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# Service Manual

## Nakamichi

### CDP-2

### CDP-2A

### CDP-2E

### OMS-20

## Compact Disc Player




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## 1. GENERAL

### 1.1. CAUTIONS/WARNINGS

#### (1) Product Safety Notice

Parts marked with the symbol  in the schematic diagram have critical characteristics.

Use ONLY replacement parts recommended by the manufacturer.

It is recommended that the unit be operated from a suitable DC supply or batteries during initial check-out procedures.

#### (2) Leakage Current Check/Resistance Check

Before returning the unit to the customer, make sure you make either (1) a leakage current check or (2) a line to chassis resistance check. If the leakage current exceeds 0.5 milliamp, or if the resistance from chassis to either side of the power cord is less than 240 k ohms, the unit is defective.

**WARNING** — DO NOT return the unit to the customer until the problem is located and corrected.

#### (3) Protection of Eyes from Laser Beam

To protect eyes from invisible laser beam during servicing, **DO NOT LOOK AT THE LASER BEAM.** See the following labels.

- US Laser Caution Label (for CDP-2A)

Located on the Disc Mechanism Ass'y. See Fig. 6.1 on page 12 (Ref. No. 15).

U.S.A.

**DANGER : INVISIBLE LASER RADIATION WHEN OPENED AND INTERLOCK FAILED OR DEFEATED. AVOID DIRECT EXPOSURE TO BEAM.**

- CSA Laser Caution Label (for CDP-2A)

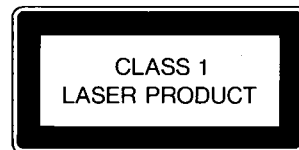
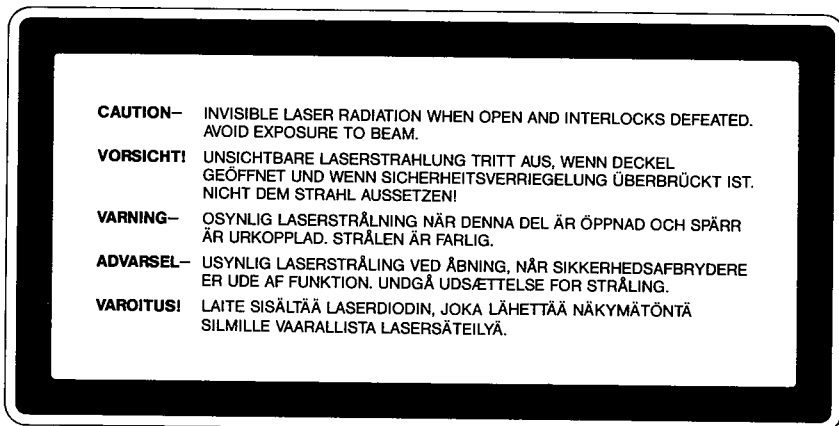
Located on the Chassis Ass'y (backward of the Disc Mechanism Ass'y).

See Fig. 6.1 on page 12 (Ref. No. 16).

Canada



• Laser Caution Label and Other Laser Labels (for CDP-2E)



THIS COMPACT DISC PLAYER IS CLASSIFIED AS A CLASS 1 LASER PRODUCT. THE CLASS 1 LASER PRODUCT LABEL IS LOCATED ON THE REAR EXTERIOR.



**LASER DIODE PROPERTIES**  
MAXIMUM RADIANT POWER: 0.5 mW  
WAVELENGTH: 760 nm–800 nm  
EMISSION DURATION: CONTINUOUS

## 1.2. Handling the Laser Pickup

In case of repair or replacement of the Laser Pickup, pay attention to the following handling instructions since the laser diode in the Laser Pickup is not resistant to static electricity.

### (1) Grounding

When you repair a Laser Pickup, first ground the human body, as well as the measuring instruments and other tools (with particular caution to soldering iron). What's more, your workbench and floor should desirably be grounded using conductive sheet or copper plate. See Fig. 1.1.

**Note:** Be careful so as not to let your clothes touch the Laser Pickup, as static electricity on the clothes will not be released even if your body is grounded.

### (2) Discharge of Electricity

Be sure to discharge electricity from objects brought into contact with the Laser Pickup (i.e., soldering iron, tweezers, probes, volt-ohm-meter probes, etc.) before starting work by contacting them with the Compact Disc Player's chassis. Besides, never touch the Laser Pickup while power is applied.

### (3) Soldering Iron to be Used

The soldering iron for use in repair work should be: (1) a ceramic soldering iron, (2) a soldering iron with its metal part grounded, or (3) a soldering iron whose insulation resistance after five minutes of power application is 10 M-ohm or more at 500 VDC. Soldering should be completed promptly, at a soldering iron temperature of 320° max (39 W). A soldering iron heated above this temperature can break down the laser diode.

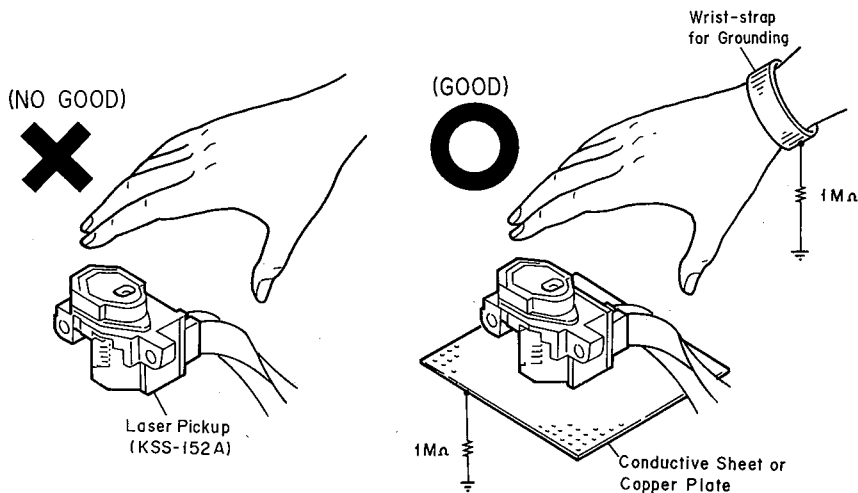


Fig. 1.1

## 1.3. Voltage Selector

Voltage Selector is installed on the Rear Panel of the Nakamichi CDP-2 (Other). The voltage selector can select 110, 127, 220, or 240 V at customer's disposal.

#### 1.4. Package Ass'y and Accessory Ass'y

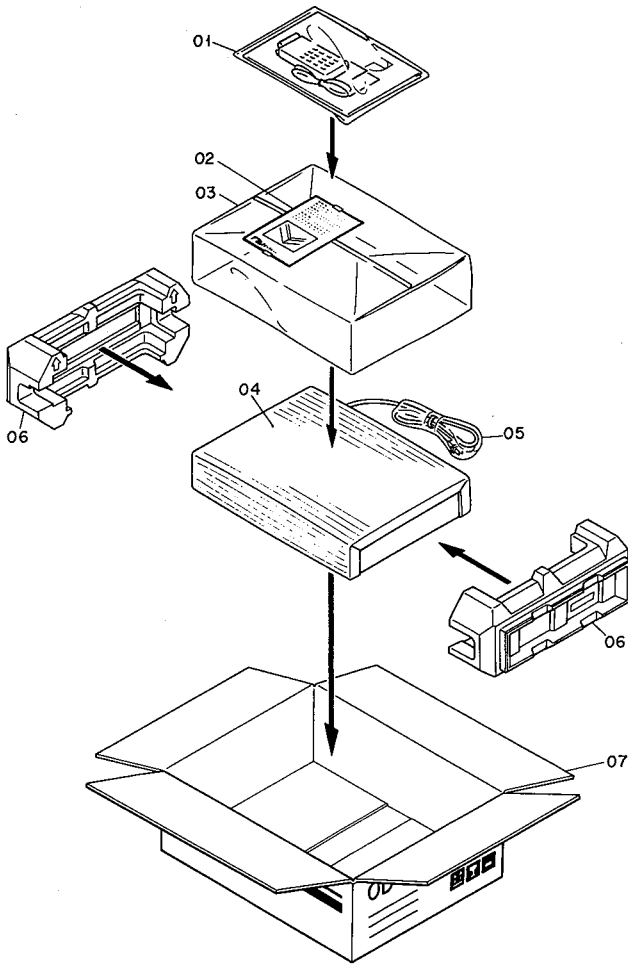


Fig. 1.2

Schematic Ref. No.	Part No.	Description	Q'ty
	—	<b>Package Ass'y</b>	
01	—	Accessory Ass'y	1
02	0M04924A	Locking Screw Caution Sheet	1
03	0C82446A	Poly-Bag for Set	1
04	0C82445A	Poly-Sheet for Set	1
05	0C81654A	Poly-Bag B for Power Cord	1
06	0C82472A	Packing	2
07	0C83280A	Carton Box (CDP-2 (Other))	1
	0C83278A	Carton Box (CDP-2A)	1
	0C83279A	Carton Box (CDP-2E)	1
	0C83281A	Carton Box (OMS-20)	1
—	0M05180A	UL CSA Label (CDP-2A)	2
—	0M05184A	Point of Sales Label (OMS-20)	1
—	0D04047A	User's Pack (OMS-20)	1
—	0D04046A	Warranty Card (OMS-20)	1
	—	<b>Accessory Ass'y</b>	
	0D04449A	Important Notice Card	1
	0C81653A	Poly-Bag	1
	0B08502A	Battery	2
	0D04864A	Owner's Manual (English/ German/French)	1
	0D04453A	Pin Cord	1
	CA80900A	Remote Control Unit (CDP-2 (Other)/2A/2E)	1
	0D04766A	General Catalog (CDP-2A)	1
	0D04797A	Warranty Card (CDP-2A)	1
	0D04865A	Owner's Manual (Japanese)	1
	0D04878A	Price Card (OMS-20)	1
	CA81057A	Remote Control Unit (OMS-20)	1

## 2. REMOVAL PROCEDURES

### 2.1. Top Cover Ass'y

Refer to Fig. 2.1.

- (1) Loosen screws F01 (6 pcs.) and pull out F02 (Top Cover Ass'y) gently in the direction of the arrow.

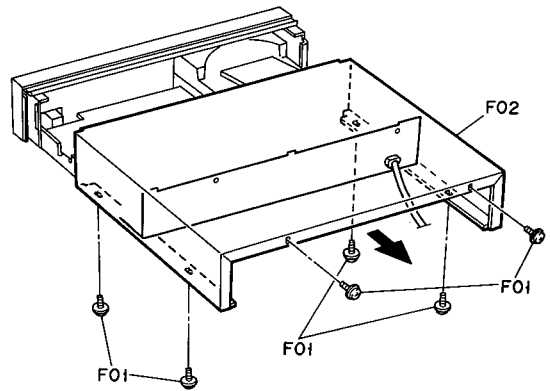


Fig. 2.1

### 2.2. Disc Tray Cover Ass'y

Refer to Fig. 2.2.

- (1) Turn the Power switch ON.
- (2) Press the Eject/Load button to eject the Disc Tray.
- (3) Turn the Power switch OFF.
- (4) Pull F01 (Disc Tray Cover Ass'y) upward to remove it.

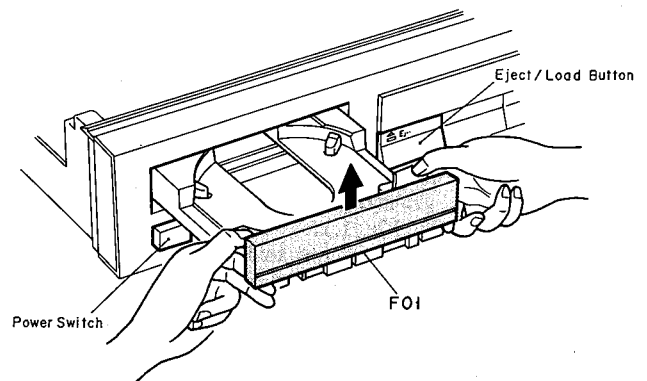


Fig. 2.2

### 2.3. Front Panel Ass'y

Refer to Fig. 2.3.

- (1) Remove the Top Cover Ass'y referring to item 2.1.
- (2) Remove the Disc Tray Cover Ass'y referring to item 2.2.
- (3) Loosen screws F01 (2 pcs.), F02 and F03 (screw with projections, 2 pcs.), and remove F04 (Front Panel Ass'y). Keep F05 (2 pcs.) as it can fall easily.

Note: When mounting F04 (Front Panel Ass'y), insert F05 (Front Panel Spacer, 2 pcs.) between F04 (Front Panel Ass'y) and the Chassis (at both ends) before tightening screws F01 to F04.

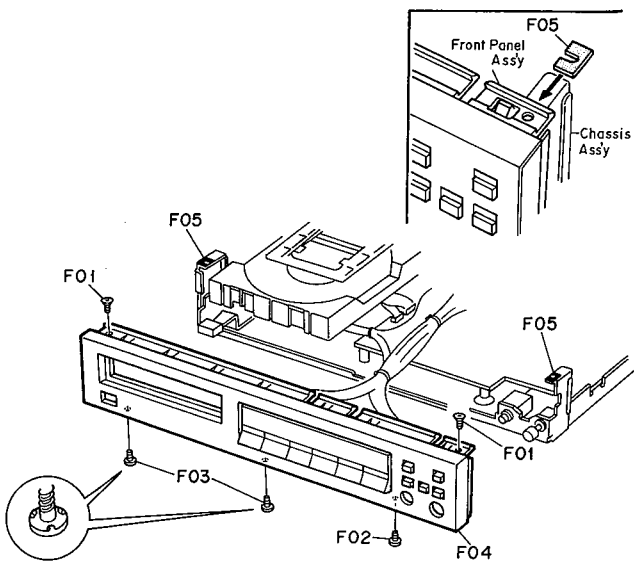


Fig. 2.3

#### 2.4. Control & Display P.C.B. Ass'y

Refer to Fig. 2.4.

- (1) Remove the Front Panel Ass'y referring to item 2.3.
- (2) Loosen screws F01 (3 pcs.), unhook claws (11 pcs.), and remove F02 (Control & Display P.C.B. Ass'y).

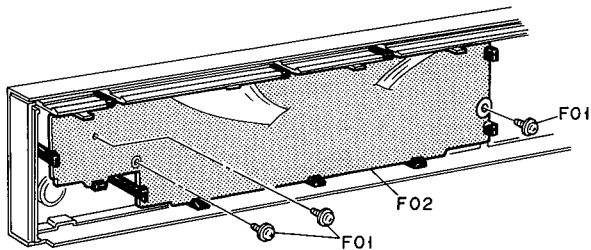


Fig. 2.4

#### 2.5. Headphone Amp. P.C.B. Ass'y

Refer to Fig. 2.5.

- (1) Remove the Front Panel Ass'y referring to item 2.3.
- (2) Loosen screws F01 and F02.
- (3) Pull out F03, F04 and F05, and remove F06 (Holder) from F07 (Headphone Amp. P.C.B. Ass'y).

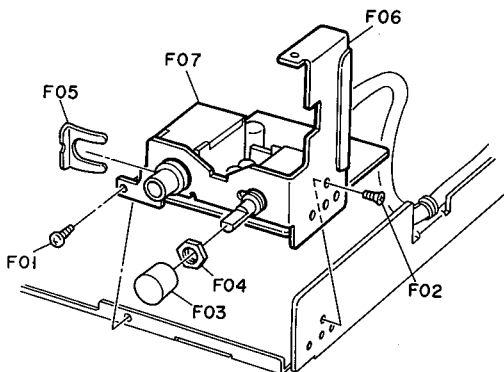


Fig. 2.5

#### 2.6. Main P.C.B. Ass'y

Refer to Fig. 2.6.

- (1) Remove the Top Cover Ass'y referring to item 2.1.
- (2) Loosen screws F01 (2 pcs.), F02 (3 pcs.), F03 (4 pcs.) and F04 (2 pcs.).
- (3) Disconnect a connector F05 from the Headphone Amp. P.C.B. Ass'y.
- (4) Turn over F06 (Main P.C.B. Ass'y).

**Caution:** Do not disconnect connectors CN101, CN102 and CN103 as the Laser Pickup will be damaged. (When disconnecting connectors, short-circuiting solder must be applied to the Laser Pickup. Refer to item 2.9.)

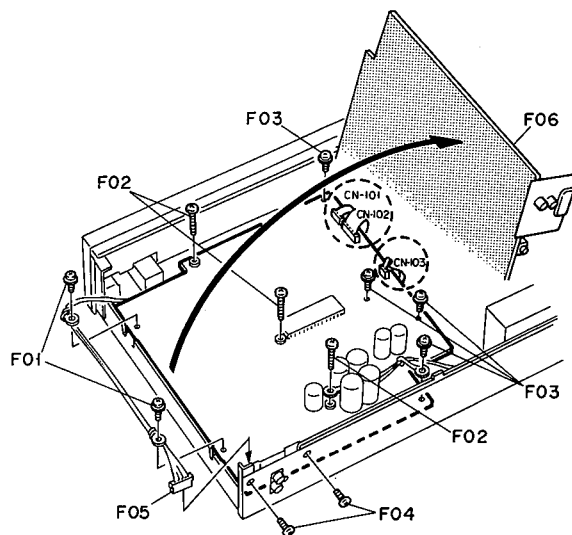


Fig. 2.6

#### 2.7. Disc Mechanism Ass'y

Refer to Figs. 2.7.1 and 2.7.2.

- (1) Remove the Top Cover Ass'y referring to item 2.1.
- (2) Remove the Disc Tray Cover Ass'y referring to item 2.2.
- (3) Loosen screws F01 (4 pcs.).
- (4) Push F02 (Disc Tray Ass'y) to load it.
- (5) Remove F03 (Disc Mechanism Ass'y) referring to Fig. 2.7.2.

**Caution:** Do not disconnect connectors CN101, CN102 and CN103 as the Laser Pickup will be damaged. (When disconnecting connectors, short-circuiting solder must be applied to the Laser Pickup. Refer to item 2.9.)

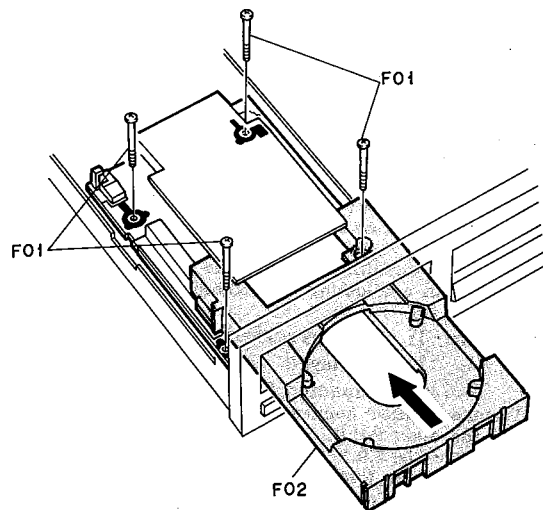


Fig. 2.7.1

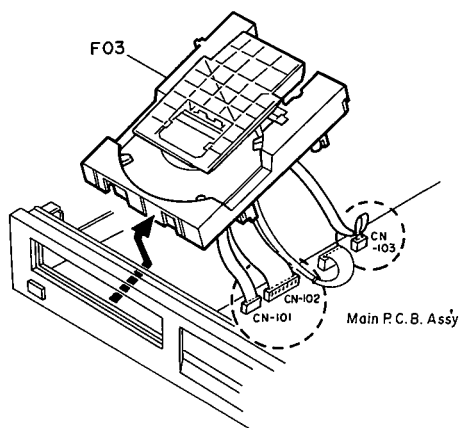


Fig. 2.7.2

## 2.8. Chuck Arm Ass'y

Refer to Fig. 2.8.

- (1) Remove the Top Cover Ass'y referring to item 2.1.
- (2) Loosen a screw F01.
- (3) With holding down F03 (Chuck Arm Ass'y) as shown in the figure, loosen a screw F02.
- (4) Gradually lift F03 (Chuck Arm Ass'y) and remove a spring F04.

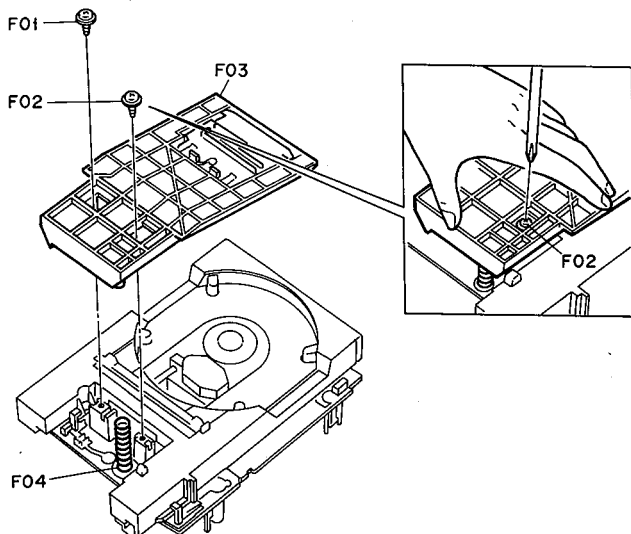


Fig. 2.8

## 2.9. Laser Pickup

Refer to Figs. 2.9.1 to 2.9.5.

### 2.9.1. Removing the Laser Pickup

- (1) Turn the Power switch ON.
- (2) Press the Eject/Load button to eject the Disc Tray.
- (3) Turn the Power switch OFF.
- (4) Remove the Chuck Arm Ass'y referring to item 2.8.
- (5) Loosen screws F01 (2 pcs.) referring to Fig. 2.9.1.
- (6) Pull out F03 (Laser Pickup) along with F02 (Pickup Rail, 2 pcs.).
- (7) Apply short-circuiting solder to the Small P.C.B. of the Laser Pickup with a soldering iron whose metal part is grounded. See Fig. 2.9.2.

**Caution:** If you miss soldering, the Laser Pickup will be damaged when its connectors are disconnected from the Main P.C.B. Ass'y.

- (8) Disconnect three connectors CN101, CN102 and CN103 from the Main P.C.B. Ass'y and remove F03 (Laser Pickup Ass'y). See Fig. 2.9.3.
- (9) Loosen a screw F04 and remove F05 (Feed Rack C) from F03 (Laser Pickup) referring to Fig. 2.9.4.

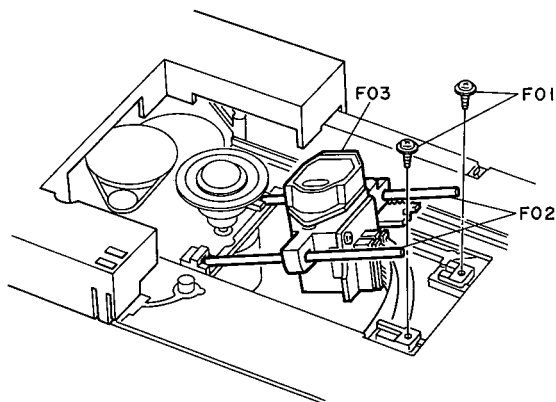


Fig. 2.9.1

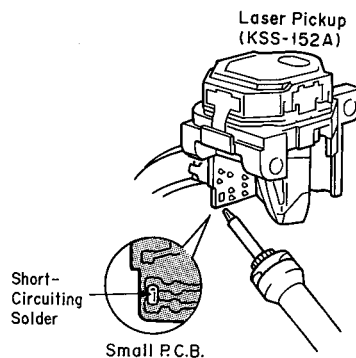


Fig. 2.9.2

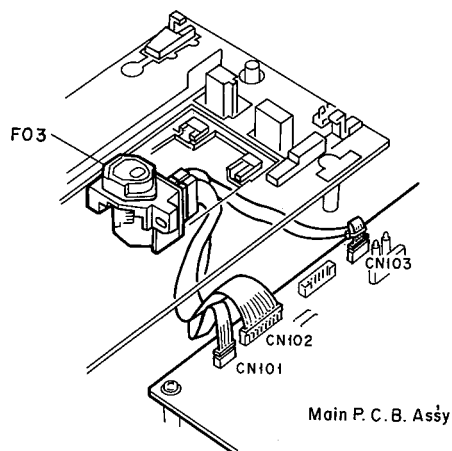


Fig. 2.9.3

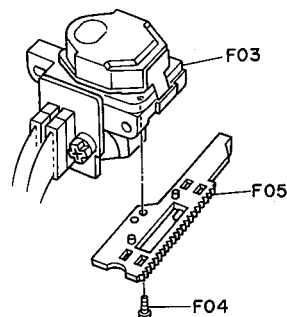


Fig. 2.9.4

### 2.9.2. Installing a New Laser Pickup

**Note:** As a Laser Pickup is packed in a conductive pack as shown in Fig. 2.9.5, do not take it out of the pack until you need it.

- (1) Mount F05 (Feed Rack C) on F03 (new Laser Pickup) with a screw F04. See Fig. 2.9.4.
- (2) Connect three connectors CN101, CN102 and CN103 to the Main P.C.B. Ass'y. See Fig. 2.9.3.
- (3) Remove the short-circuiting solder on the Small P.C.B. of the Laser Pickup with the soldering iron whose metal part is grounded. See Fig. 2.9.2.

**Caution:** If the short-circuiting solder is removed before the three connectors CN101, CN102 and CN103 are connected, damage to the laser diode of the Laser Pickup Ass'y could occur in a matter of seconds, causing failure of the new Laser Pickup.

- (4) Insert F02 (Pickup Rail, 2 pcs.) into F03 (Laser Pickup) and install them with screws F01 (2 pcs.). See Fig. 2.9.1.
- (5) Install the Chuck Arm Ass'y by reversing the steps in item 2.8.
- (6) Perform adjustments referring to "5.2. Electrical Adjustment Instructions".
- (7) Install the Top Cover.

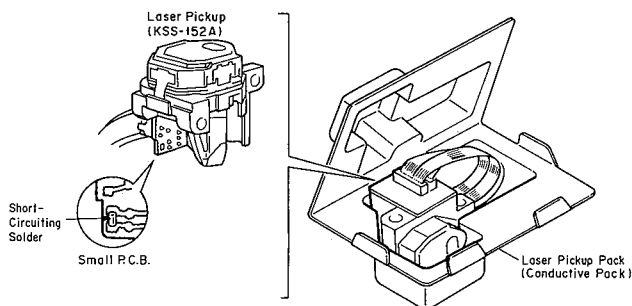


Fig. 2.9.5

### 2.10. Disc Tray Ass'y

Refer to Figs. 2.10.1 to 2.10.4.

- (1) Remove the Disc Mechanism Ass'y referring to item 2.7.
- (2) Remove the Chuck Arm Ass'y referring to item 2.8.
- (3) Slide F01 (Disc Tray Ass'y) until the end of F01 (Disc Tray Ass'y) meets section A of F02. See Fig. 2.10.1.
- (4) Apply adhesive tapes B and C to positioning F01 (Disc Tray Ass'y) and to stick F02.
- (5) Loosen screws F03 (3 pcs.).

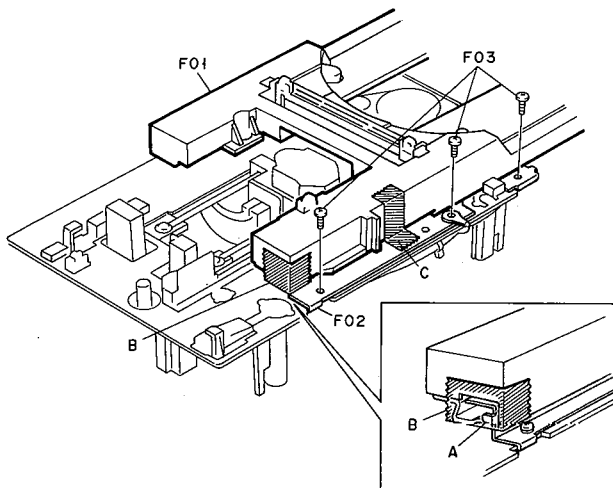


Fig. 2.10.1

- (6) Remove F01 (Disc Tray Ass'y) referring to Fig. 2.10.2. (F04 must come off the claws D.).

**Notes:** 1. When assembling the Disc Tray Ass'y, follow the next steps.

- (a) With turning F05 (Loading Cam) counterclockwise, insert F04 into claws D and place F01 (Disc Tray Ass'y). Refer to Figs. 2.10.3 and 2.10.2.
- (b) Peel off adhesive tapes B and C. Refer to Figs. 2.10.1.
- (c) Tighten screws F03 (3 pcs.).

2. How to unlock the Disc Tray Ass'y

When the Disc Tray Ass'y is pushed strongly with the power OFF, it may be locked mechanically. In this case, push the Disc Tray Rack with your finger tip to release the disc tray Ass'y. Refer to Fig. 2.10.4.

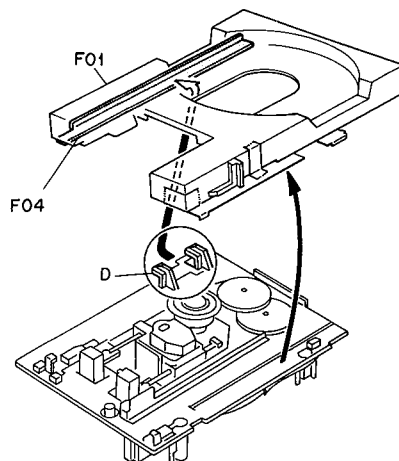


Fig. 2.10.2

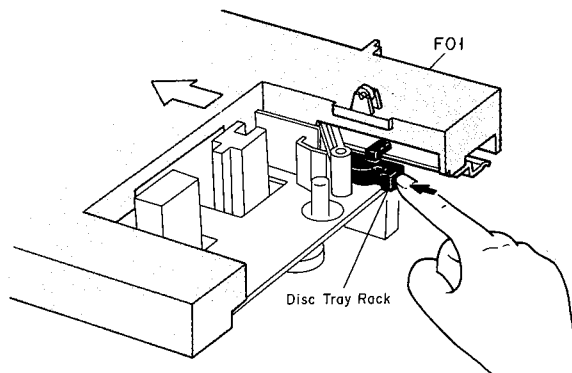


Fig. 2.10.3

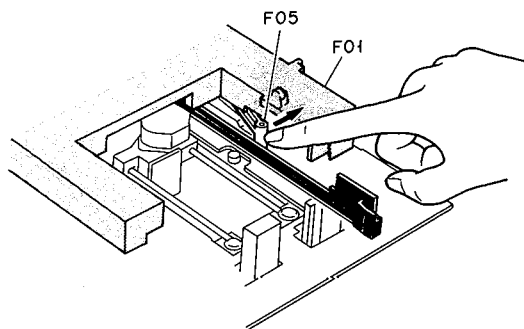


Fig. 2.10.4



### 3. MEASUREMENT INSTRUMENTS

#### 2.11. Turntable Base

Refer to Fig. 2.11.

- (1) Remove the Chuck Arm Ass'y referring to item 2.8.
- (2) Remove F01 using clock screwdrivers as shown in Fig. 2.11.
- (3) Remove F02 and pull F03 (Turntable Base) out of the disc motor shaft.
- (4) Press in a new Turntable Base to the disc motor shaft referring to "5.1. Turntable Height Adjustment".

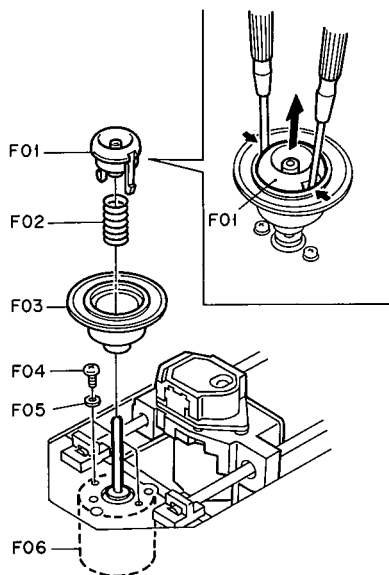
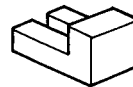


Fig. 2.11

- (1) Oscilloscope (15 MHz or more)
- (2) DC Voltmeter
- (3) AC Voltmeter
- (4) Oscillator
- (5) Frequency Counter
- (6) Philips Test Sample Disc 5/5A
- (7) Turntable Adjustment Gauge (OC82547A), see Fig. 3.



Turntable Adjustment Gauge  
(OC82547A)

Fig. 3

#### 4. PARTS LOCATION FOR ELECTRICAL ADJUSTMENT

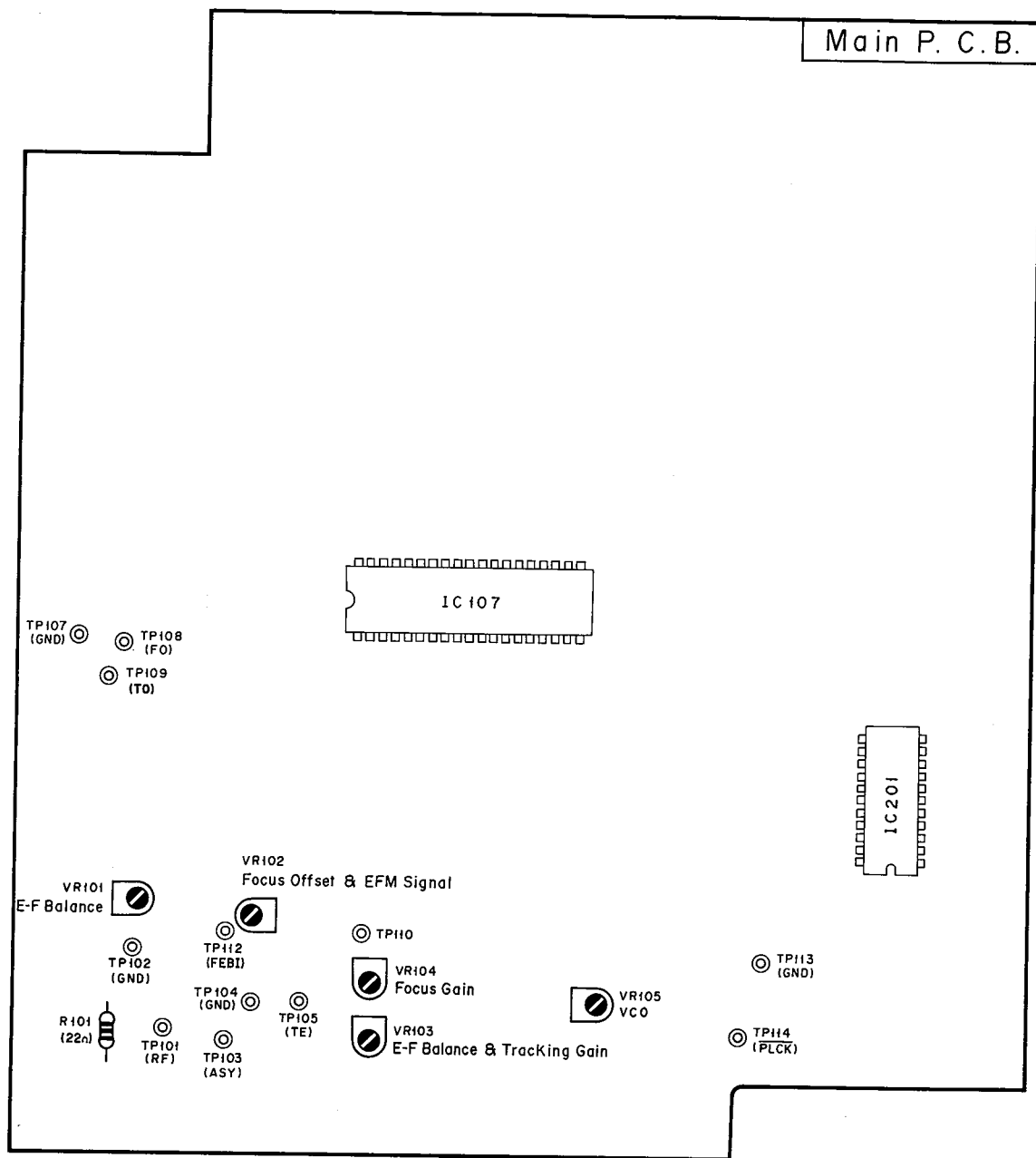


Fig. 4

#### 5. ADJUSTMENTS

##### 5.1. Turntable Height Adjustment

Note: This adjustment is required only when the Turntable Base which is press-fitted into the disc motor shaft is replaced with new one.

- (1) Remove the Turntable Base referring to item 2.11.
- (2) Place the Turntable Adjustment Gauge and press-fit a new Turntable Base so that the Turntable Base contacts with the Gauge securely. See Fig. 5.
- (3) Remove the Gauge and assemble the Turntable Base.

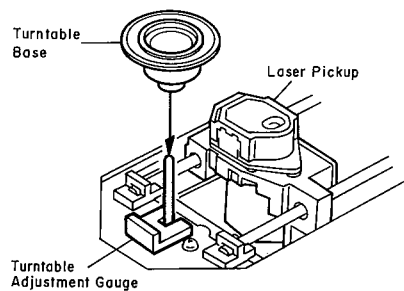
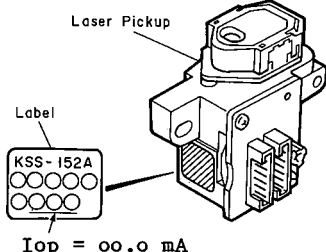
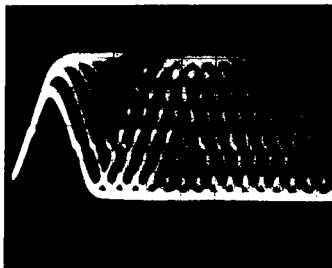
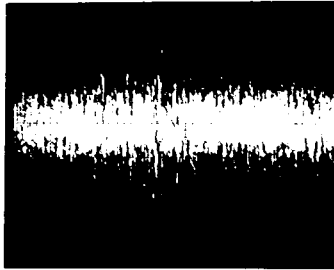


Fig. 5

## 5.2. Electrical Adjustment Instructions

STEP	ITEM	SIGNAL SOURCE	OUTPUT CONNECTION	ADJUSTMENT	REMARKS
1	Laser Power Check	Philips Test Sample 5	DC Voltmeter across R101 (22 ohms) on Main P.C.B.		<ol style="list-style-type: none"> <li>Turn the power ON and load the test disc.</li> <li>Play back the test disc and calculate the current flowing into R101 from the following formula.  <math display="block">I = \frac{\text{Voltmeter Value}}{R101 (22 \text{ Ohms})} = 00.0 \text{ mA (Measured Value)}</math> <p><b>Note:</b> The voltmeter value should be read to 3 digits after the decimal point.</p> </li> <li>Press the Eject/Load button to open the Disc Tray and check that the difference between the measured value and the current value (Iop) indicated on the label on the Laser Pickup is within <math>\pm 10\%</math>.</li> </ol> <p style="text-align: center;"><math>I_{op} - (\text{Measured Value}) = I_{op} \pm 10\%</math></p> 
2	VCO Frequency Adjustment	None	Frequency Counter (10/1 probe) between TP114 (PLCK) and TP113 (GND)	VR105	<ol style="list-style-type: none"> <li>Short TP103 (ASY) and TP104 (GND).</li> <li>Adjust VR105 to obtain <math>4.305 \pm 0.005</math> MHz on the frequency counter.</li> <li>Remove shorting.</li> </ol>
3	Focus Offset Adjustment	None	Oscilloscope (10/1 probe) between TP112 (FEBI) and TP104 (GND)	VR102	<ol style="list-style-type: none"> <li>Preset the following semi-fixed volumes to their mechanical center positions. VR101, VR102, VR103, VR104</li> <li>Set the oscilloscope as follows: DC Mode, 1 mV/div, 0.2 ms/div</li> <li>Adjust VR102 to obtain <math>0 \pm 0.01</math> V DC on the oscilloscope.</li> </ol>
4	EFM Signal Adjustment	Philips Test Sample 5	Oscilloscope (10/1 probe) between TP101 (RF) and TP104 (GND)	VR102	<ol style="list-style-type: none"> <li>Play back the first track of the test disc.</li> <li>Adjust VR102 until waveform amplitude becomes maximum and the waveform becomes clear (not thick) as shown below:</li> </ol>  <p>Oscilloscope Setting: AC Mode, 0.2 V/div, 0.5 <math>\mu</math>s/div</p>

STEP	ITEM	SIGNAL SOURCE	OUTPUT CONNECTION	ADJUSTMENT	REMARKS
5	E-F Balance Adjustment (Supplementary Beam Balance Adjustment)	Philips Test Sample 5	Oscilloscope (10/1 probe) between TP105 (TE) and TP104 (GND)	VR103 VR101	<ol style="list-style-type: none"> <li>1. Turn VR103 fully counterclockwise.</li> <li>2. Play back the first track of the test disc.</li> <li>3. Adjust VR101 so that the center level of the waveform is within the range of <math>0\text{ V} \pm 0.1\text{ V DC}</math> as shown below: <div data-bbox="860 338 1347 620" data-label="Figure"> </div> </li> </ol> <p>Oscilloscope Setting: DC Mode, 0.5 V/div, 2 ms/div</p>
6	Tracking Gain Adjustment	Philips Test Sample 5	Oscilloscope and AC Voltmeter between TP109 (TO) and TP107 (GND)	VR103	<ol style="list-style-type: none"> <li>1. Connect an oscillator between TP110 and TP102 (GND) through a 100-Kohm resistor. <div data-bbox="860 856 1209 977" data-label="Diagram"> </div> </li> <li>2. Feed in 4 kHz, 0.5 Vrms signal (measured with no load) from the oscillator.</li> <li>3. Play back the first track of the test disc.</li> <li>4. Adjust VR103 so that the AC voltmeter reads <math>0.7\text{ V} \pm 0.07\text{ Vrms}</math>. Below shown is a waveform on the oscilloscope at TP109 (TO). <div data-bbox="857 1199 1194 1475" data-label="Figure"> </div> </li> </ol> <p>Oscilloscope Setting: AC Mode, 1 V/div, 2 ms/div</p>

STEP	ITEM	SIGNAL SOURCE	OUTPUT CONNECTION	ADJUSTMENT	REMARKS
7	Focus Gain Adjustment	Philips Test Sample 5	Oscilloscope and AC Voltmeter between TP108 (FO) and TP107 (GND)	VR104	<p><b>Note:</b> Perform this adjustment last.</p> <p>1. Play back the first track of the test disc. 2. Adjust VR104 so that the AC voltmeter reads 0.23 V <math>\pm</math>0.01 Vrms. Below shown is a waveform on the oscilloscope at TP108 (FO).</p>  <p>Oscilloscope Setting: AC Mode, 0.5 V/div, 2 ms/div</p>
8	Operation Check	Philips Test Sample 5A			<p>Play back the following test programs on the test disc (Philips Test Sample 5A) and make sure that there is no noise and track-jumping.</p> <ul style="list-style-type: none"> <li>o Interruption 700 <math>\mu</math>m <ul style="list-style-type: none"> <li>8th program 0'00" - 0'20"</li> </ul> </li> <li>o Black Dot 600 <math>\mu</math>m <ul style="list-style-type: none"> <li>14th program 0'00" - 0'20"</li> </ul> </li> <li>o Simulated fingerprint <ul style="list-style-type: none"> <li>20th program 0'00" - 0'20"</li> </ul> </li> </ul>

Schematic Ref. No.	Part No.	Description	Q'ty	Schematic Ref. No.	Part No.	Description	Q'ty
<b>6.1. Synthesis</b>				20	0M04377A	Caution Sheet (CDP-2A)	1
				21	0M04925A	Locking Screw Caution Label	1
				22	CA80917A	Control & Display P.C.B. Ass'y	1
				23	0C83302A	CSA Approval Label (CDP-2A)	1
				24	0M04608A	Manufactured Label (CDP-2A)	1
				25	0M04813A	UL Label (CDP-2A)	1
				L01	0E03054A	BT3x8 @ Countersunk	2
				L02	0E03365A	BT3x8 @ Binding Projected (Black Chromate)	2
				L03	0E00921A	BT3x8 @ Binding (Black Chromate)	1
				L04	0E03432A	BT3x6 @ Tapping (Black Chromate)	7
				L05	0C82498A	M3x32 @ Pan	4
				L06	0C82497A	Plastic Rivet 3x3.5	2
				L07	0C81646A	BT2.6x8 @ Binding Washer-faced	3
				L08	0C82499A	Washer 4.2x0.3	1
				—	0M04817A	EP Laser Label (CDP-2E)	1
				—	0M04381A	EP Approval Label (CDP-2E)	1
				—	0M05111A	F Mark Label (CDP-2E)	1
				—	0M04811A	Voltage Caution Label (CDP-2 (Other))	1
				—	0M05150A	Laser Symbol Label (CDP-2E)	1
				—	0M05151A	Laser Caution Label DMK (CDP-2E)	1
				—	0C82417A	LED Filter	1
01	0C82425A	Disc Tray Cover	1				
02	0C82432A	Disc Tray Cover Spacer B	1				
03	0C82473A	Disc Tray Cover Base	1				
04	CA80938A	Front Panel Ass'y (CDP-2 (Other))	1				
	CA80921A	Front Panel Ass'y (CDP-2A)	1				
	CA80937A	Front Panel Ass'y (CDP-2E)	1				
	CA81055A	Front Panel Ass'y (OMS-20)	1				
05	0C82437A	Power Switch Knob	1				
06	CA80603A	Volume Knob Ass'y	1				
07	0C84001A	Front Panel Spacer	2				
08	—	Chassis Ass'y	1				
09	0C83273A	Rear Panel (CDP-2 (Other))	1				
	0C83271A	Rear Panel (CDP-2A)	1				
	0C83272A	Rear Panel (CDP-2E)	1				
	0C83283A	Rear Panel (OMS-20)	1				
10	0C82430A	Top Cover	1				
11	0C82474A	Top Cover Cushion A	2				
12	0C82475A	Top Cover Cushion B	2				
13	0C82476A	Top Cover Sheet	1				
14	CA80922A	Disc Mechanism Ass'y	1				
15	0M04611A	US Laser Caution Label (CDP-2A (U.S.A.))	1				
16	0M04612A	CSA Laser Caution Label (CDP-2A (Canada))	1				
17	0M05079A	Pass Label	1				
18	0M04666A	CSA Laser Label (CDP-2A)	1				
19	0M05174A	Serial No. Label	1				

6. MECHANISM ASS'Y AND PARTS LIST

6.1. Synthesis

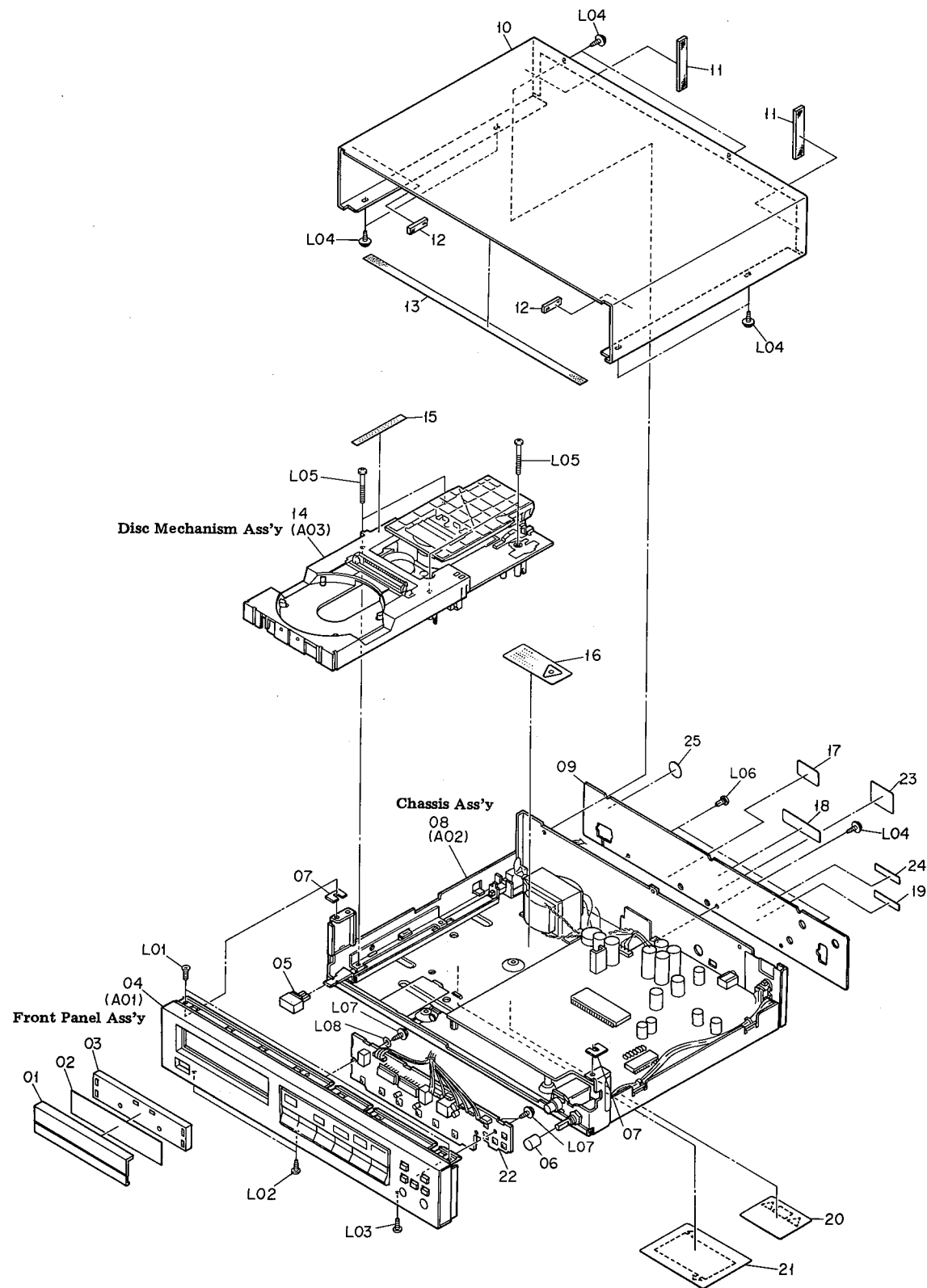


Fig. 6.1

## 6.2. Front Panel Ass'y (A01)

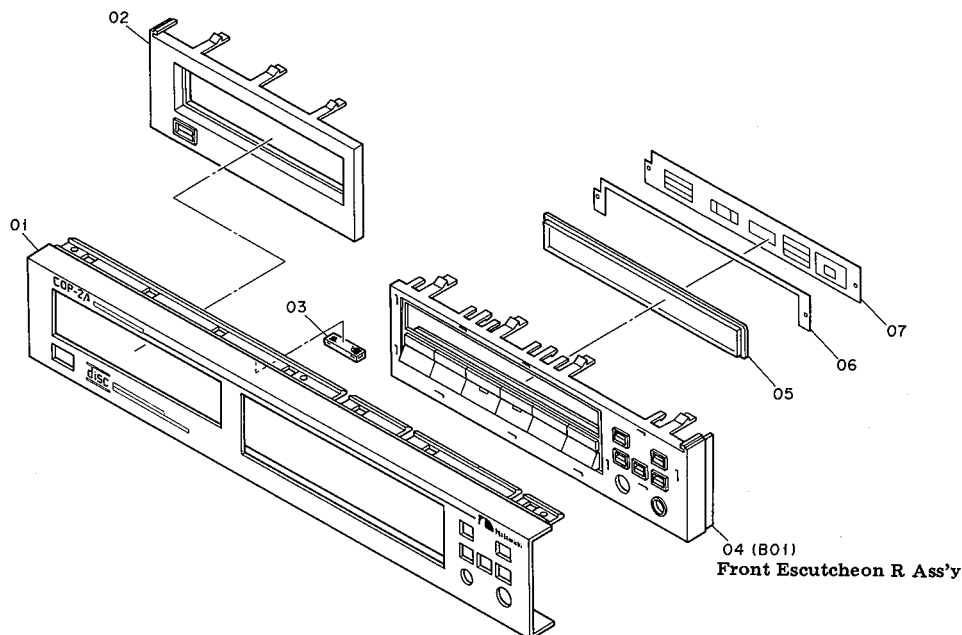


Fig. 6.2

Schematic Ref. No.	Part No.	Description	Q'ty	Schematic Ref. No.	Part No.	Description	Q'ty
<b>6.2. Front Panel Ass'y (A01)</b>				14	CA80923A	Chassis Base Ass'y	1
<b>A01</b>	CA80938A	Front Panel Ass'y (CDP-2 (Other))	1	15	0C82444A	Motor Insulator	1
	CA80921A	Front Panel Ass'y (CDP-2A)	1	16	0C82443A	Headphone Amp. P.C.B. Insulator	1
	CA80937A	Front Panel Ass'y (CDP-2E)	1	17	0C82418A	Leg	4
	CA81055A	Front Panel Ass'y (OMS-20)	1		0H05182A	Leg Ring (OMS-20)	4
					0H05183A	Leg Mold (OMS-20)	4
<b>01</b>	0C83269A	Front Panel (CDP-2 (Other))	1		0J05428A	Leg Felt (OMS-20)	4
	0C83267A	Front Panel (CDP-2A)	1	18	0C82542A	Shield Plate	1
	0C83268A	Front Panel (CDP-2E)	1	19	CA80951A	Headphone Amp. P.C.B. Ass'y	1
	0C83270A	Front Panel (OMS-20)	1	20	0C81471A	Insu-Lock L=94mm	14
<b>02</b>	0C82423A	Front Escutcheon L	1	21	0C82667A	Capacitor Cover (CDP-2 (Other)/2E)	1
<b>03</b>	0C82671A	Vibration Isolating Sheet	1	22	0C82668A	Voltage Selector Switch Holder (CDP-2 (Other))	1
<b>04</b>	CA80563A	Front Escutcheon R Ass'y	1	23	0C84004A	Voltage Selector Switch (CDP-2 (Other))	1
<b>05</b>	0C82424A	Acrylic Panel	1	L01	0E00928A	Nut Hex. M4 Washer-Faced	2
<b>06</b>	0C82426A	Spacer	1	L02	0C82497A	Plastic Rivet 3x3.5	3
<b>07</b>	0C83282A	Indicator Plate	1	L03	0E00607A	M3x8 @ Pan (3A)	8
<b>6.3. Chassis Ass'y (A02)</b>				L04	0C82496A	BT3x22 @ Binding	3
<b>A02</b>	—	Chassis Ass'y	1	L05	0C81623A	BT3x18 @ Pan Projected (Black Chromate) (CDP-2 (Other)/2A & OMS-20)	1
<b>01</b>	0C81655A	Transformer Reinforce Plate	2	L06	0E00921A	BT3x8 @ Binding (Black Chromate)	2
<b>02</b>	0C83440A	Power Transformer (CDP-2 (Other))	1	L07	0E00875A	ST3x8 @ Binding (Black Chromate) (CDP-2 (Other)/2A & OMS-20)	4
	0C83304A	Power Transformer (CDP-2A)	1		0E00875A	ST3x8 @ Binding (Black Chromate) (CDP-2E)	2
	0C83439A	Power Transformer (CDP-2E)	1	L08	0E00888A	BT3x12 @ Binding	4
	0C83513A	Power Transformer (OMS-20)	1	L09	—	Nut	1
<b>03</b>	0C82513A	Power Switch SDL01P	1	L10	—	Snap Plate	1
<b>04</b>	0B41744A	Ceramic Capacitor 4700P 400V M	1	L11	0C84007A	ST3x6 @ Pan (2A) (CDP-2 (Other))	2
<b>05</b>	CA80950A	Main P.C.B. Ass'y (CDP-2 (Other)/2A)	1		CA81066A	Wire Ass'y (CDP-2A)	1
	CA80952A	Main P.C.B. Ass'y (CDP-2E)	1		CA81061A	Wire Ass'y (OMS-20)	1
	CA81076A	Main P.C.B. Ass'y (OMS-20)	1		0C84000A	BS Damper (OMS-20)	1
<b>06</b>	0C82438A	Pin Jack Holder	1				
<b>07</b>	0C82541A	Wire Clamper B	3				
<b>08</b>	0C82500A	Supporter Male	3				
<b>09</b>	0C82501A	Supporter Female	3				
<b>10</b>	0C82670A	Holder (CDP-2A & OMS-20)	1				
<b>11</b>	0C82442A	Stud	4				
<b>12</b>	0C81472A	Cord Bushing (CDP-2 (Other)/2A & OMS-20)	1				
	0C82604A	Cord Bushing (CDP-2E)	1				
<b>13</b>	0C82300A	Power Cord (CDP-2 (Other)/2A)	1				
	0C84005A	Power Cord (CDP-2E)	1				
	0C84006A	Power Cord (OMS-20)	1				

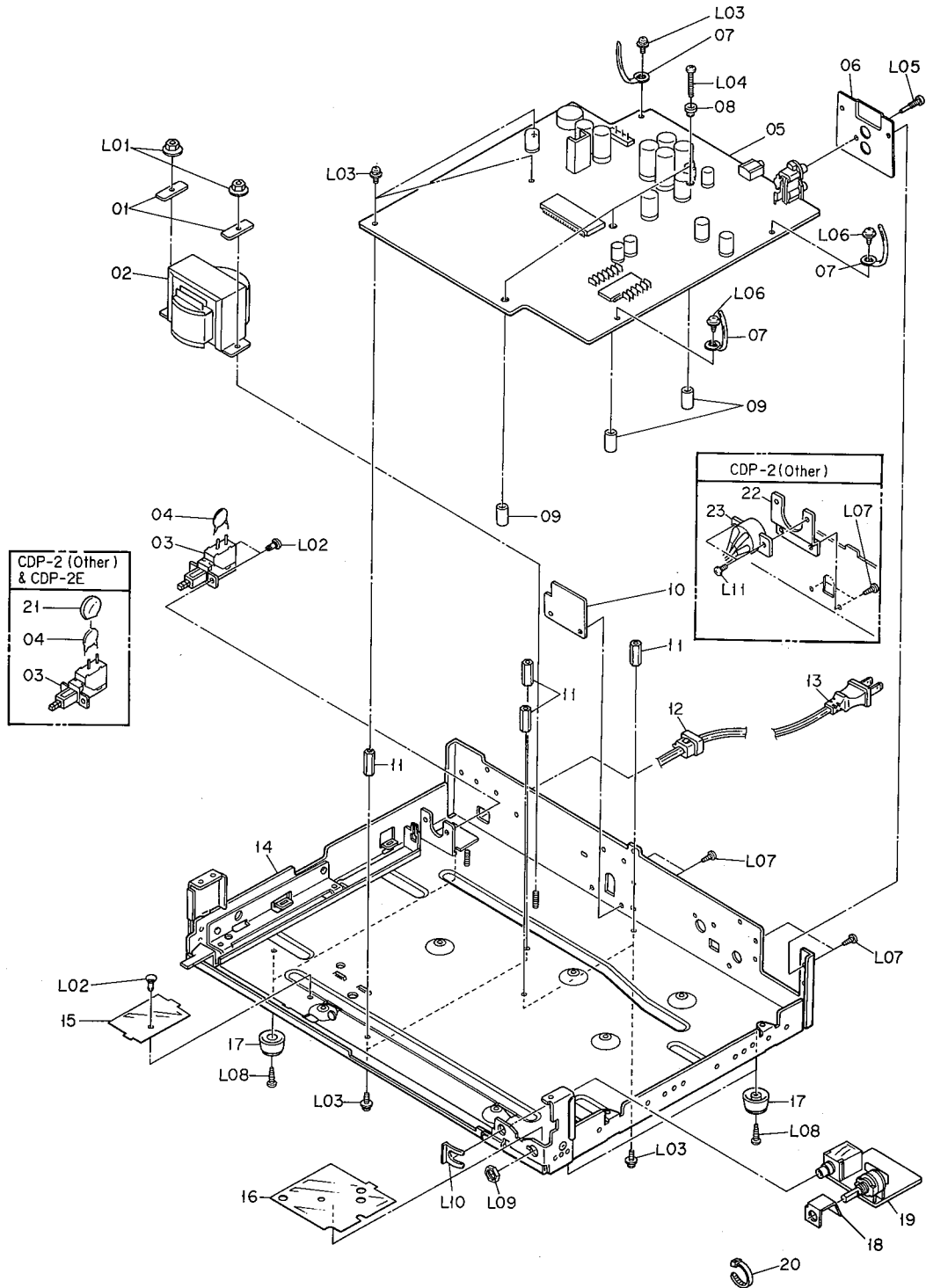


Fig. 6.3



#### 6.4. Disc Mechanism Ass'y (A03)

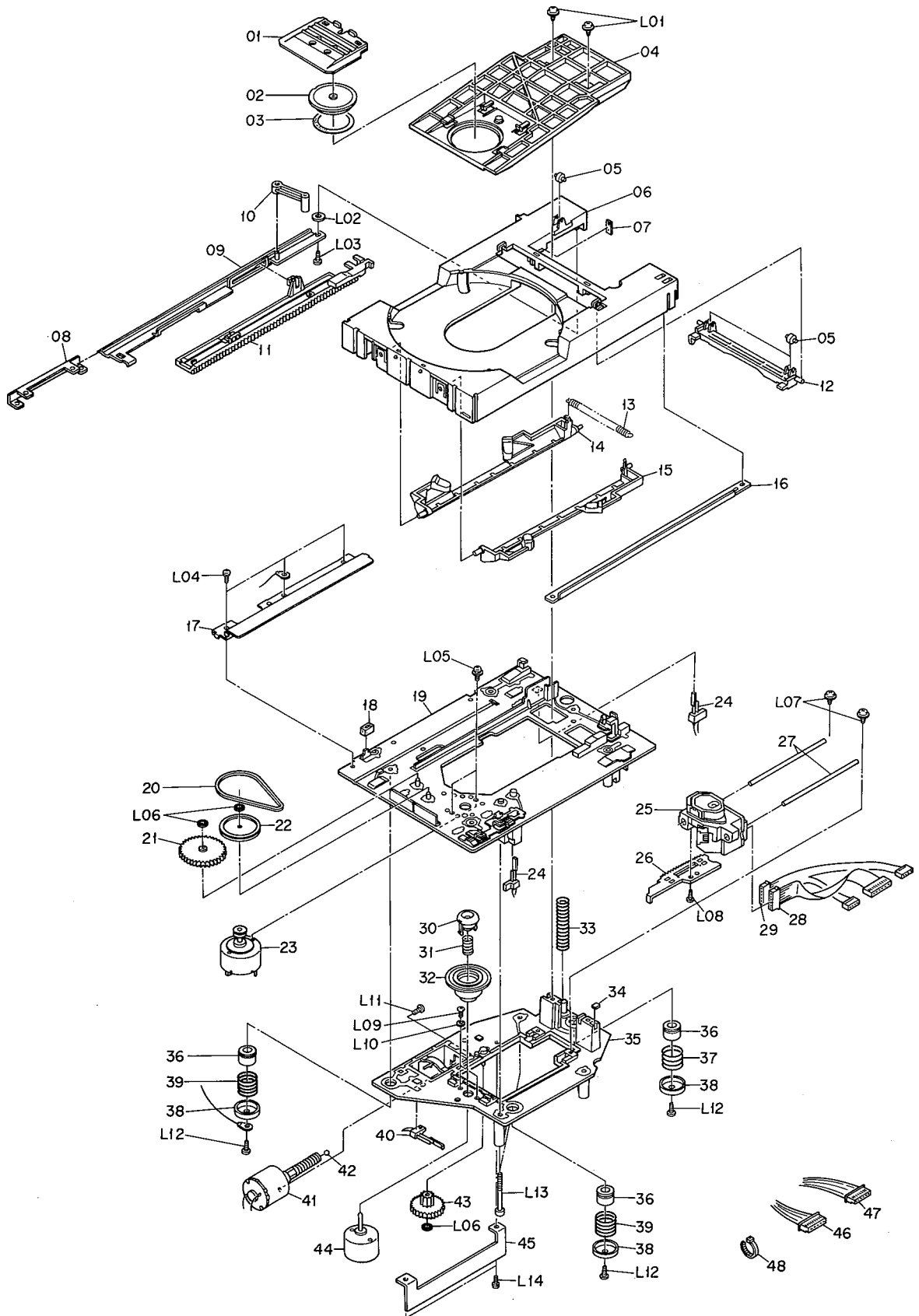


Fig. 6.4

# 6.5. Front Escutcheon R Ass'y (B01)

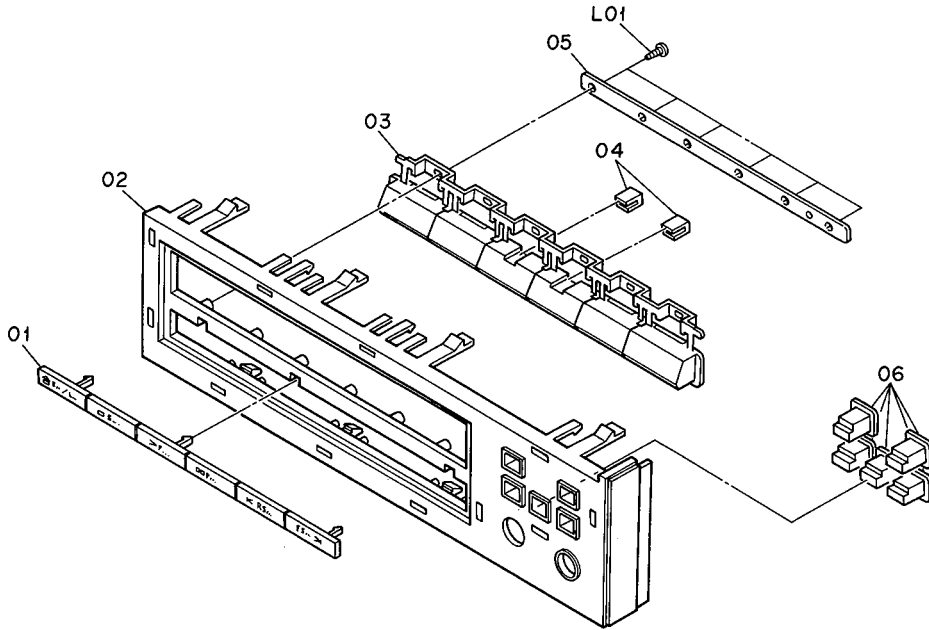


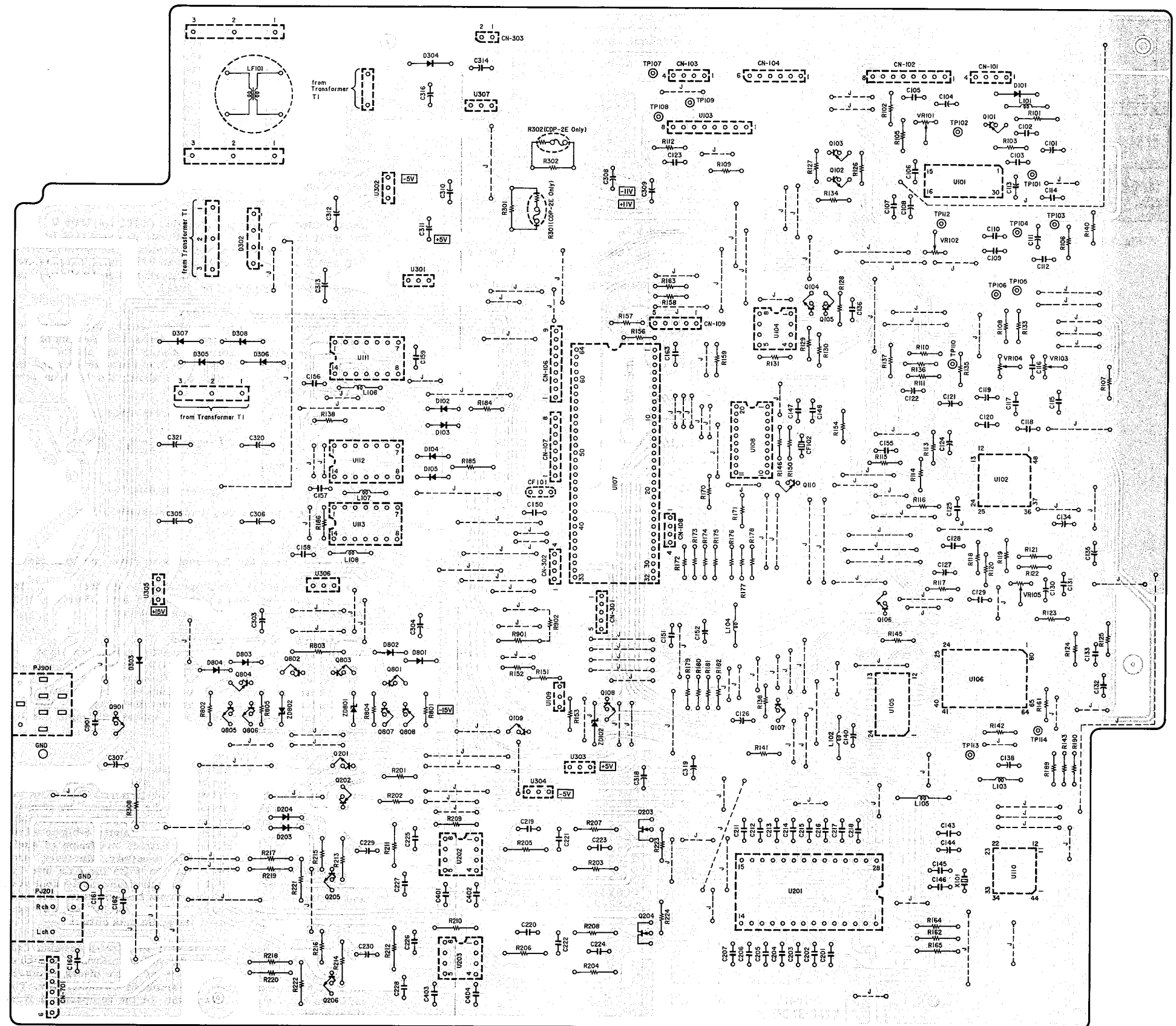
Fig. 6.5

Schematic Ref. No.	Part No.	Description	Q'ty	Schematic Ref. No.	Part No.	Description	Q'ty
<b>6.4. Disc Mechanism Ass'y (A03)</b>				45	OC82546A	Sub Chassis Holder	1
A03	CA80922A	Disc Mechanism Ass'y	1	46	OC83447A	6P-2 Connector	1
01	OC82494A	Chuck Holder	1	47	OC83448A	5P-2 Connector	1
02	CA80605A	Chuck Ass'y	1	48	OC81471A	Insu-Lock L=94mm	2
03	OC82454A	Sheet	1	L01	OC82503A	BT3x8 @ Binding with Washer	2
04	OC82493A	Chuck Arm	1	L02	OE00732A	Washer 3mm	1
05	OC82463A	Roller	3	L03	OE00868A	BT3x8 @ Binding	1
06	OC82489A	Disc Tray	1	L04	OE00510A	M3x8 @ Pan	3
07	OC83999A	Cushion	1	L05	OE03046A	M2.6x6 @ Pan (3A)	2
08	CA80606A	Bearing Ass'y	1	L06	OC81629A	Slit Washer Plastic	3
09	CA80610A	Disc Drawer Guide Ass'y	1	L07	OC81646A	BT2.6x8 @ Binding Washer-Faced	2
10	OC82492A	Loading Cam	1	L08	OC83322A	BT2x5 @ Binding	1
11	OC82490A	Disc Tray Rack	1	L09	OC83319A	M2x3 @ Pan	2
12	OC82491A	Disc Support Cam	1	L10	OC81947A	Washer 2mm	2
13	OC82469A	Disc Support Spring	1	L11	OE00866A	M2.6x4 @ Binding	1
14	OC82466A	Disc Support L	1	L12	OE00876A	BT2.6x8 @ Pan	3
15	OC82467A	Disc Support R	1	L13	OC82549A	Screw 3x33 @ Binding (for Transport)	2
16	OC82468A	Disc Drawer Guide R	1	L14	OE00866A	M2.6x4 @ Binding	2
17	OC82450A	Bearing Holder	1	<b>6.5. Front Escutcheon R Ass'y (B01)</b>			
18	OC82453A	Disc Tray Stopper Rubber	1	B01	CA80563A	Front Escutcheon R Ass'y	1
19	CA80607A	Disc Mechanism Ass'y	1	01	OC82403A	Function Switch Name Plate	1
20	OC83308A	Loading Belt	1	02	OC82419A	Front Escutcheon R	1
21	OC82461A	Loading Gear	1	03	OC82420A	Function Knob	1
22	OC82495A	Loading Pulley	1	04	OC82421A	LED Filter	2
23	CA80926A	Loading Motor Ass'y	1	05	OC82672A	Function Knob Holder	1
24	OC83313A	Leaf Switch MSW1138 NBKU	2	06	OC82422A	Push Button	5
25	OC83314A	Laser Pickup KSS-152A	1	L01	OE00792A	BT2.6x8 @ Pan	6
26	OC83309A	Feed Rack C	1				
27	OC82471A	Pickup Rail	2				
28	OC83306A	Pickup Connector A	1				
29	OC83307A	Pickup Connector B	1				
30	OC83318A	Turntable Center E	1				
31	OC82484A	Turntable Spring	1				
32	OC83303A	Turntable Base E	1				
33	OC82470A	Chuck Spring	1				
34	OC82456A	Rubber Spacer	1				
35	CA80608A	Sub Chassis C Ass'y	1				
36	OC82452A	Cushion	3				
37	OC82449A	Cushion Spring B	1				
38	OC82447A	Cushion Holder	3				
39	OC82448A	Cushion Spring A	2				
40	OC83312A	Leaf Switch	1				
41	CA80925A	Feed Motor Ass'y	1				
42	OC82457A	Steel Ball 2.5	1				
43	OC83310A	Feed Gear	1				
44	OC83315A	Disc Motor R.F-301TA-11400	1				

Notes: 1. Mounting diagram shows a dip side view of the printed circuit board.  
2. Diode is 1SS133 unless otherwise specified.  
3. Abbreviation for part name:  
TR — Transistor, SiD — Silicon Diode, ZD — Zener Diode  
RK — Carbon Resistor, RM — Metal Film Resistor  
CE — Electrolytic Capacitor, CML — Mylar Capacitor, CC — Ceramic Capacitor, CPP — PP Capacitor

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Schematic Ref. No.	Part No.	Description
C308,309	OB40091A	CE 100μ 25V
C310,311	OB40091A	CE 100μ 25V
C312	OB40083A	CE 2200μ 16V
C313	OB40084A	CE 3300μ 16V
C314	OB40206A	CE 100μ 16V
C316	OB40082A	CE 1000μ 16V
C318,319	OB40092A	CE 220μ 25V
	OB40421A	CE 220μ 25V (LN) (OMS-20)
C320,321	OB40096A	CE 2200μ 25V
	OB40428A	CE 2200μ 35V (LN) (OMS-20)
C401,402	OB41696A	CML 0.1μ 100V J
C403,404	OB41696A	CML 0.1μ 100V J
C901	OB09292A	CC 0.1μ 50V Z
TP101	OC81897A	Terminal Pin CHP-01
TP102	OC81898A	Test Pin
TP103	OC81897A	Terminal Pin CHP-01
TP104	OC81898A	Test Pin
TP105,106	OC81897A	Terminal Pin CHP-01
TP107	OC81898A	Test Pin
TP108,109	OC81897A	Terminal Pin CHP-01
TP110	OC81897A	Terminal Pin CHP-01
TP112	OC81897A	Terminal Pin CHP-01
TP113	OC81898A	Test Pin
TP114	OC81897A	Terminal Pin CHP-01
PJ201	OC81895A	2P Pin Jack
PJ901	OC83362A	1P Jack
CN101	OC81894A	4P NH Post (YEL)
CN102	OC82525A	8P NH Post (YEL)
CN103	OC82527A	4P NH Post (YEL)
CN104	OC83376A	6P Post
CN106	OC83374A	9P Post RED
CN107	OC83373A	8P Post RED
CN108	OC83377A	4P Post
CN109	OC83375A	5P Post
CN301	OC83451A	5P Post BLK
CN302	OC83371A	4P Post B4BPH-K
CN303	OC81927A	2P Post
CN701	OC83376A	6P Post
	OC81902A	3P Terminal (2)
	OC83363A	Terminal E2 (1)
	OC83364A	Terminal E3 (2)
	OC83346A	Heat Sink
	OSH1030-MP	(1)
OE00606A	M3x6 ♂Pan (3A)	(1)
OC83998A	Shield Plate	(1)
OC83449A	Wire Ass'y (CDP-2 (Other)/2A)	(1)
CA81059A	Wire Ass'y (CDP-2E)	(1)
CA81060A	Wire Ass'y (OMS-20)	(1)



### 7.3. Control & Display P.C.B. Ass'y

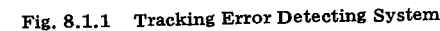
### 8.1. IC Block Diagrams

The following items are explained here briefly.

- After loading a compact disc, the object lens in the laser pickup is out of focus with respect to the compact disc's signal surface. So, the focus search operation is conducted first. When the object lens becomes in focus, then the focus servo is activated. The focus servo controls the current flowing into the focus coil and shifts the object lens vertically so that the distance between object lens and compact disc's signal surface is constant. In other word, the focus servo controls so that the focus error becomes zero. The focus error is detected by using the current outputs of the photodiodes A, B, C and D in the laser pickup. The focus error is represented by  $(B + D) - (A + C)$ .

- The EFM (Eight-to-Fourteen Modulation) signal (eye pattern) is produced by using the current outputs of the photodiodes A, B, C and D in the laser pickup. The EFM signal is represented by  $(A + B + C + D)$ . The EFM signal is then level-sliced and binary-coded EFM signal is produced.

- The tracking servo shifts the object lens in the laser pickup horizontally to correct a tracking error. The tracking error is detected by using the current outputs of the photodiodes E and F in the laser pickup. When both outputs are the same, the tracking error is zero. Fig. 8.1.1 shows the tracking error detecting system.



- Feed servo drives the feed motor to move the laser pickup horizontally.

Disc motor servo drives the disc motor (spindle motor) to turn the compact disc. When turning ON the disc motor, rough servo is used. After that, CLV (Constant Linear Velocity) servo controlled by PLL (Phase-Locked Loop) is used. (The rotational frequency of the compact disc is approx. 500 rpm for the innermost perimeter and approx. 200 rpm for the outermost perimeter.)

- The binary-coded EFM signal is input to the shift register and then the 14-bit data is demodulated into 8-bit data. Next, the 8-bit data is stored to Static RAM (S-RAM) U105. As the interleave processing is applied to the signals on the compact disc surface, de-interleave process is required to extract audio data. It is necessary to store the demodulated 8-bit data into the S-RAM over 108 frames to extract one frame of audio data. This is why the S-RAM is necessary. Moreover, error correction of data is carried out. To write the data into the S-RAM is done by using PLL clock containing mechanical wow and flutter. However, readout of data from the S-RAM is done by using X'tal (crystal) basis clock. So, the influence of wow and flutter is eliminated from the audio data output.

- **Digital-Filtering and D/A Conversion (U110 and U201)**  
The audio data and error flag are sent to U110 (Digital Filter) from U106 (Digital Signal Processor). The audio data is digitally-filtered here, and if error flag is ON, interpolation of data is made. The filtered data is sent to the 16-bit D/A (Digital-to-Analog) Converter U201 and converted into an analog audio signal. The analog audio signal is sent from U201 to the filter and amp. circuit in the next stage.  
If de-emphasis is commanded by the MPU, the filter and amp. circuit performs de-emphasis operation.

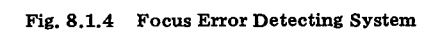
- Fig. 8.1.2 on the next page shows the focus servo circuit.

- 
- The timing diagram for the 74VHC04 shows three signals over time:
- Data Pin:** A bus signal divided into two sections: **Data** (D0, D1, D2, D3, D4) and **Address** (D5, D6, D7 (MSB)).
  - CLK Pin:** A square wave clock signal.
  - XLT Pin:** A single pulse signal.

(b) **Focus Search**  
When U102 receives the Search ON command from MPU, U102 starts focus search operation.

- The current input (A + C) from the photodiodes A and C in the laser pickup is converted into voltage by the RF I-V Amp. (1) in U101 (RF Amp.). While the current input (B + D) from the photodiodes B and D is converted into voltage by the RF I-V Amp. (2). Converted voltages are differentially-amplified by the Focus Error Amp. in U101.

If the output of Focus Error Amp. is not 0 V, i.e., both current inputs (A + C) and (B + D) are not the same and the focus error exists, i.e.,  $(B + D) - (A + C) \neq 0$ , the focus error is amplified by the Focus Amp. in U102 (Servo Signal Processor). The amplified focus error is fed to the focus coil driver U103 and the focus coil is driven so that the focus error is zero. Fig. 8.1.4 shows the laser beam pattern on the quarter-split photodiode (A, B, C and D). Good pattern shows that the current inputs (A + C) and (B + D) are the same.



## (2) Binary-coded EFM Signal Generation

See Fig. 8.1.2. The current inputs (A + C) and (B + D) are converted into voltages by the RF I-V Amp. (2) and (1), and summed by the RF Summing Amp. The output (A + B + C + D) of RF Summing Amp. is called the EFM signal (eye pattern). It is sent to the non-inverting input of the EFM Comparator. On the other hand, to the inverting input of the EFM Comparator, the Auto Asymmetry Control Amp. output is applied. This Amp. determines the slice level of the EFM signal and the binary-coded EFM signal is output from the EFM Comparator. The binary-coded EFM signal is sent to U106 (Digital Signal Processor) for EFM demodulation.

## (3) Tracking Servo

Fig. 8.1.5 shows the tracking servo circuit.

The current inputs E and F from photodiodes E and F in the laser pickup are converted into voltages by the E I-V Amp. and F I-V Amp. in U101. Then both voltages are differential-

ly-amplified by the Tracking Error Amp. If the output of Tracking Error Amp. is not 0 V, i.e., both current inputs E and F are not the same and the tracking error exists, the tracking error is amplified by the Tracking Amp. in U102 (Servo Signal Processor) and the tracking coil is driven via the tracking coil driver so that the tracking error is zero.

## (4) Feed Servo

See Fig. 8.1.5. Feed servo rotates the feed motor to move the laser pickup. Forward or Reverse kick (fast feed) is done by switching ON TM5 or TM6 in U102 (Servo Signal Processor). In playback mode, object lens moves following the track. As the object lens approaches its movable limit, the DC component in the tracking error signal increases. The DC component is charged to the capacitor connected to pin 13 of U102 and feed motor is driven so that DC component becomes 0 V.

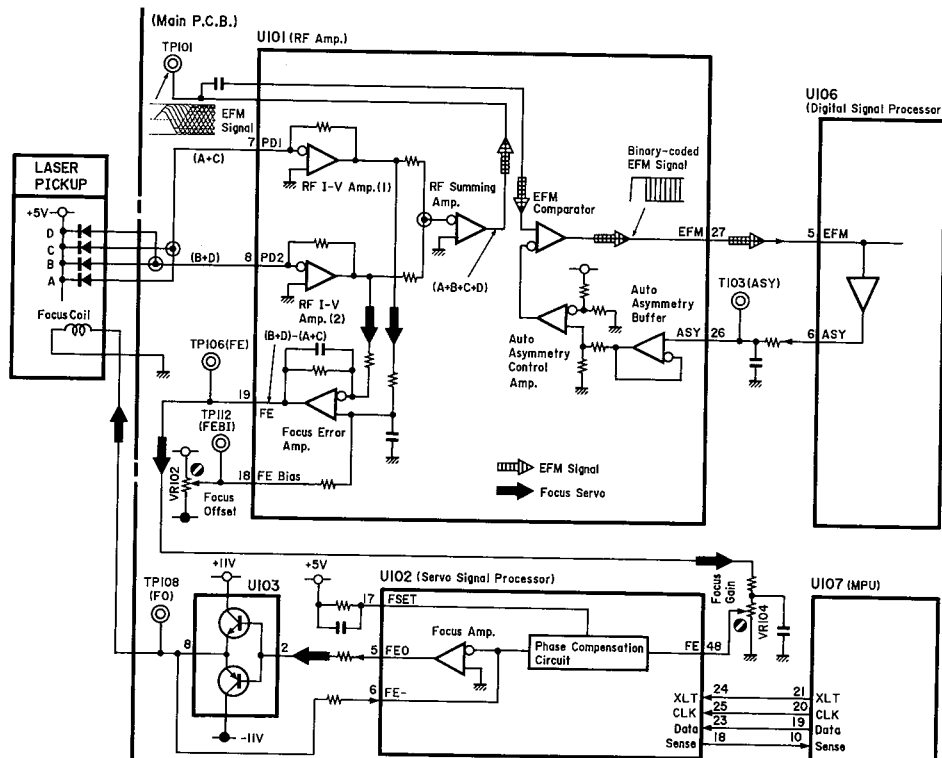


Fig. 8.1.2 Focus Servo & Binary-coded EFM Signal Generation Circuit

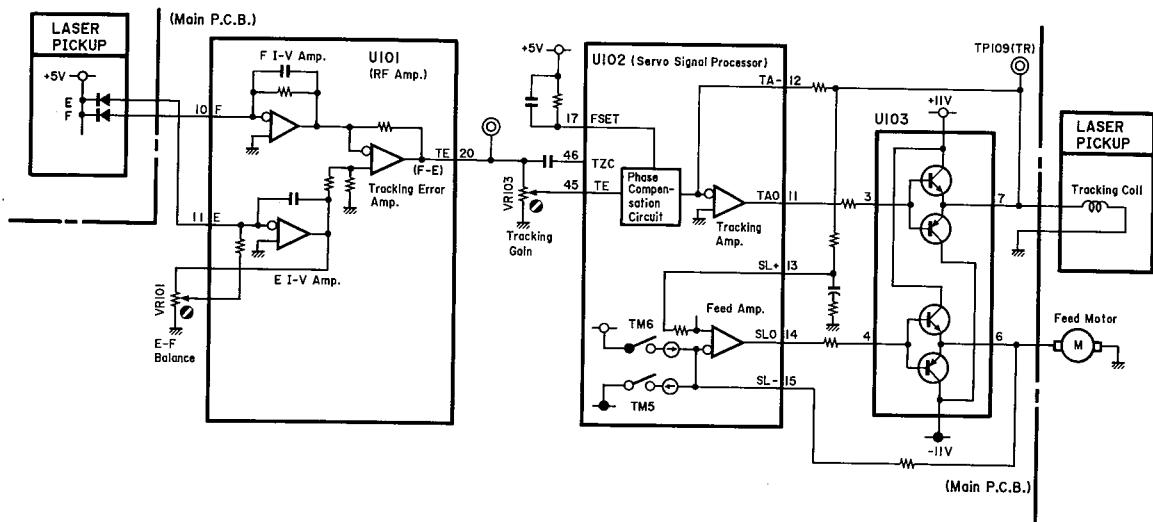


Fig. 8.1.5 Tracking Servo and Feed Servo Circuit

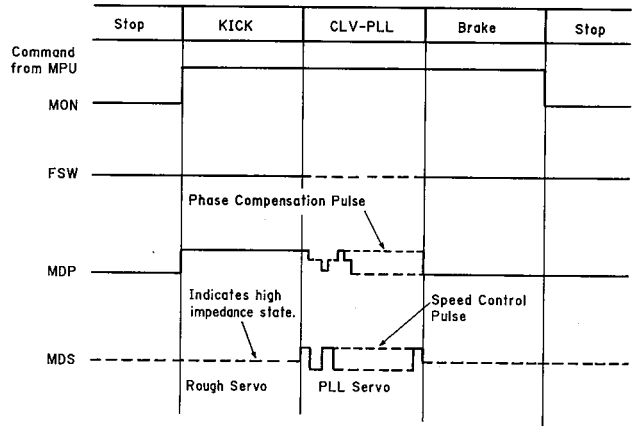
### (5) Disc Motor Servo

**Fig. 8.1.6 shows the disc motor servo circuit.**

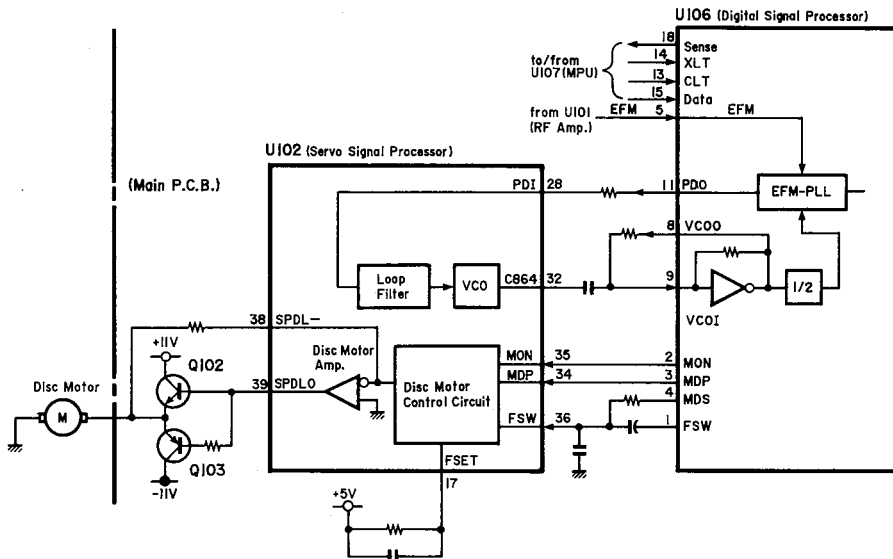
The disc motor (spindle motor) turns the compact disc. The disc motor is controlled by the MON and MDP signals sent from U106 (Digital Signal Processor). The MON signal controls ON/OFF of the disc motor. While the MDP signal is used during rough servo and PLL servo. Fig. 8.1.7 shows an example of disc motor control by the MPU. First, rough servo is used to turn ON the disc motor. Next, PLL-controlled CLV servo is used to obtain constant linear velocity. When the disc motor stops, the Brake command is issued from the MPU and the disc motor turns in the reverse direction.

PLL circuit composed of phase comparator (EFM-PLL in U106), loop filter and VCO (Voltage-controlled Oscillator) in U102. The binary-coded EFM signal sent from U101 (RF Amp.) enters to EFM-PLL block in U106. The EFM-PLL block extracts the 2.16 MHz clock component contained in the EFM signal and produces 4.32 MHz bit clock. The PLL circuit controls the VCO frequency so that it is fixed to double (8.64 MHz) of the bit clock.

The VCO output is halved in U106 and compared with the bit clock. If both do not coincide, correction pulses are output from pin 11 (PDO). Pulses are converted into DC voltage by the loop filter and fed back to the VCO. Thus, the VCO frequency locks to the bit clock obtained from the EFM signal.



**Fig. 8.1.7 Disc Motor Control Motor Sequence (Example)**



**Fig. 8.1.6 Disc Motor Servo Circuit**

#### (6) EFM Demodulation

See Fig. 8.1.8. The binary-coded EFM signal is input to the 23-bit shift register through EFM-PLL block in U106 (Digital Signal Processor).

The necessary 14-bit data is fetched from this shift register and fourteen-to-eight demodulation is carried out. The demodulated 8-bit data is stored in U105 (S-RAM). After de-interleave processing and error correcting, reproduced audio data is output to U110 (Digital Filter) together with C2PO (2.1168 MHz clock), LRCK (signal to distinguish L and R channels), and C2PO (C2 pointer, error flag which requires interpolation). Fig. 8.1.9 shows the timing chart of each signal.

Demodulated subcode data is output to the MPU together with SQCK (clock pulse), SCOR (subcode sync signal), and CRCF (cyclic redundancy code (CRC) check result of the subcode Q data). Fig. 8.1.10 shows the subcode Q data transmission timing.

#### (7) Digital Filtering and D/A Conversion

U110 (Digital Filter) digitally-filters the audio data sent from U106 (Digital Signal Processor). U110 has 83-order + 21-order FIR filters independently for L and R channels and performs 4-time over-sampling.

If error flag is ON in the C2PO signal, U110 performs interpolation of data. U110 outputs digitally-filtered audio data to U201 (D/A Converter) together with BCK and LRCK (signal to distinguish L and R channels). See Fig. 8.1.9.

The audio data sent from U110 (Digital Filter) is converted into analog signal and is output to the filter and amp. circuit to be the audio signal.

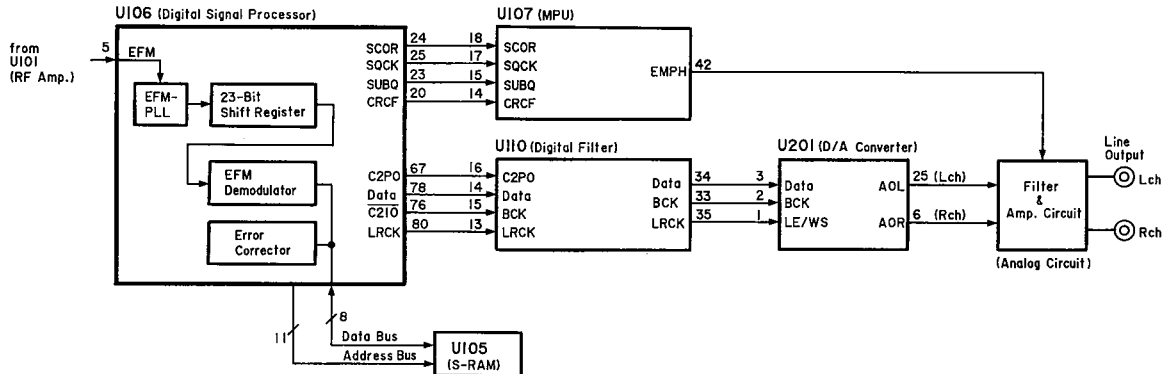


Fig. 8.1.8 EFM Demodulation, Digital Filtering and D/A Conversion Circuit

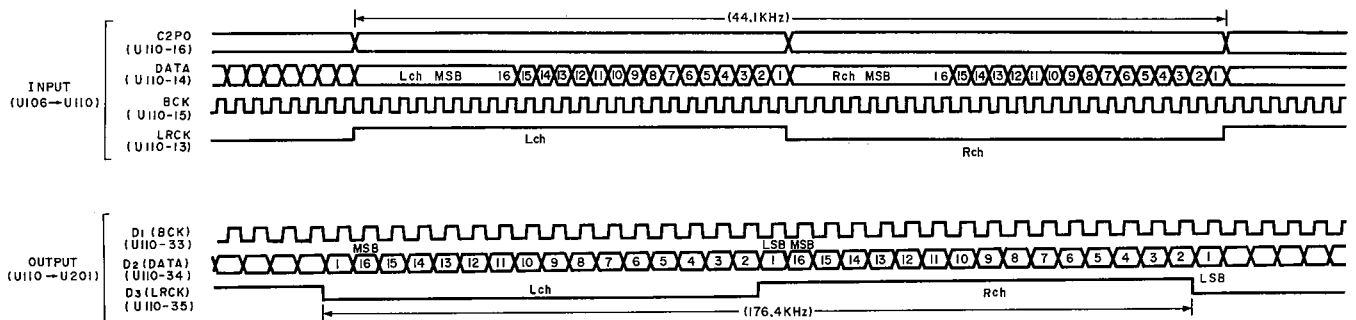
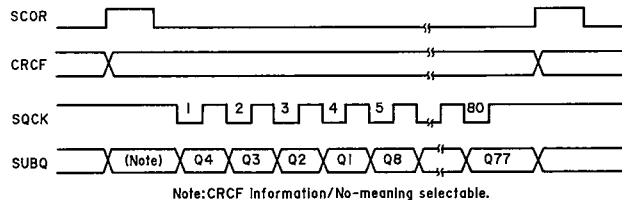


Fig. 8.1.9 Audio Data Transmission Timing (From U106 to U110/U110 to U201)



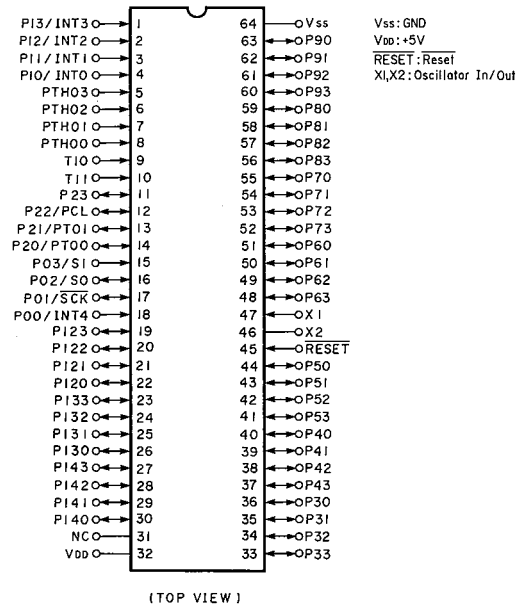
Note: CRCF Information/No-meaning selectable.

Fig. 8.1.10 Subcode Q data Transmission Timing



Pin No.	Signal Name	I/O	Function
1	D-STA	I	Inner switch is connected. Becomes "L" when Inner switch is ON, i.e., when the laser pickup reached the inner position.
2	D-Open	I	Disc Tray Open switch is connected.
3	DCLS	I	Disc Tray Close switch is connected.
4	Eject	I	Eject/Load switch is connected. Becomes "H" when the Eject/Load switch is pressed.
5 to 9	RD0 to RD4	I	Instruction input from the Remote Control Unit via U108 (Remote Control Instruction Decoder).
10	Sense	I	Sense input from U102 (Servo Signal Processor) or U106 (Digital Signal Processor). Signal meaning varies with the command sent from this IC (MPU). However, it is the answer to the command issued.
11	IR	I	Input from U108 (Remote Control Instruction Decoder).
12	FOK	I	Focus OK signal from U101 (RF Amp.).
13	RD6	I	Input from U108 (Remote Control Instruction Decoder).
14	CRCF	I	Input from U106 (Digital Signal Processor). This signal shows the cyclic redundancy code (CRC) check result of subcode Q in U106. Check result OK: "H", NG: "L" (See Fig. 8.1.10.)
15	SUBQ	I	Subcode Q data input from U106. (See Fig. 8.1.10.)
16	—	—	Not used.
17	SQCK	I	Clock for reading the subcode Q data. (See Fig. 8.1.10.)
18	SCOR	I	Subcode sync (S0 + S1) input. This IC (MPU) starts to read subcode Q information (SUBQ & CRCF) synchronizing with SQCK. (See Fig. 8.1.10.)
19	Data	O	An 8-bit serial output to U102 (Servo Signal Processor) and U106 (Digital Signal Processor). Command is output from this pin. (See Fig. 8.1.3.)
20	CLK	O	Clock for Data at pin 19. (See Fig. 8.1.3.)
21	XLT	O	"L" pulse is output when 8-bit data is sent. This pulse is used to latch the 8-bit data. (See Fig. 8.1.3.)
22	—	—	Not used.
23 to 26	KIB0 to KIB3	I	Input from the key matrix (switches on the Front Panel).
27 to 31	—	—	Not used.
32	VDD	I	+5 V is supplied.
33	—	—	Not used.
34	—	—	Not used.
35	LD ON	O	Laser diode ON signal. Becomes "L" while reading read-in area of the compact disc after loading or when CDP-2 is set in Play or Pause mode.

Pin No.	Signal Name	I/O	Function
36	IROK	O	System remote enable signal output.
37 to 40	T0 to T3	O	Output to the key matrix (switches on the Front Panel) and indicator control transistors.
41	MUTG	O	Mute control output. Active "L".
42	EMPH	O	De-emphasis control output. This IC (MPU) knows emphasis ON/OFF condition of the compact disc through subcode Q information and controls de-emphasis control circuit in the output stage accordingly.
43	D-OSG	O	Loading motor control output.
44	D-CSG	O	
45	Reset	I	Reset input. Active "L".
46	X2	—	4 MHz oscillator is connected.
47	X1	—	
48 to 55	Aa to Ah	O	Indication control output for the track number indicator, mode indicators and button LEDs.
56 to 63	Ba to Bh	O	Indication control output for the time counter.
64	GND	—	Grounded.

Fig. 8.1.11 MPU  $\mu$ PD75108CW-239 (U107) (1/2)

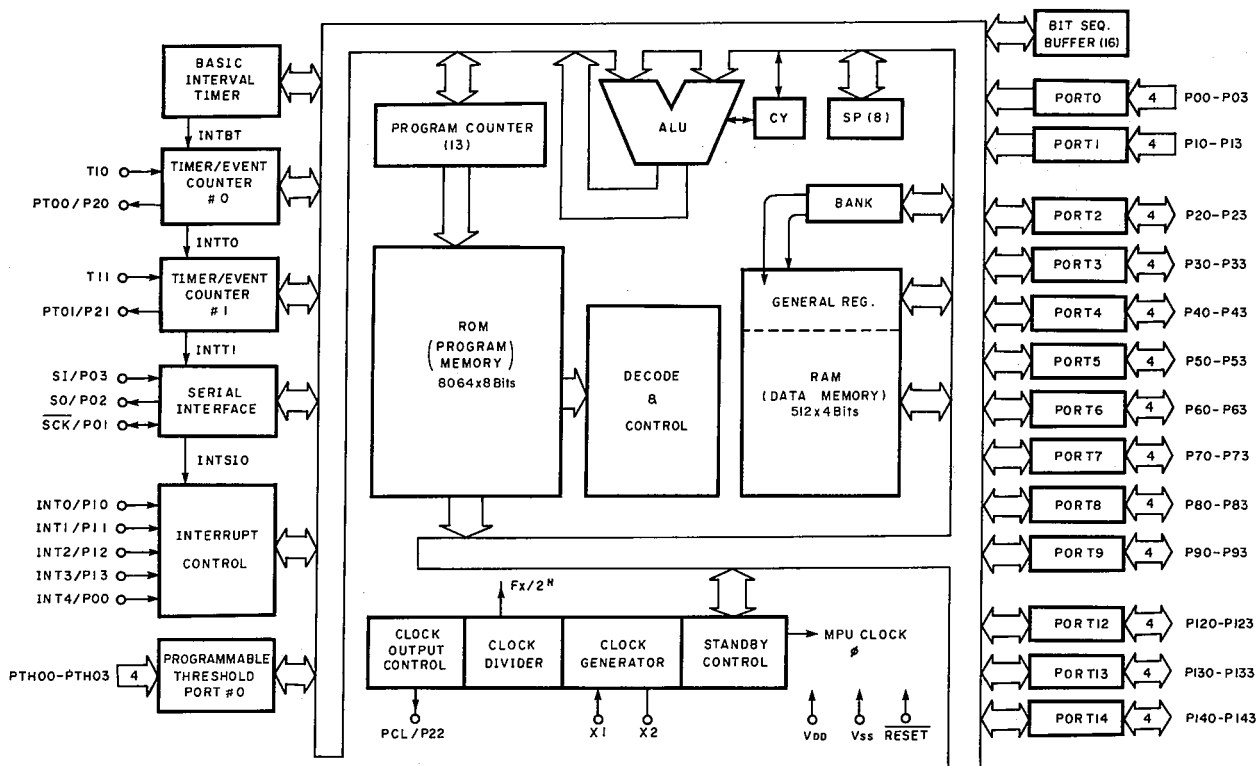


Fig. 8.1.11 MPU  $\mu$ PD75108CW-239 (U107) (2/2)

#### U101 CXA1081M (RF Amp.)

Pin No.	Signal Name	I/O	Function
1	RFI	I	EFM signal is input form the RF summing amp. through a capacitor.
2	RFO	O	EFM signal (eye pattern) output. It is output from the RF summing amp.
3	RF--	I	Feedback input to the RF summing amp.
4	P/N	I	Open. Input condition depends on the kind of laser diode to be used.
5	LD	O	Output from the APC LD (Auto Power Control for Laser Diode) amp.
6	PD	I	Input to the APC PD (Photodiode) amp.
7	PD1	I	Current input (B + D) from the photodiodes B and D of the laser pickup.
8	PD2	I	Current input (A + C) from the photodiodes A and C of the laser pickup.
9	VC	—	Grounded.
10	F	I	Current input (F) from the photodiode F of the laser pickup.
11	E	I	Current input (E) from the photodiode E of the laser pickup.
12	EO	O	E I-V amp. output.
13	EI	I	Feedback input to E I-V amp.
14	VR	O	Output voltage = (VCC + VEE)/2 (Not used.)

Pin No.	Signal Name	I/O	Function
15	CC2	I	Defect bottom hold signal input through a capacitor.
16	CC1	O	Defect bottom hold signal output.
17	VEE	I	—5 V is supplied.
18	FE Bias	I	Offset adjusting input of the focus error amp.
19	FE	O	Focus error amp. output.
20	TE	O	Tracking error amp. output.
21	DEFECT	O	Defect comparator output.
22	MIRR	O	Mirror comparator output.
23	CP	I	Mirror hold capacitor connecting pin.
24	CB	I	Defect bottom hold capacitor connecting pin.
25	DGND	—	Grounded.
26	ASY	I	EFM signal slice level control input from U106 (Digital Signal Processor).
27	EFM	O	Binary-coded EFM signal output.
28	FOK	O	Focus OK signal output.
29	LD ON	I	Laser diode ON/OFF input. Active "L".
30	VCC	I	+5 V is supplied.

**U102 CXA1082AQ (Servo Signal Processor)**

Pin No.	Signal Name	I/O	Function
1	VC	—	Grounded.
2	FGD	I	Reduces focus servo gain at high frequency. Capacitor is connected between this pin and pin 3.
3	FS3	O	Selects focus servo gain at high frequency by turning ON or OFF this pin.
4	FLB	I	Capacitor connecting pin for increasing the focus servo gain at low frequency.
5	FEO	O	Focus amp. output.
6	FE—	I	Feedback input to the focus amp.
7	SRCH	I	Capacitor connecting pin for producing focus search waveform.
8	TGU	I	Capacitor connecting pins for changing over the tracking gain at high frequency.
9	TG2	O	
10	AVCC	I	+5 V is supplied.
11	TAO	O	Tracking amp. output.
12	TA—	I	Feedback input to the tracking amp.
13	SL+	I	Non-inverting input of the feed motor amp.
14	SLO	O	Feed motor amp. output.
15	SL—	I	Inverting input of the feed motor amp.
16	SSTOP	I	(Not used.)
17	FSET	I	Input to determine the peak value for tracking/focus phase compensation, and fc of CLV LPF (Constant Linear Velocity Low Pass Filter).
18	Sense	O	Sense output to U107 (MPU). Signal meaning varies with the command sent from U107 (MPU). However, it is the answer to the command received. Example: Outputs FZC (Focus Zero Cross: in focus condition) for focus search command.
19	AVEE	I	—5 V is supplied.
20	C.OUT	O	Tracking pulse output.
21	DIRC	I	One-track jump direct control input. (Not used.)
22	XRST	I	Reset input. Active "L".
23	Data	I	8-bit serial data is input from U107 (MPU). (See Fig. 8.1.3.)
24	XLT	I	"L" pulse is input from U107 (MPU). This pulse is used to latch the 8-bit data at pin 15 (Data). (See Fig. 8.1.3.)
25	CLK	I	Clocks for reading Data (pin 23). (See Fig. 8.1.3.)
26	DGND	—	Grounded.
27	BW	I	Input to determine the time-constant of the loop filter.
28	PDI	I	Phase difference compensation signal is input in order to match the VCO frequency with the EFM signal frequency.
29	ISET	I	Input to determine the amount of current on focus search, track jump and feed kick.

Pin No.	Signal Name	I/O	Function
30	VCOF	I	VCO frequency adjusting input.
31	3.5V	O	Regulated +3.5 V is output.
32	C864	O	VCO frequency (8.64 MHz) is output.
33	LOCK	I	Input to prevent reckless run of the feed motor.
34	MDP	I	Disc motor drive input. Speed control pulse is input while in rough servo or PLL servo mode. (See Fig. 8.1.7.)
35	MON	I	Disc motor ON/OFF control input. (See Fig. 8.1.7.)
36	FSW	I	Input to determine the time-constant of the CLV LPF.
37	DVCC	I	+5 V is supplied.
38	SPDL—	I	Non-inverting input to the disc motor amp.
39	SPDLO	O	Disc motor amp. output.
40	WDCK	I	Strobe signal input from U106 (Digital Signal Processor). (88.2 kHz)
41	FOK	I	Focus OK signal input.
42	MIRR	I	Input from the mirror comparator in U101 (RF amp.)
43	DVEE	I	—5 V is supplied.
44	DRCT	I	Input from defect comparator in U101 (RF amp.).
45	TE	I	Tracking error signal input.
46	TZC	I	Input to the tracking zero cross comparator.
47	ATSC	—	Grounded. (Not used.)
48	FE	I	Focus error signal input.

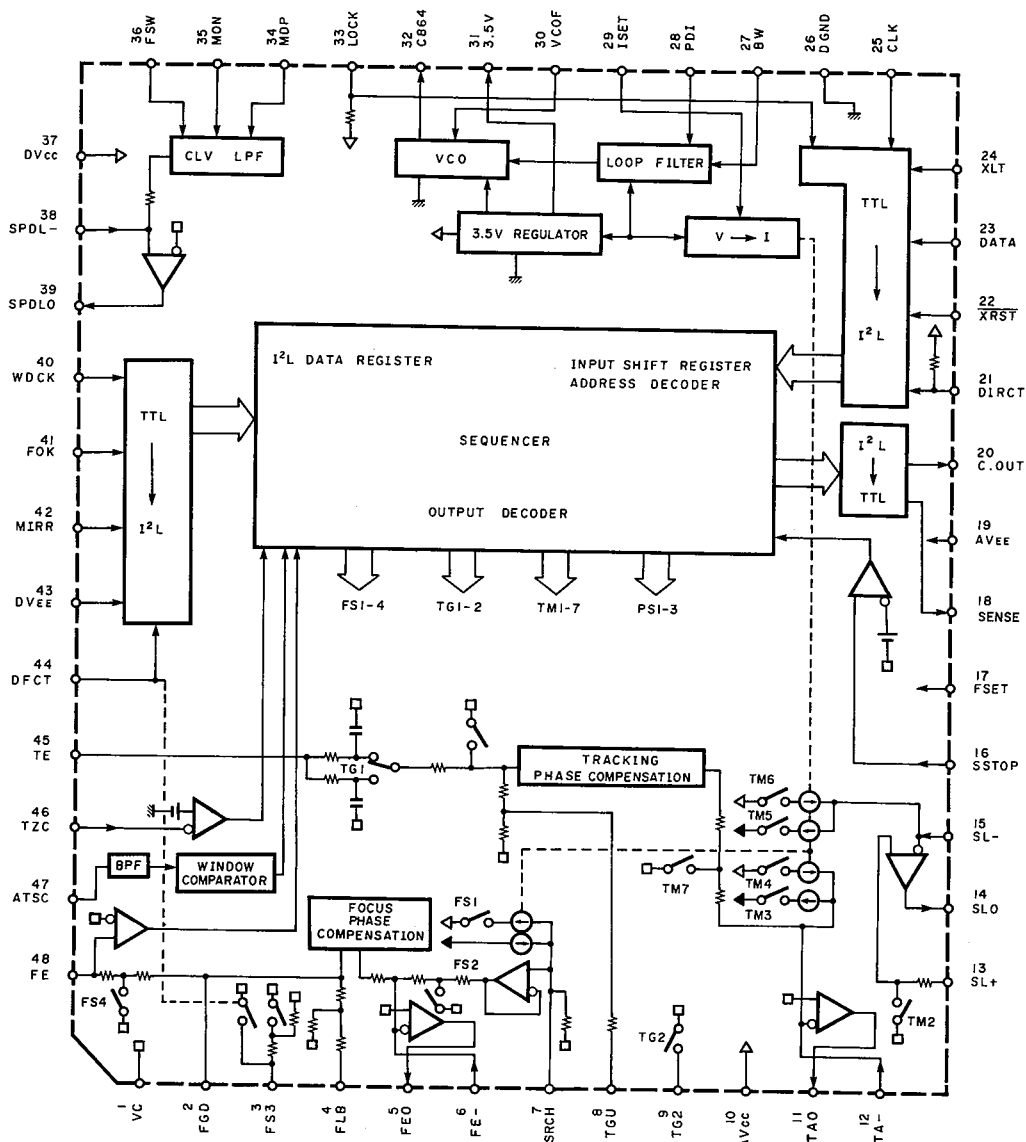


Fig. 8.1.12 Servo Signal Processor CXA1082AQ (U102)

**U106 CXD1135Q (Digital Signal Processor)**

Pin No.	Signal Name	I/O	Function
1	FSW	O	Output to change over the time-constant of the CLV LPF in U102 (Servo Signal Processor). (See Fig. 8.1.7.)
2	MON	O	Disc motor ON/OFF control output. (See Fig. 8.1.7.)
3	MDP	O	Disc motor drive output. Outputs a speed control pulse while in rough servo or PLL servo mode. (See Fig. 8.1.7.)
4	MDS	O	Disc motor drive output. Outputs a speed control pulse while in PLL servo mode. (See Fig. 8.1.7.)
5	EFM	I	Binary-coded EFM signal input from U101 (RF Amp.).
6	ASY	O	Output to control the slice level of the EFM signal.
7	LOCK	O	Output to prevent reckless run of the feed motor.
8	VCOO	O	VCO output. Frequency is 8.6436 MHz when locked to the clock extracted from the EFM signal.
9	VCOI	I	VCO input.
10	Test	I	Grounded. (Not used.)
11	PDO	O	Phase difference compensation signal between the clock extracted from the EFM signal and VCO/2.
12	VSS	—	Grounded.
13	CLK	I	Clocks for reading Data (pin 15). (See Fig. 8.1.3.)
14	XLT	I	"L" pulse is input from U107 (MPU). This pulse is used to latch the 8-bit data at pin 15 (Data). (See Fig. 8.1.3.)
15	Data	I	8-bit serial data is input from U107 (MPU). (See Fig. 8.1.3.)
16	$\overline{\text{XRST}}$	I	Reset input. Active "L".
17	CNIN	I	Tracking pulse is input from U102 (Servo Signal Processor).
18	Sense	O	Sense output to U107 (MPU). Signal meaning varies with the command sent from U107 (MPU). However, it is the answer to the command received. Example: Informs of track-jump completion by the specified amount.
19	MUTG	I	Muting input. By combining MUTG signal with the attenuation command send from U107 (MPU), muting is performed.
20	CRCF	O	Output of CRC check result of subcode Q data.
21	EXCK	I	Clock input to read SBSO. (Not used.)
22	SBSO	O	Subcode data serial output. (Not used.)
23	SUBQ	O	Subcode Q data output.
24	SCOR	O	Subcode sync (S0 + S1) output.
25	SQCK	O	Clock for subcode Q data.

Pin No.	Signal Name	I/O	Function
26	SQEX	I	Fixed to "H".
27	DOTX	O	Digital output. (Not used.)
28	GFS	O	Indicates frame sync lock condition.
29 to 32	DB08 to DB05	I/O	Data bus between U105 (Static RAM). (DB08: MSB)
33	VDD	I	+5 V is supplied.
34 to 37	DB04 to DB01	I/O	Data bus between U105 (S-RAM). (DB1: LSB)
38 to 48	RA01 to RA11	O	Address bus to U105 (S-RAM). (RA01: LSB, RA11: MSB)
49	$\overline{\text{RAW}}\text{E}$	O	Write enable signal to U105 (S-RAM). Active "L".
50	$\overline{\text{RACS}}$	O	Chip select signal to U105 (S-RAM). Active "L".
51	C4M	O	Frequency (4.2336 MHz) output. Produced by dividing X'tal frequency. (Not used.)
52	VSS	—	Grounded.
53	XTAI	I	X'tal oscillating frequency input. f=16.9344 MHz
54	XTAO	O	X'tal oscillating frequency output. (Not used.)
55 to 57	MD1 to MD3	I	Mode select input. (MD1="L", MD2=MD3="H") • Digital output OFF • Internal digital filter is not used.
58	SLOB	I	Audio data code change-over input. Fixed to "L". 2's complement is selected.
59	PSSL	I	Audio data format change-over input. Fixed to "L". Serial output is selected.
60	APTR	O	Aparture compensation control output. "H" for R channel. (Not used.)
61	APTL	O	Aparture compensation control output. "H" for L channel. (Not used.)
62 to 66	DA01 to DA05	O	(Not used.)
67	C2PO	O	C2PO error flag output. C2PO: C2 pointer which is generated on C2 correction. (See Fig. 8.1.9.)
68 to 69	DA07 to DA08	O	(Not used.)
70	$\overline{\text{PLCK}}$	O	One-half frequency of VCO is output.
71 to 72	DA10 to DA11	O	(Not used.)
73	VDD	I	+5 V is supplied.
74 to 75	DA12 to DA13	O	(Not used.)
76	$\overline{\text{C2IO}}$	O	Inversed output of the internal system clock (2.1168 MHz). (See Fig. 8.1.9.)

Pin No.	Signal Name	I/O	Function
77	DA15	O	(Not used.)
78	Data	O	Demodulated serial audio data output. (See Fig. 8.1.9.)
79	WDCK	O	Strobe signal output to U102 (Servo Signal Processor). (88.2 kHz)
80	LRCK	O	Signal to distinguish L channel and R channel is output to U110 (Digital Filter). (44.1 kHz) (See Fig. 8.1.9.)

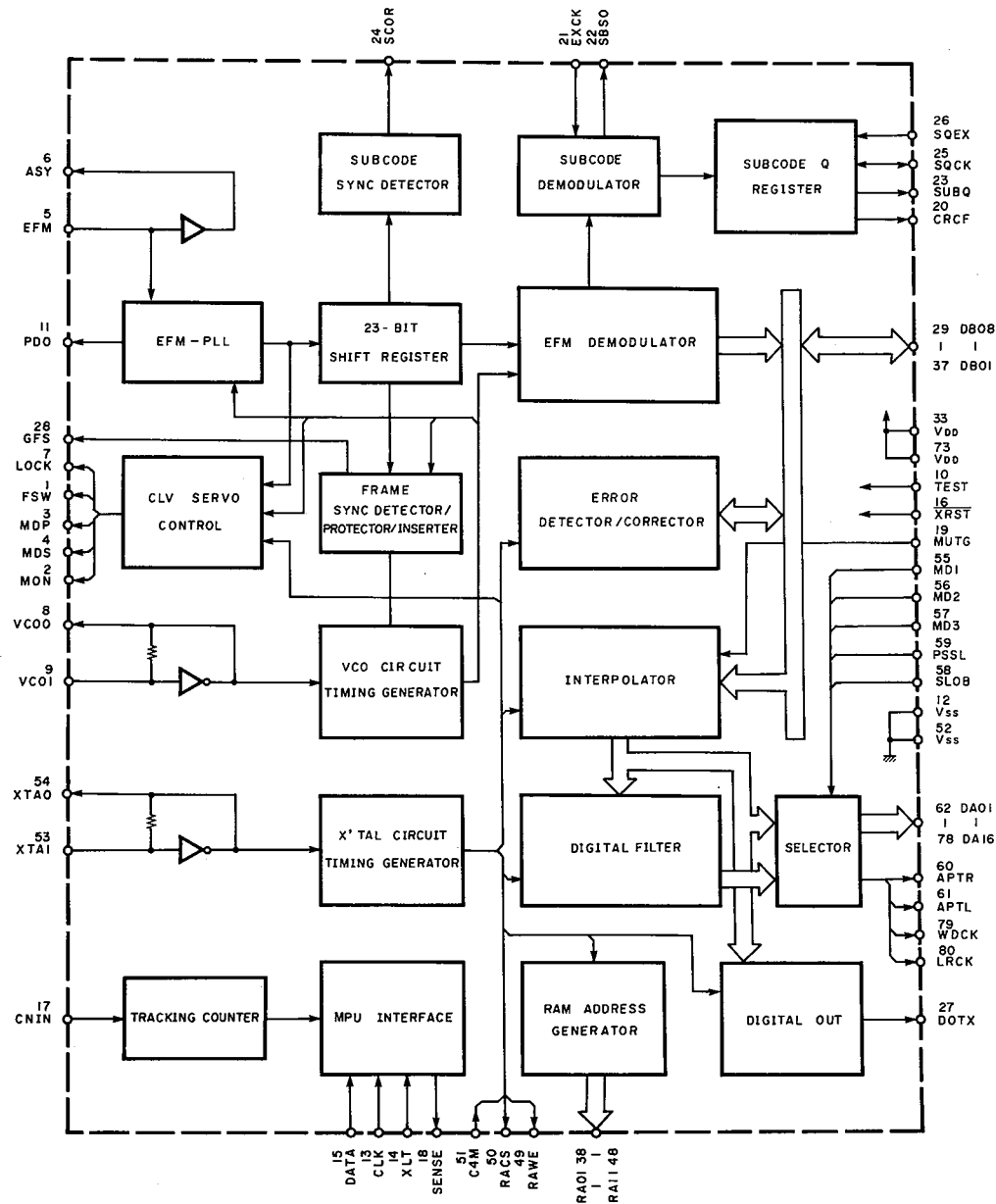


Fig. 8.1.13 Digital Signal Processor CXD1135Q (U106)

U110 CXD1088Q (Digital Filter)

Pin No.	Signal Name	I/O	Function
1 to 5	D12 to D16	O	Parallel data output. (Not used.)
6	VSS	—	Grounded.
7	MUTE	I	Muting input. Fixed to "L". (Not used.)
8	Test1	I	(Not used.)
9	SOFT	I	Soft muting ON/OFF input. Active "H".
10	Hold	I	Muting control input. Fixed to "L". (Not used.)
11	INIT	I	Initialization (reset) input. Active "L".
12	DPOL	I	Grounded. (Not used.)
13	LRCK	I	Input signal to distinguish L channel and R channel. (44.1 kHz) (See Fig. 8.1.9.)
14	Data	I	Serial audio data input. Data: 2's complement (See Fig. 8.1.9.)
15	BCK	I	Clock for reading Data (pin 14). (See Fig. 8.1.9.)
16	C2PO	I	Error flag input. C2 pointer is input. (See Fig. 8.1.9.)
17	VDD	I	+5 V is supplied.
18	Test2	I	Grounded. (Not used.)
19	ROM1	I	Fixed to "H". (1st filter (83-order) characteristics select input.)
20	ROM2	I	Fixed to "L". (2nd filter (21-order) characteristics select input.)
21	OFST	I	Fixed to "H". Offset value specified by OPOL (pin 22) is added to the output data.

Pin No.	Signal Name	I/O	Function
22	OPOL	I	Fixed to "H". Offset value to be added to the output data is set to +1%.
23	DRES	I	Fixed to "L". Serial output data length is set to 16-bit.
24	FORM	I	Fixed to "H". Serial output data format is set to I <sup>2</sup> S.
25	SCK	O	System clock output. (16.9344 MHz)
26	XOUT	O	X'tal (16.9344 MHz) is connected.
27	XIN	I	
28	VSS	—	(Not used.)
29	APTR	O	
30	APTL	O	
31	SP	I	Fixed to "L". Data is output in the form of serial data.
32	LRO	O	(Not used.)
33	BCK	O	Clock for digitally-filtered serial output data. (See Fig. 8.1.9.)
34	Data	O	Digitally filtered serial output data. (See Fig. 8.1.9.)
35	LRCK	O	Signal to distinguish L channel and R channel is output to U201 (D/A Converter). (176.4 kHz) (See Fig. 8.1.9.)
36 to 38	D4 to D6	O	Parallel data output. (Not used.)
39	VDD	I	+5 V is supplied.
40 to 44	D7 to D11	O	Parallel data output. (Not used.)

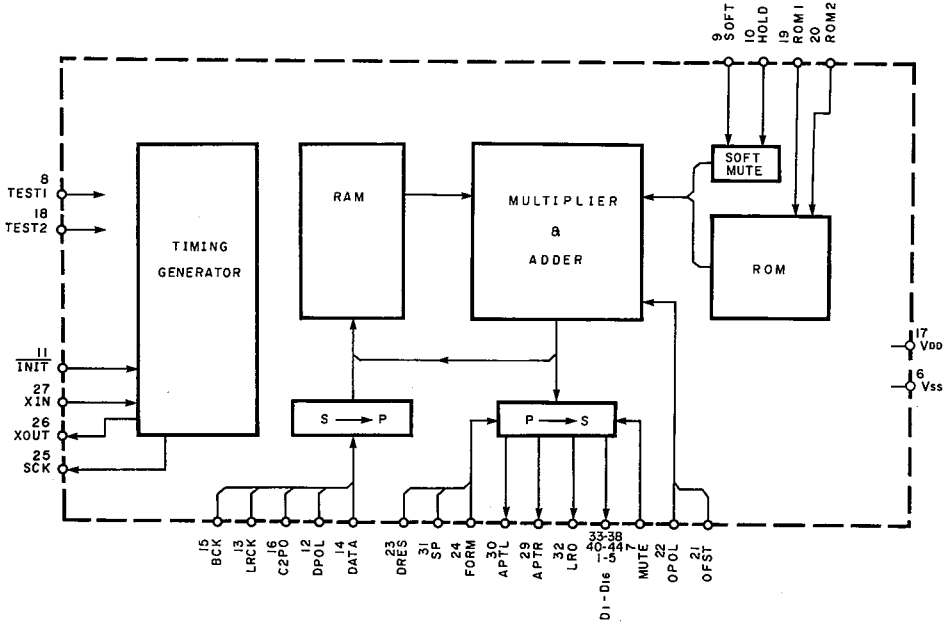


Fig. 8.1.14 Digital Filter CXD1088Q (U110)

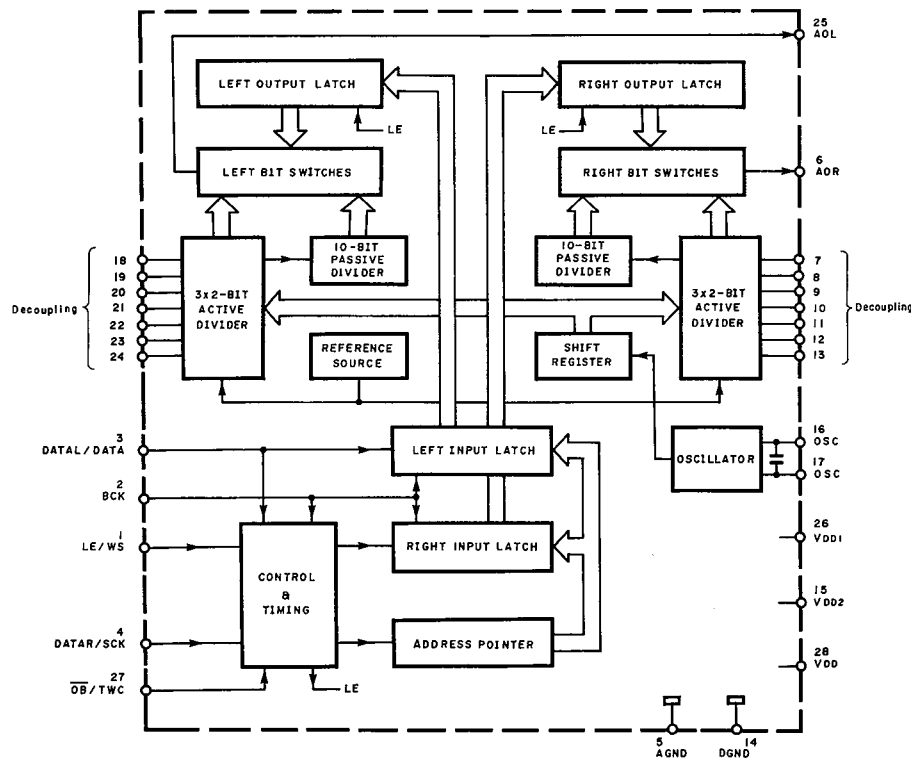


Fig. 8.1.15 D/A Converter TDA1541 (U201)

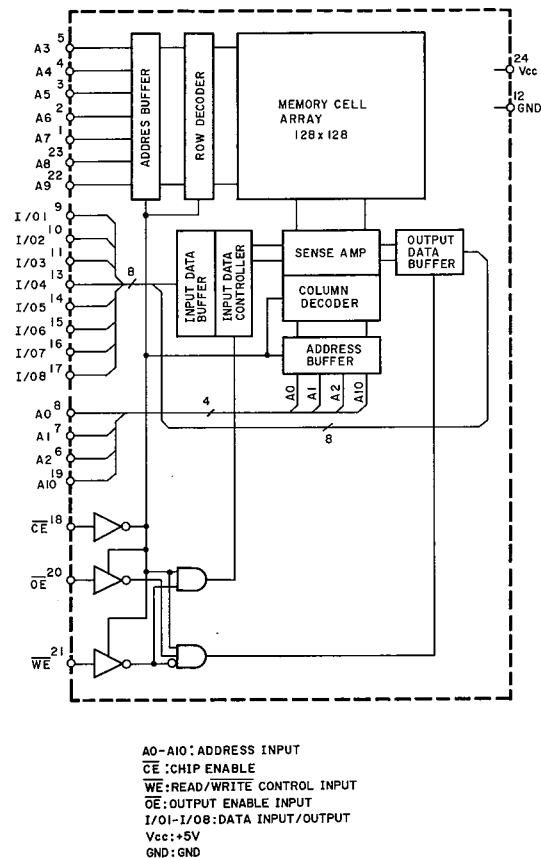


Fig. 8.1.16 Static RAM LC3517BML-15 (U105)

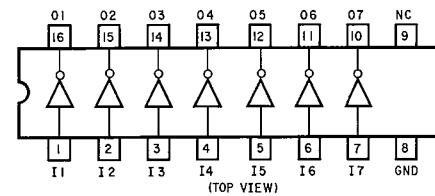


Fig. 8.1.18 LED Driver μPA81C

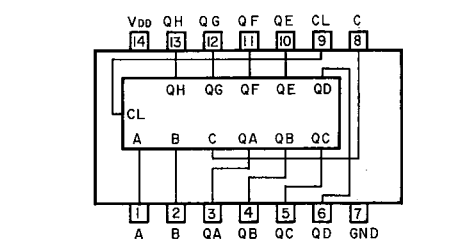


Fig. 8.1.19 3-to-8 Line Decoder TC74HC164P

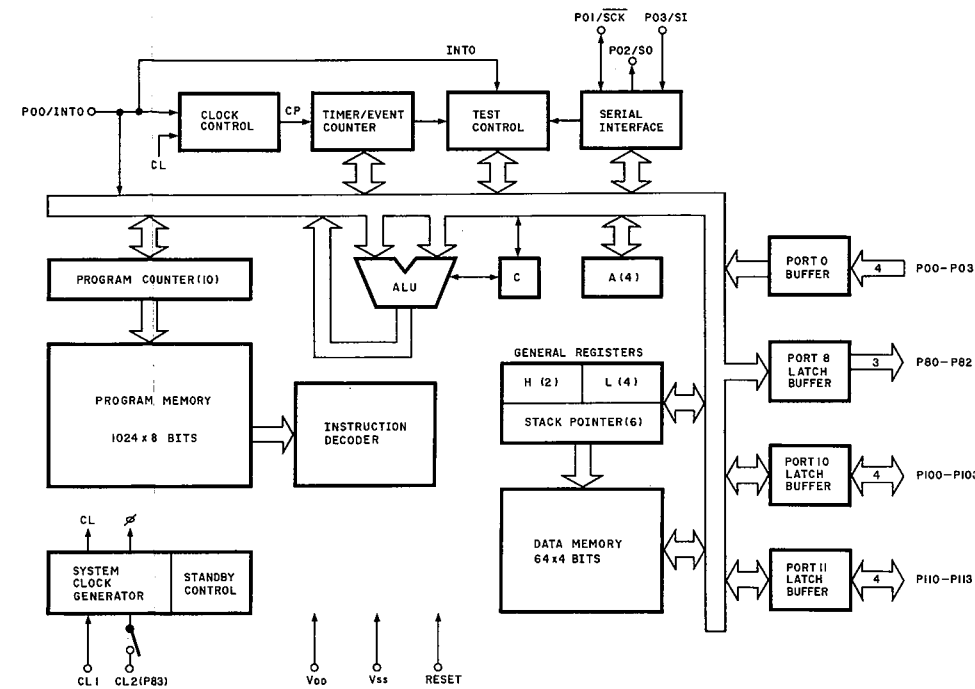
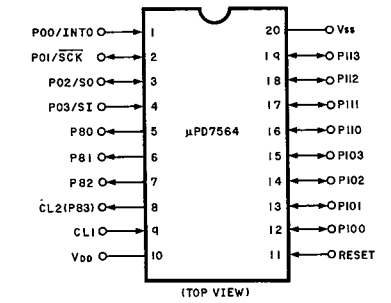


Fig. 8.1.17 Remote Control Instruction Decoder (MPU) μPD7564CS-092 (U108)



RESET : Reset  
 CL1, CL2 : Crystal Input  
 INT0 : Interrupt  
 SCK : Serial Data Clock  
 SO : Serial Data Output  
 SI : Serial Data Input  
 P00-03 : Input/Bidirectional Port  
 P80-83 : Output Port  
 P100-103, P110-113 : Bidirectional Ports

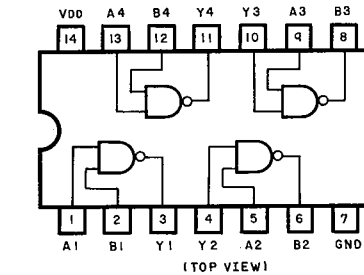


Fig. 8.1.20 NAND Gate μPD74HC00C

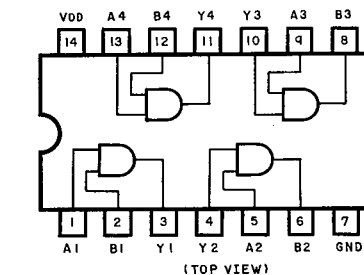


Fig. 8.1.21 AND Gate μPD74H08C

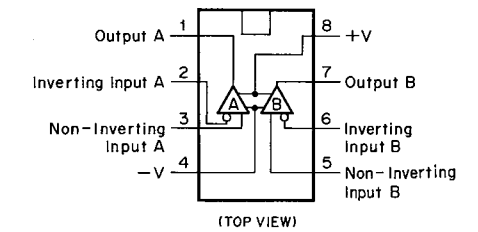


Fig. 8.1.22 Operational Amplifier μPC4558C, NE5532, M5218L

# 10. BLOCK DIAGRAM

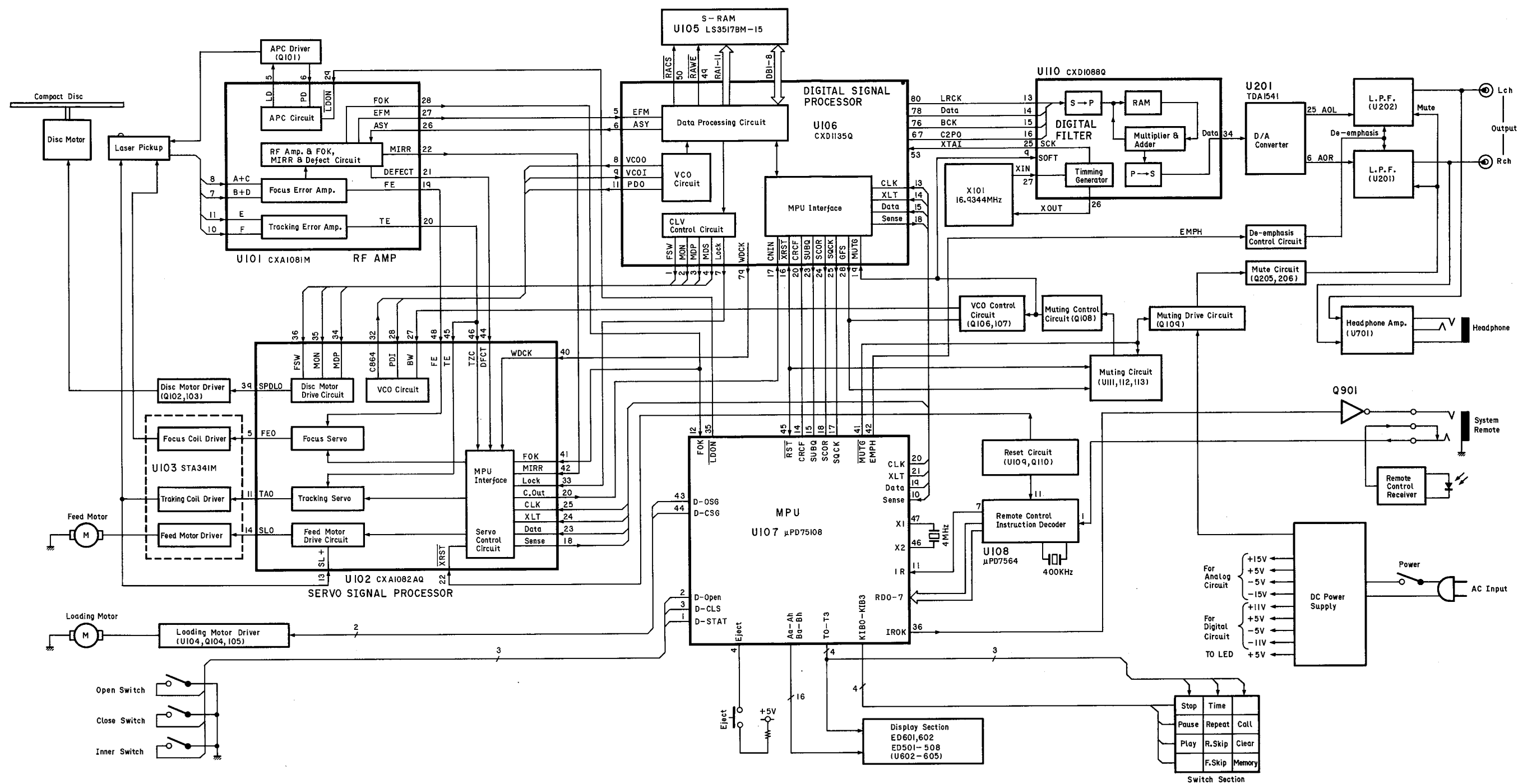


Fig. 10



11. TIMING CHART

Fig. 11.1 shows a timing chart for playing back a compact disc loaded.  
Fig. 11.2 shows an operational flowchart.

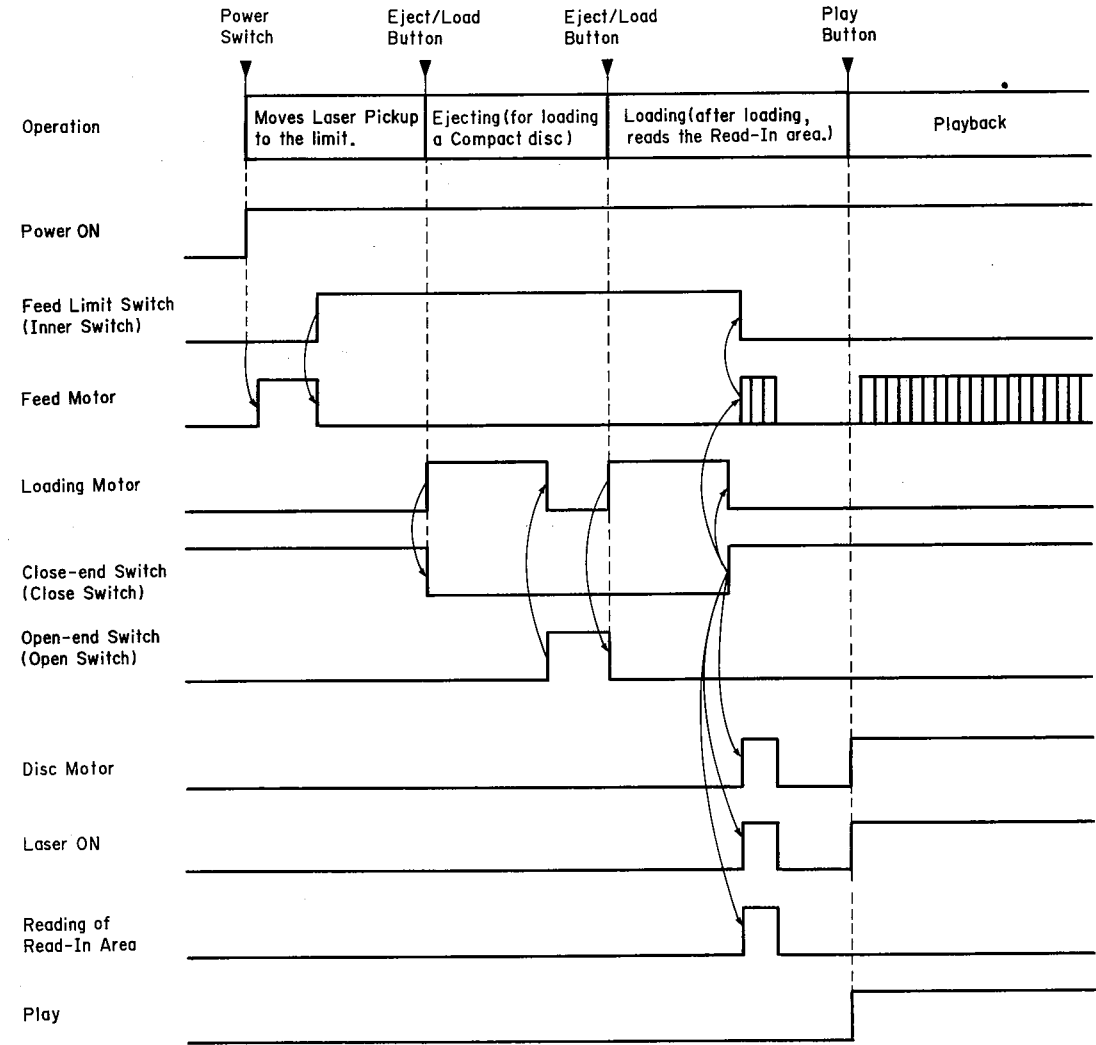


Fig. 11.1

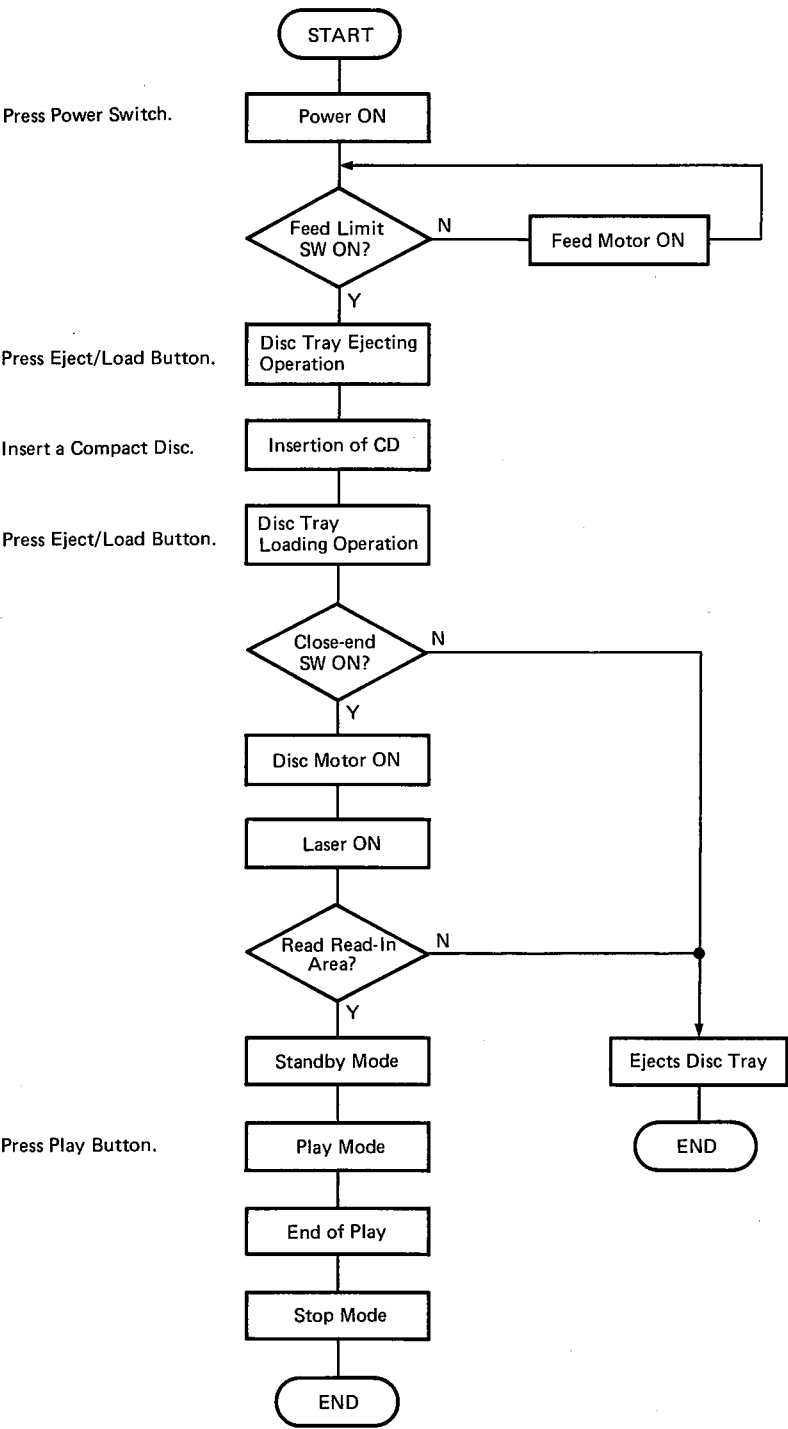


Fig. 11.2

## 12. SPECIFICATIONS

### Main Unit

System	Compact Disc digital audio
Signal Readout	Optical (semiconductor laser)
Error Correction	CIRC principle
Number of Channels	2 channels, stereo
Sampling Frequency	44.1 kHz
Quantization	16 bit linear
Disc Rotational Velocity	Approx. 200 to 500 rpm (constant linear velocity)
Wow and Flutter	Below measurement limit
Frequency Response	5—20,000 kHz $\pm 0.5$ dB
Signal to Noise Ratio (IHF A-WTD)	Better than 100 dB
Dynamic Range	Better than 96 dB
Total Harmonic Distortion (1 kHz)	0.0025%
Total Harmonic Distortion + Noise (1 kHz)	0.003%
Channel Separation	Better than 95 dB
Output (Line, 1 kHz, 0 dB)	2.5 V/600 $\Omega$
Power Requirements	120, 220, 240 or 110/127/220/240 V AC, 50/60 Hz (According to country of sale)
Power Consumption	24 W max.
Dimensions	430 (W) x 75 (H) x 322 (D) mm 16-15/16 (W) x 2-15/16 (H) x 12-11/16 (D) inches
Approximate Weight	5.1 kg, 11 lbs. 4 oz.

### Remote Control Unit (RM-2CDP)

Principle	Infrared pulse system
Power Supply	3 V DC (1.5 V x 2)
Dimensions	63 (W) x 18 (H) x 135 (D) mm 2-1/2 (W) x 11/16 (H) x 5-5/16 (D) inches
Approximate Weight	100 g, 3-1/2 oz (including batteries)

- Specifications and design are subject to change for further improvement without notice.

# Service Manual

# Nakamichi

# CDP-2, CDP-2A, CDP-2E, OMS-20

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