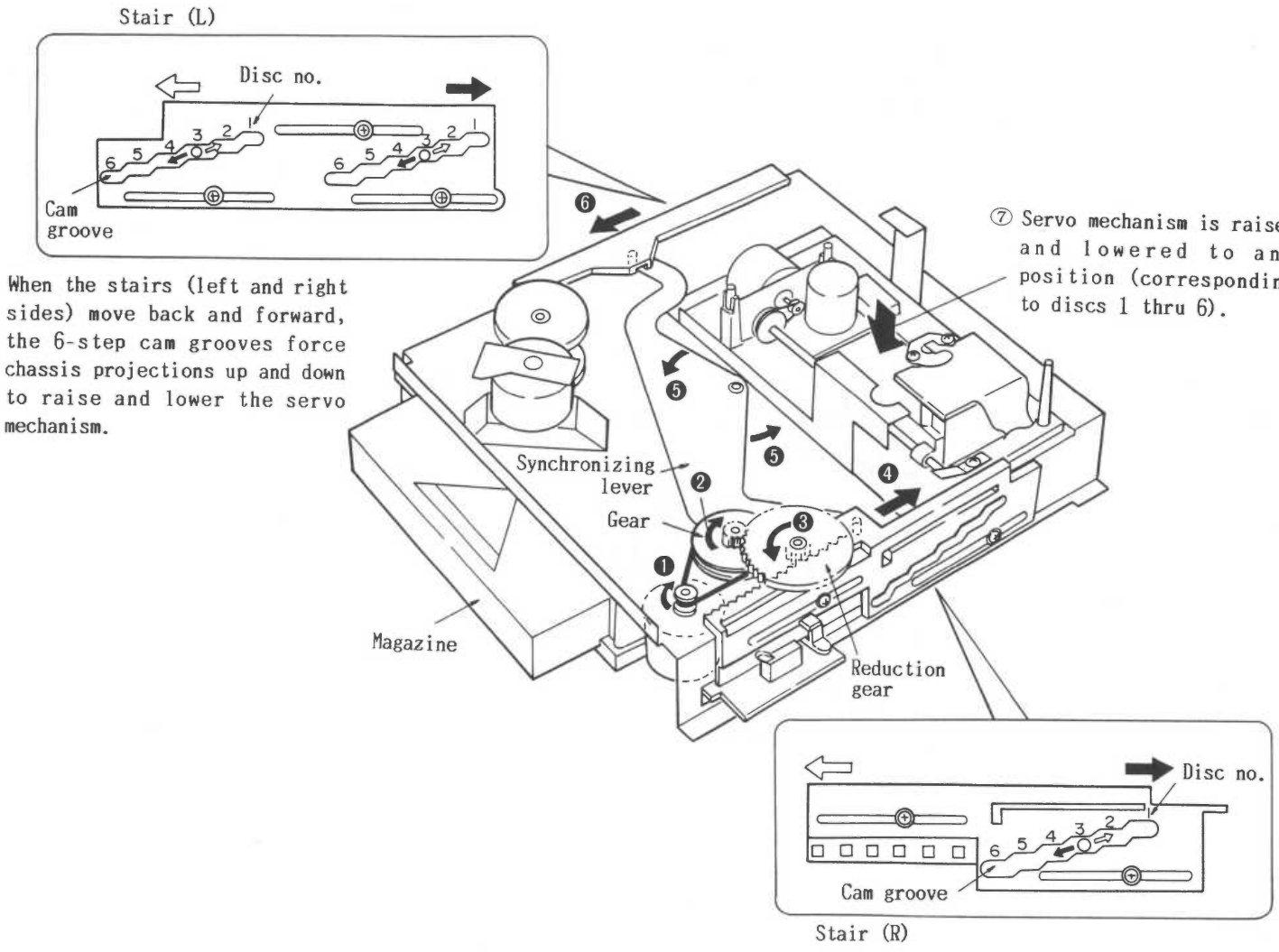


Fig.3-5 Disc selector

3. 4 DISC COUNTER

At the same time that the servo mechanism is raised or lowered, the tray positions (disc 1 thru 6) are detected by the disc selector motor.

1. Stair (R) is moved back or forward.
2. A slit in stair (R) is detected by Q601 (photo - interrupter), and a disc count pulse is passed to pin 24 of IC12. The home position (disc 1) isdetected by S601 (DCHM) with the detector signalalso being passed to pin 24 of IC12.
3. The disc selector motor is stopped when the disccount pulse matches the disc number value (1 thru 6).

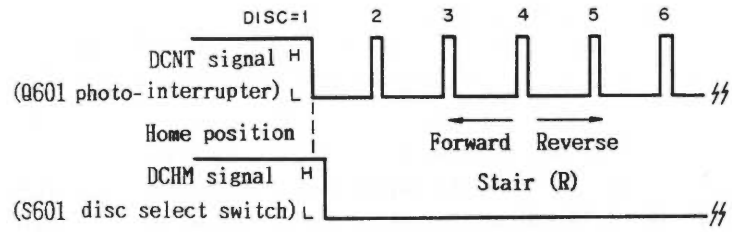
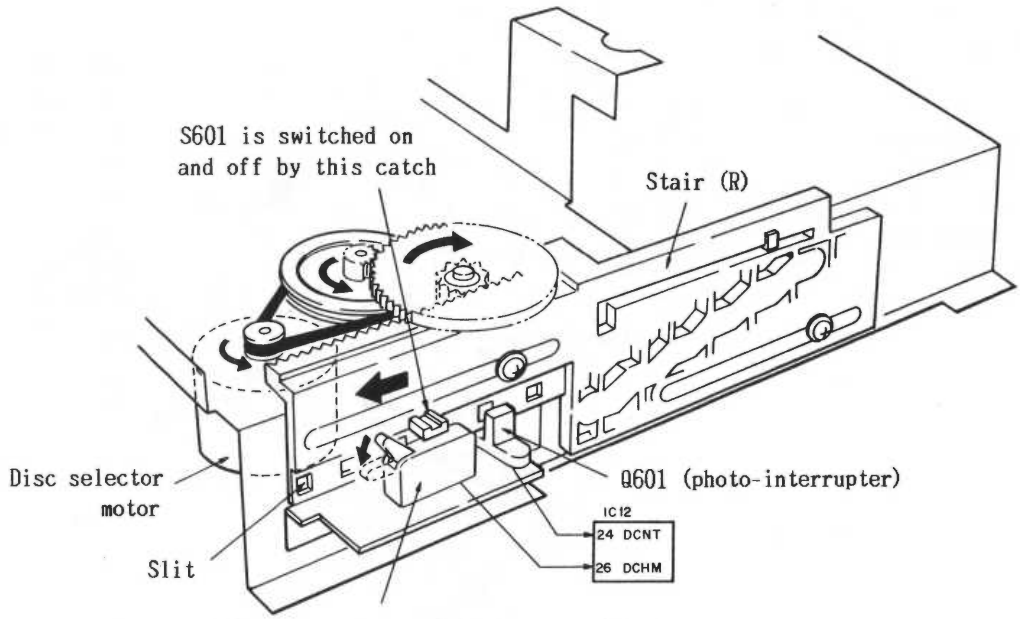


Fig.3-6 Disc count pulse



S601: Disc select switch (home position)
H (ON) -- L (OFF)
(Home position -- Other positions)

Fig.3-7 Disc counter

3. 5 LOADING MECHANISM

(1) Loading motor operations

① Removal of single tray from the magazine and clamping it into position. (Forward motor movement)

② Returning of clamped disc to magazine. (Reversemotor movement)

③ Ejection of magazine from main unit. (Reverse motor operation)

Operations ① thru ③ are executed by motor control voltage outputs from the motor driver IC (IC4) when logic signals (H or L) from pins 44 and 45 of the system control IC (IC12) are received by IC4. (See Fig.3-1.)

	Motor forward	Motor reverse	Stop
L IN (IC12, pin 44)	H	L	H
L OUT (IC12, pin 45)	L	H	H
LOAD+ (IC4, pin 10)	+Vcc	L	L
LOAD- (IC4, pin 2)	L	+Vcc	L

・+Vcc : Motor control voltage

(2) Loading status detector switch (S701, S702)
The loading status is detected by a rack catch switching S701 and S702 on (H) and off (L) when the rack is moved in and out. Detector signals are passed to pins 28 and 29 of IC12.

	Stopped	Loading	Clamped	Ejecting
S701 (LPS1)	H	L	L	H
S702 (LPS2)	H	H	L	L

(3) Operations

Operation ①: Disc clamped status is achieved when S702 (LPS2) is switched from H to L.

Operation ②: Loading home position is reached when S701 (LPS1) is switched from H to L and back to L.

Operation ③: Loading motor is reversed until S704 (MZS1) and S703 (MZS2) (see magazine identifier in Fig.3-2) are switched to H and L respectively (indicating absence of magazine). The loading motor is then rotated forward and stopped when when S702 (LPS2) is switched to H.

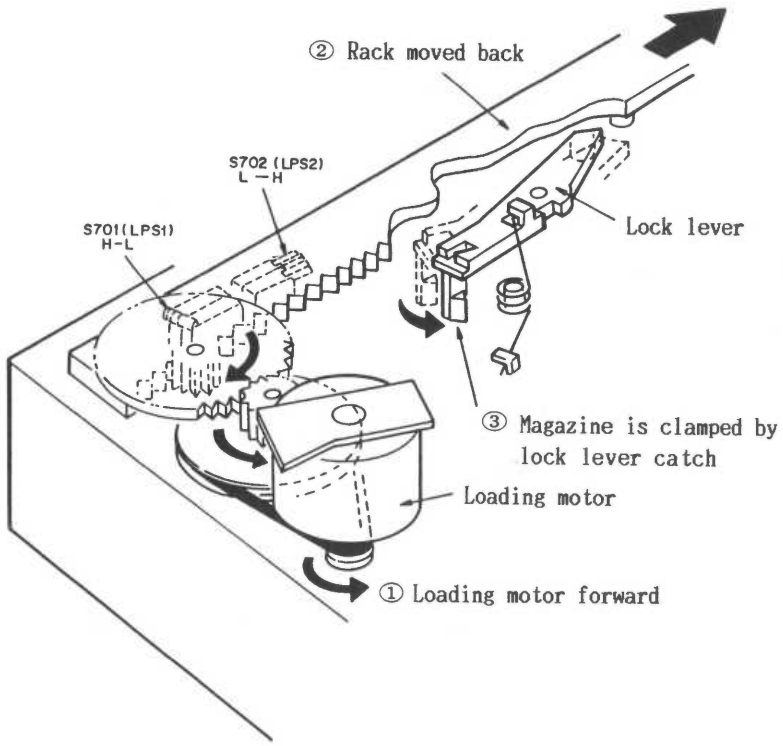
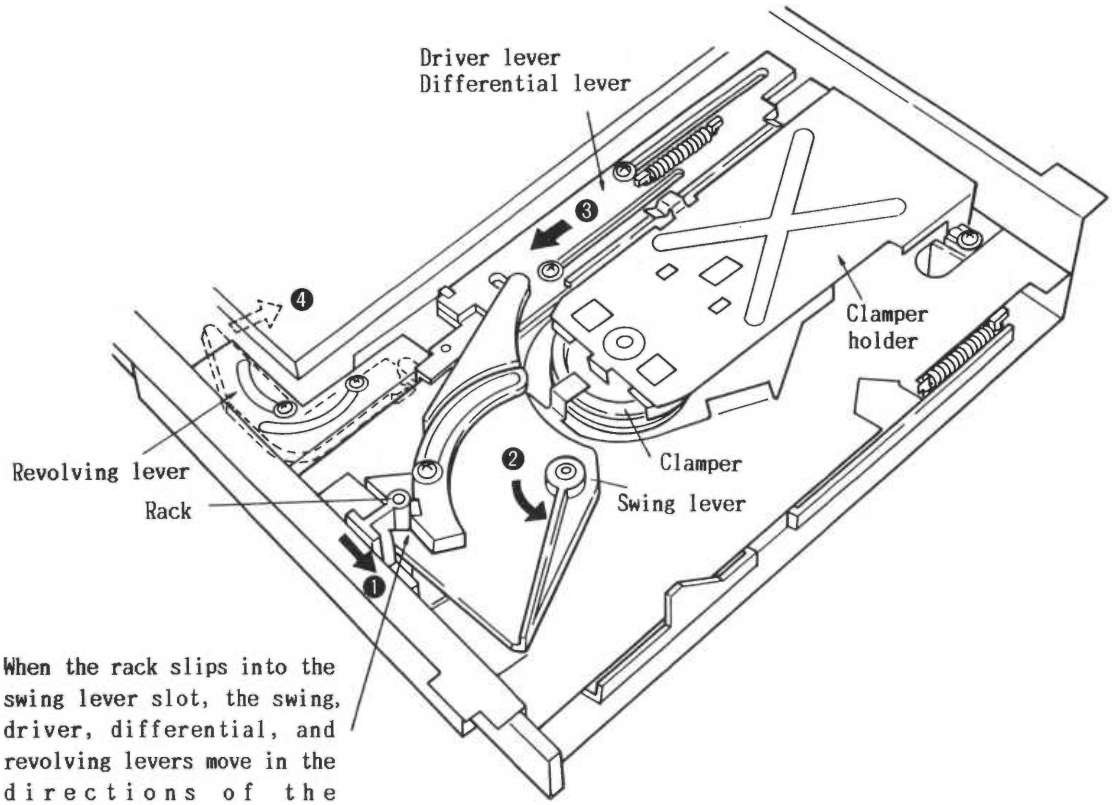


Fig.3-8 Loading operation



④ When the rack slips into the swing lever slot, the swing, driver, differential, and revolving levers move in the directions of the corresponding arrows.

Fig.3-9 Swing lever movement (1)

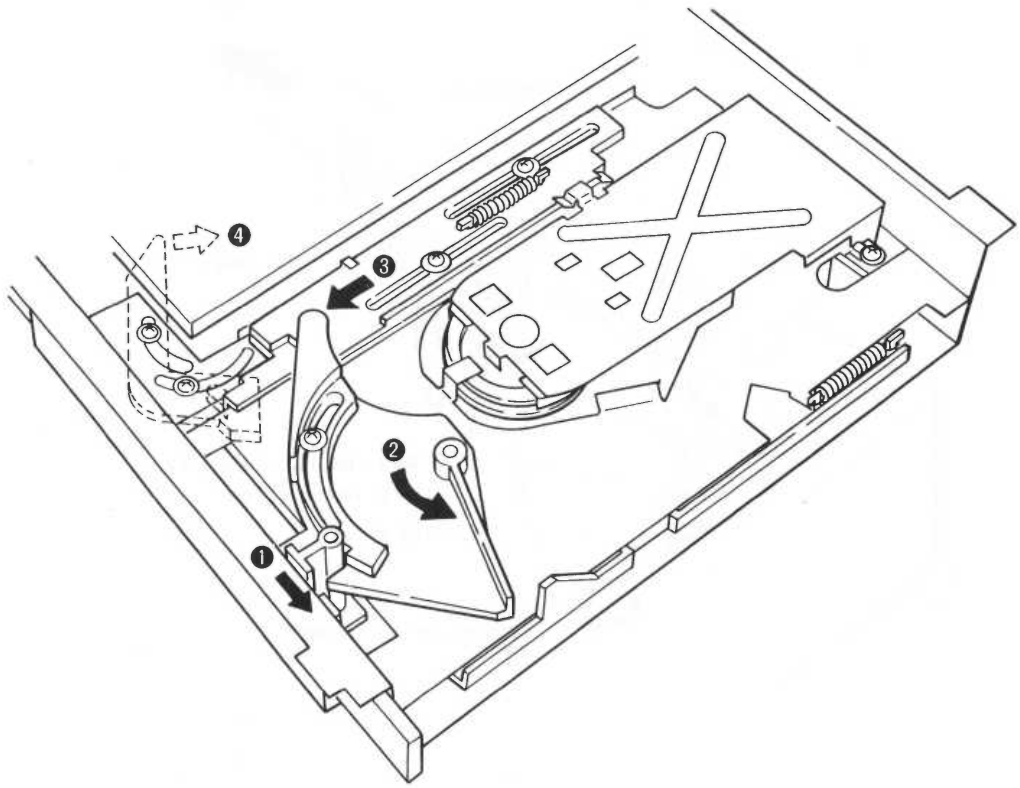


Fig.3-10 Swing lever movement (2)
(levers in motion)

⑤ Any disc can be removed from tray by rotation of the revolving lever.

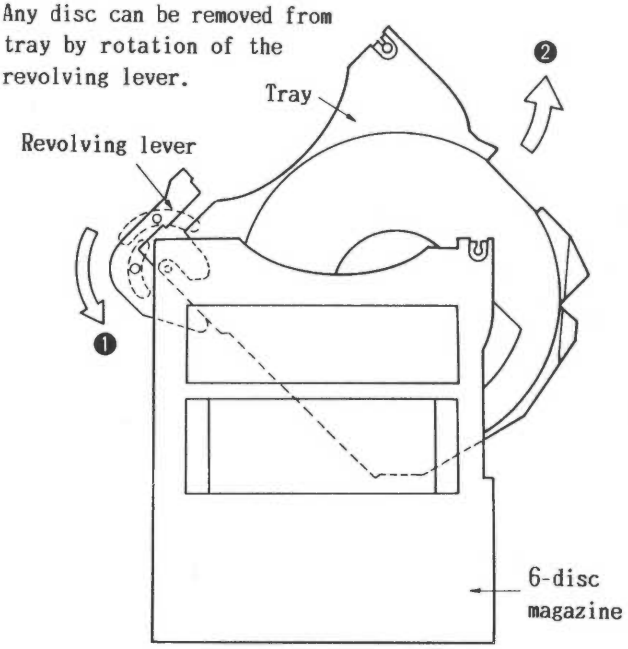


Fig.3-11 Revolving lever movement

⑥ The disc on the tray is set directly below the disc table.

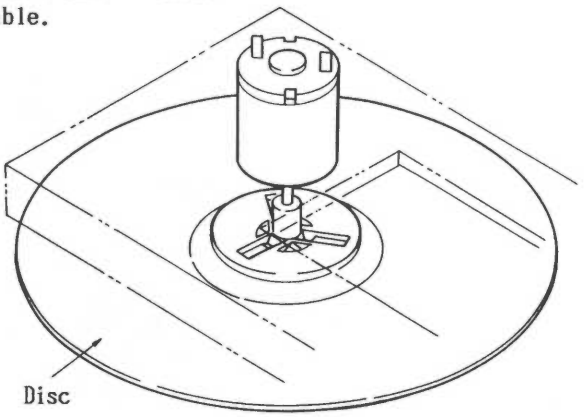
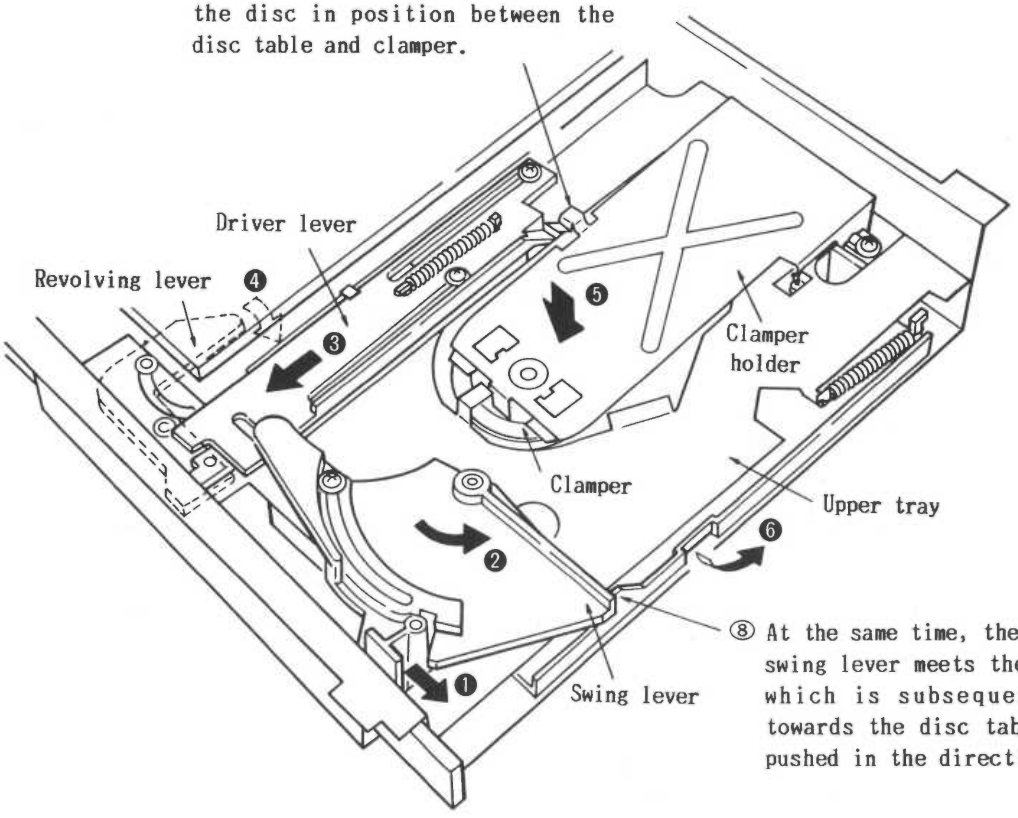


Fig.3-12 Disc setting

⑦ The clamper holder catch disengages the driver lever lock, and clamps the disc in position between the disc table and clamper.



⑧ At the same time, the edge of the swing lever meets the upper tray which is subsequently moved towards the disc table by being pushed in the direction of arrow 6

Fig.3-13 Clamper and upper tray movements

3. 6 EJECT OPERATION

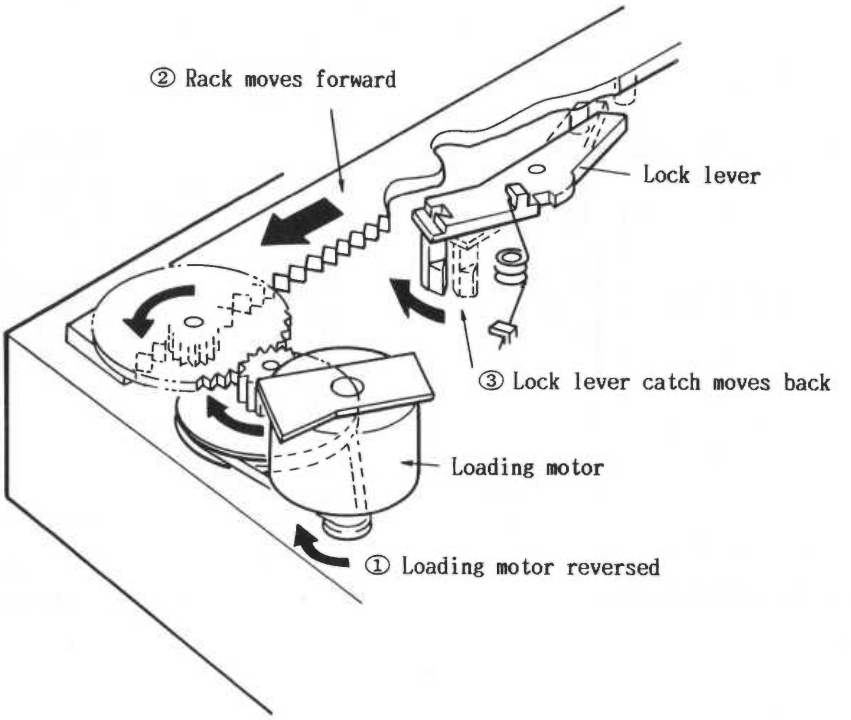


Fig.3-14 Eject operation (1)

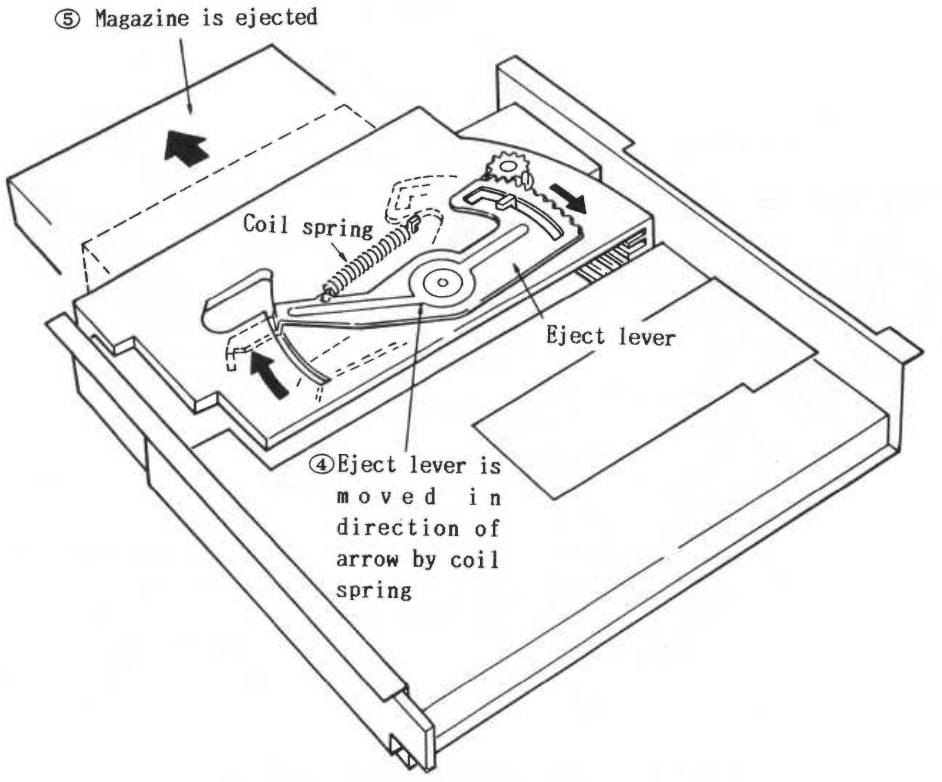


Fig.3-15 Eject operation (2)

4. DESCRIPTION OF OPERATION

The movement of parts in the mechanical section is described below in conjunction with the actual operating procedure and flow chart.

4. 1 PLAY PROCEDURE

1. Specify the disc by the relevant control keys.
2. The disc selector motor is switched on, and stairs (L and R) begin to move forward and backward.
3. The servo mechanism is raised or lowered by combined interaction between catches on the servo mechanism sub-chassis, and the stair (L and R) cam and chassis guide grooves.
4. The servo mechanism stops at the specified disc.
5. The loading motor is activated and the rack is shifted towards the rear.
6. The swing and differential levers move (with driver lever still locked).
7. The revolving lever is shifted and the tray moves out from the magazine.
8. The disc is moved up to a position concentric with the disc retainer on the disc table.
9. Upon further movement of the differential lever (with the differential and driver levers unlocked), the clamper holder moves towards the disc table and lifts the disc. At the same time, the disc table is clamped. (This status corresponds to DISC LOAD in the flow chart in Fig.4-2).
10. The upper tray is also raised together with the table by swing lever movement. Note that once the disc has been loaded on the disc table, the upper tray moves slightly away from the disc and does not obstruct disc rotation.
11. Disc play then begins.

At the end of play, the disc is returned to the magazine in the reverse order.

4. 2 FLOW CHART

A flow chart outlining stair (R) operation and disc select operation centered about DCNT (Q601) and DCHM (S601) signals is shown in Fig.4-2.

① When a disc select operation is started, the system control IC (IC12) calculates on the basis of the current selected disc position and the search disc position, and activates/reverses the selector motor according to the results, thereby moving stair (R) forward or backward. During this stair (R) movement, the DCNT signal from Q601 is passed to IC12. Each L —> H change is counted and the servo mechanism is shifted to the specified disc.

② If the DCNT signal (Q601) is L when a select operation is started (indicating that the servo mechanism is in an intermediate position between any two discs), the servo mechanism is returned (stair (R) moved forwar d) to the home position where the DCHM signal (S601) becomes H. Operation ① is then commenced.

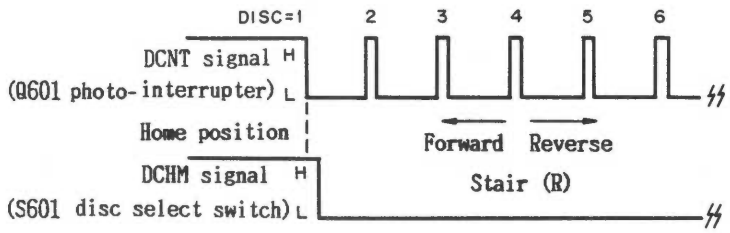


Fig.4-1 Stair (R) movement timing

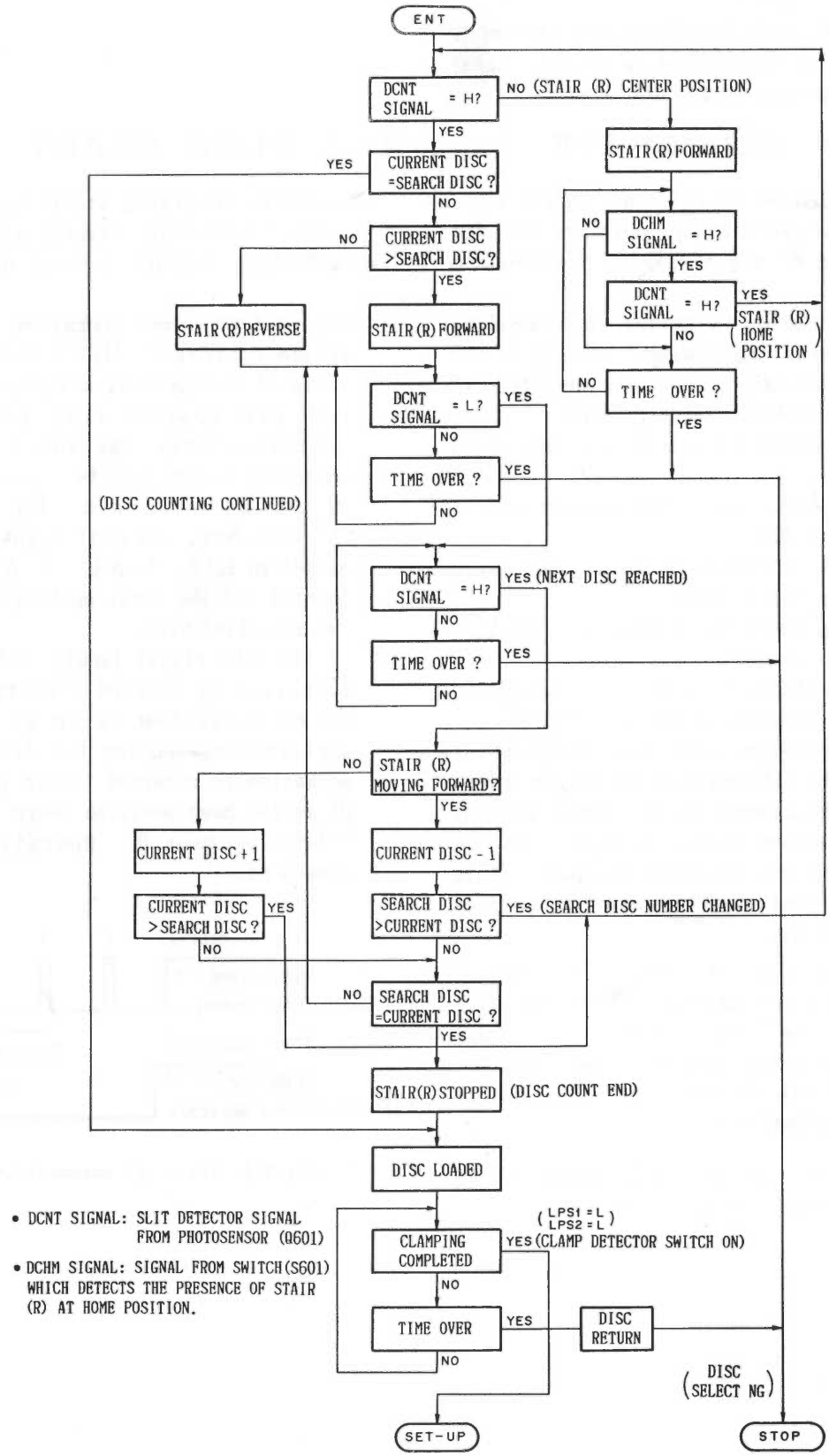


Fig.4-2 Flow chart

PIONEER

Service Manual

CIRCUIT DESCRIPTIONS

The photo shows the model PD-9010X[BK].

ORDER NO.
ARP-883-0

COMPACT DISC PLAYER

PD-9010X(BK)
PD-7010(BK)
PD-5010(BK)

CONTENTS

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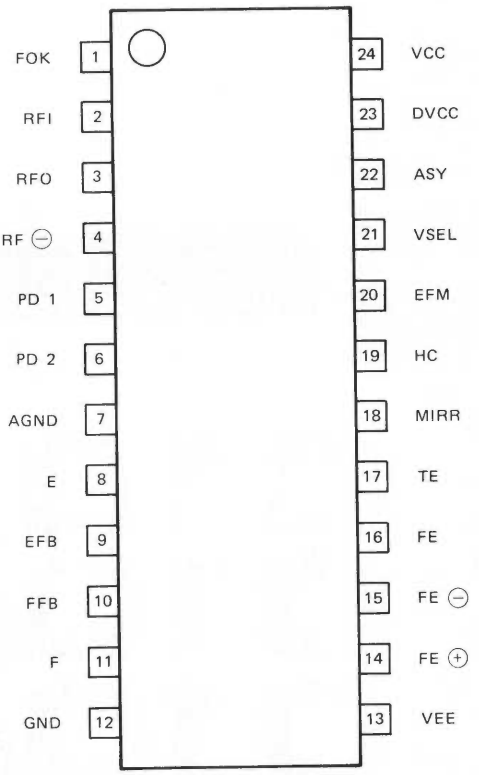
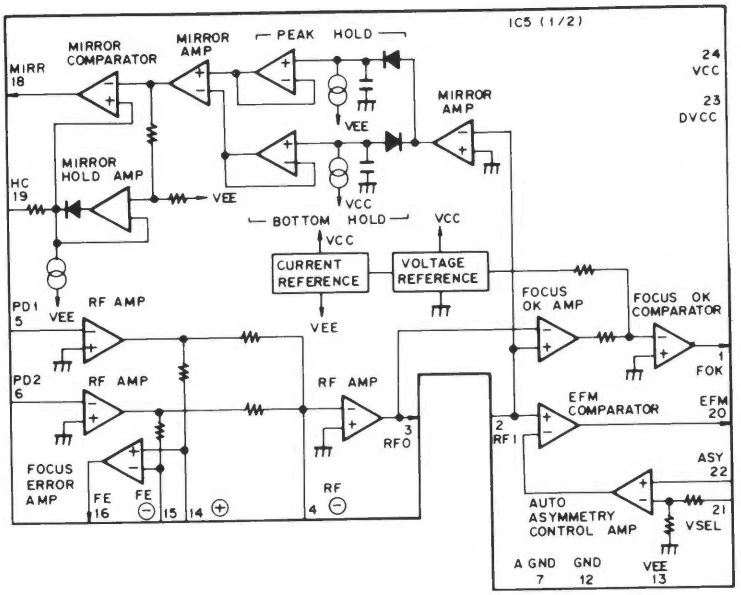
1. IC INFORMATION

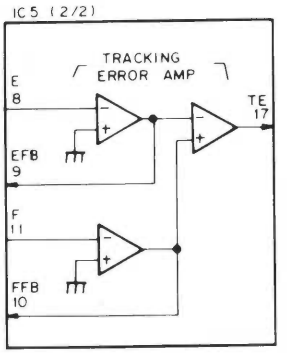
- CX20109

- Pin Name



- Block Diagram



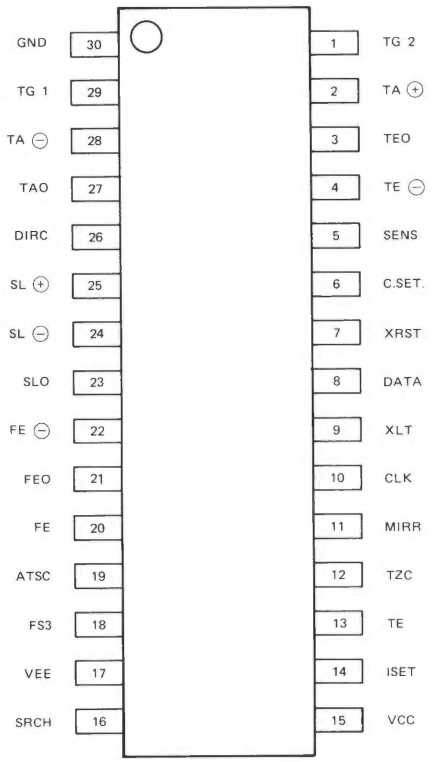


• Pin Functions

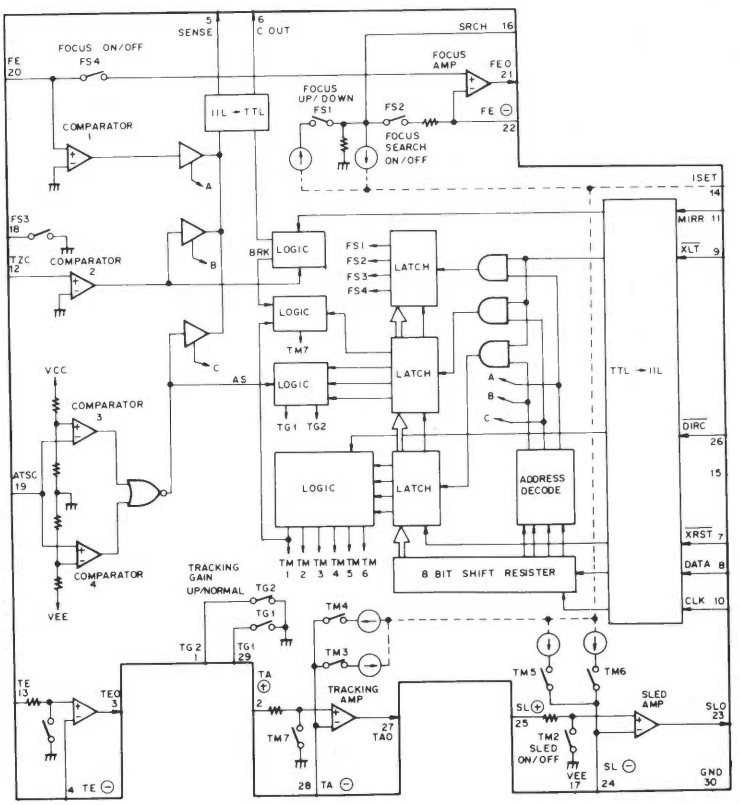
Pin No.	Pin name	I/O	Function
1	FOK	O	Output of Focusing Servo Allowed, Active at Comparator Output "H". Connects Load Resistor (PNP Open Collector).
2	RFI	I	Inputs RF Summing Amp Output by a C coupling.
3	RFO	O	RF Summing Amp Output, Eve Pattern Test Point.
4	RF −	I	RF Summing Amp Inverted Input, Connects Feedback CR to ③ − ④.
5	PD 1	I	RF I-V Amp (1) Inverted Input, Current Input by connection to PIN Diodes B + D.
6	PD 2	I	RF I-V Amp (2) Inverted Input, Current Input by connection to PIN Diodes A + C.
7	AGND	—	Small Signal Analog Channel Ground
8	E	I	E I-V Amp Inverted Input, Current Input by connection to PIN Diode E.
9	EFB	O	E I-V Amp Output Connects Feedback CR to ⑧ − ⑨.
10	FFB	O	F I-V Amp Output Connects Feedback CR to ⑩ − ⑪.
11	F	I	F I-V Amp Inverted Input, Current Input by connection to PIN Diode F.
12	GND	—	GND
13	V_{EE}	—	Negative Power Supply
14	FE ⊕	I	Focus Error Amp Non-Inverted Input, Connects CR for Low Pass Filter.
15	FE ⊖	I	Focus Error Amp Inverted Input
16	FE	O	Focus Error Amp Output, Connects Feedback CR to ⑮ − ⑯
17	TE	O	Tracking Error Amp Output
18	MIRR	O	Mirror Comparator Output (active at "H"), Connects Load Resistor (PNP Open Collector).
19	HC	I	Mirror Hold Capacitor connecting pin
20	EFM	O	EFM Comparator Output
21	VSEL	I	Auto-Asymmetry Control Amp Reference Input Level setting pin; Vcc when under ±5V Power Supply, GND when under +10V Power Supply
22	ASY	I	Auto-Asymmetry Control Input
23	DV_{CC}	—	Positive Power Supply for EFM Comparator
24	V_{CC}	—	Positive Power Supply

- CX20108

- Pin Name



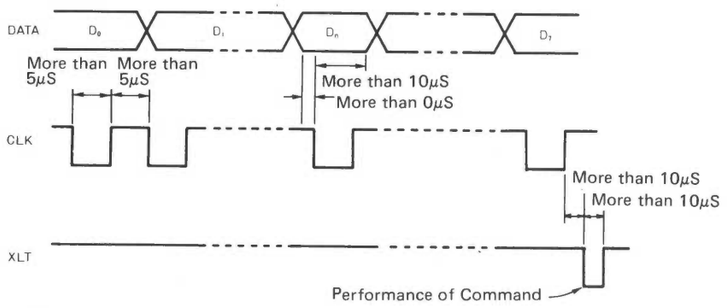
- Block Diagram



• Pin Functions

Pin No.	Pin name	I/O	Function
1	TG2		Tracking amplifier gain-switching pin; either open or at the GND level.
2	TA ⊕		Non-inverted input of operational amplifier 2.
3	TEO		Output of operational amplifier 4.
4	TE ⊖		Inverted input of operational amplifier 4.
5	SENSE	O	Output indicating the internal status of SSP determined by ADDRESS sent from the CPU to SSP (varies with the value of ADDRESS in the internal serial register (Note 1)).
6	C.SET	O	Track-counting signal output at the time of high-speed access.
7	XRST	I	Clears all internal registers when the CPU-to-SSP level is Low; connected to CPU RESET (Note2).
8	DATA	I	CPU-to-SSP serial data transfer; input from LSB; D0 to D7.
9	XLT	I	Latching of CPU-to-SSP serial data (transfers data in the internal serial shift register to each address-decoded latch); transfers data at the Low level; the level must be changed to High immediately at the completion of transfer as no edge trigger method is applied.
10	CLK	I	CPU-to-SSP serial data transfer clock pulses; data is fetched at the negative-going edge; the level must be H before and after transfer.
11	MIRR	I	Mirror signal input from the RF amplifier.
12	TZC		Tracking-error signal input by capacitor coupling; The time constant is determined according to the condition of one-track jump, but is normally 2 kHz.
13	TE		Tracking error signal input
14	ISET		For setting current to determine the focus search voltage, tracking jump voltage, and sled-feeding voltage.
15	Vcc		Power supply pin; normally at +5V.

COMMAND	ADDRESS D7, D6, D5, D4	SENS	EXPLANATION
FOCUS CONTROL	ϕϕϕϕ	FZC	When focus zero cross or focus error voltage is over O V, use high level focus pull operations.
TRACKING CONTROL	ϕϕϕI	AS	When ⑲ ATSC input level exceeds the window comparator level, then 1.
TRACKING MODE	ϕϕIϕ	TZC	Tracking zero cross Plus or minus tracking error decision output Use for one track jump. Adjust DIRC to LOW at the time of FWD JUMP TZC search or REV JUMP TZC search.

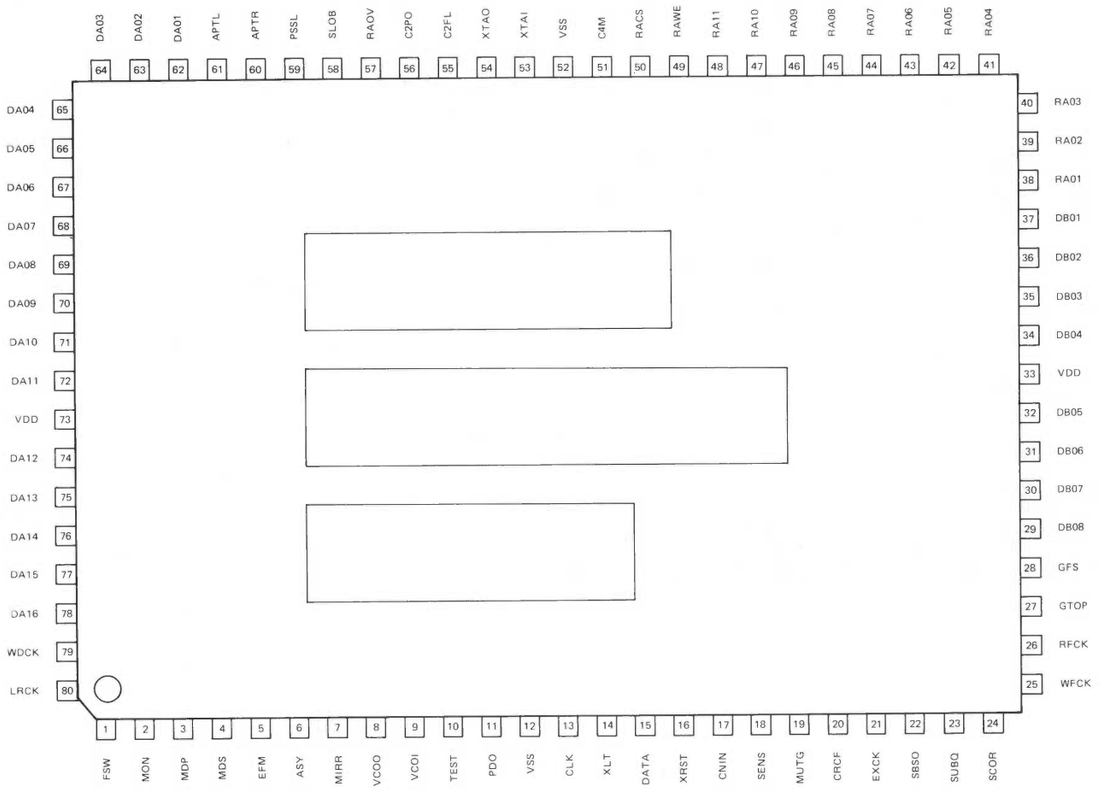


Pin No.	Pin name	I/O	Function
16	SRCH		Connected to the capacitor which determines the time constant of charging and discharging curves for focus search.
17	Vee		Power supply pin; normally at −5V.
18	FS3		Focus amplifier gain-switching pin; either open or at the GND level.
19	ATSC		Input of data indicating that mechanical impact has been applied to the player; inputs tracking errors via BPF in simplified operation; should be connected to GND when not in use.
20	FE		Forcus error signal input.
21	FEO		Output of operational amplifier 1.
22	FE ⊖		Inverted input of operational amplifier 1.
23	SLO		Output of operational amplifier 3.
24	SL ⊖		Inverted input of operational amplifier 3.
25	SL ⊕		Non-inverted input of operational amplifier 3.
26	DIRC	I	Used at the time of one-track jump; normally High; inverts the direction of track-Jump pulses at the Low level; establishes the normal tracking mode when set to go High immediately after the inversion; goes Low for a specified period at the detection of positive- and negative-going edges of TZC.
27	TAO		Output of operational amplifier 2.
28	TA ⊖		Inverted output of operational amplifier 2.
29	TG1		Tracking amplifier gain-switching pin; either open or at the GND level.
30	GND		GND pin of the IC.

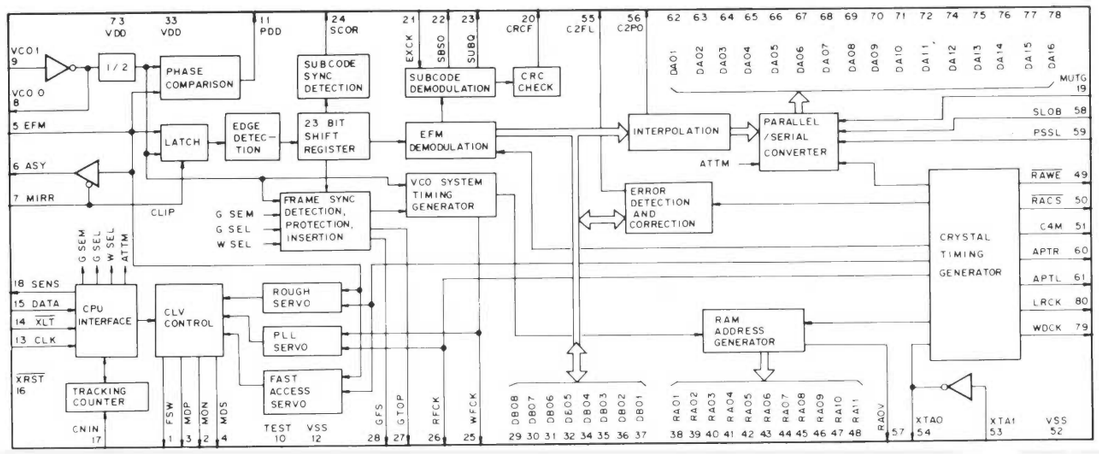
Note: Functions above describe the applications in typical examples only.

- CX23035

- Pin Name



- Block Diagram



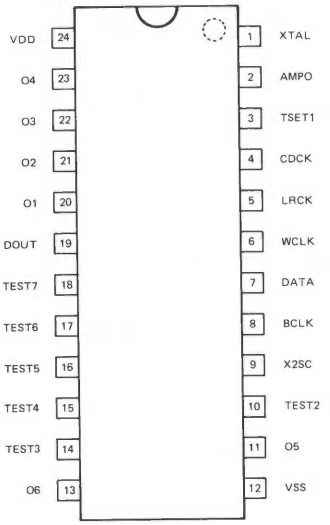
- Pin Functions

Pin No.	Pin name	I/O	Function	
1	FSW	O	Spindle motor output filter time constant select output.	
2	MON	O	Spindle motor ON/OFF control output.	
3	MDP	O	Spindle motor drive output. Rough control during CLV-S mode and phase control during CLV-P mode.	
4	MDS	O	Spindle motor drive output. Speed control during CLV-P mode.	
5	EFM	I	EFM signal input from RF amp.	
6	ASY	O	EFM signal slice level control output.	
7	MIRR	I	MIRROR input from RF amp.	
8	VCOO	O	VCO output. When locked to EFM signal, f = 8.6432 MHz.	
9	VCOI	I	VCO input.	
10	TEST	I	(O V)	
11	PDO	O	EFM signal and VCO/2 phase comparison output.	
12	VSS	—	GND (O V)	
13	CLK	I	Serial data transfer clock input from CPU. Data latching clock rise edge.	
14	XLT	I	Latch input from CPU. Latching 8-bit shift register data (serial data from CPU) to respective registers.	
15	DATA	I	Serial data input from CPU.	
16	XP.ST	I	System reset input. Reset at L.	
17	C_{NIN}	I	Tracking pulse input.	
18	SENS	O	Outputting internal state according to address.	
19	MUTG	I	Muting input with internal register A ATTM at L, normal state when MUTG is low and no sound when it is high.	
20	CRCF	O	Output the CRC result of subcode Q	
21	EXCK	I	Clock input for subcode serial output.	
22	SBS0	O	Subcode serial output.	
23	SUBQ	O	Subcode Q output.	
24	SCOR	O	Subcode sync S0 + S1 output.	
25	WFCX	O	Write frame clock output. When frame synch is locked, f = 7.35 KHz.	
26	RFCX	O	Read frame clock output. Crystal system 7.35 KHz.	
27	GTOP	O	Frame sync protection state display output.	
28	GFS	O	Frame sync lock state display output.	
29	DBO8	I/O	External RAM data terminal.	DATA8 (MSB)
30	DB07	I/O	External RAM data terminal.	DATA7
31	DB06	I/O	External RAM data terminal.	DATA6
32	DB05	I/O	External RAM data terminal.	DATA5
33	VDD	—	Power supply (+5 V)	
34	DB04	I/O	External RAM data terminal.	DATA4
35	DB03	I/O	External RAM data terminal.	DATA3
36	DB02	I/O	External RAM data terminal.	DATA2
37	DB01	I/O	External RAM data terminal.	DATA1 (LSB)
38	RA01	O	External RAM address output.	ADDR01 (LSB)
39	RA02	O	External RAM address output.	ADDR02
40	RA03	O	External RAM address output.	ADDR03
41	RA04	O	External RAM address output.	ADDR04

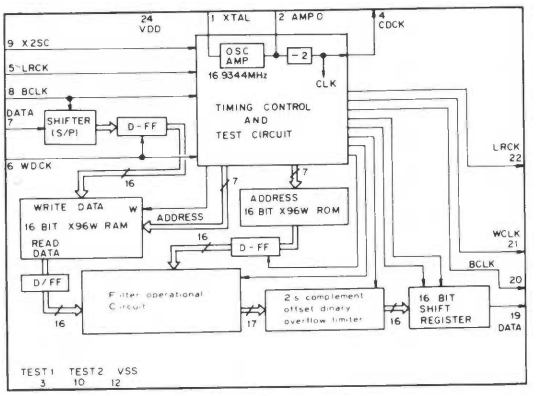
Pin No.	Pin name	I/O	Function
42	RA05	O	External RAM address output. ADDR05
43	RA06	O	External RAM address output. ADDR06
44	RA07	O	External RAM address output. ADDR07
45	RA08	O	External RAM address output. ADDR08
46	RA09	O	External RAM address output. ADDR09
47	RA10	O	External RAM address output. ADDR10
48	RA11	O	External RAM address output. ADDR11 (MSB)
49	RAME	O	Write enable signal output to external RAM (active when low).
50	RACS	O	Chip select signal output to external RAM (active when low).
51	C_{AM}	O	Crystal 1/2 frequency division output. f = 4.2336 MHz.
52	V_{SS}	—	GND (0 V)
53	XTAL	I	Crystal oscillation circuit input. f = 8.4672 MHz.
54	XTAO	O	Crystal oscillation circuit output. f = 8.4672 MHz.
55	C2FL	O	Corrects state output. When currently corrected C2 series is incorrectable, it becomes high.
56	C2PO	O	C2 pointer display output. Synchronized to audio data output.
57	RAOV	O	±4 frame jitter absorption RAM overflow and underflow display output.
58	SLOB	I	Audio data output code select input. Two's complement output when low, offset binary output when high.
59	PSSL	I	Audio data output mode select input. Serial output when low, parallel output when high.
60	APTR	O	Aperture compensation control output. High with R-ch.
61	APTL	O	Aperture compensation control output. High with L-ch.
62	DA01	O	DA01 (parallel audio data LSB) output when PSSL is H. C1F1 output when PSSL is L.
63	DA02	O	DA02 output when PSSL is high, C1F2 output when PSSL is low.
64	DA03	O	DA03 output when PSSL is high, C2F1 output when PSSL is low.
65	DA04	O	DA04 output when PSSL is high, C2F2 output when PSSL is low.
66	DA05	O	DA05 output when PSSL is high, UGFS output when PSSL is low.
67	DA06	O	DA06 output when PSSL is high, WFCK output when PSSL is low.
68	DA07	O	DA07 output when PSSL is high, FCKV output when PSSL is low.
69	DA08	O	DA08 output when PSSL is high, FCKX output when PSSL is low.
70	DA09	O	DA09 output when PSSL is high, PLCK output when PSSL is low.
71	DA10	O	DA10 output when PSSL is high, LRCK output when PSSL is low.
72	DA11	O	DA11 output when PSSL is high, C4LR output when PSSL is low.
73	V_{DD}	—	Power supply (+5 V).
74	DA12	O	DA12 output when PSSL is high, DENL when PSSL is low.
75	DA13	O	DA13 output when PSSL is high, DENR when PSSL is low.
76	DA14	O	DA14 output when PSSL is high, C210 when PSSL is low.
77	DA15	O	DA15 output when PSSL is high, C210 when PSSL is low.
78	DA16	O	DA16 (parallel audio data MSB) output when PSSL is high, DATA output when PSSL is low.
79	WDCX	O	88.2 KHz strobe signal output.
80	LRCX	O	44.1 KHz strobe signal output.

•CX23034

• Pin Name



• Block Diagram

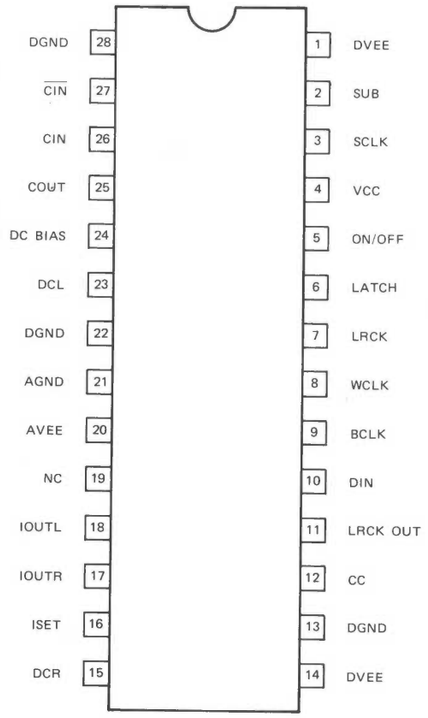


• Pin Functions

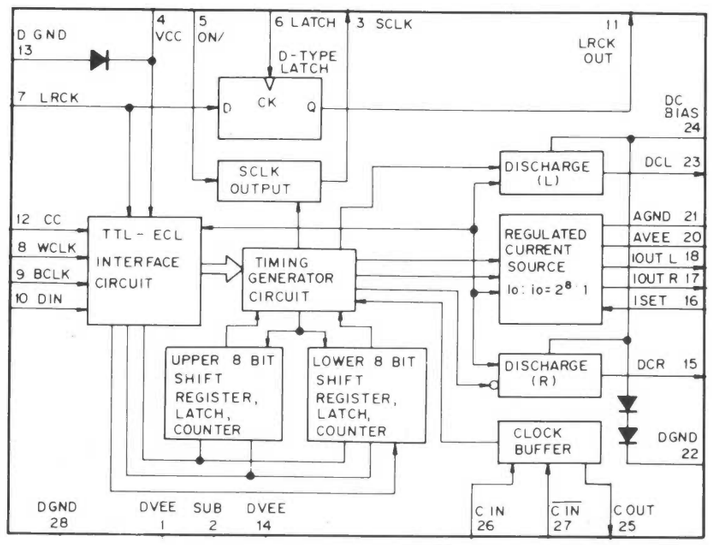
Pin No.	Pin name	I/O	Function
1	XTAL	I	Input for crystal oscillator (16.9344 MHz)
2	AMPO	O	Output for crystal oscillator (16.9344 MHz)
3	TSET1	I	Input for testing (Normally connected to Vss)
4	CDCK	O	Clock output (8.4672 MHz)
5	LRCK	I	44.1 kHz strobe input
6	WCLK	I	88.2 kHz strobe input
7	DATA	I	Serial data input (Two's complement, MSB first)
8	BCLK	I	Bit clock input (input for serial data)
9	X2SC	I	Input for output format selection (High offset binary, low two's complement)
10	TEST2	I	Input for test (normally connected to Vss)
11	O5	O	Timing signal
12	Vss	—	GND pin (0V)
13	O6	O	Timing signal
14	TEST3	O	Test data output (normally open)
15	TEST4	O	Test data output (normally open)
16	TEST5	O	Test data output (normally open)
17	TEST6	O	Test data output (normally open)
18	TEST7	O	Test data output (normally open)
19	DOUT	O	Serial data output (MSB first)
20	O1	O	Timing signal
21	O2	O	Timing signal
22	O3	O	Timing signal
23	O4	O	Timing signal
24	V_{DD}	—	Power supply pin (+5V)

- CX20152

- Pin Name



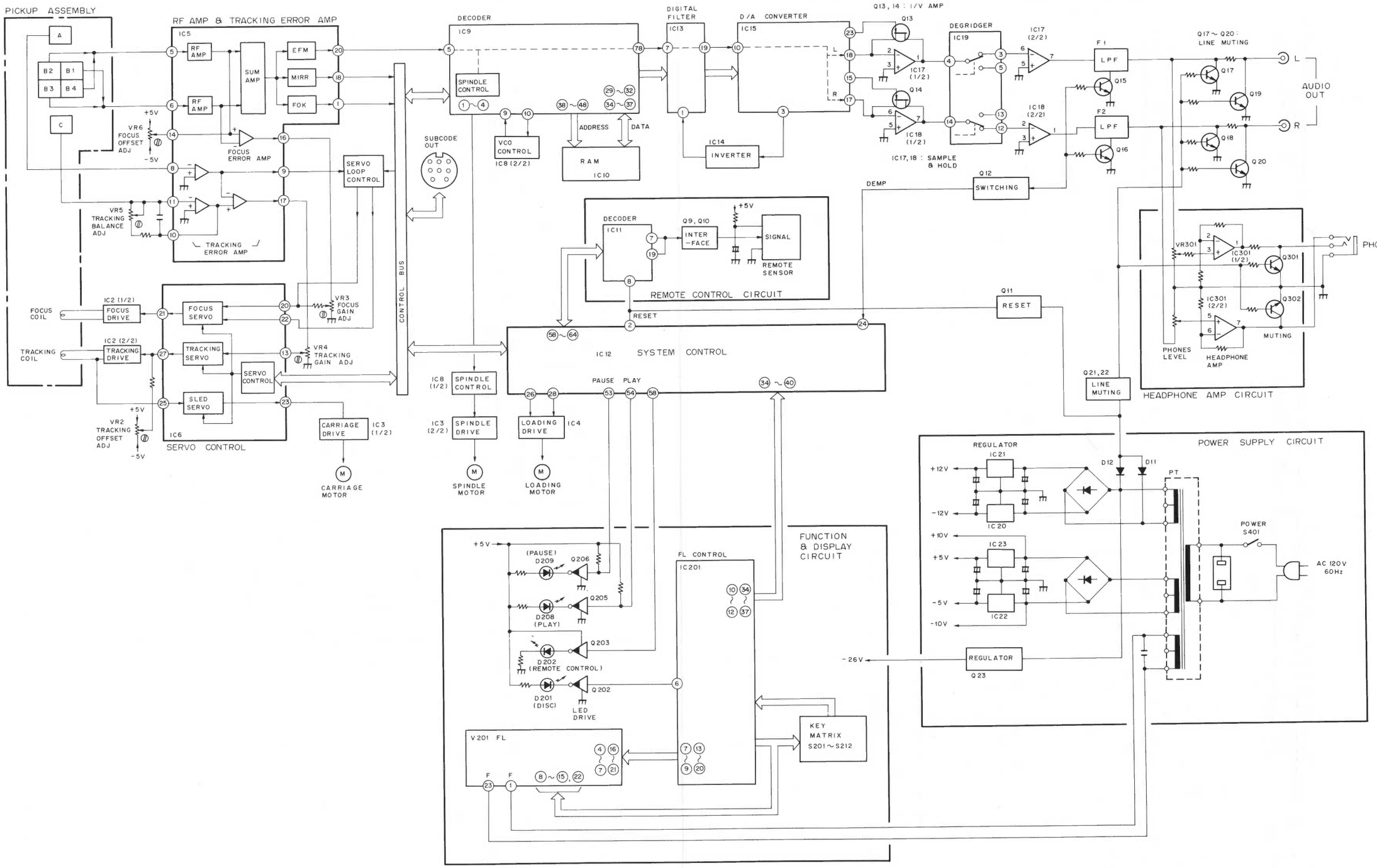
- Block Diagram



- Pin Functions

Pin No.	Pin name	Function
1	DV_{EE}	Digital system power supply terminal: −5V
2	SUB	IC substrate: Be sure to connect to Pin 1.
3	SCLK	System clock output terminal
4	V_{CC}	Digital system power supply terminal: +5V
5	ON/OFF	Terminal to determine the system clock on/of
6	LATCH	Clock terminal of D type latch
7	LRCK	LRCK input terminal
8	WCLK	WCLD input terminal
9	BCLK	BCLK input terminal
10	DIN	DIN (data input terminal)
11	LRCKOUT	LRCK output terminal
12	CC	CC input terminal: MSB first
13	DGND	Digital system ground terminal
14	DV_{EE}	Digital system power supply terminal: −5V
15	DCR	Right channel discharge drive signal output terminal
16	ISET	Integration current setting terminal
17	IOUTR	Right channel current output terminal
18	IOUTL	Left channel current output terminal
19	NC	No connection
20	AV_{EE}	Analog system power supply terminal
21	AGND	Analog system ground terminal
22	DGND	Digital system ground terminal
23	DCL	Left channel discharge drive signal output terminal
24	DCBIAS	Discharge circuit bias terminal
25	COUT	Clock generator output terminal
26	CIN	Clock generator positive input terminal
27	CIN	Clock generator negative input terminal
28	DGND	Digital system ground terminal

2. BLOCK DIAGRAM



3. CIRCUIT DIAGRAM

3.1 SERVO SECTION

Servo control in this CD player is performed using two LSIs (CX20109, CX20108) configured around a system control CPU. Each LSI is connected to the CPU by a data bus. All control is conducted using the serial data from the CPU. The data pattern will be described later.

The primary servo control systems of the CD player are listed below.

1. Focus servo
2. Tracking servo
3. Spindle servo

An explanation of these three systems follows.

3.1.1 The Focus Servo Loop

Purpose:

To control the distance between lens and disk so as to keep the laser beam focused on the pits on the disc surface.

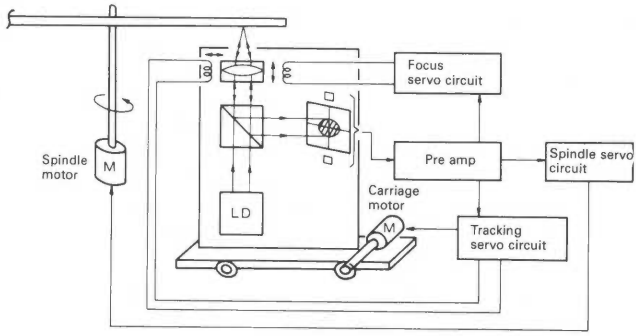
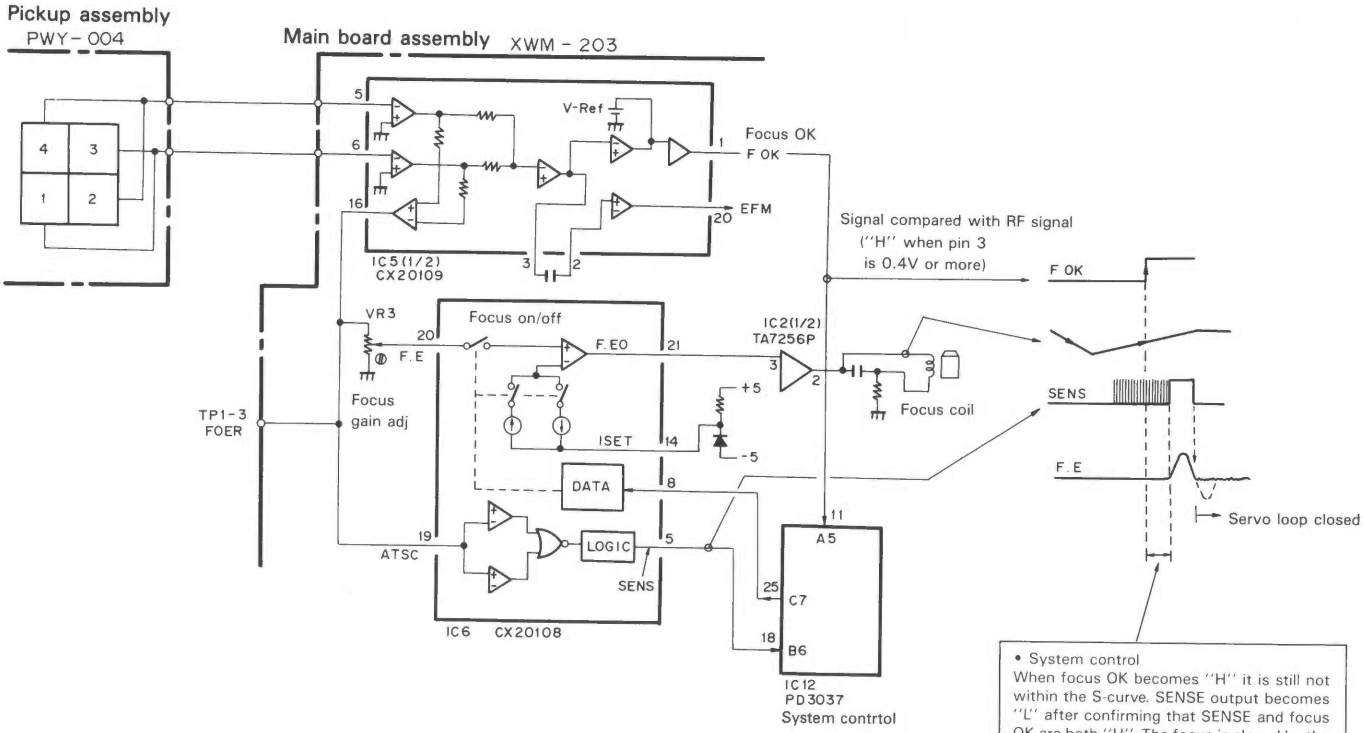


Fig. 3-1 Focus servo loop circuit



Block diagram of focus servo

Fig. 3-2

FOCUS SERVO

When the focus servo does not lock, focus-in is performed one more time. If the result is still unsatisfactory, focus-in operation is stopped.

START-UP CONDITIONS

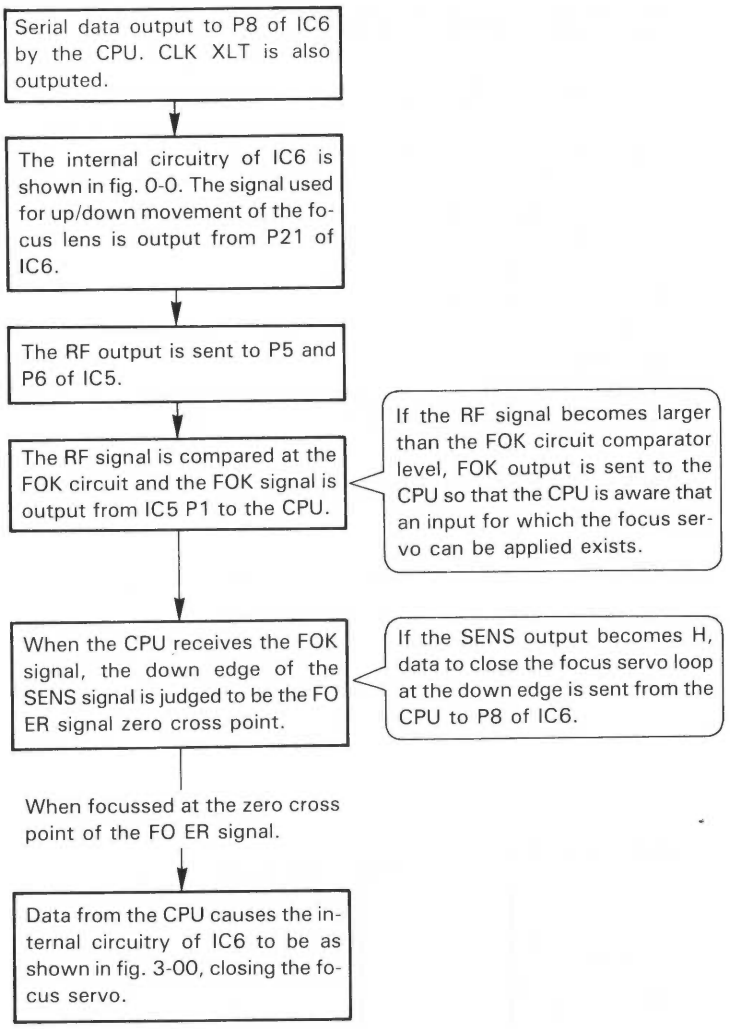
1. Disc is loaded.
2. Laser diode is emitting a beam.
3. Focus start-up data is being output from the system control PD3037 (IC?).

SUMMARY OF OPERATION

1. Lens is forcibly moved down and then up (internally processed by CX20108 (IC6)).
2. The related signals are as follows when the zero cross is located during this lens movement:
   a) SENS output: Goes to focus lock after generation.*1
   b) Focus OK output (H level): If system control does not confirm the existence of this output, focus lock is not performed. Furthermore, this output is checked again before proceeding to the next step.
   c) Focus error signal: Generates zero cross (s-curve).

   *1: When zerko cross is detected using the SENS output, → the disc set LED lights and the focus servo loop is closed.

3. The next step is acceleration of the spindle motor and tracking.
   Refer to the focus servo block diagram.



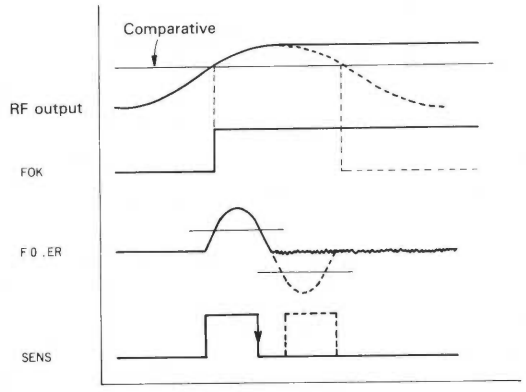


Fig. 3-3

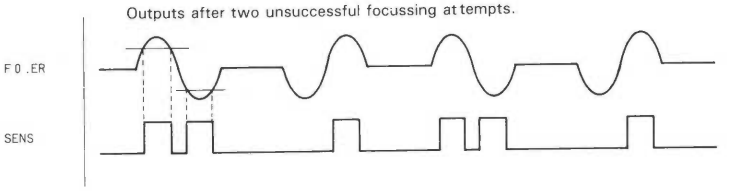


Fig. 3-4

3.1.2 Tracking Servo Loop

PURPOSE:

To control horizontal alignment of the CD pickup so that the laser beam is accurately aimed at the pits on the disc surface. On/off switching of the tracking servo is used during track jump and search to locate the desired point on the disc.

Start-up Conditions

1. Proper focusing (FOK signal)
2. Spindle motor ratatin.

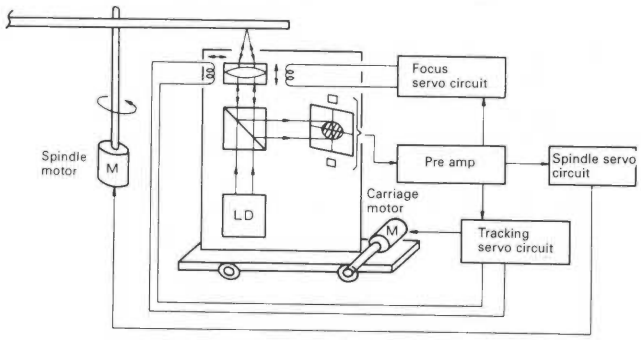
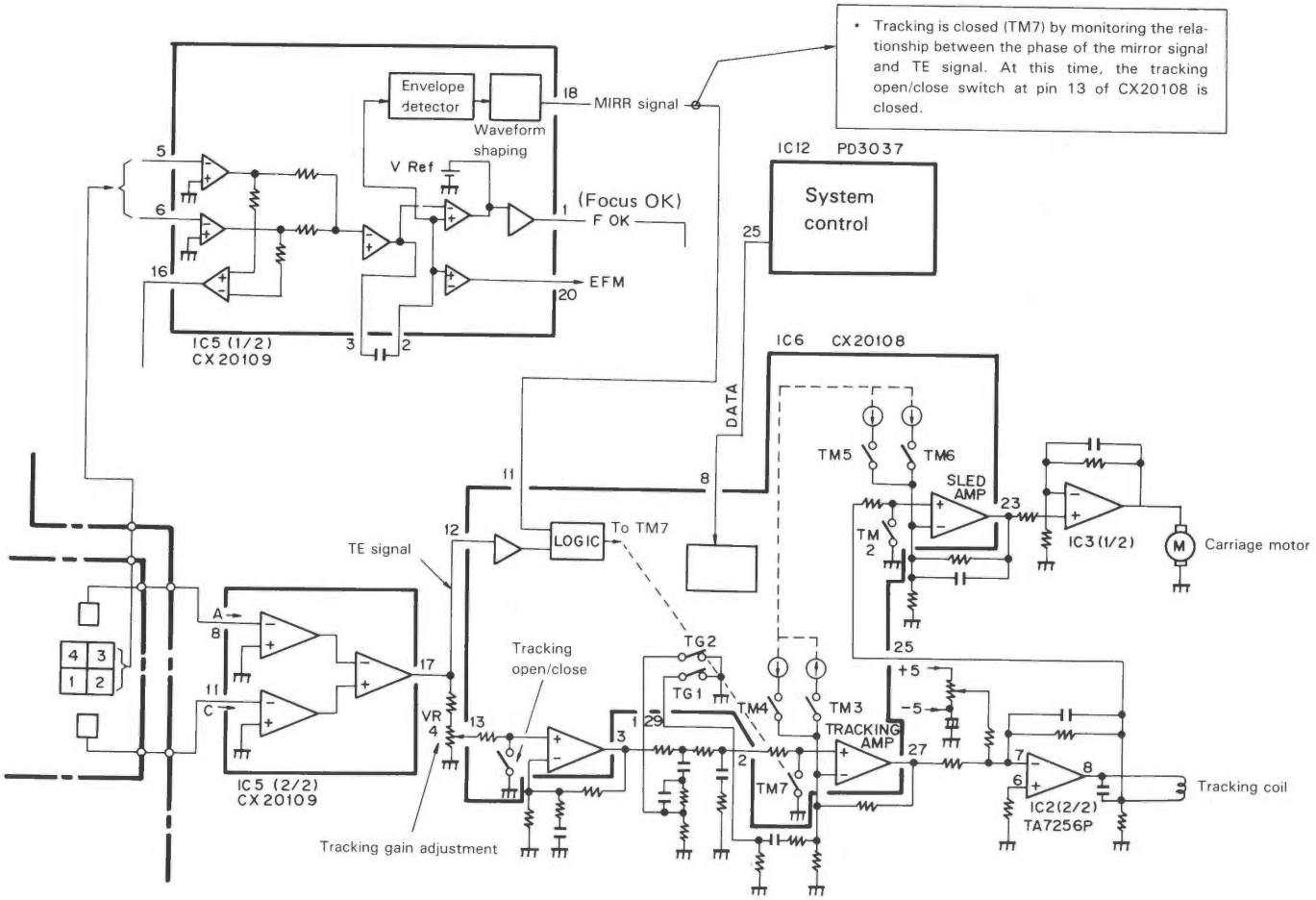


Fig.3-5 Tracking servo loop circuit



Block diagram of tracking servo

Fig. 3-6

Summary of Operation

1. When the FOK signal is confirmed by the system control, acceleration of the spindle motor begins and the "start tracking" data are output.
2. The RF and TE signals are obtained from the pickup. The RF signal is then used to produce the MIRR signal. When RF exists, this signal is "L"; when RF does not exists, the MIRR signal is "H". This provides the indispensable data needed to close tracking. (The MIRR signal is also used for judgment of the outer edge mirror and track count during search and jump.)
3. The system control indirectly knows that tracking has begun because of (1) when the RF signal exists, the MIRR signal is "L" and (2) the G FS signal (see the spindle servo explanation).
4. The next step is spindle lock.
   Refer to the tracking servo block diagram for details.

3.1.3 Spindle Servo Loop

Purpose:

To control disc rotation speed so that constant linear velocity(CLV) is maintained. (Disc speed is gradually lowered as the pickup moves from the inside of a disc to the outside as the disc is played.)

Standard:

The servo controls the spindle rotation speed to maintain the frame synch encoded in the disc pits at 7.35 kHz.

Start-up conditions

1. Proper focusing (FOK signal)

Summary of Spindle Lock Operations

1. When the focus OK signal is confirmed by the system control, spindle acceleration is triggered for an interval of .300m sec.
2. When tracking (with ON TRACK) has begun and the PLL is locked, CX23035 generates an "H" GFS signal.
3. This GFS signal is how the system control knows the tracking and spindle servo loops are locked.
   Refer to the spindle servo block diagram for details.

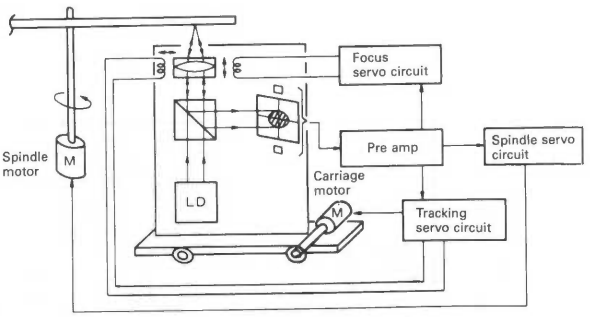
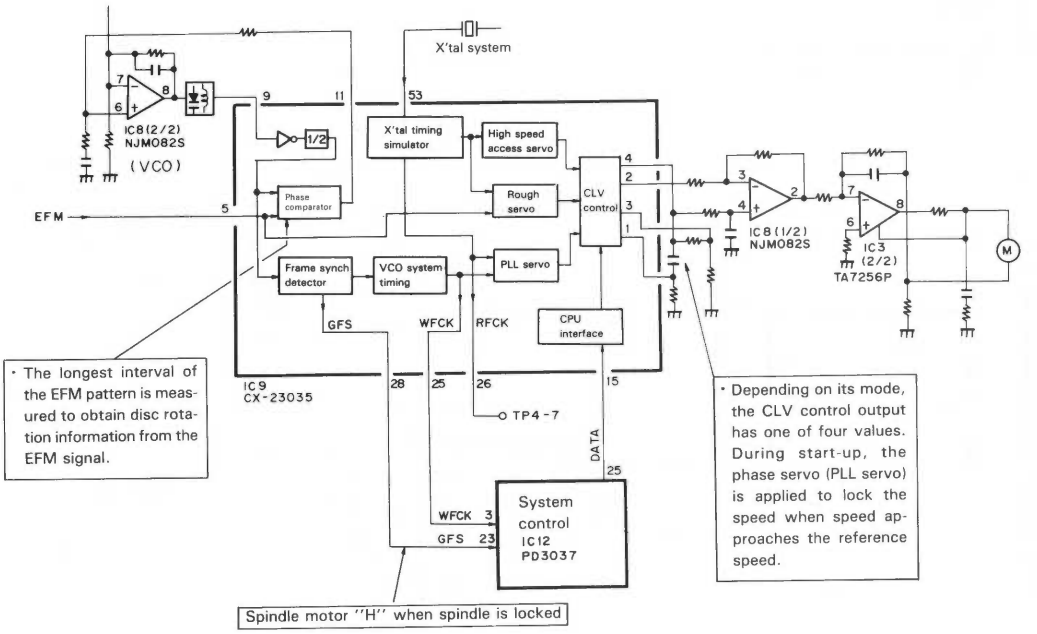


Fig. 3-7

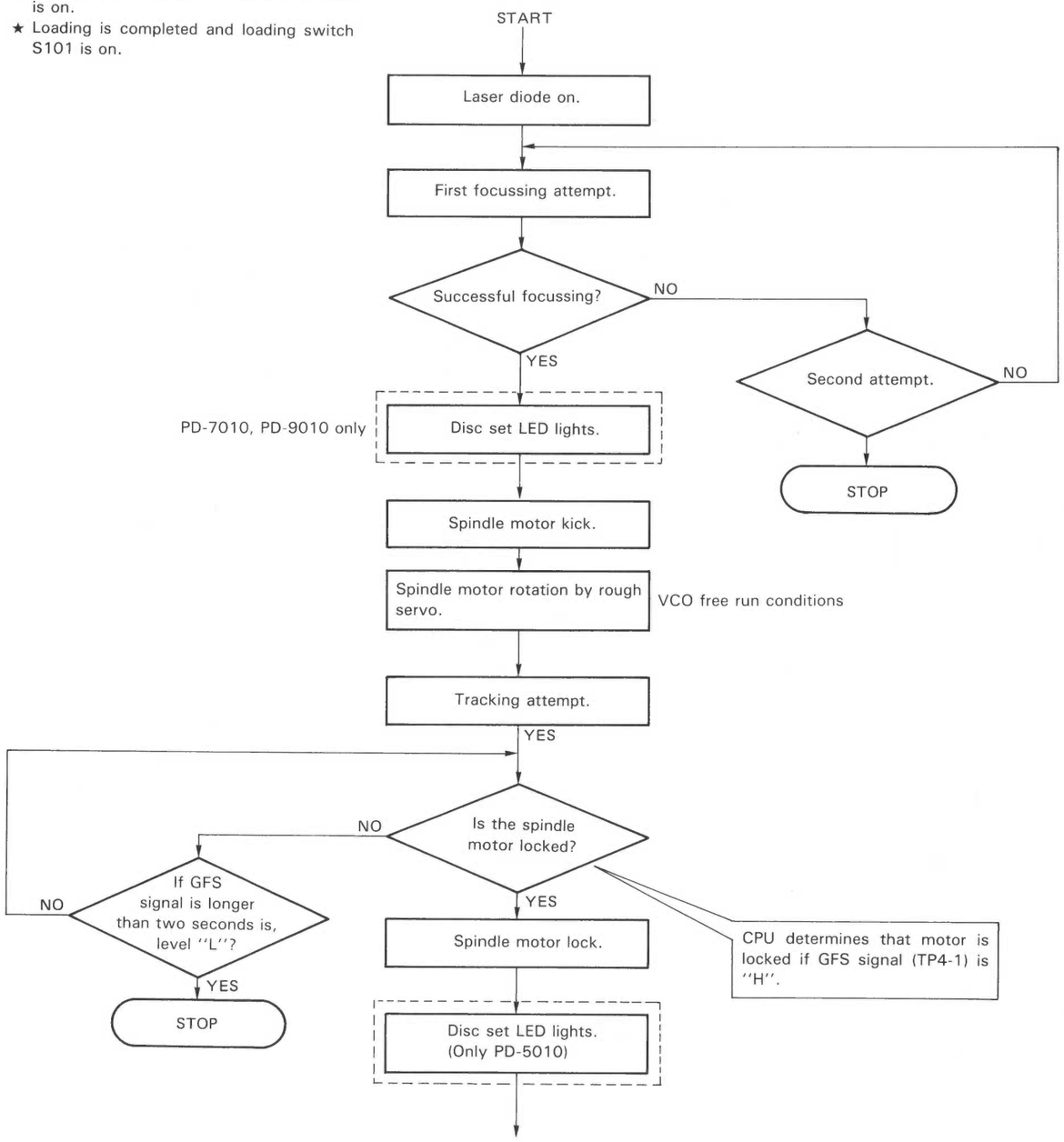


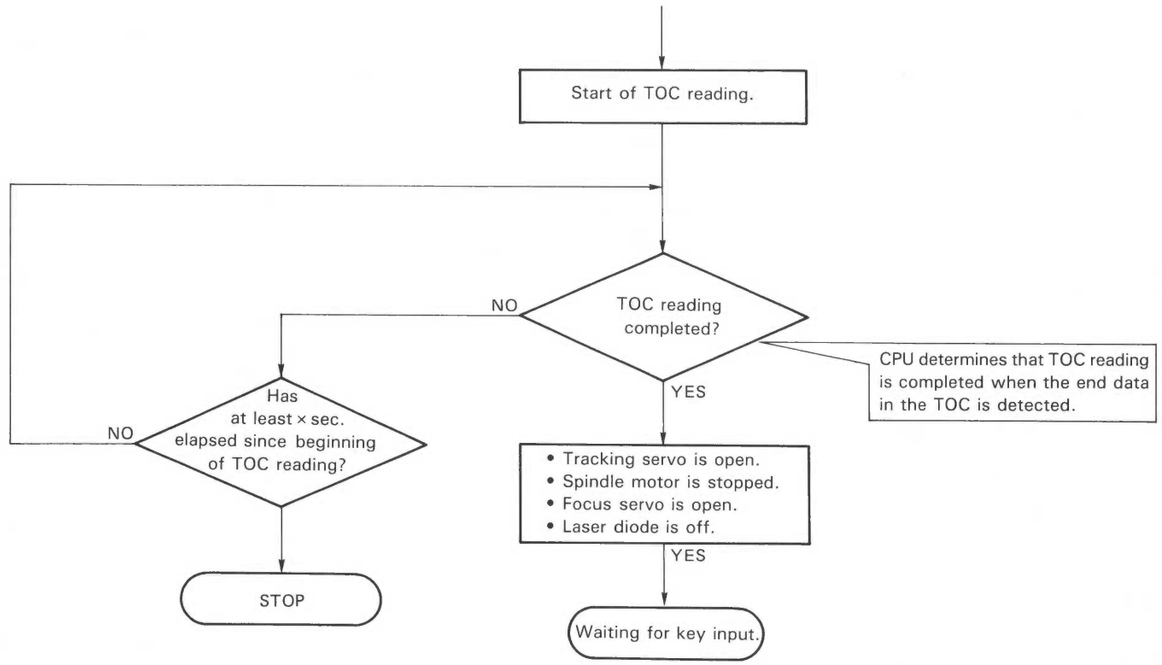
Block diagram of spindle servo

Fig. 3-8

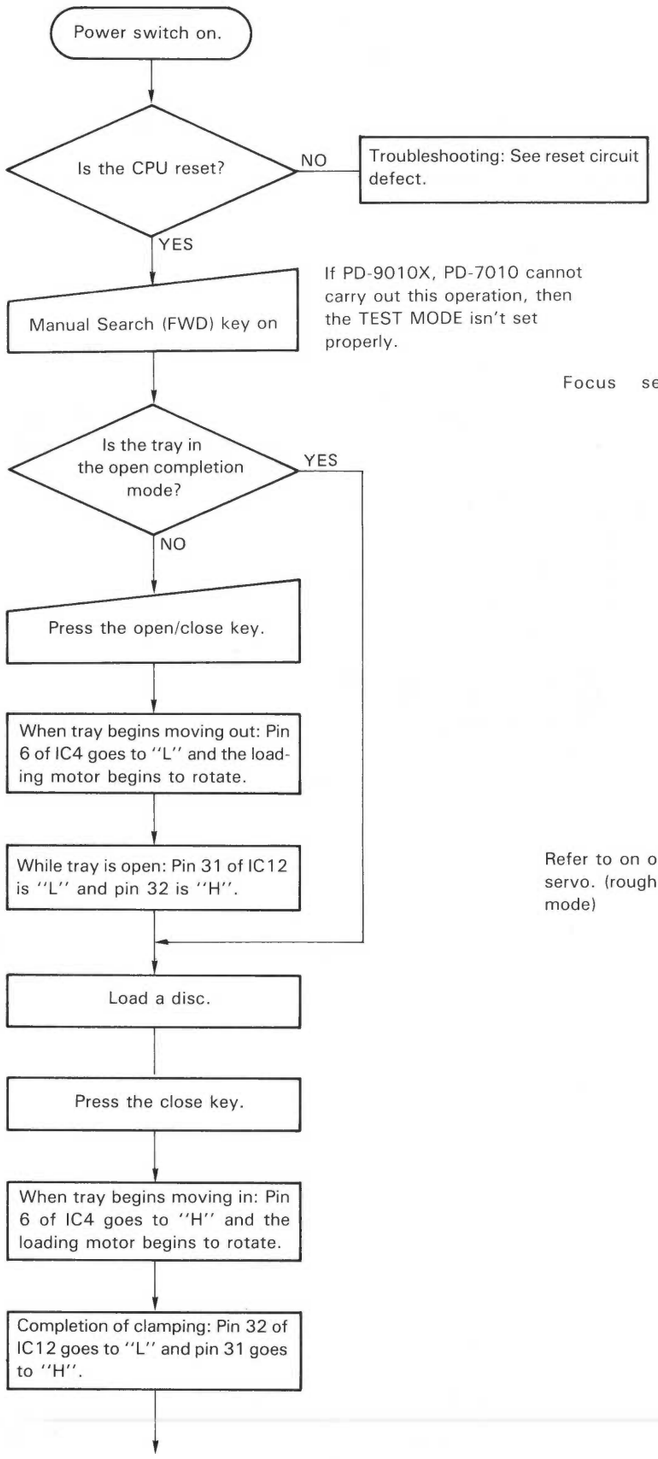
Initial Settings for Reading of Table of Contents

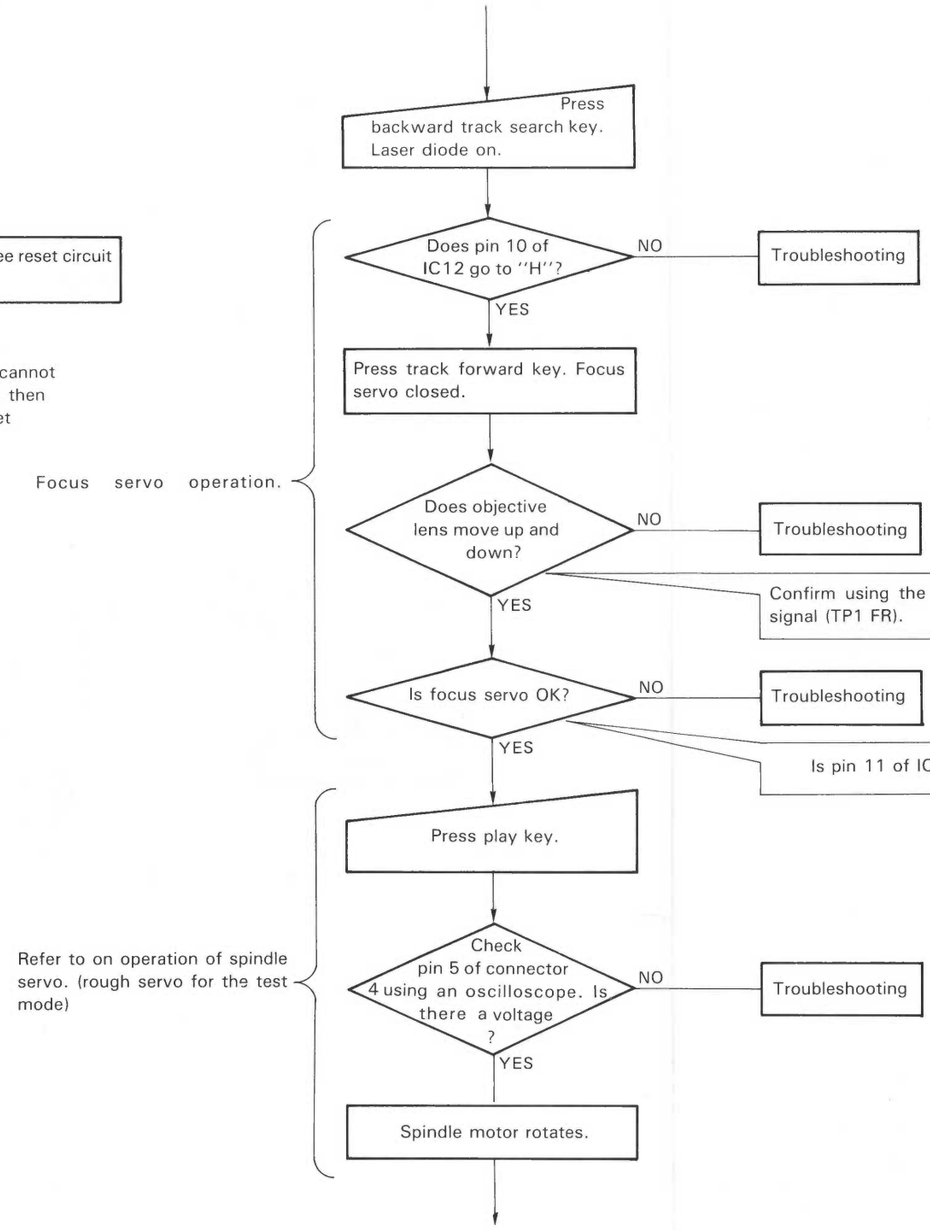
Conditions:
- ★ Carriage is inside and the inside switch S102 is on.
- ★ Loading is completed and loading switch S101 is on.

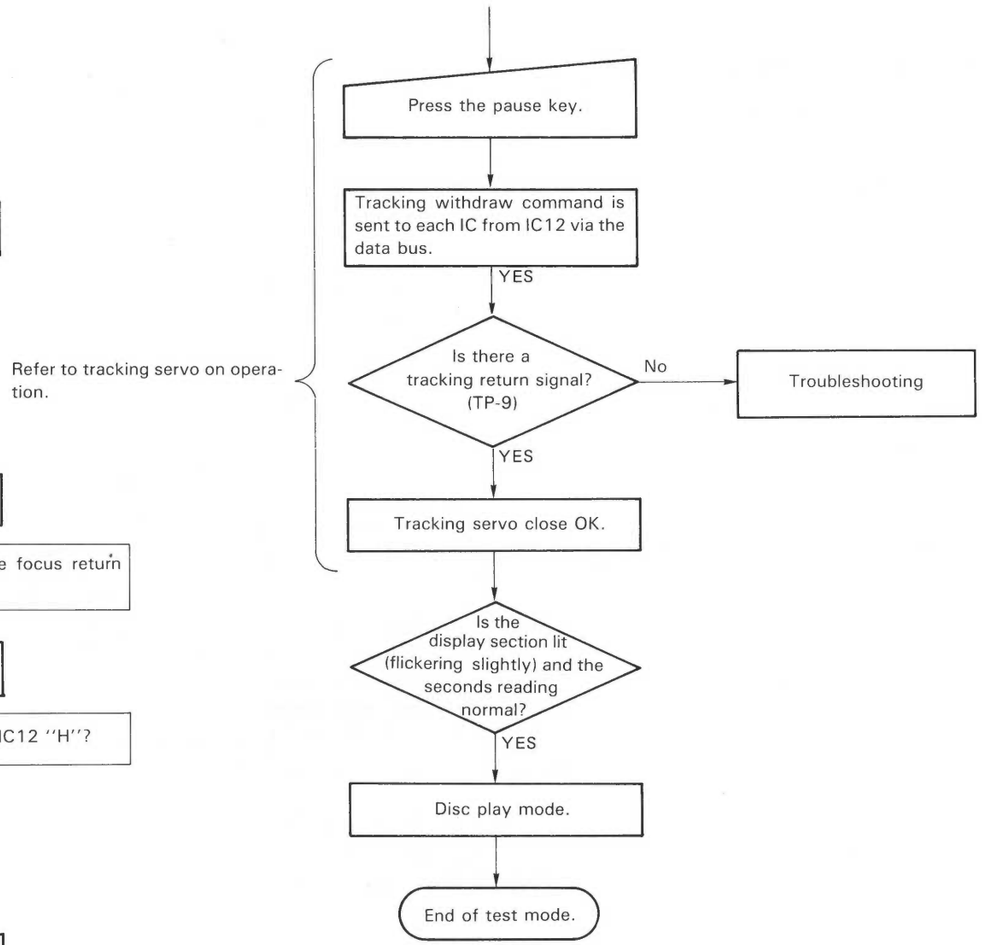




The operations described in this flow chart are carried out in TEST MODE.



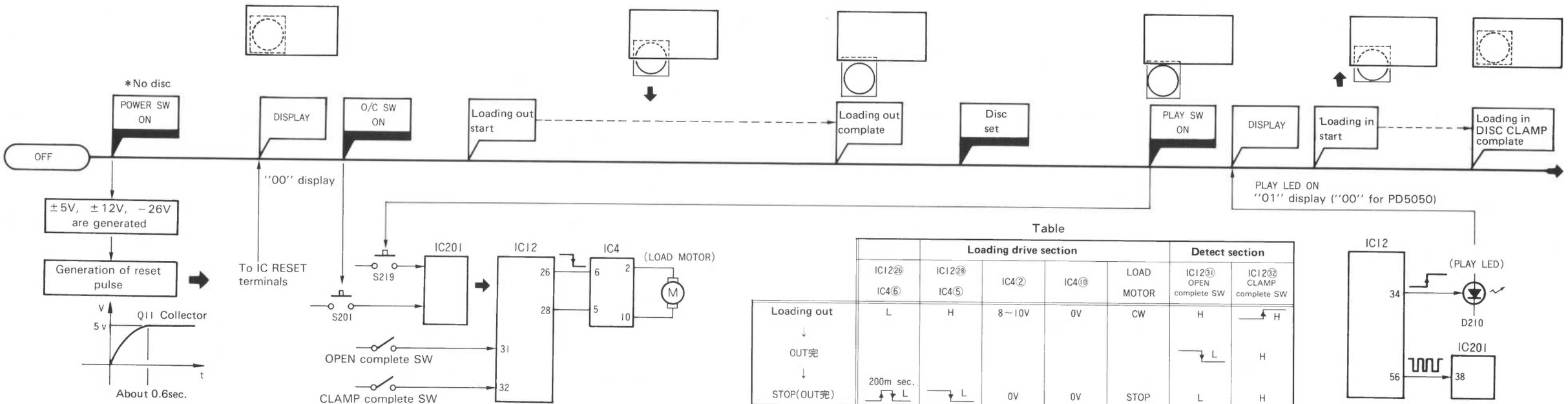




Timing Chart

• Timing Chart (POWER ON→PLAY)

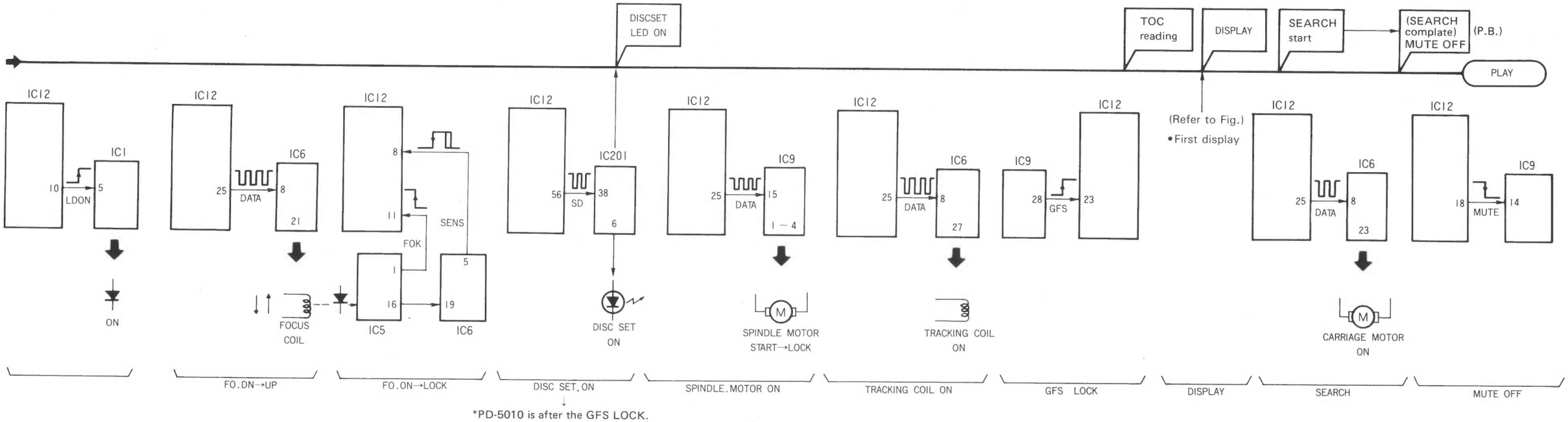
: Designed on the basis of PD-9010/7010.
(Refer to PD-9010/7010 for IC Pin Nos., etc.)



Table

	Loading drive section					Detect section	
	IC12㉖ IC4⑥	IC12㉘ IC4⑤	IC4②	IC4⑩	LOAD MOTOR	IC12㉛ OPEN complete SW	IC12㉜ CLAMP complete SW
Loading out	L	H	8～10V	0V	CW	H	H
↓ OUT完 ↓						L	H
STOP(OUT完)	200m sec. L	L	0V	0V	STOP	L	H
Loading in	H	L	0V	8～10V	CCW	H	H
↓ CLAMP complate ↓						H	L
STOP(IN完)	H	H	0V	0V	STOP	H	L

Fig



*PD-5010 is after the GFS LOCK.

3.2 CIRCUIT DESCRIPTIONS

(1) Preamp

This section processes the output signal received from the pickup and then sends signals to the servo section of the next stage, the demodulator and the controller. CX20109 and other parts of the preamp are described below.

The IC is a 24-pin flat package; its internal configuration is shown in fig. 3-9.

A description of the internal parts of the IC follows.

1. RF amp

The pin diode currents input at PD1 and PD2 each undergo I-V conversion at the 60kohm equivalent input resistors of RF I-V amps (1) and (2). Then (B1 + B2 + B3 + B4), added at the RF summing amp, is output to RFO. (An eye pattern check can be performed at this terminal.)

The low frequency component of the RF0 output voltage VRF0 is:

VRFO = −[(R30 + R32)/10kohms] × (VA + VB)
= [(R30 + R32)/10kohms] × (iPD1 + iPD2) × 60kohms

Furthermore, C1 and R3, have been provided because they are necessary for equalizing the EFM eye pattern.

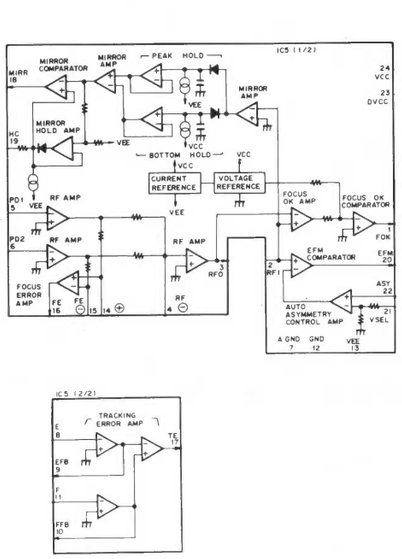


Fig. 3-9

This equalizer raises high range gain at an external circuit. The equalizer has a response peak in the high range to compensate for the drop in high range gain in the IC itself. The RF0 output (pin 3) is an RF (DC) signal having a peak of 2.3V (DC) and a bottom of 0.5V (DC).

The high range pole setting is 2.5.MHz, however this is attenuated above around 1MHz because of the high range characteristics of the op amp inside the IC. As a result, the amplitude of high range signals such as 3T is raised.

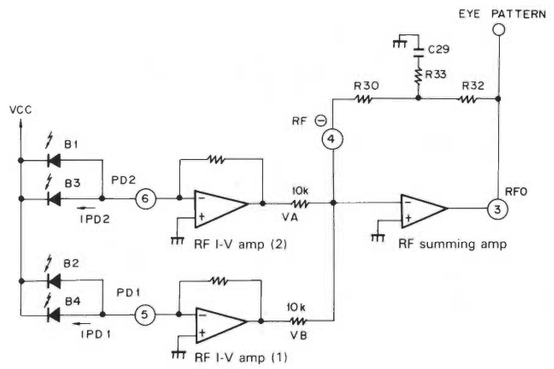


Fig. 3-10

2. Focus error amp

The difference between the output of the RF I-V amp (1) (B2 + B4) and RF I-V amp (2) (B1 + B3), B1 + B3 − B2 − B4, is computed and output.

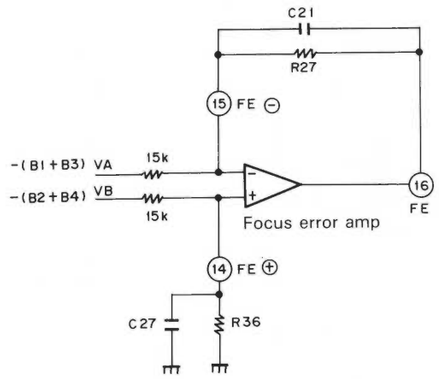


Fig. 3-11 Focus error amp circuit

When R27 = R36, the FE output voltage (low frequency) is:

VFE = R27/15kohms) × VA-VB = R27/15kohms
× (iPD2 − iPD1) × 60k

C21, C27 is needed to prevent leakage of the EFM component into the focus error output. Due to the gain setting, R27 = R36 = 100 and C21 = C27 = 56 (PF). That means fc = 28.4kHz. For the pin 16 output, a 5V p-p output in the form of an S curve is output.

3. Tracking error amp

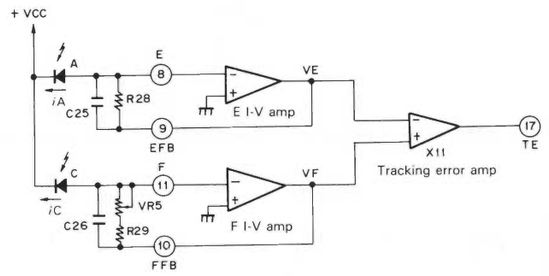


Fig. 3-12 Tracking error amp circuit

The current of the sidespot pin diode that is input at E and F undergoes I-V conversion at the E and F I-V amps (R28 and R29 + VRS) in the following manner:

3VE = iAR28
VF = iC (R29 + VR5)

Then, the difference between the two I-V amps is calculated at the tracking error amp to produce the output (E − F). The gain of the tracking error amp for 11 (21dB) is:

VTE = (VE − VF) × 11 = (iA − iC) × R28 × 11

C25, C26 is required to prevent leakage of the EFM component into the tracking error output.

The gain setting makes R28 = R29 + VRS = 150kohms and C25 = C26 = 47PF. Here, fc = 22.6kHz.

R29 + VR5 includes adjustment VR. This is tracking error balance for the purpose of obtaining a DC balanced tracking error signal such as the one shown in figure 3-17. It is needed primarily to perform tracking jump properly. The output of pin 17 is a 4V p-p tracking error signal.

4. Focus OK circuit

The focus OK circuit makes the timing window for switching on the focus servo from the focus search mode.

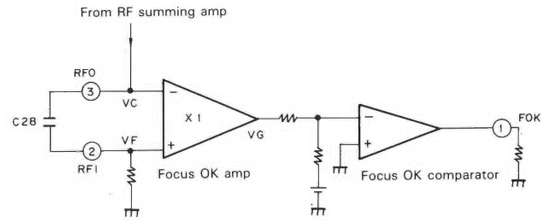


Fig.3-13 Focus OK circuit

The threshold value VTH of the focus OK comparator is set so that it is reversed when VG = − 0.4V. Therefore the focus OK comparator is reversed when VRF0 = VC = 0.4V. The threshold value of this comparator is stable due to the accuracy of the reference voltage within the IC.

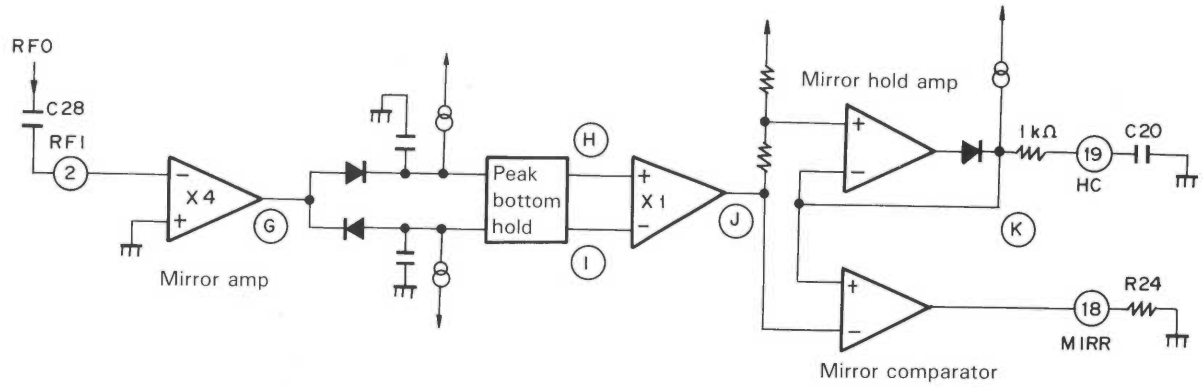
C28 determines the time constants for the EFM comparator, mirror circuit high-pass filter and focus OK amp low-pass filter. This makes it possible to prevent the worsening of the black error rate caused by the RF envelope loss when scratches and other disc damage is encountered.

In this system, 0.0047μF is used as the optimum value for C28. For this value, fc = 3.4kHz and the RF offset current is unnecessary.

5. Mirror circuit

After amplifying the RFI signal, peak and bottom hold are performed. For peak hold, the time constant is such that the 30kHz traverse can also be followed. For bottom hold, the time constant is such that the rotation cycle envelope fluctuations can be followed.

The DC restored envelope signal is obtained by performing differential amplification of these peak/bottom hold signals. By comparing this signal with the signal held by peak hold at 2/3 of the peak level using the large time constant, the mirror output is obtained. In other words, mirror output is "L" when over a track (row of pits) and "H" when between tracks (rows of pits). Furthermore, "H" is also output when a defect is detected. The time constant for mirror hold must be sufficiently larger than the traverse signal.



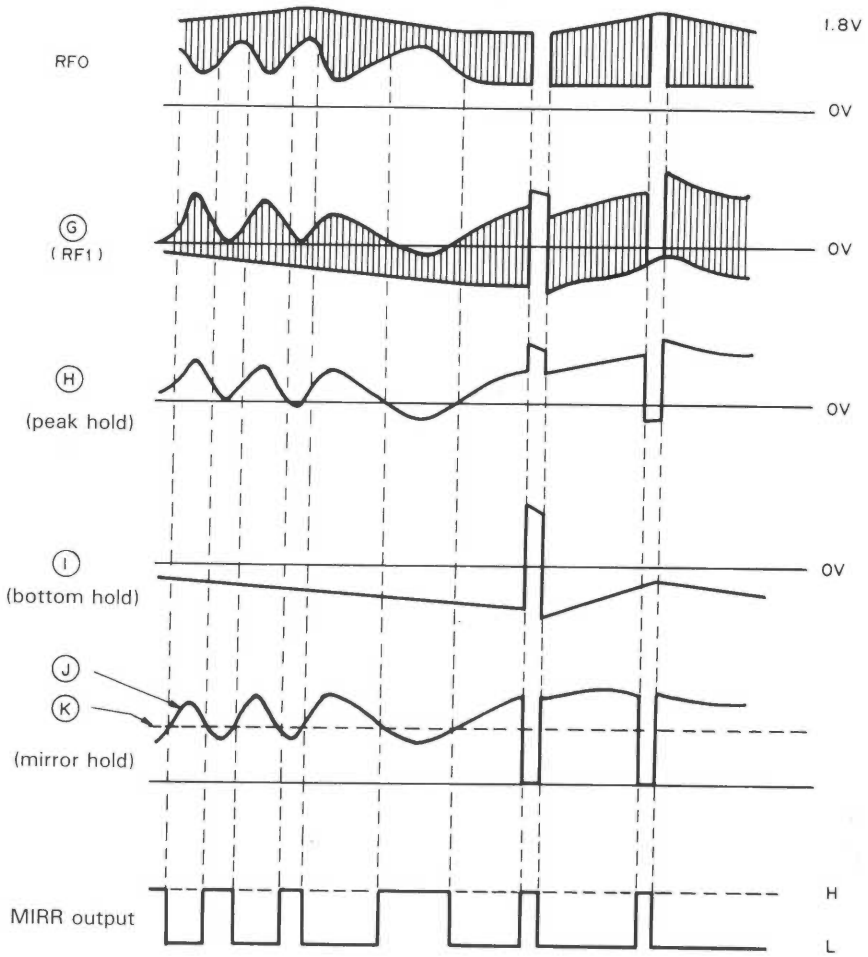


Fig.3-14 Mirror circuit

6. EFM comparator

The EFM comparator serves to convert the RF signal into a signal having two values. Problems caused by disc asymmetry can not be dealt with by AC linkage alone. Therefore, the EFM comparator reference voltage is controlled by using the fact that a 1.0 occurrence probability becomes 50% for each of the two EFM signals.

Because this EFM comparator is a current switch type unit, the H and L levels do not become the same as that of the power supply voltage. It is, therefore, necessary to apply feedback through a CMOS buffer. R25, R90, C22 and C60 are the low-pass filter needed to obtain DC +2.5V. If fc is 500Hz or more, leakage of the reduced component of EFM becomes serious, resulting in a worsening of the block error rate. This system has two stages, one in which R25 = 100kohms and C22 = 0.47μF so that fc = 3.4Hz and a second in which R90 = 10kohms and C60 = 0.01μF so that fc = 1.6kHz.

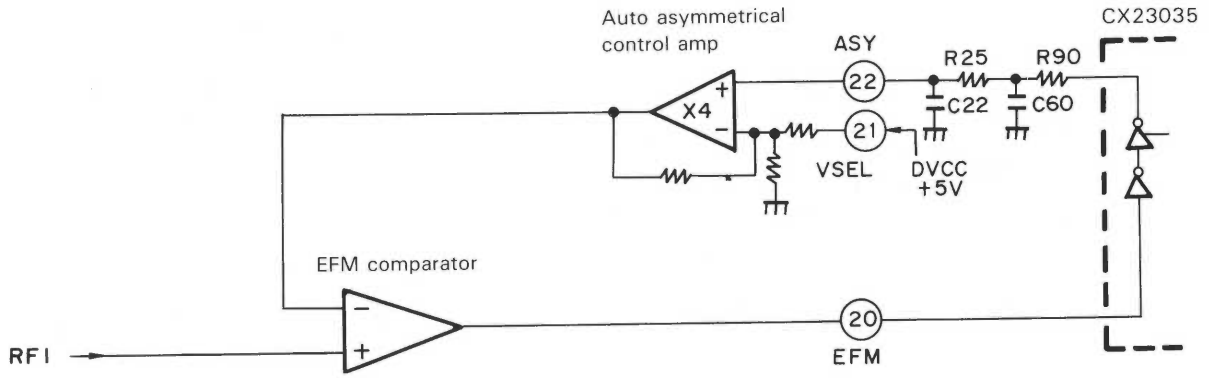


Fig. 3-15 EFM comparator circuit

Servo Section

This section uses an external control signal for focus servo, tracking servo and carriage servo operation (normal servo operation) and special servo control operation such as focusing and track jump. Its primary component is a IC CX20108 chip. To improve servo performance with regard to disc scratches and other disc defects, a discrete defect correction circuit is included.

The IC is a 30-pin flat package having a construction as shown in figure 3-16. A description of each section follows. The operation modes and data of this IC are shown in Table 3-1.

COMMAND	ADDRESS D7 D6 D5 D4	DATA D3	D2	D1	D0	SENSE
FOCUS CONTROL	0 0 0 0	FS4 FOCUS ON	FS3 GAIN DOWN	FS2 SEARCH ON	FS1 SEARCH UP	FZC
TRACKING CONTROL	0 0 0 1	ANTI SHOCK	BREAK ON	TG2 GAIN	TG1 SET *	AS
TRACKING MODE	0 0 1 0	TRACKING * MODE		SLED * MODE		TZC

TRACKING MODE	D3	D2
OFF	0	0
ON	0	1
FWD JUMP	1	0
REV JUMP	1	1

SLED MODE	D1	D0
OFF	0	0
ON	0	1
FWD MOVE	1	0
REV MOVE	1	1

Table 3-1

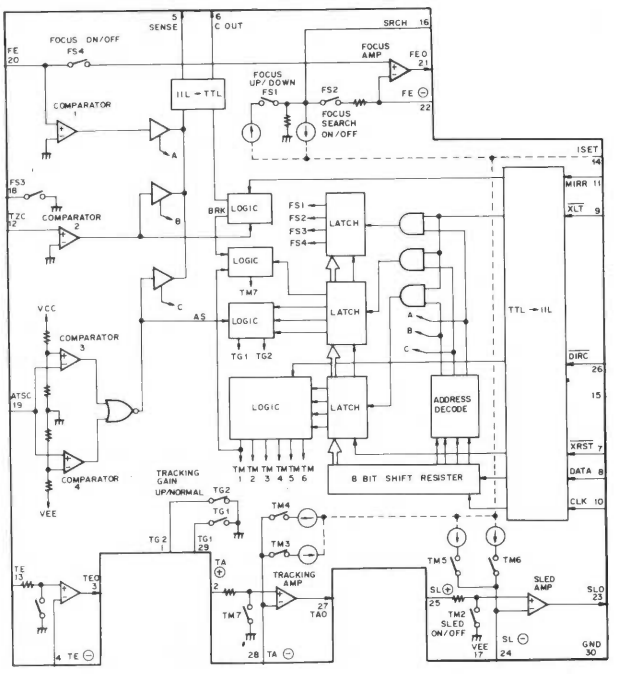


Fig. 3-16

1. Command codes

The modes of both IC CX20108 and the demodulator IC CX23035, which will be discussed later, are controlled by the serial data (from the control microcomputer). All types of detection outputs are output from the "SENS" terminal. These control data and detection outputs link the control microcomputer, CX20108 and CX32035 in the form of a control bus line. The DATA, C, LK (serial) for mode control and XLT timing for starting execution are shown in figure 3-17.

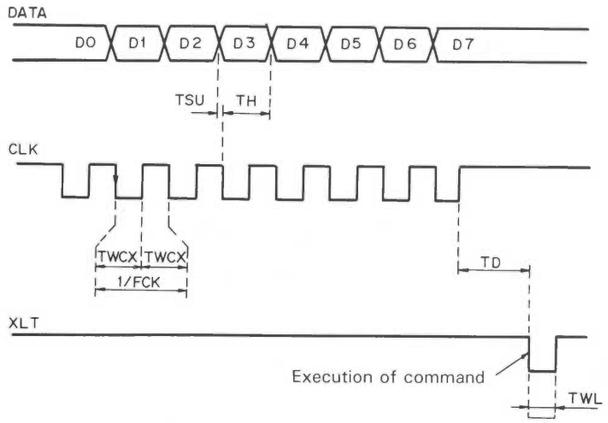


Fig. 3-17

Item	Code	Standard			Unit
		Min.	Std.	Max.	
Clock frequency	FCK			250	kHz
Clock pulse width	TWCK	2			μS
Set-up time	TSU	-0.1			μS
Hold time	TH	4			μS
Delay time	TD	4			μS
Latch pulse width	TWL	1			μS

Table 3-2

2. Focus-in sequence

(a) Focus servo

The focusing sequence moves the lens to within the focus S-curve and closes the servo loop at the center of the S. For moving the lens up and down, the following section of the IC is used.

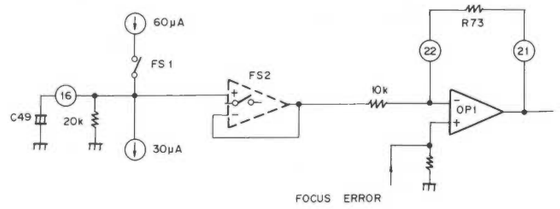


Fig. 3-18

Operation of FS1 and FS2 is as follows. The numbers shown in fig. 3-18 (and in this section) are pin numbers of CX20108. op1 is the op amp used for the focus servo. The FS2 output is sustained at the reverse terminal. For 1, FS2 is on and operates as a normal voltage follower. For 0, FS2 becomes a switch to give this output a high impedance. FS1 is simply a current switch that is off for 1 and produces a current of 60μA for 0. The 60μA figure is the value when 240μA is sent to ISET (pin 14). The focus search voltage can, therefore, be produced by using FS1 and FS2.

In this system, 89μA is fed to ISET. That means the positive current supply is 22μA and the negative current supply is 11μA. Here, the voltage of pin 16 is:

When FS1 is off: $-11\mu A \times 20\text{kohms} = -0.22V$

When FS1 is on: $(22-11)\mu A \times 20\text{kohms} = +0.22V$

This is returned to original form and used to perform up/down lens movement. Furthermore, all current supplies for the tracking servo drive described below are 22μA.

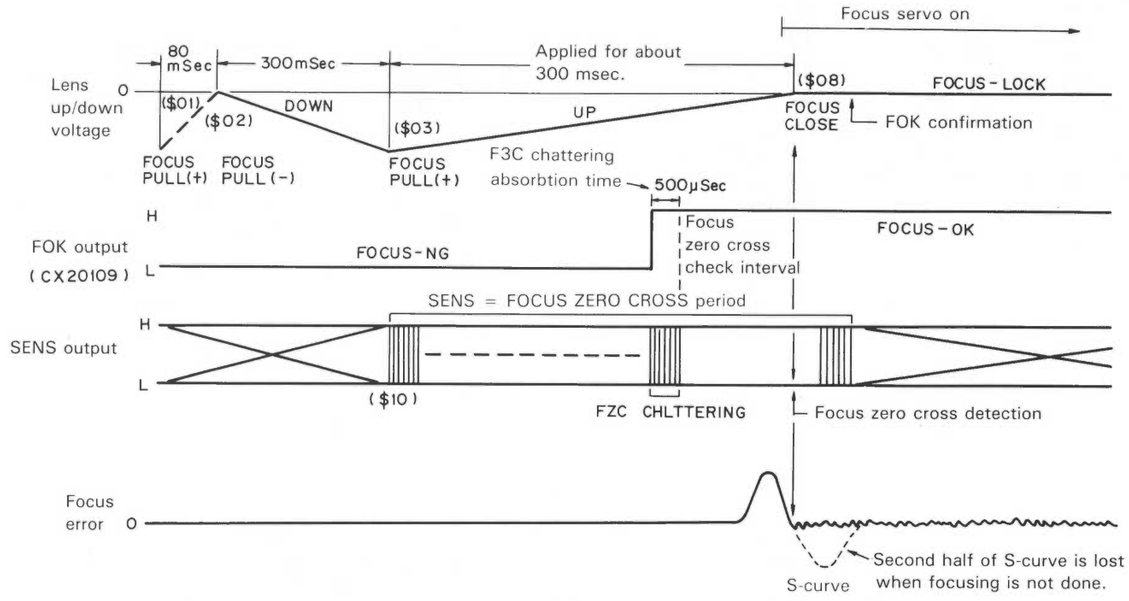


Fig. 3-19

In the sequence shown in fig. 3-19, focusing is being performed. First, for lens up/down movement, FS1 of fig. 3-18 causes the control microcomputer to reset CX20108 when power on is reset. As a result, the internal register becomes $00, the focus mode. At this time, FS1 is on so the voltage at pin 16 is +0.22V.

Although the focusing sequence is as shown in fig. 3-19, positive charging of pin 16 when power is switched on corresponds to lens drive in the downward direction. Consequently, switching FS2 on immediately would cause the lens to move downward rapidly. To prevent this from occurring, FS1 is switched off and negative charging is performed. FS2 is then switched on to begin the drive sequence only after pin 16 has reached ground potential (approximately).

The usual sequence is as follows. The lens is lowered (max. of 1mm) and then raised. When the lens approaches the S-curve, "FOK" (the focus output based on the RF output) goes to "H", the center of the S-curve is detected using the SENS output and the servo loop is closed.

The maximum amount of lens movement in the upward direction is also 1mm (see fig. 3-19). If focusing can not be done the first time, the lens is lowered and raised again in a second attempt to attain proper focusing. Focusing is attempted no more than two times. If proper focusing is still not possible, the unit proceeds to a processing routine.

For focus error zero cross detection in this system, a window comparator in CX20108 is used. The input for this comparator is pin 19 "ATSC". As is shown in the table, comparator output is obtained from "SENS" when in the tracking control mode. By doing this, instability occurring immediately before and after a focus error and mistaken zero cross point detection due to focus error offset are eliminated. Here, the threshold is about ±0.65V.

(b) Main loop

This loop consists of a one stage low range gain compensator, one stage high range phase compensator and two stage high-cut filter for high range noise attenuation. The main loop is designed to provide a residual error of under $-1\ \mu$m as well as excellent playability, taking into consideration the above characteristics and disc standards (including pickup actuator performance).

3. Tracking servo

(a) Brake mode circuit

The brake mode circuit is constructed to make possible the smooth closing of tracking when the pickup and disc are moving in relation to each other. The directions of pickup and disc movement are detected using the phase relationship between the envelope and tracking error (at RF). Switching is conducted in such a way that the accelerating side of the tracking error is cut. Consequently, only the decelerating side is used. This operation, called the brake mode, is shown in fig. 3-20 and 3-21. External control of the activity and inactivity of this mode is possible.

The brake mode is used when closing tracking after focusing. By doing this, smooth focus closing is possible even for tracks (lines of pits) whose distance to the pickup is varying greatly due to disc eccentricity, warping and other factors.

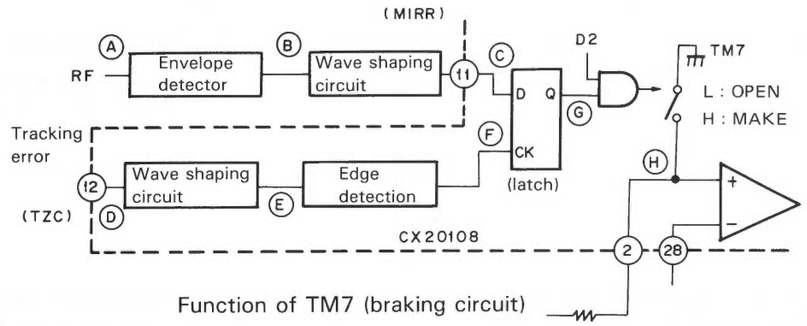
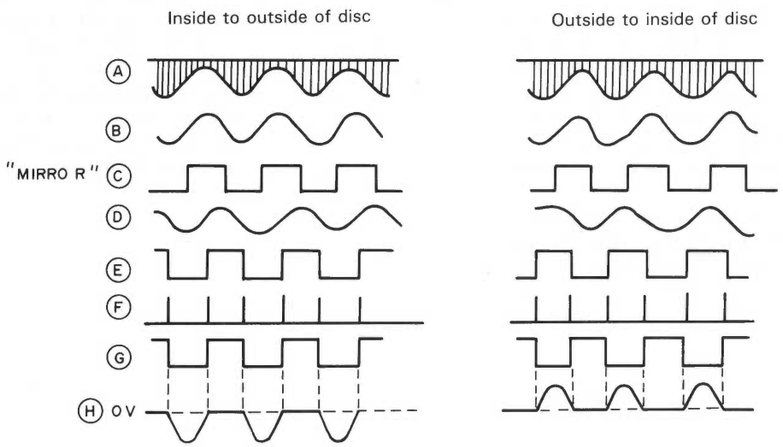


Fig. 3-20



(external waveform)

Fig. 3-21

(b) Main loop

There are two gain settings for normal disc play, the normal gain setting and the higher gain setting for track jump. The main loop consists of a one stage fixed low range gain compensator, one stage switching reduced gain compensator, one stage fixed high range phase compensator, one stage switching high range phase compensator and two stage high range noise cut filter.

As shown in the diagram, there are two low range and two high range stages at the normal gain setting and two low range and one high range stage at the high gain setting. Fig. 3-22 shows the circuit configuration of this section. For normal gain, both TG1 and TG2 are on; for the high gain, both TG1 and TG2 are off.

The drive current supply is, as was shown earlier, 22μA. Therefore, in this system the output voltage of pin 27 is the voltage obtained when this current is applied to the resistance between pins 28 and 27 (9.1kohms). In this case, the output voltage is 200mV. This becomes the kick and brake drive voltage (the output voltage of pin 27). This output voltage is then used for current drive of the tracking actuator in the final driver.

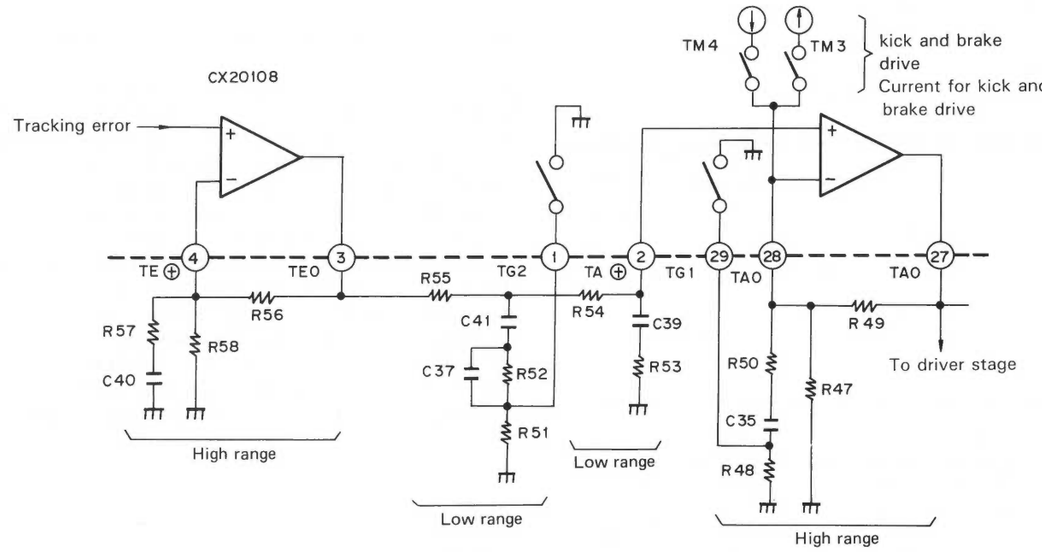


Fig.3-22

4. Carriage servo

The return resistance voltage of the tracking actuator current driver final stage is used as the input (see fig. 3-23). The required carriage movement components are obtained by using the filter characteristics.

The carriage movement drive is performed by controlling the current supply in CX20108 with the serial data so that the output is a DC voltage. Because this type of

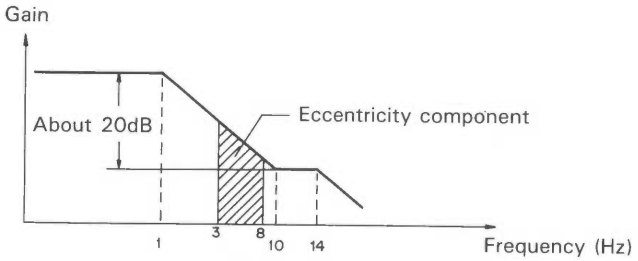


Fig. 3-23

carriage drive system is used, the final stage employs voltage drive. The power supply is unregulated, so the drive voltage is also unregulated when carriage movement is started. Due to the gain setting, the movement drive is limited at about ±11V. Consequently, motor drive becomes a DC voltage when the unregulated voltage becomes high.

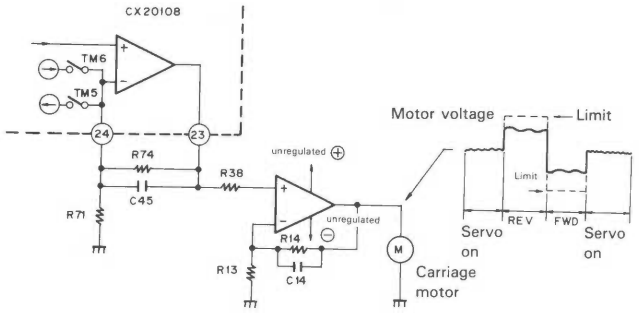


Fig. 3-24

5. Defect processing circuit

This circuit detects disc defects (scratches, dirt, etc.) and switches the focus servo loop equalizer to improve playability when defects are encountered. (A) is the output of the leading beam of the 3-beam tracking pickup. It is obtained from the preamp. This output changes in the manner shown on the right when a defect is encountered.

The output is amplified at IC7 2/2 and ends up as shown in diagram (B) due to a capacitor that extends the dropoff in the output. By routing this output through a comparator, output (C) becomes correct from the beginning of the defect period to the point where the 2.4msec. time constant component is extended (after the defect period has ended). The focus servo equalizer is switched by using this procedure. Equalizer switching is executed by switching the Transistors of Q2 and Q3 on using (C) output.

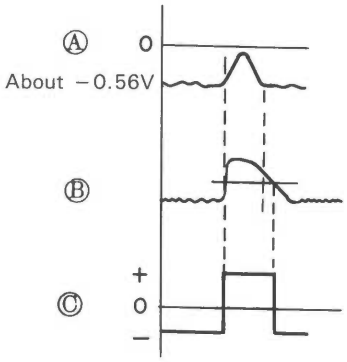


Fig. 3-25

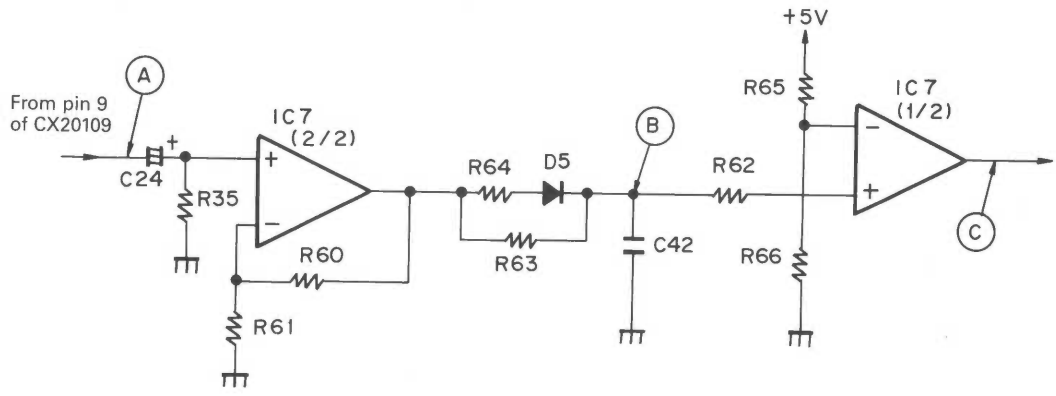


Fig. 3-26

(3) Demodulator

The demodulator is composed primarily of LSI CX23035; it also includes a small amount of added-on circuits. Its functions are:

1. Bit clock regeneration using the EFM-PLL circuit.
2. Demodulation of the EFM data.
3. Detection, protection and internal extension of the frame synch signal.
4. Powerful error detection and correction.
5. Interpolation using averaging or previous value hold.
6. Demodulation of the sub-code and error detection for sub-code Q.
7. CLV servo for the spindle motor.
8. 8-bit tracking counter.
9. CPU interface using the serial bus.

Of these nine functions, an external circuit is required for the PLL section and CLV servo. All other functions are performed by the LSI alone. Here, the external discrete circuitry will be discussed.

The external circuitry consists of a loop filter and its amplifier and VCO.

Pin 11 "PDO" of CX23035 emits an output when an error is encountered. The loop filter is a low-pass filter for this output having a 70Hz pole and 1.6kHz zero point. The output is amplified by the error amp and sent to VCO. The main amplifier of VCO is within CX23035.

An output signal is produced from MDP and MDS according to the CLV servo mode of CX23035. The mixed. filter section is a low-pass filter having a cut-off at about 500Hz and the loop filter is a low-pass filter having a cutoff at about 300kHz. FSW switches the mixed filter cutoff to about 20Hz with regard to the CLV servo motor. MON causes the loop filter output to become 0V; it is operated by the stop motor.

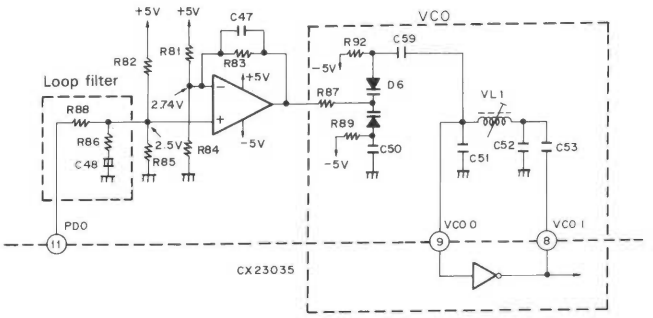


Fig. 3-27

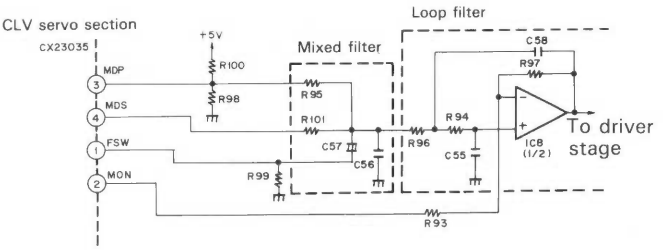


Fig. 3-28

2. AUDIO SECTION

In the high end models of this CD player series, a digital filter is employed. This digital filter is IC CX23034. It doubles the sampling frequency to 88.2kHz; it is a 16-bit 96 tap FIR filter. By using this filter:

1. Group delay near the cut-off frequency is greatly reduced.
2. The cut-off characteristics are almost perfect. In addition, high end distortion is lower and signal transmission performance is improved.

Other audio circuits are basically the same as those of conventional components, however, except for the top of the line model, deemphasis switching and muting are performed by transistors. Also, deemphasis is switched on during manual search to reduce high range noise. Muting is provided to suppress noise produced when power is switched on. It is controlled by a timing signal from a discrete circuit.

3. OPTICAL SECTION

(1) Optical path and elements

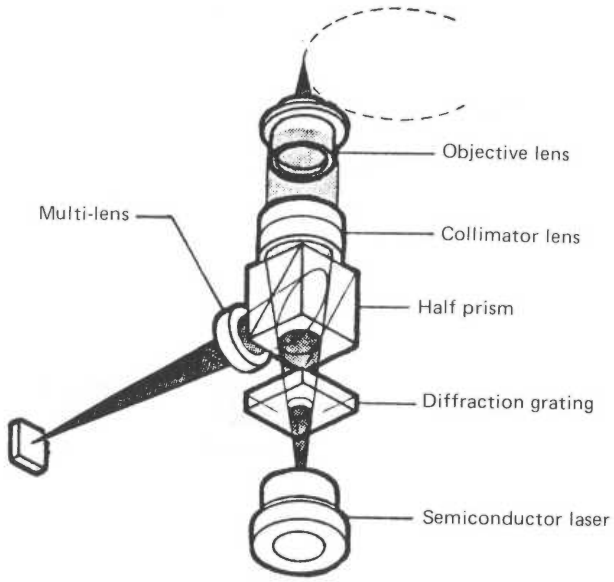


Fig.3-29 Optical path and elements

The path of the laser beam and arrangement of the optical elements are shown in fig. 3-29. The semi-conductor laser emits a beam of light having a wavelength of 780 μm. It is barely within the range of visibility. The beam is produced form an extremely small point and has an elliptical distribution. It is dispersed in a conical shape.

To produce the beam used to detect tracking error, the beam is passed through a diffraction grating that splits the beam into three beams, the primary beam (zero order) and two side beams ($\pm$1 order). A small amount of higher order elements are also produced, but these are lost without being used. Next, the beams are passed through a half prism where 50% of the energy is lost. Details of the half prism are described later in this publication.

The collimator lens produces a completely collimated beam. The diameter of the collimated beam is large enough to cover the movement of the objective lens. The beam is then condensed a spot having an extremely small diameter by the objective lens before going on to the disc. Part of the beam is then reflected back from the disc, diffracted and routed back through the objective lens where the returning beam is collimated and then the collimator lens where the beam is condensed.

When this beam reaches the half prism, 50% passes through the grating and returns to the laser diode. The other 50% is reflected by the prism to the multiple lens that has the functions of both a concave and cylindrical lens. This beam then goes to the photo diode alley where an electrical signal having a strength proportional to the intensity of the beam is produced. This completes the discussion of the optical path. Next, its features compared with those of a video disc player will be discussed.

The first feature is that the outgoing path is a straight line. That means no auxiliary parts to alter the light path are needed, so overall tolerances can be minimized. As a result, adjustments of optical part installation locations are also minimized. The development of the double shaft actuator for use in the parallel drive method allowed the objective lens unit to be reduced in size. This makes it possible to maintain very satisfactory performance while using compact optical parts.

The second feature is the half prism. In the video disc player optical system, the outgoing and incoming light paths are separated by a 1/4 wavelength panel and polarizing beam splitter. The reasons why the half prism can be used in a CD player but not a video disc player are primarily:

(1) Although a semi-conductor laser diode is much smaller than an He-Ne laser, it nevertheless has a fairly high optical output power. Therefore, the energy loss caused by the half mirror is not a problem.

(2) (A) shows an He-Ne laser beam reflected from

(3) Both video and compact discs tend to polarize light because they are made of a resin based material that is not perfectly flat. In video discs, the amount of polarization is carefully checked against an established standard. In compact discs, the limitation is not very strict. Because of the lack of a strict standard, CD players normally use an extremely accurate 1/4th wavelength plate. In actual use, however, this plate can not function properly due to polarization of the laser beam caused by the disc. A half prism, on the other hand, is not at all affected by polarization of the laser beam. Consequently, a very stable optical path can be made.

Another feature of this optical system is the use of a parallel drive unit to allow optimum utilization of the objective lens at all times. As is shown in fig. 3-30, the beam from the laser diode is converted into a completely collimated beam by the collimator lens. The parallel drive unit causes the objective lens to move parallel and perpendicular to the beam. Therefore, the optical path is not often affected by movement of the objective lens within the collimated light cluster.

Another feature of the optical section is the use of a multiple lens. This lens prevents the focusing point depth on the photo diode from becoming two shallow, a problem that has appeared as optical sections have become more compact. It is an effective way to permit lowering of the installation accuracy required by the photo diode. This multiple lens is a cylindrical lens having the functions of a concave lens. Previously, there were two beams and both a concave and cylindrical lens. In this pickup, however, one lens performs both functions, thereby allowing a further reduction in size.

When designing the optical section of a CD player, the most important point is the degree by which differences between various compact discs can be dealt with. To do this, it is desirable to have a very short wavelength. The wavelength actually being used is 780μm because this is the shortest wavelength possible today with mass produced pickups.

The NA of the objective lens should also be made as small as possible to deal with disc variations. However, reducing NA adversely affects the performance of the optical system as a whole. Aberrations caused by differences between discs are generated geometrically in a form proportional to 1/NA2, 1/NA3, 1/NA4 ... Furthermore, the E.F.M. signal level decreases almost in proportion to NA under these conditions. Taking these factors into consideration and after many test calculations and experiments, it was determined that NA should be 0.45.

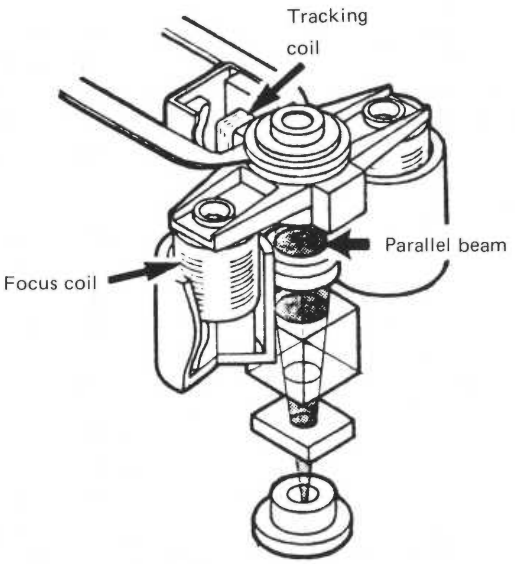


Fig. 3-30

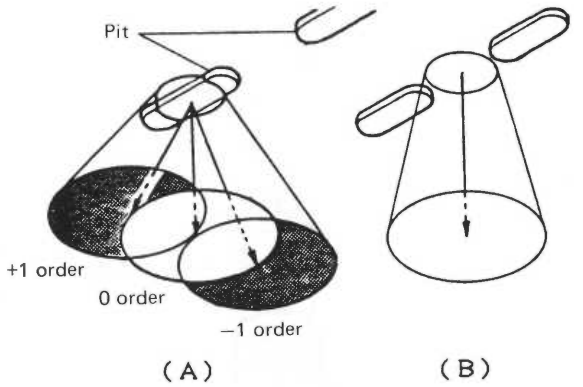


Fig. 3-31

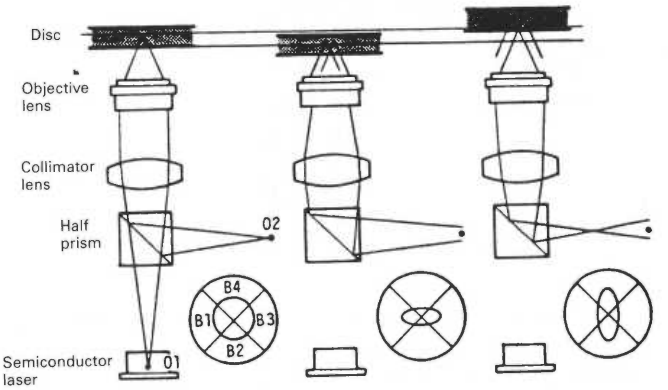


Fig. 3-32

(2) RF and servo signals

The beam, which has been reduced to an extremely small spot by the objective lens, now strikes the disc side on which the signal is located. Part of the beam is then reflected back to the objective lens and photo diode. A diagram showing how this beam is reflected off the disc is shown in figure 3-35. (A) shows what happens when the concentrated beam is directed at a pit. Normally, this reflected light would disrupt the output light beam. In the laser diodes used in CD players, however, noise is reduced instead, resulting in stable performance. This property is very advantageous for the half prism which allows only half of the light energy to pass.

A pit and (B) shows the same beam when reflected from a space between pits. In case (A), the beam is diffracted, so the dark part of the beam does not return to the objective lens. Instead, only the center of the beam passes through the objective lens and reaches the photo diode. In case (B), there is no diffraction because the beam does not strike a pit. Therefore, the entire beam is reflected back to the photo diode, producing brighter beam than when a pit is reached. In this system, the data on the disc, which is represented by pits, is covered into an electrical signal at the photo diode according to the intensity (brightness) of the reflected beam. The RF signal is then produced from this electrical signal by the computation circuit.

Fig. 3-36 shows how the focus signal is detected. (1) is when the beam from the laser diode is accurately focused on the disc by the objective lens. (2)shows what happens when the disc comes closer to the pickup and (3) shows what happens when the disc moves farther away. The grating and concave lens, which have no direct effect on the focusing are not shown in the diagram.

In case (1), the beam emanating from point 01 is reflected and diffracted on the disc surface to produce the condensed beam (02). In case (2), the beam is directed at a point farther than that of beam 02. Fig. 3-37 shows the properties of the cylindrical lens. Since the cylindrical lens is shaped as shown in the diagram, the lens is operated in the vertical direction of the diagram, not the horizontal direction. 1 through 7 shows the shape of the beam at each point. between points 2 and 6, which are in a straight line, the beam is circular at point 4. Point 6 corresponds to beam 02 of fig. 3-36. If we assume that fig. 3-37 shows mode (1) of fig. 3-36, that means the beam is circular because the photo diode is located at point 4. In mode (2) of fig. 3-36, the location of the photo diode is closer to the cylindrical lens than it was in fig. 3-37. That means the shape of the beam is the same as that of point 3 (an ellipse that has a longer width than height). In mode (3) of fig. 3-36, the shape of the beam is that of point 5, an ellipse that has a longer height than width.

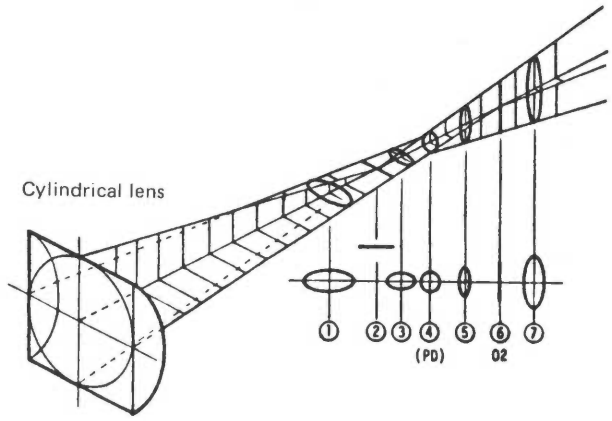


Fig.3-33 Cylindrical lens

These beam shapes are shown in fig. 3-36. By performing a (B1 + B3) − (B2 + B4) computation using the B1-B4 photo diode quartering elements, the focus signal is produced.

Let's consider what happens as the objective lens is gradually moved closer to the disc. If the objective is fairly far from the disc, only a small amount of light will be returned to the photo diode. Furthermore, since the returning light is quartered, the focus signal would be 0.

If the objective lens is moved closer to the disc until point 7 of fig. 3-37 is reached, the shape of the beam at the photo diode becomes an ellipse that is higher than it is wide. The focus signal would then be positive because (B1 + B3) is greater than (B2 + B4). However, after the peak (vertical line) is reached at point 6, it begins to return to zero. If it becomes zero at point 4, the beam becomes an ellipse that is wider than it is high because (B1 + B3) is less than (B2 + B4) and the focus signal be comes negative. After peaking at point 2, the focus signal returns to zero just as when the objective lens is too far from the disc. Focusing signals produced in the above manner are shown in fig. 3-38. Due to its shape, this is called an S-curve, an important graph that expresses the properties of the focus signal.

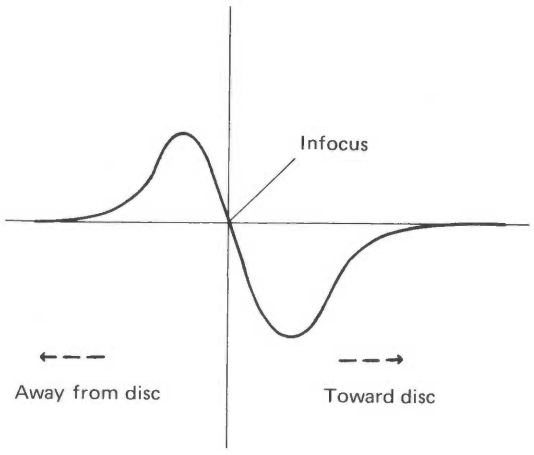


Fig.3-34 S-curve

Since the real purpose of the focus servo is to maintain the focus signal at zero, only a tiny section at the center of the S-curve appears as residual error.

Fig. 3-39 shows how the tracking signal is detected. The beam from the laser diode is divided into three beams. The ±1 order beams on either side of the 0 order beam are used to produce the tracking signal. These two beams are, like the 0 order beam, are directed at the disc in a tiny spot. In principle, the spots of the two side beams are an equal distance from the center spot as shown in fig. 3-39. (The actual distance is much greater than that shown in the figure.) These two side beams are reflected and diffracted and returned to their respective detection elements in the photo diode. If these two elements detect the same intensity from both beams, it can be assumed that the primary (0 order) beam is correctly following the line of pits on the disc. Fig. 3-40 shows the relationship between the track and the output of each photo diode element (A, B and C).

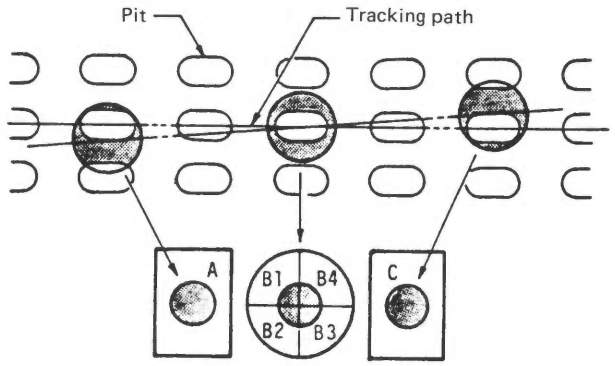


Fig.3-35 Detection of tracking error

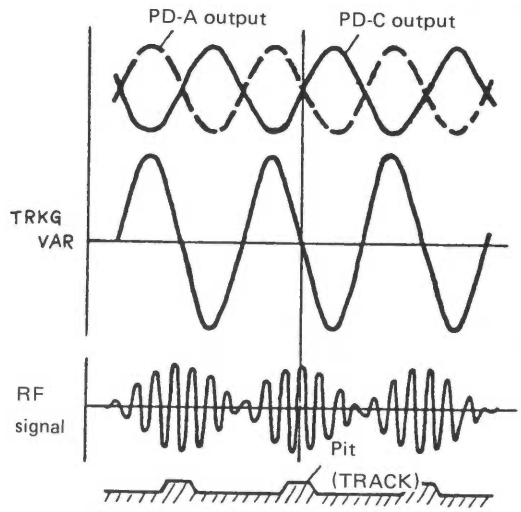


Fig.3-36 Tracking error and the RF signal

PD5010 OPERATIONS

Power on mode

1. Pickup is returned to the home position (inside SW on).
2. Load disc except when the disc tray is not completely open (open SW on). If the tray is all the way out, nothing needs to be done.
3. If the disc is properly loaded, the DISC SET LED lights, the table of contents is read, the number tracks on the disc is displayed in the 7-segment display for 4 seconds and then the first track number is displayed.
4. If no disc is in the player, the 7-segment display reads "00".
5. The spindle motor and carriage motor stop.
6. The laser diode is switched off.
7. Digital mute is switched on. Analog mute is switched on for about 2 seconds after power is switched on and then switched off.

Examples of PD-5010 Displays (for a disc having 10 tracks)

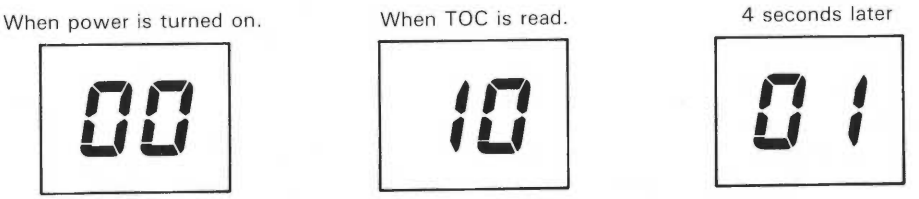


Fig. 3-37

Open/Close

1. If the open key is pressed during loading-in or the clamp mode, the program and table of contents data are cleared and the disc tray opens. If the open key is pressed during disc play, all operations are stopped and the disc tray opens. The 7-segment display reads "OP" from the time the open key is pressed until open operation is completed after which the display switches to "00".
2. If the close key is pressed during loading-out or the open mode or if the disc tray is pushed inward, loading-in is performed. The disc LED lights when the disc is properly loaded, the table of contents are read, the tracks contained in the disc are displayed by the 7-segment display and the disc stops rotating. The track display is shown for only 4 seconds after which the first track number or first programmed track number is shown.
3. If loading in/out operation is not completed after 3 seconds has passed, the unit judges that a loading problem exists and performs all steps up to that point in the reverse order. If loading-out can not be completed after 3 seconds a second time, the disc tray is stopped in its present position. This operation is always completed in the disc tray open direction.
4. Open operation is judged to be completed when the open switch is on (OPEN terminal on) and close operation when the clamp switch is on (CLMP terminal on).

Mode / Pin	OPEN	CLMP
Loading out complated	L	H
During the loading	H	H
Loading in complated	H	L

H:+5V

L:0V

Table 3-3

5. If the spindle is stopped due to a GFS abnormality or focusing problem, loading-out operation is not performed until the 7-second period needed for the disc to come to a complete stop has elapsed.
6. Pick-up home position, SPDL, STOP, LD OFF.

Play

1. If the play key is pressed during the loading or stop mode, the play LED lights, the pickup moves to the home position.
   a) LD (laser diode) on.
   b) Focus down for 0.3 sec., up
   c) Detection of proper focusing and focus zero cross (SENS terminal).
   d) Focus servo on (disc set LED ON: only PD7010 and PD-9010X)
   e) Spindle acceleration for 0.3 sec.
   f) Tracking servo and spindle servo closed.
   g) Carriage servo closed.
   h) Completion of GFS (PLL lock mode H; lock), FOK (focus lock H; lock) and monitor table of contents reading. (disc set LED ON: PD-5010 only)

   After the above set-up operations have been performed, the beginning of the first track is located, digital muting is released and disc play is started.
2. Deemphasis on/off switching is automatically performed by constantly reading sub-code Q.
3. To prevent the generation of abnormal noises, digital muting is switched on if the GFS lock is released for 16 or more continuous frames, and switched off if the GFS remains locked for 16 or more continuous frames. Furthermore, if the lock is off for more than two seconds at a time the player judges that an abnormal condition exists and switches to replay operation.
4. If the FOK signal is NG (low) for 100msec. or more, the player judges that focus is not correct and switches to replay operation.
5. If the present address is equal to the previous address or the address read one second later, the player judges that skipping has occurred. The previous address is then located and disc play is resumed from that point. If the skipping is detected again at the same address, restoration processing is not conducted.
6. Replay operation
   If search, play, pause or scan can not be continued due to a GFS or focus problem, all servo circuits are switched off for a moment without moving the carriage. The carriage is then driven again to locate the original address after which the player returns to the play or pause mode. This procedure is called replay operation. If a problem occurs again during replay operation, however, the player is stopped.
7. During disc play, all keys except the program keys can be used.

Pause

1. If the pause key is pressed during disc play, the pause LED lights and the player switches to the pause mode at that point. If track search is then performed, the player returns to the pause mode at the address (sec.) where search was completed. Pause is released by pressing the pause or play key.
2. If the pause key is pressed during the stop or search mode, the pause LED lights and the player returns to the pause mode at the address (sec.) where search was completed. During the stop mode, the pause LED goes out if the pause, stop or clear key is pressed.
3. Digital muting is on during the pause mode.
4. The tracking and carriage servo loops are switched off for a moment when jumping. All servo loops are closed at all other times.
5. Indicates beam movement during the pause mode.
   If the pause key is pressed at point A, data is read, jump reverse (point A) is performed and data is read (point B). If the data at point B are at least one second smaller than those at point A, the disc is played. If the difference is less than one second, jump reverse is performed. Play is started at the point where the difference becomes smaller by one second or more. Jump reverse is performed at the point (point D) where the difference becomes one second or more compared with point A.
   Pause key on: A... repeated
   Address larger than at point A (in seconds)
   When pause is released, play is resumed after performing 2 or 3 reverse track jumps. The display remains at point A until point A is passed.

Stop

1. When disc play has ended or when the stop/clear key is pressed, all operations are stopped, the pickup returns to the home position and the display shows the first track on the disc or, if the player was in the program mode, the first programmed track.
   Repeat and pause are also cancelled.
2. If the stop/clear key is pressed during the stop mode, the program is cleared.

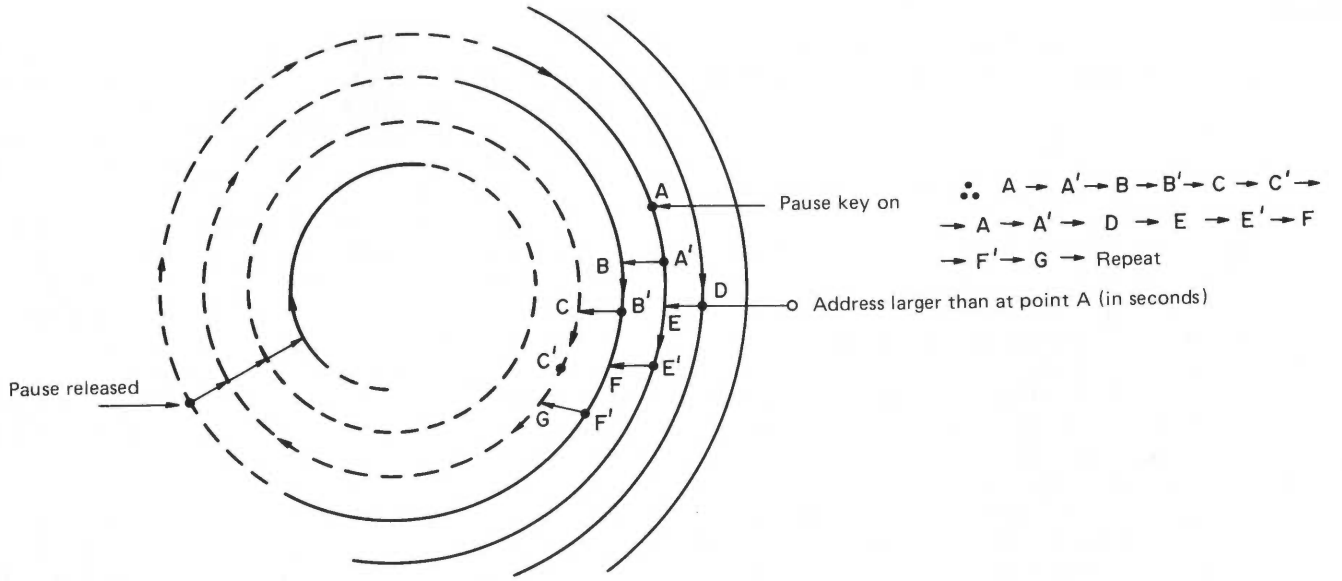


Fig. 3-38

Manual search fwd/rev

1. Operates only during the play and pause modes.
2. If the manual search-FWD or REV key is pressed during the play or pause mode, the elapsed time of the track currently being searched is shown in the 7-segment display for as long as the key is held down and forward or reverse search is conducted. The player returns to the play or pause mode when the key is released.
3. Manual search during disc play causes sound to be heard at fixed intervals (-12dB, deemphasis on). After the key is pressed, the first 4 seconds are passed over at five times normal disc play speed as the play LED slowly flashes on and off. The speed then changes to 20 times normal speed and the play LED rapidly flashes on and off.
4. Manual search during the pause mode is silent. Search speed is 60 times normal disc play speed and the play LED flashes on and off even more rapidly.
5. If manual search is used to return the pickup to the beginning of the first song, the player switches to the pause mode. If the pickup is advanced to the leadout track, the 7-segment display shows the letter "E" and the player switches to the pause mode.
6. Manual search during program play causes the pickup to move rapidly forward or backward only over the current song. If the pickup reaches the previous song, the player switches to the pause mode at the beginning of the current song. If the pickup reaches the next song, the player switches to the pause mode at the end of the current song.

How N times normal speed movement is done.

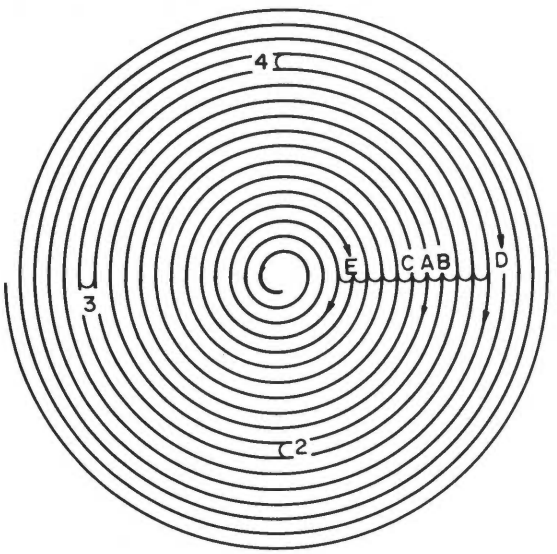
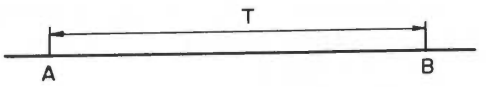


Fig. 3-39

During normal disc play, T is the amount of time required to go from point A to B (the time is about the same for movement from point C to A).



Therefore, moving to point D over the same time period required to perform forward jump four times at point A means that movement is being done at five times normal play speed. In the same manner, moving to point E over the amount of time required to perform reverse jump six times also means that movement is being done at five times normal play speed. High speed movement is performed, therefore, by altering the number of jumps and the intervals. For example, it is possible to move in the same manner to point D by using one forward jump at an interval of t/4.

Track Search

1. If the track search key is pressed during the play or pause mode to raise or lower the track number shown by the 7-segment display, track search is performed.
2. The pickup moves forward one track if the track search forward key is pressed once and moves ahead continuously one track at a time if the key is held down. If the track search reverse key is pressed once, the pickup returns to the beginning of the current track. If the key is held down, the pickup moves continuously back one track at a time.
3. If the table of contents has been read, forward and reverse track search is possible over the entire disc. If the table has not been read, search is possible only from track 1 through track 99.
4. During program play, track search (skip) is possible over the programmed tracks.
5. If the play key is pressed after having selected a particular track number using the track search keys during the stop mode, disc play is started from the track number shown by the 7-segment display.
6. Reverse track search is not possible while using search for the first track on the disc (or the first programmed track). Forward track search is not possible while using search for the last track on the disc (or the last programmed track).

Program Inputs

1. If a track search key is used to set the displayed track number to a particular number and then the program set key is pressed (during the stop mode), the track number shown by the 7-segment display will be programmed. At this time, the program LED lights to show that the track is now stored in the memory. For all following tracks, the program LED indicator lights for a moment to show that they have been stored. If a track number not on the disc is input, that input is automatically cleared.
2. The range over which track numbers can be specified using the track search keys is the entire disc is the table of contents has been read and from track 1 to 99 if the table has not been read. If the table has not been read, program contents will be checked after the table is read and track numbers not on the disc automatically cleared.
3. The program can contain up to 27 steps.
4. After a program has been entered, additions can be made but program checking and corrections are not possible.
5. The program can be cleared by pressing the stop/clear key when the player is in the stop mode.

Program Play

After entering a program (program LED is on), pressing the play key causes the programmed tracks to be played in order. During program play, the 7-segment display shows the number of the track currently being played. If a track search key is pressed during program play, search is possible over all programmed tracks. If a manual search key is pressed during program play, the pickup can be moved rapidly forward and backward only over the current track.

Program Clear

To clear program contents, press the open key or, during the stop mode, the stop key. Program contents will not be cleared if the stop key is pressed during program play.
Program LED on

Repeat

If the repeat key is pressed during normal disc play, the repeat LED lights and the entire disc is played repeatedly. The repeat mode is cancelled by pressing the repeat, stop/clear, open/close or power key.

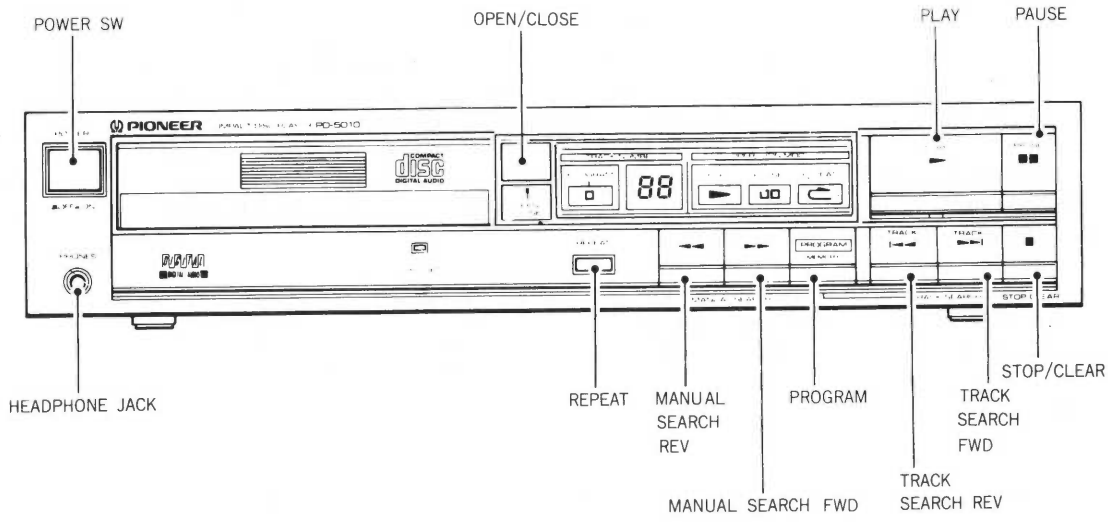


Fig. 3-40

○····· Key operation
×····· Not key operation

KEY / Condition	OPEN / CLOSE	▶ PLAY	⏸ PAUSE	⏮ TRACK	⏭ TRACK	■ STOP/ CLEAR	PROGRAM	◀◀ M.SEARCH.R	▶▶ M.SEARCH.F	REPEAT
Play	○	×	○	○	○	○	×	○	○	○
Pause	○	○	○	○	○	○	×	○	○	○
Stop	○	○	○	○	○	○	○	×	×	○
During the track serch	○	○	○	○	○	○	×	×	×	○
During the manual search	×	×	×	×	×	×	×	×	×	×
Loading is complated	○	○	○	○	○	○	○	×	×	○
During the loading in	○	○	○	○	○	×	×	×	×	○
During the loading out	○	○	○	×	×	×	×	×	×	○

Table 3-4

PD07010, 9010X OPERATIONS

1. Power on mode

a) The pickup is returned to the home position (inside SW on).
b) Loading-in except when the disc tray is completely opened (open SW on). If the tray is all the way out, nothing happens.
c) If a disc is loaded, the disc LED lights and the table of contents is read. The number of tracks on the disc and total playing time are then displayed for four seconds after which the first track/index number is displayed.
d) If a disc is not loaded, the player mode immediately after power is switched on is maintained.
e) The spindle motor and carriage motor are stopped.
f) The laser diode is switched off.
g) Digital muting is switched on. Analog muting is switched on for about 2 seconds after power is switched on and then switched back off.

Example of PD-7010, 9010X display (for disc having 10 tracks)

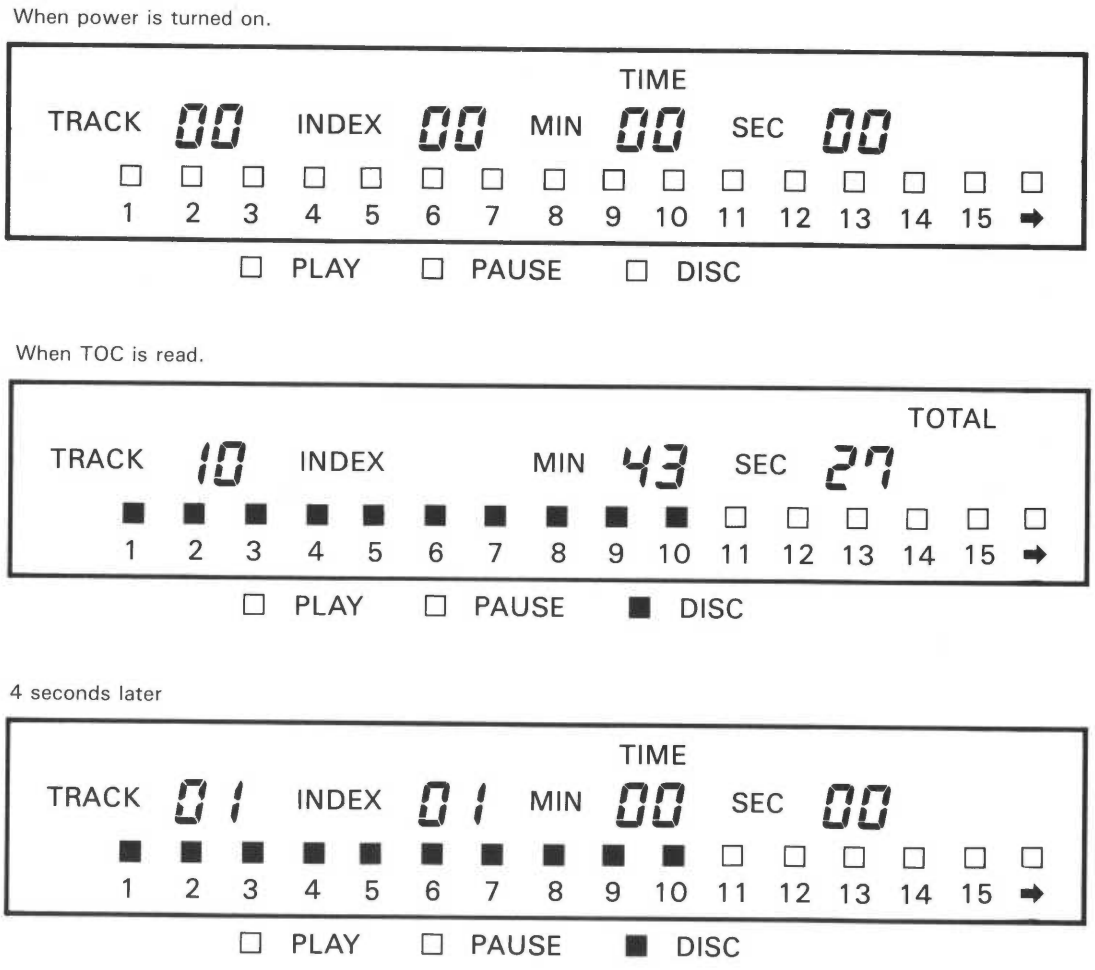


Fig. 3-41

2. Open/Close

a) If the open key is pressed during loading-in or the clamp mode, program and table of contents data are cleared and the disc tray opens. If this key is pressed during disc play, all operations are stopped and the disc tray opens. The fluorescent display reads "OPEN" from the time the key is pressed until open operation is completed.

b) If the close key is pressed during loading-out or the tray open mode or if the disc tray is pushed inward during the open mode, loading-in is performed. If a disc is loaded, the disc LED lights, the table of contents is read, the tracks and total playing time of the disc are displayed and the player goes to the stop mode. The track display is held for only four seconds.

c) If loading in/out operation is not completed after 3 seconds has passed, the unit judges that a loading problem exists and performs all steps up to that point in the reverse order. If loading-out can not be completed after 3 seconds a second time, the disc tray is stopped in its present position. This operation is always completed in the disc tray open direction.

d) Open operation is judged to be completed when the open switch is on (OPEN terminal GND) and close operation when the clamp switch is on (CLMP terminal GND).

e) If the spindle is stopped due to a GFS abnormality or focusing problem, loading-out operation is not performed until the 7-second period needed for the disc to come to a complete stop has elapsed.

f) Pick-up home position, SPDL, STOP, LD OFF.

Mode / Pin	OPEN	CLMP
Loading out complated	L	H
During the loading	H	H
Loading in complated	H	L

H:+5V

L:0V

Table 3-5

Play

1. If the play key is pressed during the loading or stop mode, the play LED lights, the pickup moves to the home position.
   a) LD (laser diode) on.
   b) Focus down for 0.3 sec., up
   c) Focus servo switched on, disc set LED switched on.
   d) Spindle acceleration for 0.3 sec.
   e) Tracking servo and spindle servo closed.
   f) Carriage servo closed.
   g) Completion of GFS (PLL lock mode H; lock), FOK (focus lock H; lock) and reading of monitor table of contents.

   After the above set-up operations have been performed, the beginning of the first track is located, digital muting is released and disc play is started.
2. Deemphasis on/off switching is automatically performed by constantly reading sub-code Q.
3. To prevent the generation of abnormal noises, digital muting is switched on if the GFS lock is released for 16 or more continuous frames (about 2.2 msec.). Muting is switched back off after GFS has remained locked for at least 16 continuous frames. If the lock is off for more than 2 seconds at one time, the player judges that an abnormal situation exists and switches to replay operation.
4. If the FOK signal is NG (low) for 100msec. or more, the player judges that focus is not correct and switches to replay operation.
5. If the present address is equal to the previous address or the address read one second later, the player judges that skipping has occurred. The previous address is then located and disc play is resumed from that point. If the skipping is detected again at the same address, restoration processing is not conducted.
6. Replay operation
   If search, play, pause or scan can not be continued due to a GFS or focus problem, all servo circuits are switched off for a moment without moving the carriage. The carriage is then driven again to locate the original address after which the player returns to the play or pause mode. This procedure is called replay operation. If a problem occurs again during replay operation, however, the player is stopped.
7. During disc play, all keys except the program keys can be used.

Pause

1. If the pause key is pressed during disc play, the pause LED lights and the player switches to the pause mode at that point. If track search is then performed, the player returns to the pause mode at the address (sec.) where search was completed. Pause is released by pressing the pause or play key.
2. If the pause key is pressed during the stop or search mode, the pause LED lights and the player returns to the pause mode at the address (sec.) where search was completed. During the stop mode, the pause LED goes out if the pause, stop or clear key is pressed.
3. Digital muting is on during the pause mode.
4. The tracking and carriage servo loops are switched off for a moment when jumping. All servo loops are closed at all other times.
5. Indicates beam movement during the pause mode.
   If the pause key is pressed at point A, data is read, jump reverse (point A) is performed and data is read (point B). If the data at point B are at least one second smaller than those at point A, the disc is played. If the difference is less than one second, jump reverse is performed. Jump reverse is performed at the point (point D) where the difference becomes one second or more compared with point A.
   Pause key on: A... repeated
   Address larger than at point A (in seconds)
   When pause is released, play is resumed after performing 2 or 3 reverse track jumps. The display remains at point A until point A is passed.

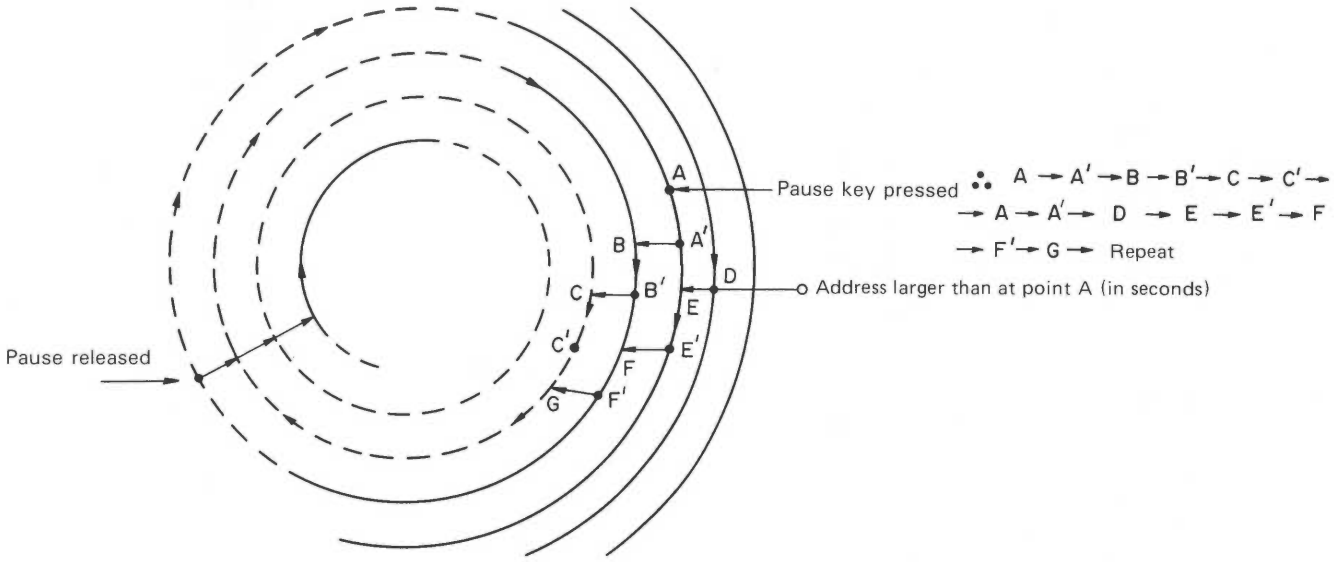


Fig. 3-42

Stop

1. When disc play has ended or when the stop/clear key is pressed, all operations are stopped, the pickup returns to the home position and the display shows the first track on the disc or, if the player was in the program mode, the first programmed track.
   Repeat and pause are also cancelled.
2. If the stop/clear key is pressed during the stop mode, the program is cleared.

Manual search fwd/rev

1. Operates only during the play and pause modes.
2. If the manual search-FWD or REV key is pressed during the play or pause mode, the elapsed time of the track currently being searched is displayed for as long as the key is held down and forward or reverse search is conducted. The player returns to the play or pause mode when the key is released.
3. Manual search during disc play causes sound to be heard at fixed intervals (-12dB, deemphasis on). After the key is pressed, the first 4 seconds are passed over at five times normal disc play speed as the play LED slowly flashes on and off. The speed then changes to 20 times normal speed and the play LED rapidly flashes on and off.
4. Manual search during the pause mode is silent. Search speed is 60 times normal disc play speed and the play LED flashes on and off even more rapidly.
5. If manual search is used to return the pickup to the beginning of the first song, the player switches to the pause mode. If the pickup is advanced to the leadout track, the display shows the word "END" and the player switches to the pause mode.
6. Manual search during program play causes the pickup to move rapidly forward or backward only over the current song. If the pickup reaches the previous song, the player switches to the pause mode at the beginning of the current song.

How N times normal speed movement is done.

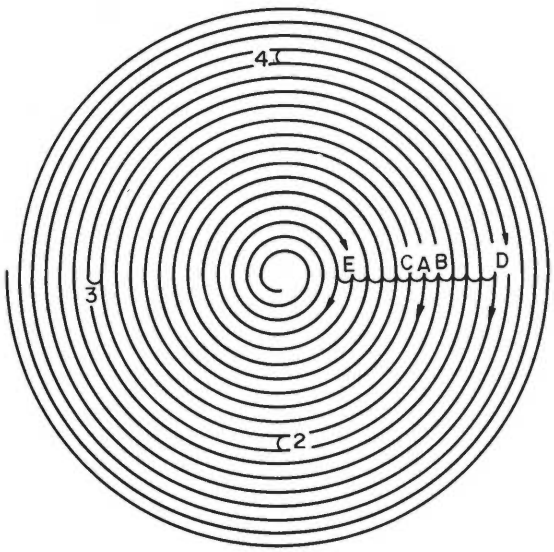
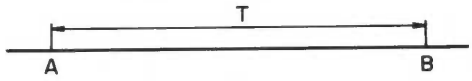


Fig. 3-43

During normal disc play, T is the amount of time required to go from point A to B (the time is about the same for movement from point C to A).



Therefore, moving to point D over the same time period required to perform forward jump four times at point A means that movement is being done at five times normal play speed. In the same manner, moving to pint E over the amount of time required to perform reverse jump six times also means that movement is being done at five times normal play speed. High speed movement is performed, therefore, by altering the number of jumps and the intervals. For example, it is possible to move in the same manner to point D by using one forward jump at an interval of t/4.

Track Search

1. If the track search key is pressed during the play or pause mode to raise or lower the track number shown by the fluorescent display, track search is performed. The play LED slowly flashes on and off during search operation to show that search is being performed. The play LED returns to normal when search is finished.
2. The pickup moves forward one track if the track search forward key is pressed once and moves ahead continuously one track at a time if the key is held down. If the track search reverse key is pressed once, the pickup returns to the beginning of the current track. If the key is held down, the pickup moves continuously back one track at a time.
3. If the table of contents has been read, forward and reverse track search is possible over the entire disc. If the table has not been read, search is possible only from track 1 through track 99.
4. During program play, track search (skip) is possible over the programmed tracks.
5. If the play key is pressed after having selected a particular track number using the track search keys during the stop mode, disc play is started from the track number shown by the fluorescent display.
6. Reverse track search is not possible while using search for the first track on the disc (or the first programmed track). Forward track search is not possible while using search for the last track on the disc (or the last programmed track).

Program Play

1. If the play key is pressed after loading a program (program RAM-LED on), the programmed sequence of tracks will be played in order.
   During program play, the number of the track currently being played is displayed. If a track search key is pressed during program play, search is possible over all programmed tracks. If a manual search key is pressed during program play, the pickup can be moved rapidly forward and backward only over the current track.

Program Clear

To clear program contents, press the open key or, during the stop mode, the stop key. Program contents will not be cleared if the stop key is pressed during program play.
Program LED on

Repeat

If the repeat key is pressed during normal disc play, the repeat LED flashes on and off and the entire disc is played repeatedly. If this key is pressed during program play, all programmed tracks are played repeatedly. The repeat mode is cancelled by pressing the repeat, stop/clear, open/close or power key.

Time

The time key is pressed to switch between the elapsed time and remaining time display modes.

Keys

The 0-9 numeric keys are used for direct track selection and program entries.

PROGRAMMING

Program Input

1. Program Entries

Program input is possible only during the stop mode. A desired track number is specified by the numeric keys and then the program key is pressed to store that number in the memory. If the table of contents has been read, track numbers not on the disc will not be accepted. If the table has not been read (for example, when the tray is still open), all track numbers will be accepted. Any numbers not on the disc will then be cleared automatically after the table of contents has been read.
As tracks are programmed, the total playing time of the program up to that point is displayed. Up to 32 steps can be stored in the memory.

2. Program Checking

After a program has been entered, the programmed track numbers can be displayed one by one in order by pressing the track key when the player is in the stop mode.

3. Program Play

When a program has been entered, pressing the play key causes the programmed tracks to be played in order. During program play, it is possible to add more tracks by performing the programming entry procedure but it is not possible to change or delete program entries.

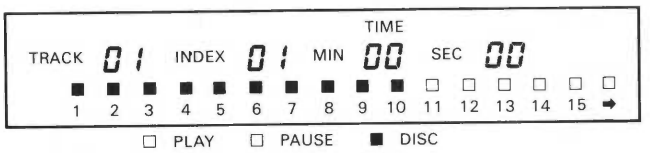
4. Program Clear

Program contents are cleared if the open/close key is pressed. During program play, pressing the stop key stops disc play but it does not clear program contents. The stop key must be pressed once more to clear program contents as well.

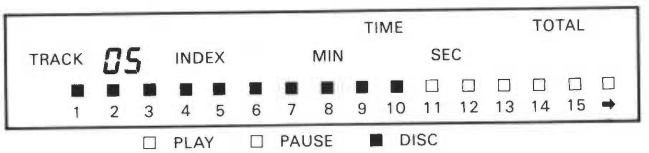
Repeat

When the repeat key is pressed during normal disc play, the repeat indicator lights and the entire disc is played repeatedly. During program disc play, the programmed tracks are played repeatedly. Repeat is cancelled if the repeat key is pressed once again.

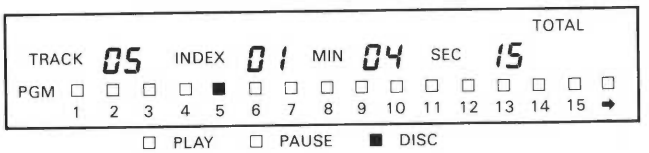
EXAMPLE During the stop mode



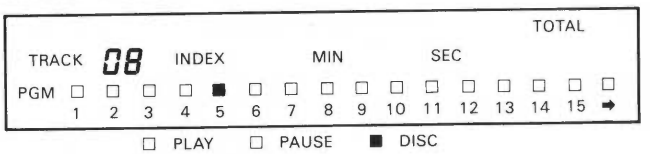
Track 5 for step 1



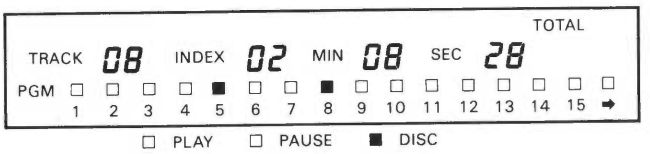
<PROGRAM>



Track 8 for step 2

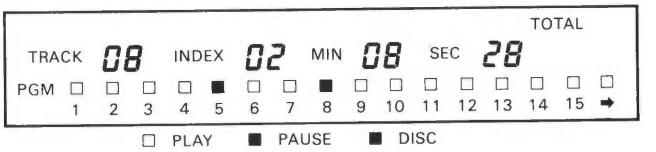


<PROGRAM>

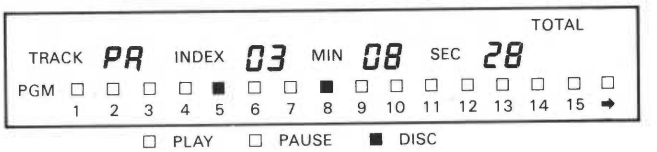


Pause for step 3

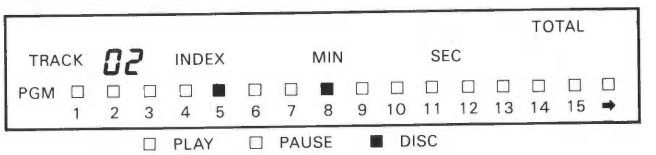
<PAUSE>



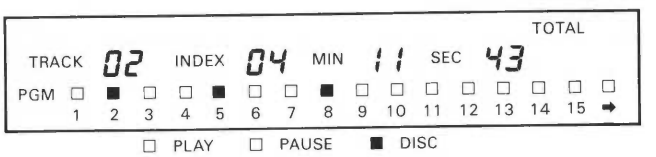
<PROGRAM>



Track 2 for step 4



<PROGRAM>



Programming is completed and the total playing time of the three tracks is 11 min. 43 sec.

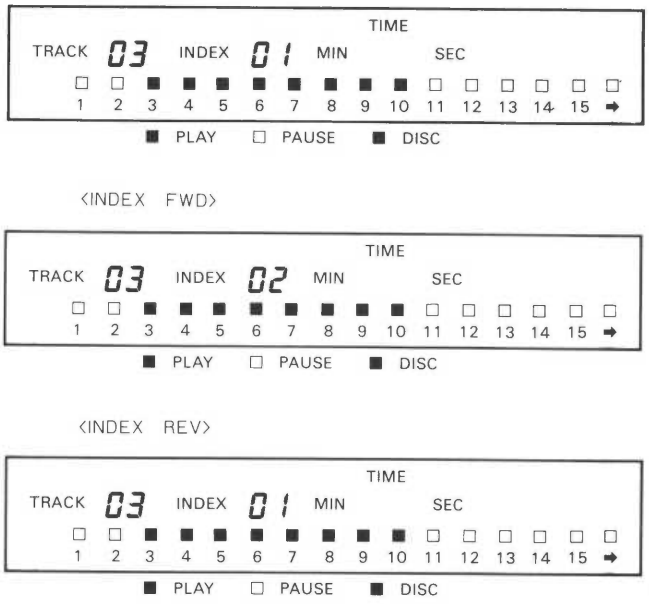
Fig. 3-44

Index Search

During the play or pause mode, pressing the INDEX FWD key moves the pickup ahead to the beginning of the next index. The INDEX REV key moves the pickup back to the beginning of the present index. Using the INDEX FWD/REV keys during search causes the pickup to move to the index following (or preceding) the index currently being searched.

EXAMPLE

To search track 3 of a disc containing 10 tracks.



Index search is not possible during program disc play.

Fig. 3-45

Display Functions

Pressing the time key switches the display progressively through three modes: time, remain and total. If a program has been entered, the remain and total modes show the remaining and total playing time of all programmed tracks. If the time key is pressed after entering a track number using the numeric keys, the total playing time of that track is displayed for four seconds.

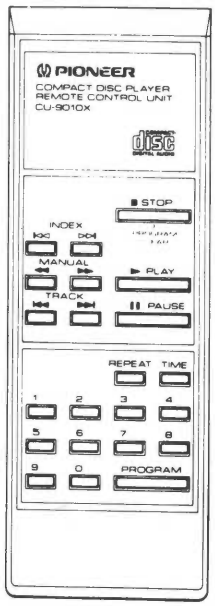


Fig. 3-46

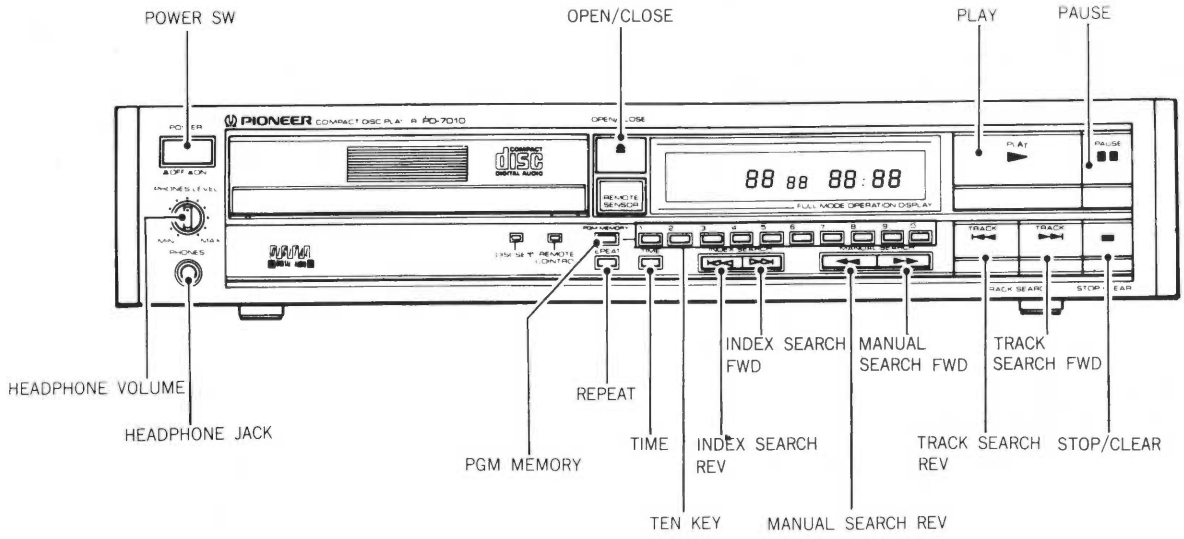


Fig. 3-47

○……Key operation
×……Not key operation

KEY / Condition	OPEN / CLOSE	▶ PLAY	⏸ PAUSE	⏮ TRACK	⏭ TRACK	■ STOP/ CLEAR	PROGRAM	◀◀ M.SEARCH.R	▶▶ M.SEARCH.F	⏮ IN.SEARCH.R	⏭ IN.S.F	TIME	10 KEY	REPEAT
Play	○	×	○	○	○	○	×	○	○	○	○	○	○	○
Pause	○	○	○	○	○	○	×	○	○	○	○	○	○	○
Stop	○	○	○	○	○	○	○	×	×	○	○	○	○	○
During the track serch	○	×	○	○	○	○	×	×	×	○	○	○	○	○
During the manual search	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Loading is complated	○	○	○	○	○	○	○	×	×	○	○	○	○	○
During the loading in	○	○	○	○	○	×	×	×	×	○	○	○	○	○
During the loading out	○	○	○	×	×	×	×	×	×	×	×	○	×	○
During the index serch	○	×	○	○	○	○	×	×	×	○	○	○	○	○

Table 3-6

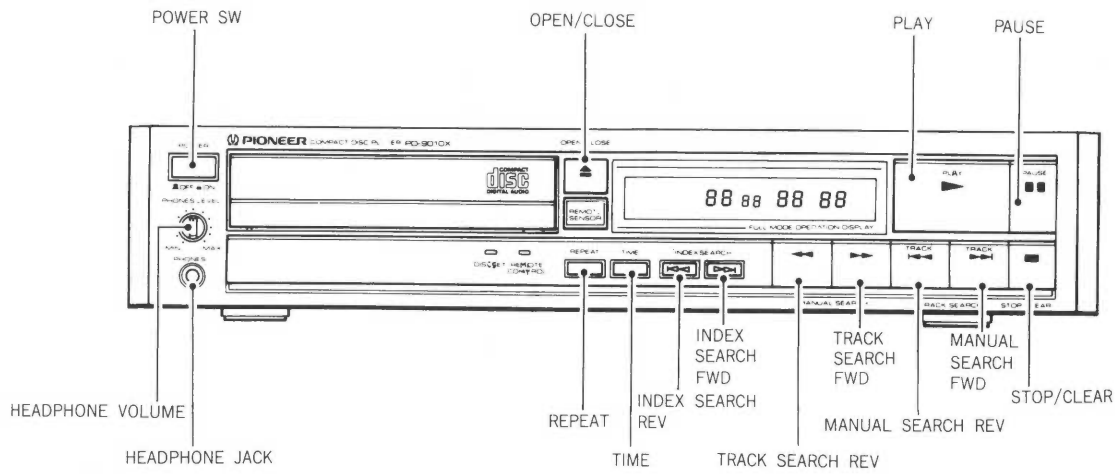


Fig. 3-48

○·····Key operation
×·····Not key operation

KEY / Condition	OPEN / CLOSE	▶ PLAY	⏸ PAUSE	⏮ TRACK	⏭ TRACK	■ STOP/ CLEAR	PROGRAM	◀◀ M.SEARCH.R	▶▶ M.SEARCH.F	⏮ IN.SEARCH.R	⏭ IN.S.F	TIME	10 KEY	REPEAT
Play	○	×	○	○	○	○	×	○	○	○	○	○	○	○
Pause	○	○	○	○	○	○	×	○	○	○	○	○	○	○
Stop	○	○	○	○	○	○	○	×	×	○	○	○	○	○
During the track serch	○	×	○	○	○	○	×	×	×	○	○	○	○	○
During the manual search	×	×	×	×	×	×	×	×	×	×	×	×	×	×
Loading is complated	○	○	○	○	○	○	○	×	×	○	○	○	○	○
During the loading in	○	○	○	○	○	×	×	×	×	○	○	○	○	○
During the loading out	○	○	○	×	×	×	×	×	×	×	×	○	×	○
During the index serch	○	×	○	○	○	○	×	×	×	○	○	○	○	○

Table 3-7