


# ONKYO® SERVICE MANUAL

## COMPACT DISC PLAYER MODEL DX-3500

### Black model

BUDN, BUD	120V AC, 60 Hz
BUG	220V AC, 50Hz
BUU	110/120/220/240V AC, 50/60Hz
BUQA	240V AC, 50 Hz

### SAFETY-RELATED COMPONENT WARNING!!

COMPONENTS IDENTIFIED BY MARK  ON THE SCHEMATIC DIAGRAM AND IN THE PARTS LIST ARE CRITICAL FOR RISK OF FIRE AND ELECTRIC SHOCK. REPLACE THESE COMPONENTS WITH ONKYO PARTS WHOSE PARTS NUMBERS APPEAR AS SHOWN IN THIS MANUAL.

MAKE LEAKAGE-CURRENT OR RESISTANCE MEASUREMENTS TO DETERMINE THAT EXPOSED PARTS ARE ACCEPTABLY INSULATED FROM THE SUPPLY CIRCUIT BEFORE RETURNING THE APPLIANCE TO THE CUSTOMER.

### SPECIFICATIONS

Signal readout system:	Optical non-contact
Reading rotation:	About 500~200 r.p.m. (constant linear velocity)
Linear velocity:	1.2~1.4m/s
Error correction system:	Cross interleave readsolomon code
Decoded bits:	16 bits linear
Sampling frequency:	352.8kHz (8 times oversampling)
Number of channels:	2 (Stereo)
Frequency response:	2Hz~20kHz
Total harmonic distortion:	0.003% (at 1kHz)
Dynamic range:	96dB
Signal to noise ratio:	100dB
Channel separation:	96dB (at 1kHz)
Wow and Flutter:	Below threshold of measurability
Power consumption:	16 watts
Output level:	2 volts r.m.s.
Dimensions (W×H×D):	435×118×312 mm 17-1/8"×4-5/8"×12-1/4"
Weight:	5.0kg, 11.0 lbs.

Specifications are subject to change without notice.



## PROTECTION OF EYES FROM LASER BEAM DURING SERVICING

This set employs a laser. Therefore, be sure to follow carefully the instructions below when servicing.

### WARNING!!

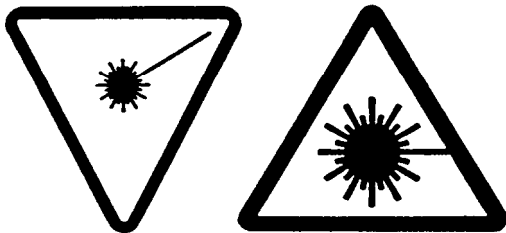
WHEN SERVICING, DO NOT APPROACH THE LASER EXIT WITH THE EYE TOO CLOSELY. IN CASE IT IS NECESSARY TO CONFIRM LASER BEAM EMISSION, BE SURE TO OBSERVE FROM A DISTANCE OF MORE THAN 30cm FROM THE SURFACE OF THE OBJECTIVE LENS ON THE OPTICAL PICK-UP BLOCK.

## LASER WARNING LABEL

The label shown below are affixed.

### 1. Warning label

This label is located on the arm of mechanism.



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

**CAUTION** —HAZARDOUS LASER AND ELECTROMAGNETIC RADIATION WHEN OPEN AND INTERLOCK DEFEATED.

**ATTENTION** —RAYONNEMENT LASER ET ELECTROMAGNETIQUE DANGEREUX SI OUVERT AVEC L'ECLANCHMENT DE SECURITE ANNULE. SN29360911

ADVARSEL: USYNLIG LASERSTRÅLING VED ÅBNING, NÅR SIKKERHEDSAFBRYDER ER UDE AF FUNKTION. UNDGÅ UDSÆTTELSE FOR STRÅLING.

### Laser Diode Properties

- Material: GaAS/GaAlAs
- Wavelength: 780nm
- Emission Duration: continuous
- Laser output: max. 0.5mW\*

\*This output is the value measured at a distance about 1.8mm from the objective lens surface on the Optical Pick-up Block.

### 2. Certification label (120V model)

This label is located on the back panel.

PRODUCT IS CERTIFIED BY THE MANUFACTURER TO COMPLY WITH DHHS RULES 21 CFR SUBCHAPTER J APPLICABLE AT THE DATE OF MANUFACTURE.

MANUFACTURED

### 3. Class 1 label (Except 120V model)

This label is located on the back panel.

"CLASS 1 LASER PRODUCT"

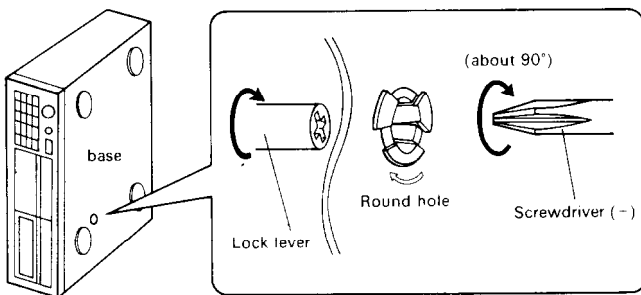
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## SERVICE PROCEDURES

### 1. How to Release the Transport Lock

To protect the optical assembly including the laser pickup from vibration related damage during shipping, this unit is equipped with a transport lock lever located on the base.



- Use a screwdriver to turn the lock lever in the round hole in the direction of the arrow (↷ about 90°).
- Before transporting the unit, turn the lock lever in the opposite direction.

### 2. Safety-check out

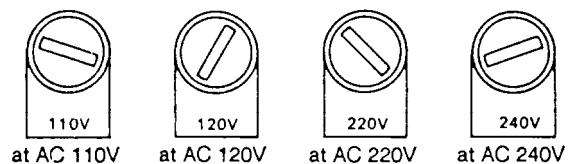
After correcting the original service problem, perform the following safety check before releasing the set to the customer:

Connect the insulating-resistance tester between the plug of power supply cable and chassis.

Specifications: more than 10Mohm at 500V.

### 3. Voltage selector (back panel)

Worldwide models are equipped with a voltage selector to conform with local power supplies. Be sure to set this selector to match the voltage of the power supply in your area before turning the power switch on. Voltage is changed by turning the voltage selector with a screwdriver or similar instrument to the 110V, 120V, 220V or 240V position. Confirm that the selector has been set to the correct position before turning the power switch on. If there is no voltage selector switch on the unit you have purchased, it can only be used in areas where the power supply voltage is the same as that of the unit.



## CAUTION ON REPLACEMENT OF OPTICAL PICKUP

The laser diode in the optical pickup block is so sensitive to static electricity, surge current and etc. that the components are liable to be broken down or its reliability remarkably deteriorated.

During repair, carefully take the following precautions. (The following precautions are included in the service parts).

### PRECAUTIONS

#### 1. Ground for the work-desk.

Place a conductive sheet such as a sheet of copper (with impedance lower than  $10^6 \Omega$ ) on the work-desk and place the set on the conductive sheet so that the chassis.

#### 2. Grounding for the test equipment and tools.

Test equipments and toolings should be grounded in order that their ground level is the same the ground of the power source.

#### 3. Grounding for the human body.

Be sure to put on a wrist-strap for grounding whose other end is grounded.

Be particularly careful when the workers wear synthetic fiber clothes, or air is dry.

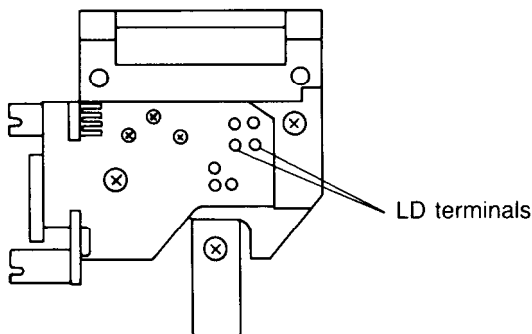
#### 4. Select a soldering iron that permits no leakage and have the tip of the iron well-grounded.

#### 5. Do not check the laser diode terminals with the probe of a circuit tester or oscilloscope.

### Care should be taken with the optical pickup.

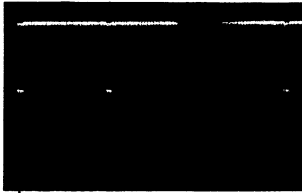
The optical pickup is sensitive to static electricity, surge currents, and other high electrical noise, and because there is the possibility of damage to performance, in the handling of the pickup, the utmost care must be taken, particularly with regard to static electricity.

1. When checking the laser terminal, avoid making connections using the probes of a tester or oscilloscope, or an ordinary power supply.
2. When replacing the optical pickup, first short the LD terminals and remove the connector. Also, when attaching the new optical pickup, after attaching the connector, unsolder the LD terminals.

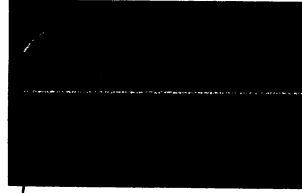


**SCHEMATIC DIAGRAM**

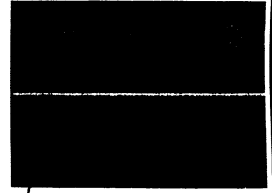
- Use the high impedance probe. (10:1)
- Play the track 2 of test disc. (YEDS-18)



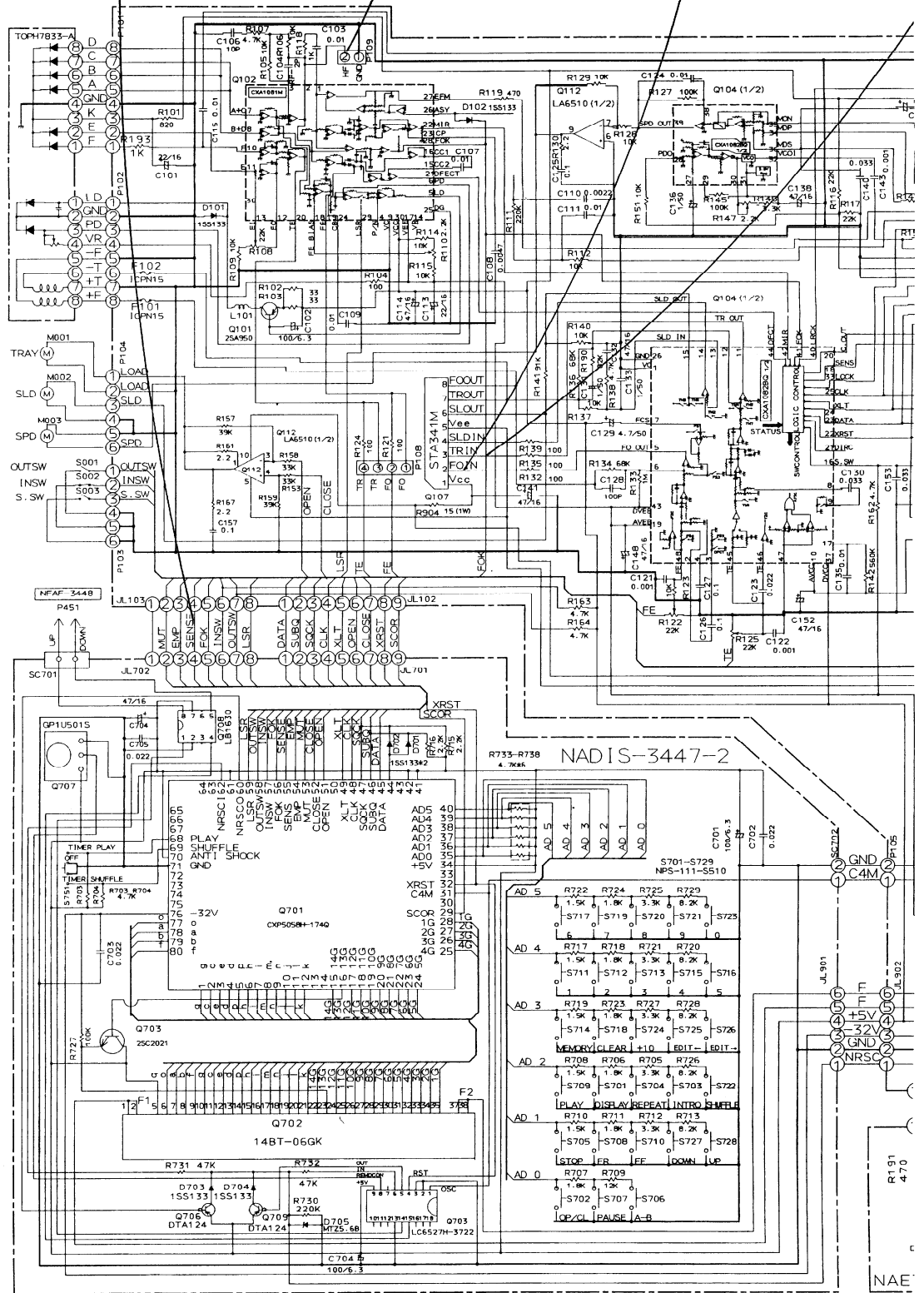
V : 0.2V/div JL-103 #4  
H : 5mS/div SENS



V : 50mV/div  
H : 0.5μS/div

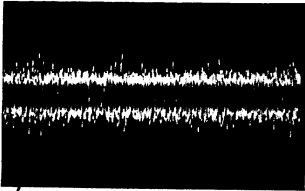


V : 50mV/div  
H : 0.5mS/div

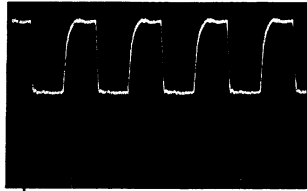


A  
B  
C  
D  
E  
F

NAE



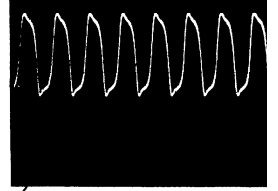
V : 0.1V/diV  
H : 0.5mV/diV



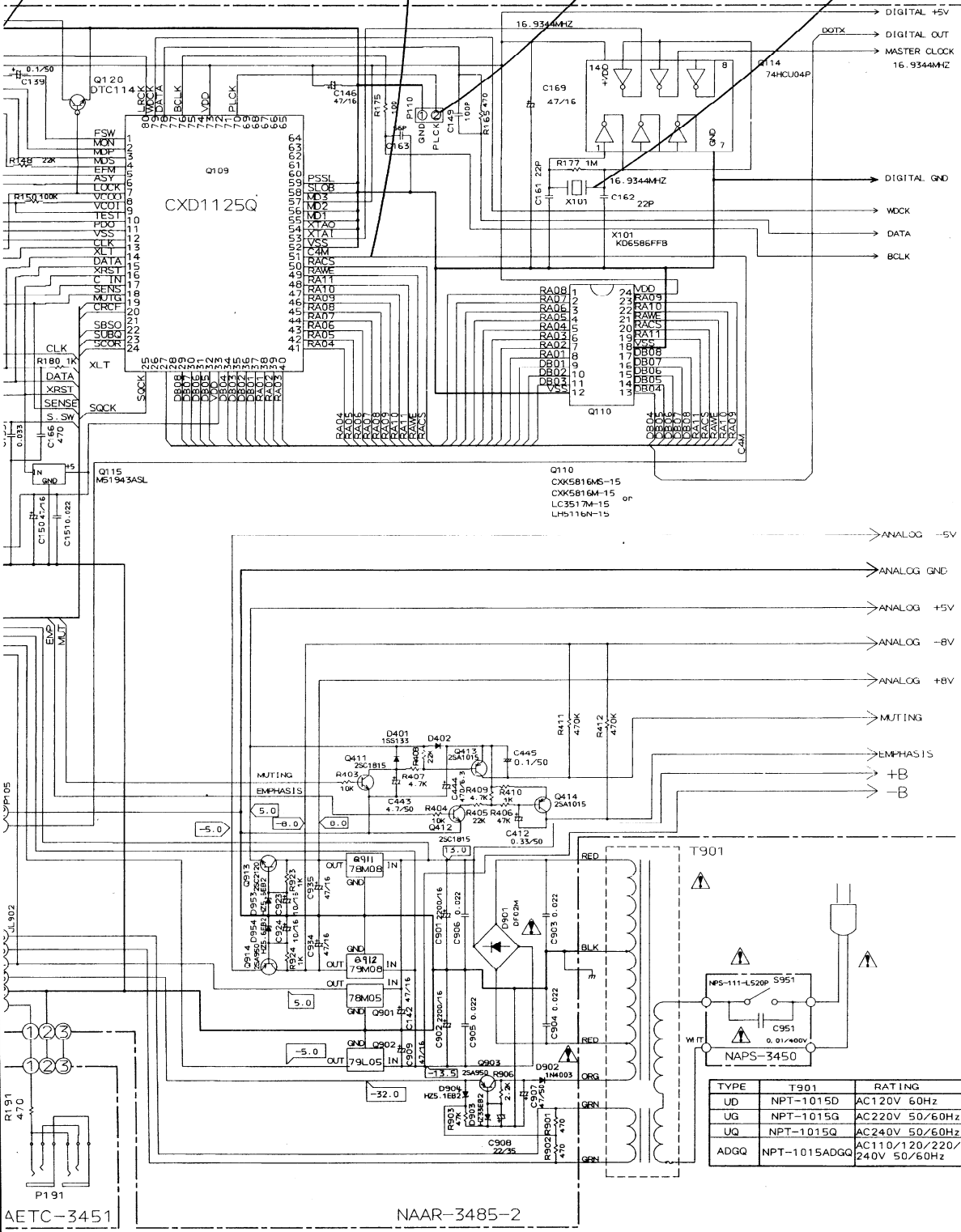
V : 0.2V/diV  
H : 0.1μS/diV



V : 0.2V/diV  
H : 0.1μS/diV



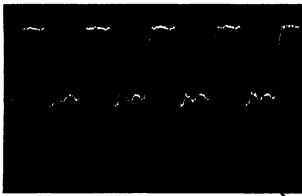
V : 0.2V/diV  
H : 0.05μS/diV



AETC-3451

NAAR-3485-2

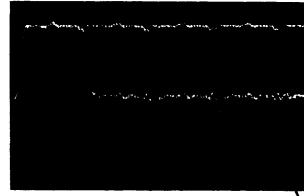
# SCHEMATIC DIAGRAM



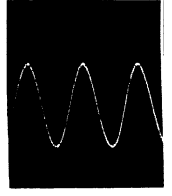
V : 0.2V/diV  
H : 0.05μS/diV



V : 0.2V/diV  
H : 1μS/diV

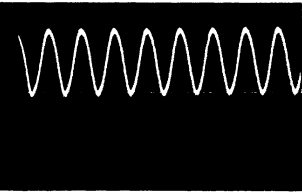


V : 0.2V/diV  
H : 0.05μS/diV



V : 0.2V/diV  
H : 0.5μS/diV

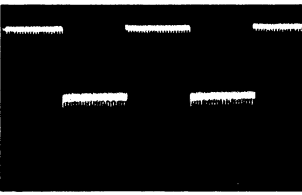
• Use the high impedance probe. (10:1)



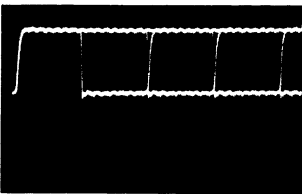
V : 0.2V/diV  
H : 0.05μS/diV



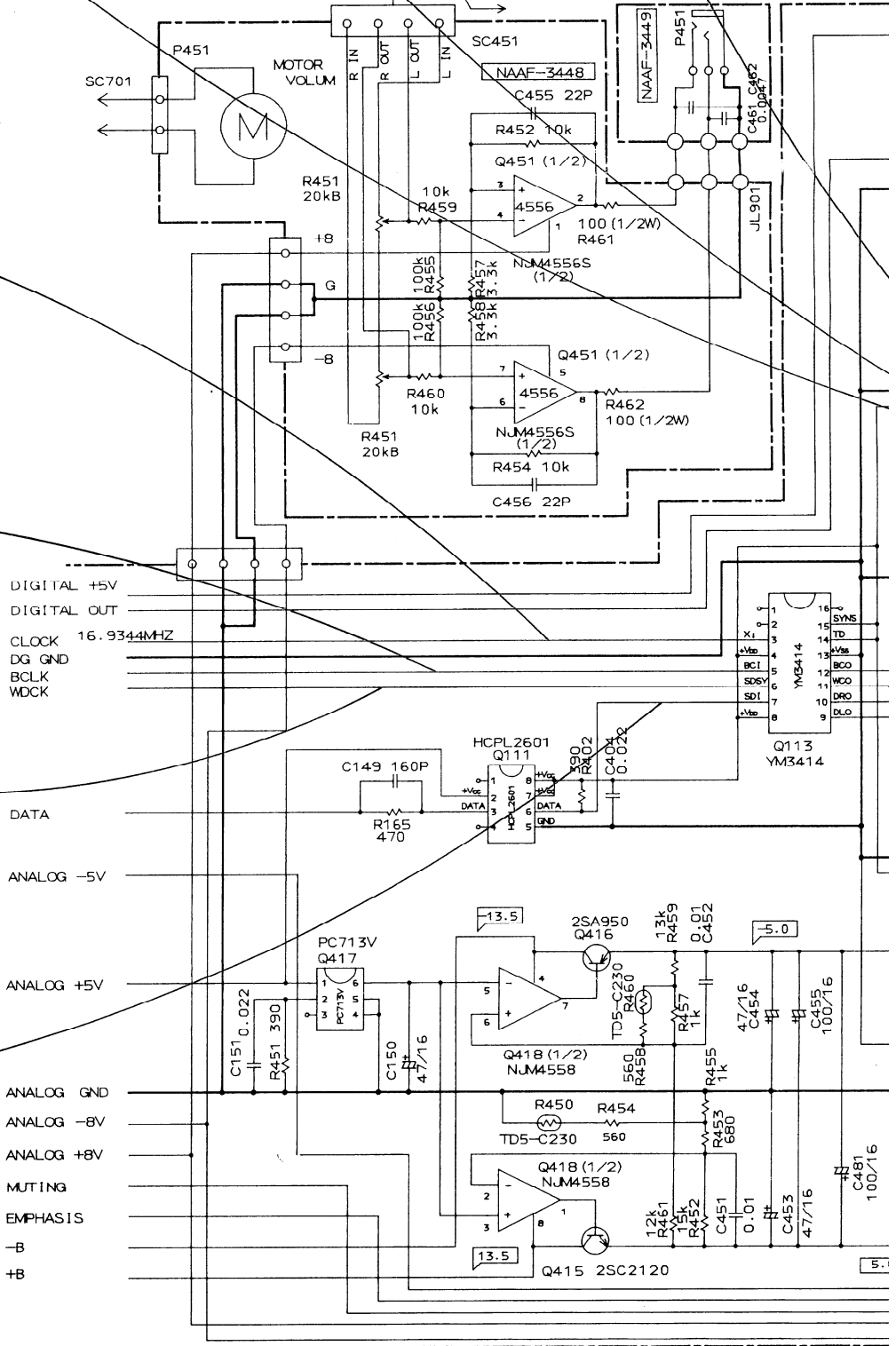
V : 0.2V/diV  
H : 0.05μS/diV



V : 0.2V/diV  
H : 5μS/diV



V : 0.2V/diV  
H : 0.2μS/diV



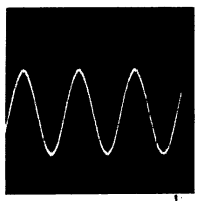
DIGITAL +5V  
DIGITAL OUT  
CLOCK 16.9344MHZ  
DG GND  
BCLK  
WDCK

DATA  
ANALOG -5V

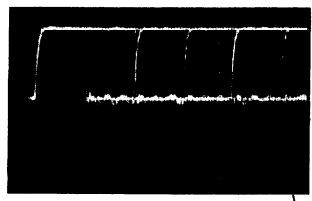
ANALOG +5V

ANALOG GND  
ANALOG -8V  
ANALOG +8V  
MUTING  
EMPHASIS  
-B  
+B

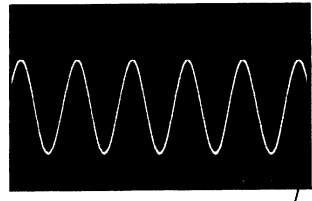
A  
B  
C  
D  
E  
F



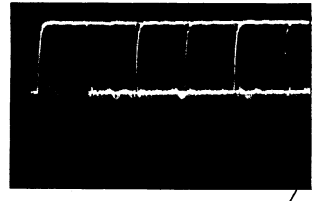
V : 0.2V/diV  
H : 0.5ms/diV



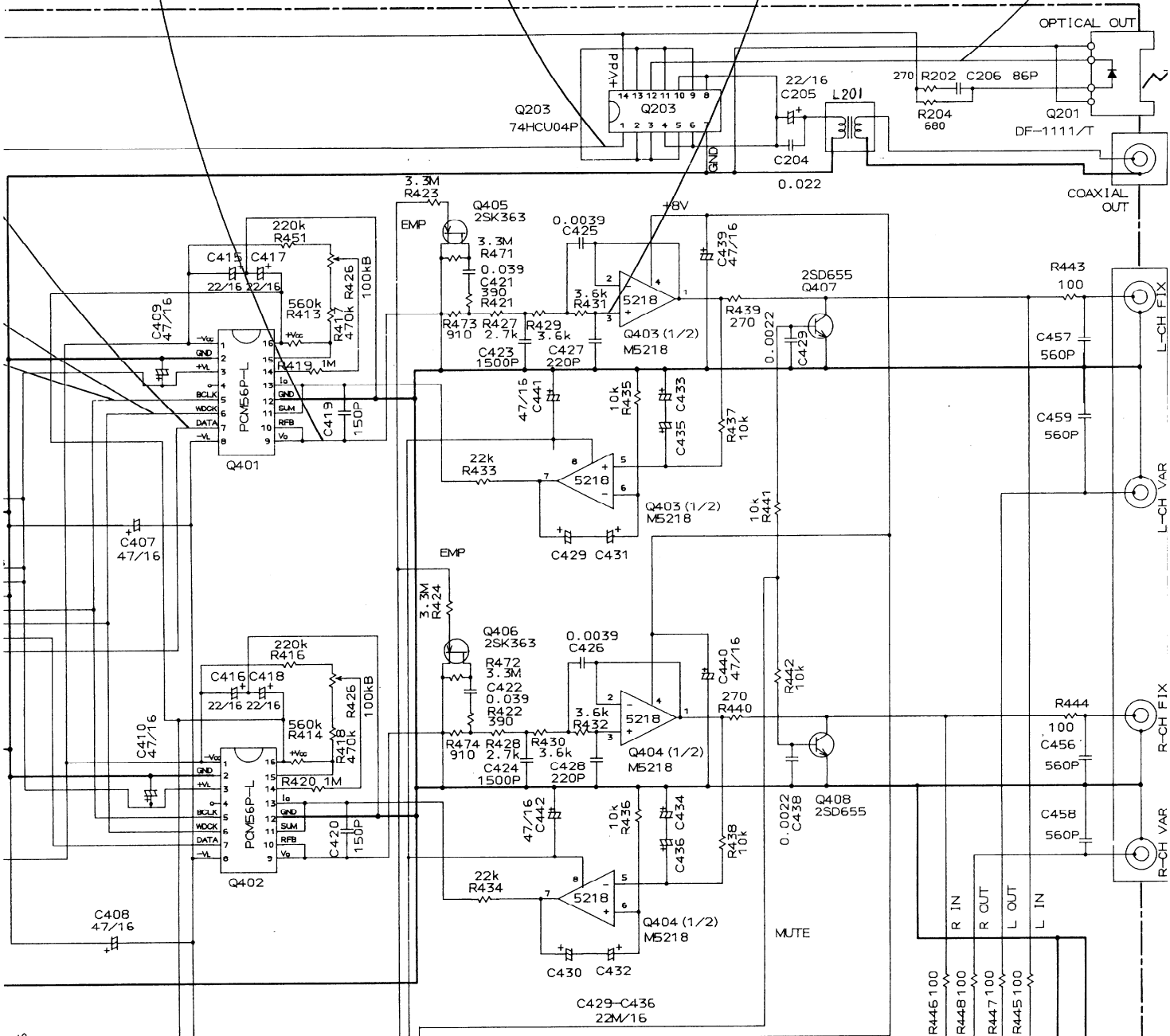
V : 0.2V/diV  
H : 0.1μS/diV



V : 50mV/diV  
H : 0.5ms/diV



V : 0.2V/diV  
H : 0.1μS/diV

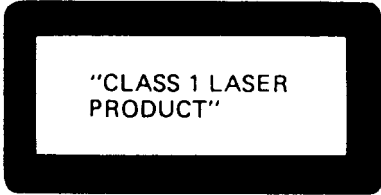


- ALL RESISTORS ARE IN OHMS 1/4WATT UNLESS OTHERWISE NOTED.
- ALL CAPACITORS ARE IN μF/50wV UNLESS OTHERWISE NOTED.
- ELECTROLYTIC CAPACITORS (±) ARE IN μF/WV.
- VOLTAGE (MEASURED WITH V.T.V.M) MEASURED WITH ⓈV IS DC VOLTAGE. (NO INPUT)
- THE COMPONENTS IDENTIFIER ARE CRITICAL FOR SAFETY. REPLACE ONLY WITH PART NUMBER SPECIFIED.
- CIRCUIT IS SUBJECT TO CHANGE FOR IMPROVEMENT.

NAAF-3448  
SC451



## ADVARSEL



"CLASS 1 LASER  
PRODUCT"

Denne mærkning er anbragt på apparatets højre side og indikerer, at apparatet arbejder med laserstråler af klasse 1, hvilket betyder, at der anvendes laserstråler af svageste klasse, og at man ikke på apparatets yderside kan blive udsat for utilladelig kraftig stråling.

APPARATET BØR KUN ÅBNES AF FAGFOLK MED SÆRLIGT KENDSKAB TIL APPARATER MED LASERSTRÅLER!

Indvendigt i apparatet er anbragt den her gengivne advarselmærkning, som advarer imod at foretage sådanne indgreb i apparatet, at man kan komme til at udsætte sig for laserstråling.



ADVARSEL USYNLIG LASERSTRÅLING  
VED ÅBNING. NÅR SIKKERHEDSAF  
BRYDER ER UDE AF FUNKTION  
UNDGÅ UDSÆTTELSE FOR STRÅLING

VAROITUS! Laitte sisältää laserdiodin, joka lähettää (näkymätöntä) silmille vaarallista lasersäteilyä.

## NOTE ON COMPACT DISC

- **Holding Compact Discs**

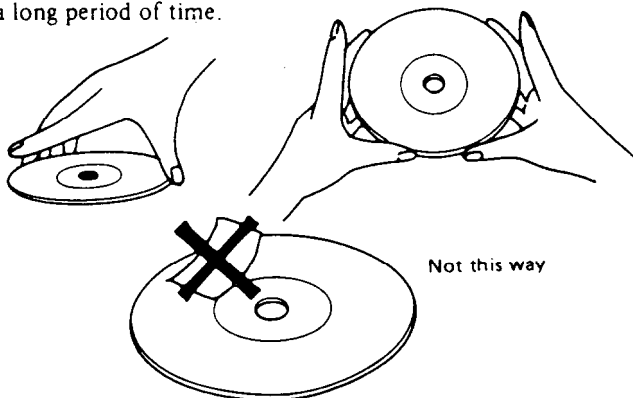
Hold Compact Discs by the edges so that you do not touch the surface of disc. Remember that the side of the disc with the "rainbow" reflection is the side containing the audio information.

Do not attach tape or paper to the label side of the disc and always be careful not to leave fingerprints on the side that is played.

- **Storing Compact Discs**

Store Compact Discs in a location protected from direct sunlight, high heat and humidity and extremely high and low temperatures. Discs should never be left in the trunk or interior of an automobile in the sun since the temperature can become very high in such a closed environment.

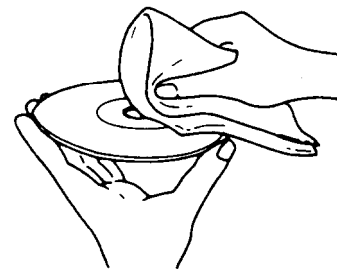
Always store Compact Discs in the holders in which they were sold. Never leave a disc in the player's disc holder for a long period of time.



- **Cleaning Compact Discs**

Before playing a disc wipe off the playing surface with a soft cloth to remove dust and other soil. Wipe the surface in straight lines from the center of the disc outward, not in a circular motion as you would with a phonograph record.

Do not use benzene, chemical cleansers or phonograph record cleaning solutions to clean Compact Discs. Also avoid static electricity prevention solutions since they can damage the surface of Compact Discs.



- **Problems Caused by Dew**

Dew can form inside a Compact player when it is brought from a cold environment into a warm room, when a room is rapidly heated and if a player is left in a humid environment.

This dew can prevent the laser pickup from reading the data contained in the pits in the disc surface. If the player does not operate properly because of dew, remove the disc and leave the player's power switch on for about one hour to remove all moisture.



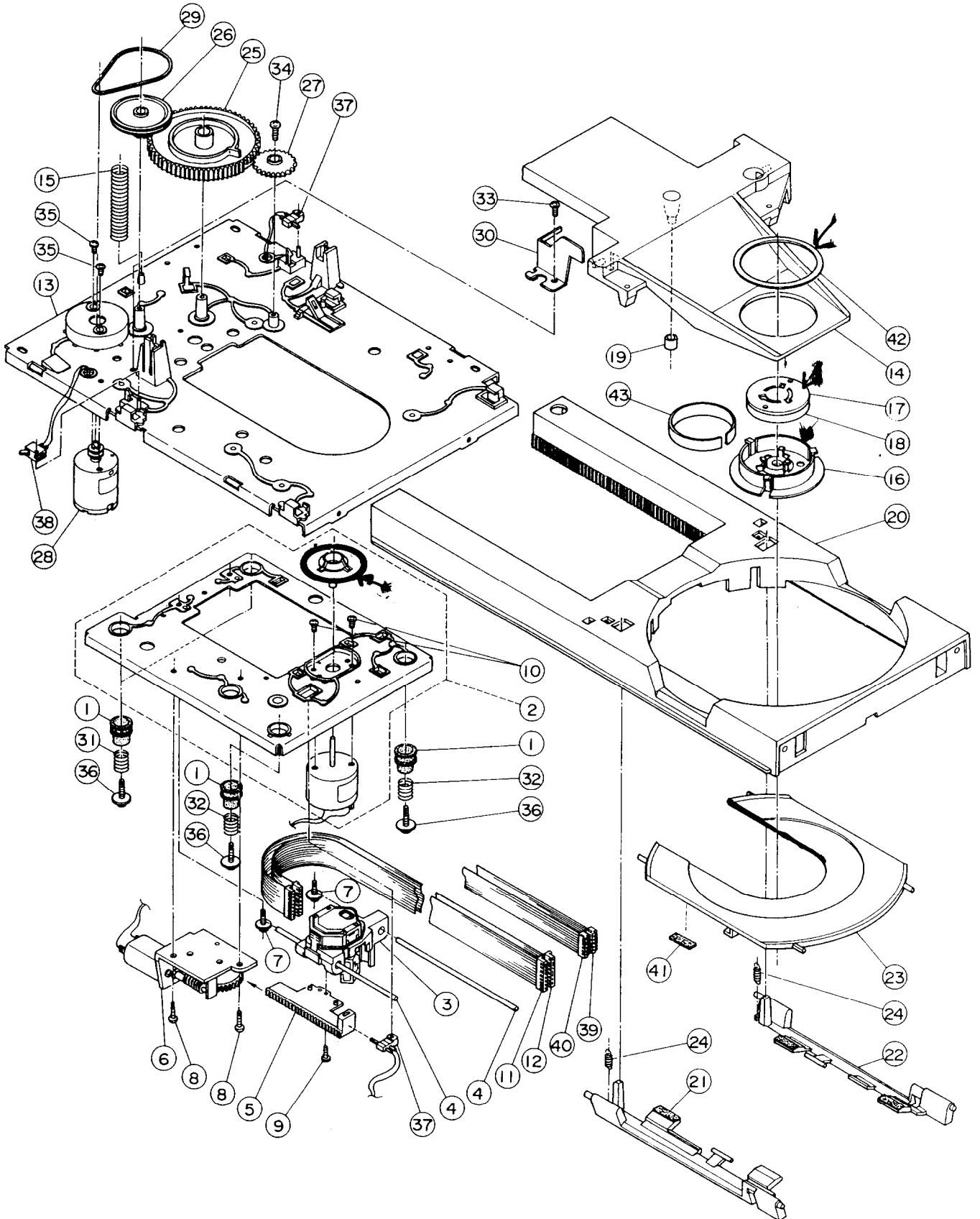
## PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
A1	27100181A	Chassis	T901	2300384A	△ NPT-1015D, Power transformer (D)
A2	27121207	Back panel (D)		2300385A	△ NPT-1015G, Power transformer (G)
	27121208	Back panel (G)		2300386A	△ NPT-1015Q, Power transformer (Q)
	27121209	Back panel (U)		2300387A	△ NPT-1015ADGQ, Power transformer (U)
	27121218	Back panel (QA/QB)		IH064585-2	NAAR-3485-2, Main circuit pc board ass'y (D/U)
A4	27300750	△ Strainrelief		IH064585-2A	NAAR-3485-2A, Main circuit pc board ass'y (G/OA/QB)
A5	27190266	Holder		IH064547-2	NADIS-3447-2, Display circuit pc board ass'y
A7	27273112	Joint, power		IH064548-2	NAAF-3448-2, Headphone amplifier pc board ass'y
A9	27270214A	Spacer	U1	IH064549-2	NAAF-3449-2, Headphone terminal pc board ass'y
A10	27141331	Bracket L		IH064550-2	△ NAPS-3450-2, Power switch pc board ass'y
A11	27141309A	Bracket		IH064551-2	NAETC-3451-2, Terminal pc board ass'y
A12	27175011C	Bracket		260208	Binder
A14	28140265	Leg(Cushion)			
A15	830440109	20×40×8, Cushion			
A16	834430088	4TTC+10C(BC), Tapping screw			
A17	833430080	3TTS+8B(BC), Tapping screw			
A18	831130088	3TTP+8P(BC), Tapping screw			
A19	834230108	3TTW+8B, Tapping screw			
A20	834430108	3TTS+10B(Ni), Nickel screw			
A21	834430068	3TTS+10B(BC), Tapping screw			
A26	27110458A	3TTS+6B(BC), Tapping screw			
A30	28133216	Front bracket ass'y			
A301	28184429	Back plate			
A302	28140932	Top cover			
A310	28191492	50×50×5t, Cushion for top cover			
A312	28140928	Clear plate			
A313	27175153	25×25×4t, Cushion			
A315	27267578	Leg			
A316	27270255	Guide			
A501	1H064121	Spacer			
A508	27211043	Front panel ass'y			
A801	28323571	Tray panel ass'y			
A802	28323152-1	Knob LEVEL			
P921	253112A	Knob MODE			
		△ AS-UC-4#18, Power supply cord (D)			
		△ AS-CEE, Power supply cord (G/U)			
		△ AS-SAA, Power supply cord (QA)			
		△ 2-0.75BS16, Power supply cord (OB)			
S902	25065168	△ HXW0131-01-060, Voltage selector switch (U)			

NOTE: THE COMPONENTS IDENTIFIED BY MARK △ ARE CRITICAL FOR RISK OF FIRE AND ELECTRIC SHOCK. REPLACE ONLY WITH PART NUMBER SPECIFIED.

NOTE: <D>: Only 120V model  
<G>: Only 220V model  
<U>: Only Worldwide model  
<QB>: Only U.K. model  
<QA>: Only Australian model

# MECHANISM-EXPLODED VIEW



## PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
1	27301158A	Cushion rubber	26	27300943	Pulley gear
2	1H057901	Spindle motor ass'y	27	27300944A	Gear
3	24110004	TOPH7833-A, Pick-up	28	1H025901	Tray motor ass'y
4	27260222	Shaft	29	27301079	Rubber belt
5	27300939	Rack PU	30	27141230	Bracket, holder
6	1H025902	Slide motor ass'y	31	27180414A	Spring
7	831430100	3TTW+10P(BC), Tapping screw	32	27180425	Spring
8	834430088	3TTS+8B(BC), Tapping screw	33	834430068	3TTS+6B(BC), Tapping screw
9	82542006	2B+6F(BC), Binding screw	34	831126060	2.6TTW+6B(BC), Tapping screw
10	82142003	2P+3F(BC), Pan head screw	35	82143004	3P+4FN(BC), Pan head screw
11	2000951	NSAS-8P903, Socket	36	801414	W=11, Special screw
12	2000952	NSAS-8P904, Socket	37	25065321	NMS-1113, Microswitch(Black)
13	27100174A	Chassis L	38	25065322	NMS-1214, Microswitch(Green)
14	27301154A	Arm	39	2000733B	NSAS-6P689, Socket ass'y for tray motor
15	27180341A	Spring	40	2000734B	NSAS-6P690, Socket ass'y
16~18	1H057902	Cap CH ass'y	41	28140922	Cushion
16	27301132B	Cap CH	42	27270282	Spacer
17	27301133	York CH	43	27270283	Spacer, cap
18	28181019A	Magnet CH	44	28140931	Cushion PU
19	27301189	Cap. arm			
20	27301112C	Disc tray			
21	27301114A	Disc lifter L			
22	27301115A	Disc lifter R			
23	27301151	Disc plate			
24	27180400	Spring			
25	27300942C	Cam gear			

## LUBRICATION

FLOIL G902S (Part No. 260447)

Engaged section of cap, arm (19) and cam gear (25)

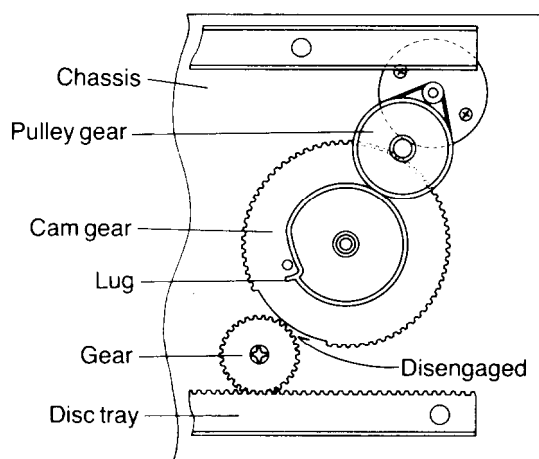
Engaged section of disc tray (20) and chassis L (13)

Engaged section of disc tray (20) and disc lifters (21, 22)

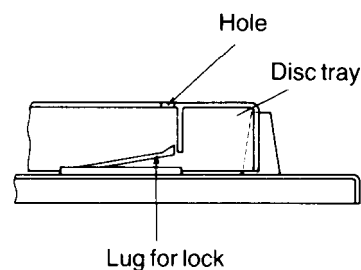
Shaft of cam gear (25), pulley gear (26) and gear (27)

## DISASSEMBLING PROCEDURES

### Method for removing the tray



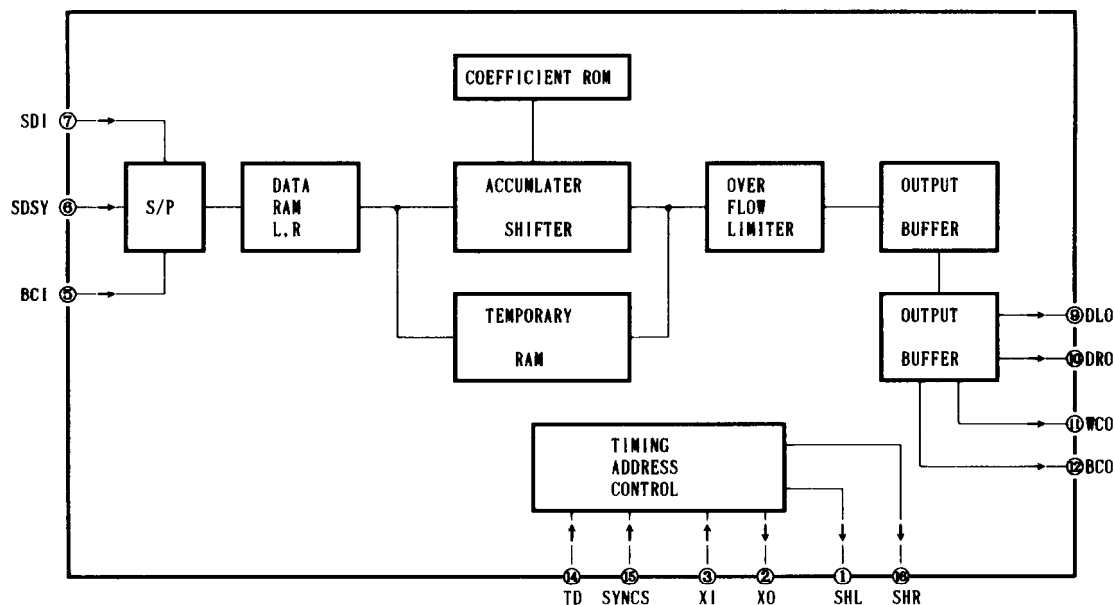
1. Set the position so that the cam gear and gear are disengaged.
2. Pull the tray to the front.



3. Insert a small flat-bladed screw driver into the hole section of the right side of the back of the tray, and push the lug used for locking the tray to bring the tray to the front.

**CAUTION:** When inserting the tray, the cam gear and gear parts are not in the meshing position.

## YM3414 (Eight times over sampling digital filter)



PIN NO.	TERMINAL	I/O	DESCRIPTION
1	SHL	O	When one DAC(TD=L):Deglitching signal of left channel (when four times) When two DAC(TD=H):Deglitching signal of left and right channels(when eight times)
2	XO	O	Connect the x'tal oscillator between XI and XO. The clock frequency is $384 \times F_s$ .
3	XI	I	
4	VDD2		+5V:Power supply terminal for x'tal oscillator and deglitching signal.
5	BCI	I	Bit clock input terminal. Clock shown L/Rch division of input data and input timing. 16 bits serial data input terminal.
6	SDSY	I	
7	SDI	I	
8	VDD1		+5V:Power supply terminal for digital signal.
9	DLO	O	When one DAC(TD=L):Output terminal for L/R channel data (When four times) When two DAC(TD=H):Output terminal for L channel data (when eight times)
10	DRO	O	R channel data output terminal. Word clock of output data DLO/DRO. Bit clock of output data.
11	WCO	O	
12	BCO	O	
13	VSS		Ground terminal
14	TD	I	1DAC/2DAC selector terminal: 1DAC at low. 2DAC at high.
15	SYNCS	I	Asynchronous input jitter absorption synchronous signal. Synchronous input at high level. SDSY inhibiting at low level.
16	SHR	O	R channel deglitching signal when one DAC.

# CIRCUIT DESCRIPTIONS

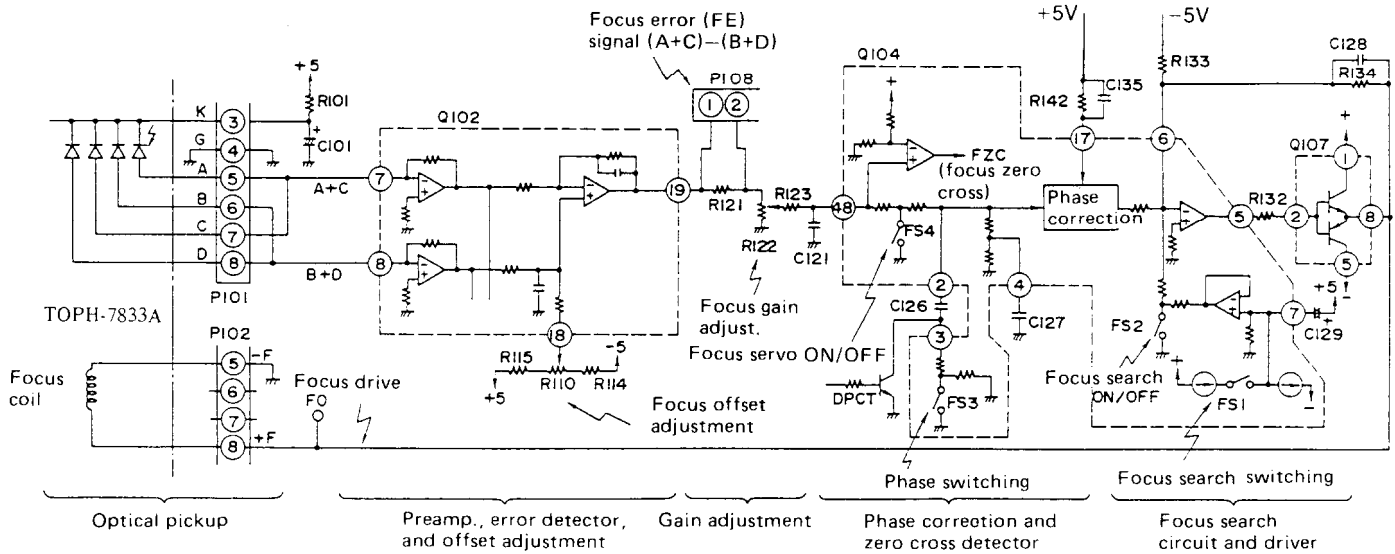


Fig.1 Focus servo circuit

## 1. Focus servo circuit

From the optical pickup objective lens, the emitted laser beam is focused on the disc reflecting surface, and this circuit controls the movement of the lens up and down.

### 1-1. Error detecting circuit

The error is detected by means of the astigmatic aberration method and obtains its focus error signal from the optical pickup output signal  $(A+C) - (B+D)$ .

The individual signals  $(A+B)$  and  $(C+D)$  input to pins 7 and 8 of Q102 are subtracted by means of the IC internal op amp, and from pin 19, the F.E. signal is output. Also, in order to eliminate the focus error, offset adjustment is carried out by the semi-fixed resistor R110 of pin 18 of Q102.

### 1-2. Phase correction and driver circuit

By means of the semi-fixed resistor R122, the gain adjusted F.E. signal passes by way of the phase correction circuit from pin 48 of Q104, and from pin 5 of Q104 to the driver Q107, and is feedback to the coil used for driving the optical pickup TOPH-7833A objective lens. In addition, there are the FS4 servo ON/OFF switch and FS3 phase characteristic selector switch.

### 1-3. Focus zero cross circuit and focus search circuit

In order to have mandatory drive of the objective lens in the capture range of only  $10\mu\text{m}$  at the focus point it is necessary to turn off the above mentioned FS4 and close the servo loop. The timing diagram for that operation is shown in Fig. 2.

The triangular wave generated by means of the focus search circuit internal to Q104 shifts the objective lens up/down direction, and at the correct focus point, the fall of F.E. signal is detected by the focus zero cross (FZC) circuit to close the servo loop. At this time, it is necessary that the focus OK (FOK) signal be in the high level. In Fig. 2, the dotted line is the waveform of the focus capture failure.

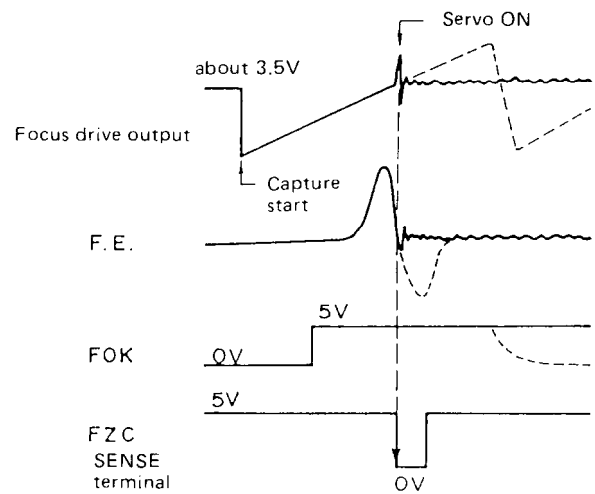
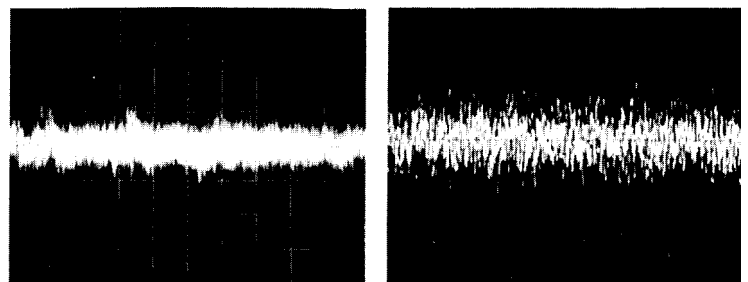


Fig. 2 Capture operation of focus



Focus signal P108 pin 1  
V: 10mV/div  
H: 0.5ms/div

Focus signal Q107 pin 2  
V: 50mV/div  
H: 0.5ms/div

Photo 1

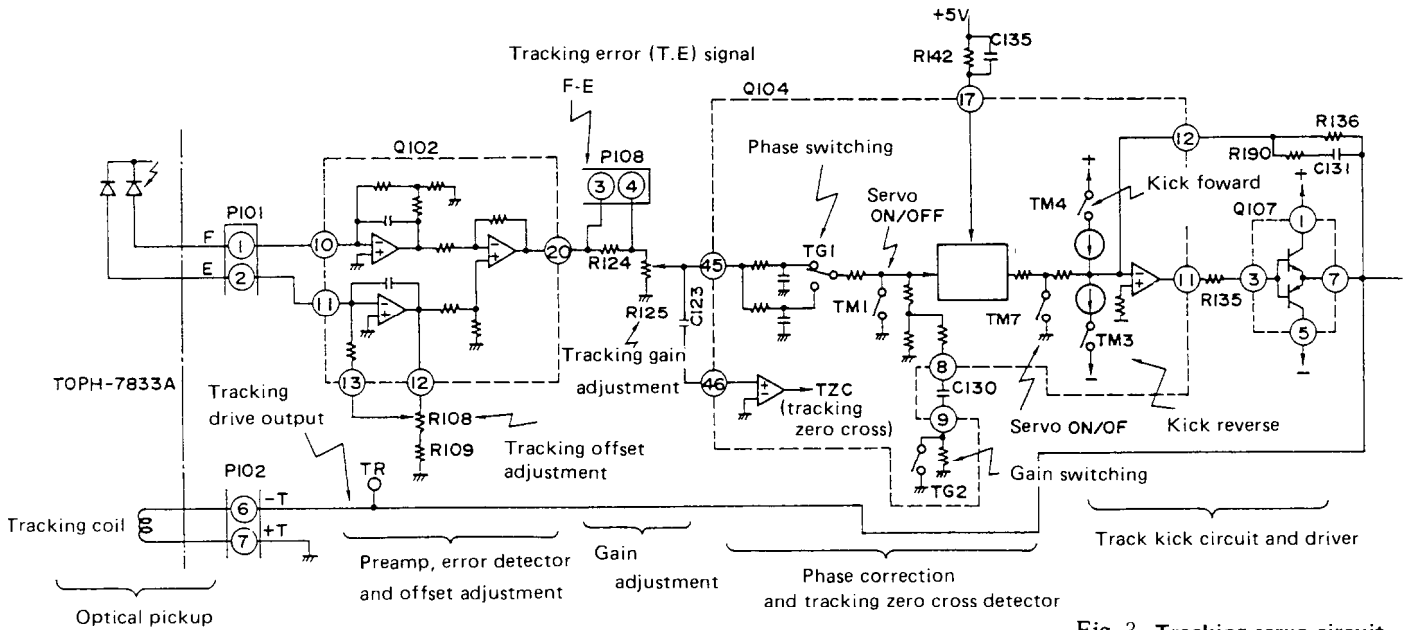


Fig. 3 Tracking servo circuit

## 2. Tracking servo circuit

On the disc at a pitch of  $1.6\mu\text{m}$ , the laser beam accurately traces the center of the pits cut into the disc, and this is the control circuit that shifts the objective lens in the radial direction.

### 2-1. Error detection circuit

The F-E is obtained from the tracking error (T.E.) signal by means of a 3 beam method. The F.E. signal input to pins 10 and 11 of Q102 is subtracted internally, and is output as the T.E. signal from pin 20. R108 is the semi-fixed resistor control for tracking offset.

### 2-2. Phase correction and driver circuit

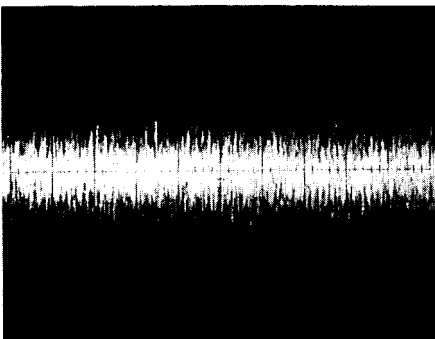
The T.E. signal adjusted for gain by means of the semi-fixed resistor R125 passes through the phase correction circuit from pin 45 of Q104, and from pin 11 by way of driver Q107 objective lens. TM1 and TM7 are used as the tracking servo ON/OFF switches, and TG1 and TG2 respectively are used as the phase selector and gain selector switches.

### 2-3. Tracking zero cross and track kick circuit

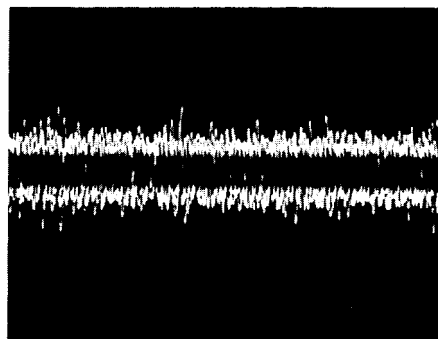
At the time the head comes out and when there is manual fast forward, in the event that it is necessary to skip over the track being traced, the T.E. signal receives a kick pulse, and by means of this, shifting of the objective lens can be achieved.

TM3 and TM4 respectively are the switches for providing the forward and reverse direction kick pulses. Also, the tracking zero cross (TZC) circuit counts the number of tracks skipped over and produces the signal in order to determine the timing of the servo ON/OFF.

The ON/OFF command for these switches is output from the microcomputer.



Tracking signal  
P108 pin 4  
V: 20mV/div  
H: 0.5ms/div



Tracking signal  
Q107 pin 3  
V: 0.1V/div  
H: 0.5ms/div

Photo 2



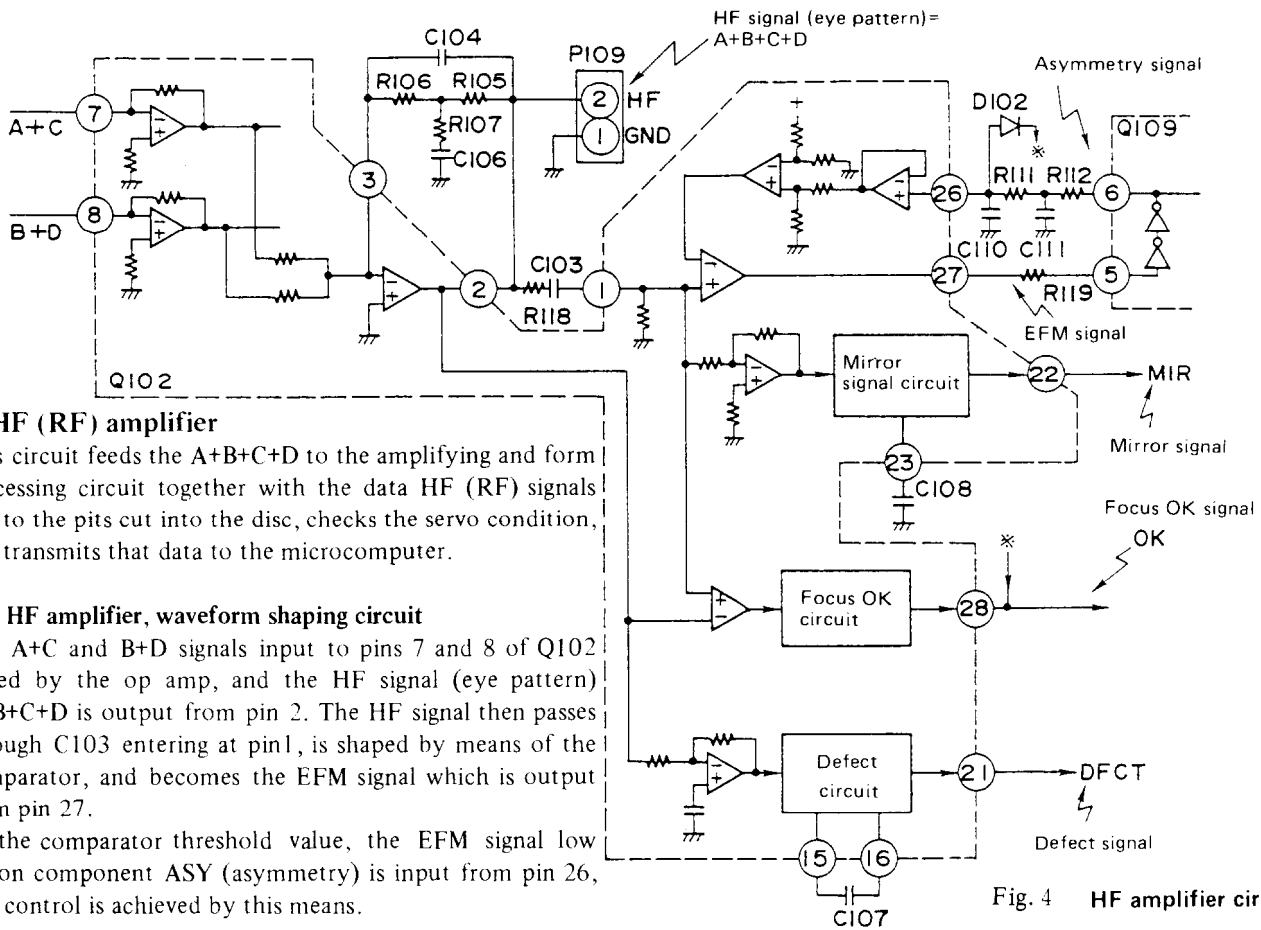


Fig. 4 HF amplifier circuit

### 3. HF (RF) amplifier

This circuit feeds the A+B+C+D to the amplifying and form processing circuit together with the data HF (RF) signals due to the pits cut into the disc, checks the servo condition, and transmits that data to the microcomputer.

#### 3-1. HF amplifier, waveform shaping circuit

The A+C and B+D signals input to pins 7 and 8 of Q102 added by the op amp, and the HF signal (eye pattern) A+B+C+D is output from pin 2. The HF signal then passes through C103 entering at pin 1, is shaped by means of the comparator, and becomes the EFM signal which is output from pin 27.

In the comparator threshold value, the EFM signal low region component ASY (asymmetry) is input from pin 26, and control is achieved by this means.

#### 3-2. MIR circuit, FOK circuit, and DFCT circuit

After the HF signal is processed the detection, shaping, etc, respectively the MIR, FOK, and DFCT signals are output from pins 22, 28, and 21.

##### 3-2-1. MIR (mirror) signal

When the head is extended, at the time the signal becomes high at the disc track and between tracks, the number of tracks is counted, and this is used for determining the timing for the ON/OFF of the servo.

##### 3-2-2. FOK (focus OK) signal

This signal goes high at the time the focus servo is required. (Refer to 1-3)

##### 3-2-3. DFCT (defect) signal

If there is a defect (scratch, dirt, etc.) in the disc, this signal goes high, the servo and gain are controlled, and the circuit prevents a sound outburst.

### 4. APC circuit

By means of feedback from the monitor, this circuit controls the light output due to a bad condition resulting from the temperature characteristic of the laser diode.

For the pin 29 LDON (laser diode ON) signal, when the APC ON/OFF control signal is LOW, the laser is emitted.

### 5. CLV servo circuit

In the compact disc there is a CLV system (constant linear velocity), and at the replay position, because the disc rotary speed varies, the clock is taken out of the HF signal, and

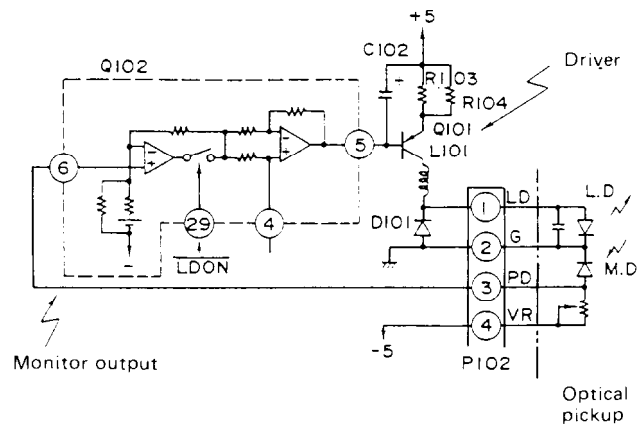


Fig. 5 APC circuit

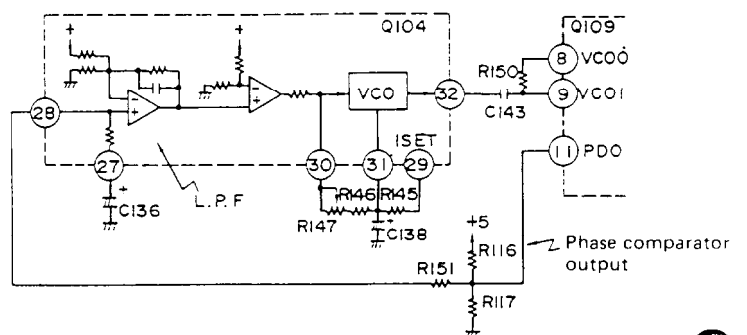


Fig. 6 PLL circuit

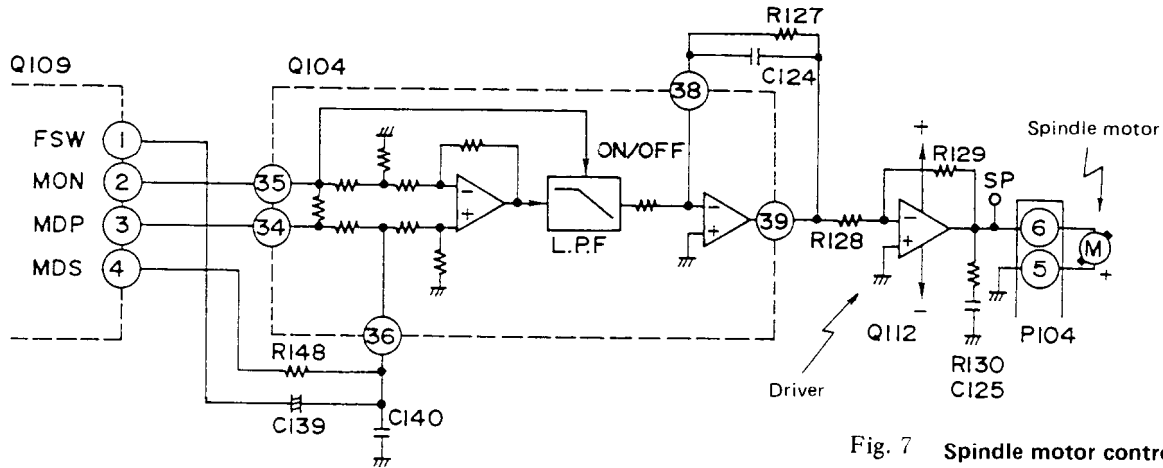
the PLL circuit and its clock must be synchronized to control the spindle motor.

**5-1. PLL circuit**

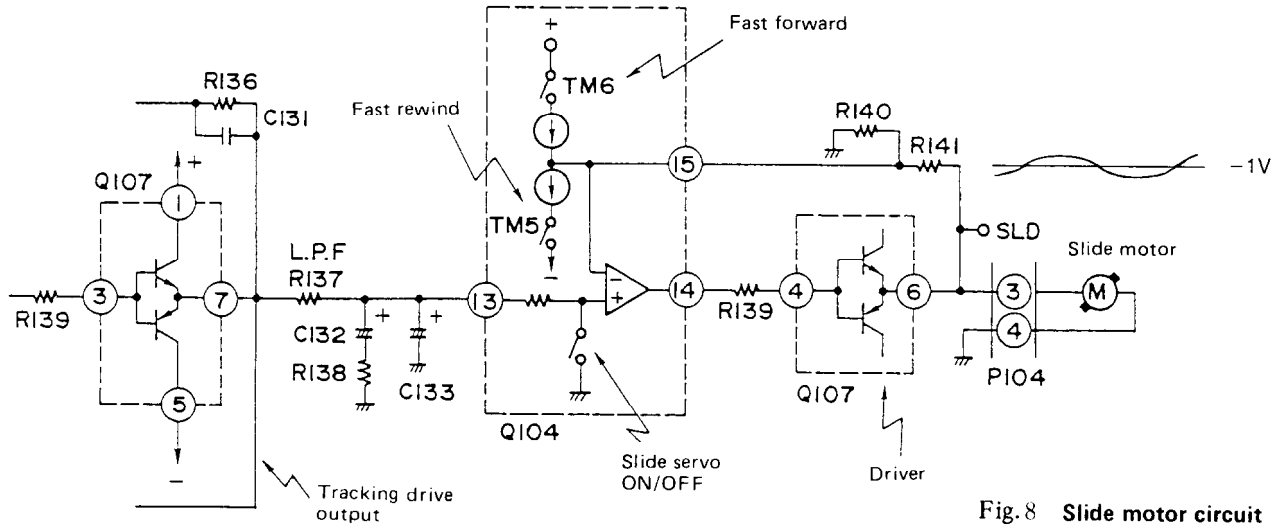
As shown in Fig. 6, for the phase comparator, in Q109 the LPF and VCO are each built into Q104. The semi-fixed resistor R147 is the control for adjusting the 8.6436 MHz free run frequency (WFCK = 7.35 KHz).

**5-2. Spindle motor control circuit**

The output of the phase comparator (MDP) and frequency comparator (MDS) from pins 3 and 4 of Q109 is fed to pins 34 and 36 of Q104. Also, the spindle motor ON/OFF signal (MON) from pin 2 of Q109, and the phase selector signal (FSW) from pin 1, are output and fed to pin 36 of Q104. After these signals are processed in Q104, they are passed from pin 39 through the driver Q108, and are supplied to the spindle motor.



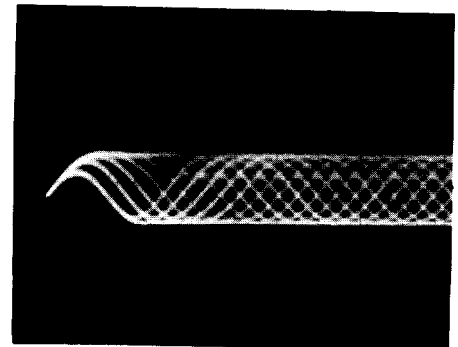
**Fig. 7 Spindle motor control circuit**



**Fig. 8 Slide motor circuit**

**6. Slide motor circuit**

This circuit controls the slide motor which is used for moving the optical pickup from inside the disc to the outside. In the normal playback time, the low region component of the tracking driver output is amplified and fed to the motor, but when the head is extended, switches TM5 and TM6 internal to Q104 control the ON/OFF.



RF signal  
P109 pin2 (HF)  
Vertical : 0.5V/div.  
Horizontal: 0.5 μs/div.

# ADJUSTMENT PROCEDURES

## Instruments required

Dual trace oscilloscope, Frequency counter, AF oscillator, Test disc (SONY YEDS-18), AC voltmeter, Jitter meter, and Socket P4(Part no. 25050138)

### 1. VCO frequency adjustment

Connect the frequency counter to terminal P110.

Turn the power switch to ON.(No load the disc.)

Adjust R147 until the frequency counter reading becomes  $4322 \pm 5\text{kHz}$ .

After adjustment, disconnect the frequency counter.

### 2. Focus offset adjustment

Load the test disc YEDS-18 on the tray and play the track 2.

Connect the oscilloscope or jitter meter to terminal P109.

(Oscilloscope)

Adjust R110 until a clear trace of waveform pattern as shown photo 1 appear on the oscilloscope.

When the amount of jitter is broad, set R110 to mechanical center.

(Jitter meter)

Adjust R110 until the jitter meter reading becomes minimum.(Less than 10ns.)

After adjustment, disconnect the oscilloscope or jitter meter.

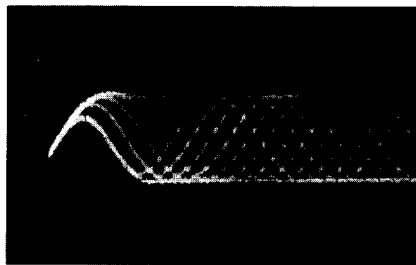
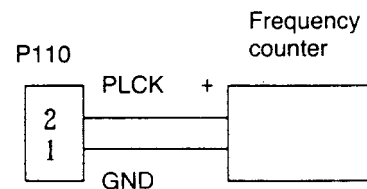
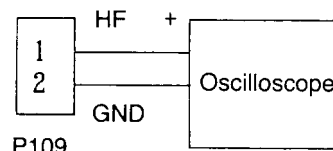
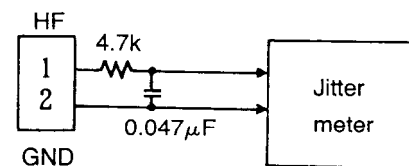


Photo 1



Oscilloscope range  
Vertical : 0.5V/div.  
Horizontal : 0.2  $\mu\text{s}/\text{div}$ .  
AC



### 3. Tracking offset adjustment

Load the test disc YEDS-18 on the tray and play the track 2.

Turn R125 to minimum position.(Counter clockwise)

Connect the oscilloscope between pin 3 (TR) of P108 and pin 2 (GND) of P109.

Adjust R108 until the center of tracking error signal on the oscilloscope becomes GND level.

Turn R125 to the mechanical center.

After adjustment, disconnect the oscilloscope.

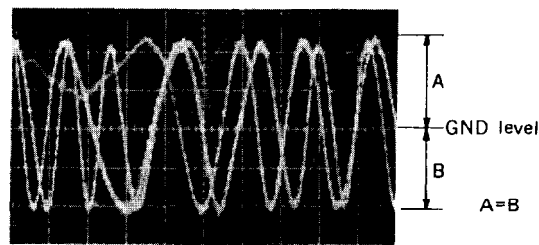
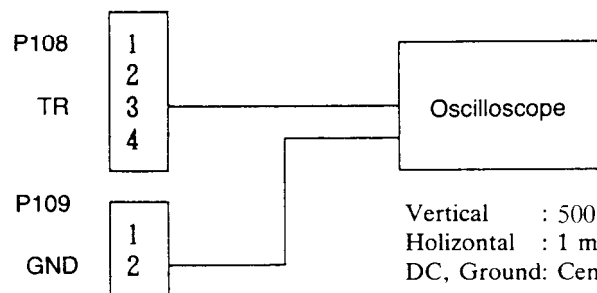


Photo 2



Vertical : 500mV/div.  
Horizontal : 1 ms/div.  
DC, Ground: Center

#### 4. Focus gain adjustment

Set the output of AF oscillator to 800Hz, 1~1.5Vp-p.  
 Play the track 2 of test disc.  
 Connect the oscilloscope and the AF oscillator as shown below.

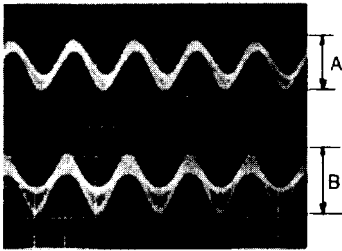
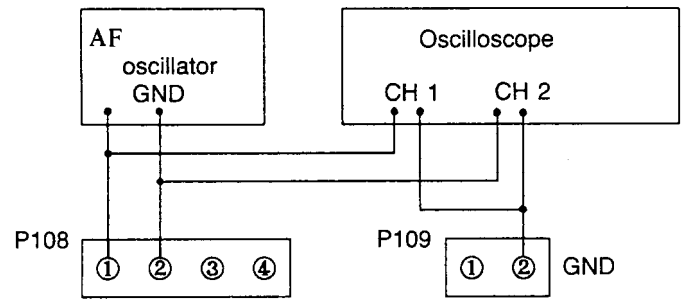


Photo 3



Vertical : 0.2V/div.  
 Horizontal: 0.5 ms/div.

Adjust R122 until 800Hz components of channels 1 and 2 on oscilloscope become same level.  
 After adjustment, disconnect the AF oscillator and the oscilloscope.

#### 5. Tracking gain adjustment

Set the output of AF oscillator to 1.2kHz, 1~1.5Vp-p.  
 Play the track 2 of test disc.  
 Connect the oscilloscope and the AF oscillator as shown below.

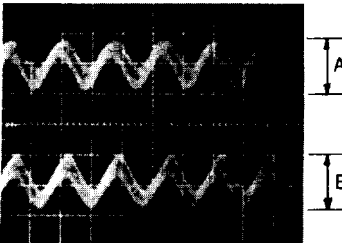
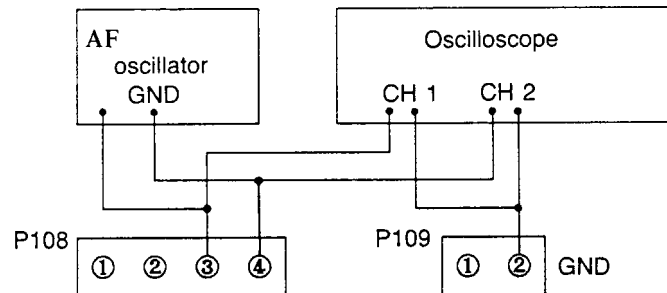


Photo 4



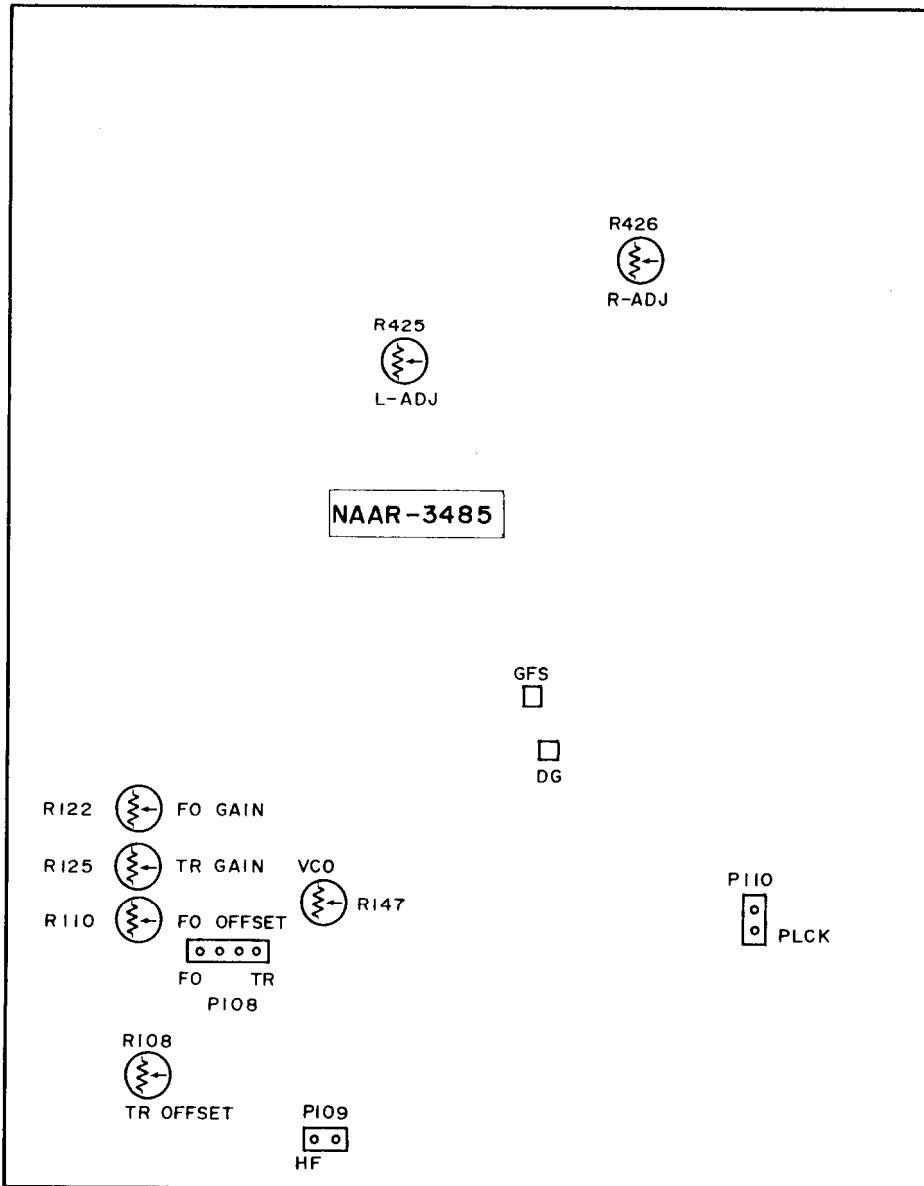
Vertical : 0.2V/div.  
 Horizontal: 0.5 ms/div.

Adjust R125 until 1.2kHz components of channels 1 and 2 on oscilloscope become same level.  
 After adjustment, disconnect the AF oscillator and the oscilloscope.

After adjustment, confirm that the center of tracking error signal becomes GND level.

#### 6. Audio circuit adjustment

Connect the AC voltmeter to output terminal of left channel (right channel).  
 Load the test disc and play the track 2.  
 Next, play the track 17.  
 Adjust R425 (R426) so that the output discrepancy between track 2 and track 17 is  $60 \pm 0.25$ dB.

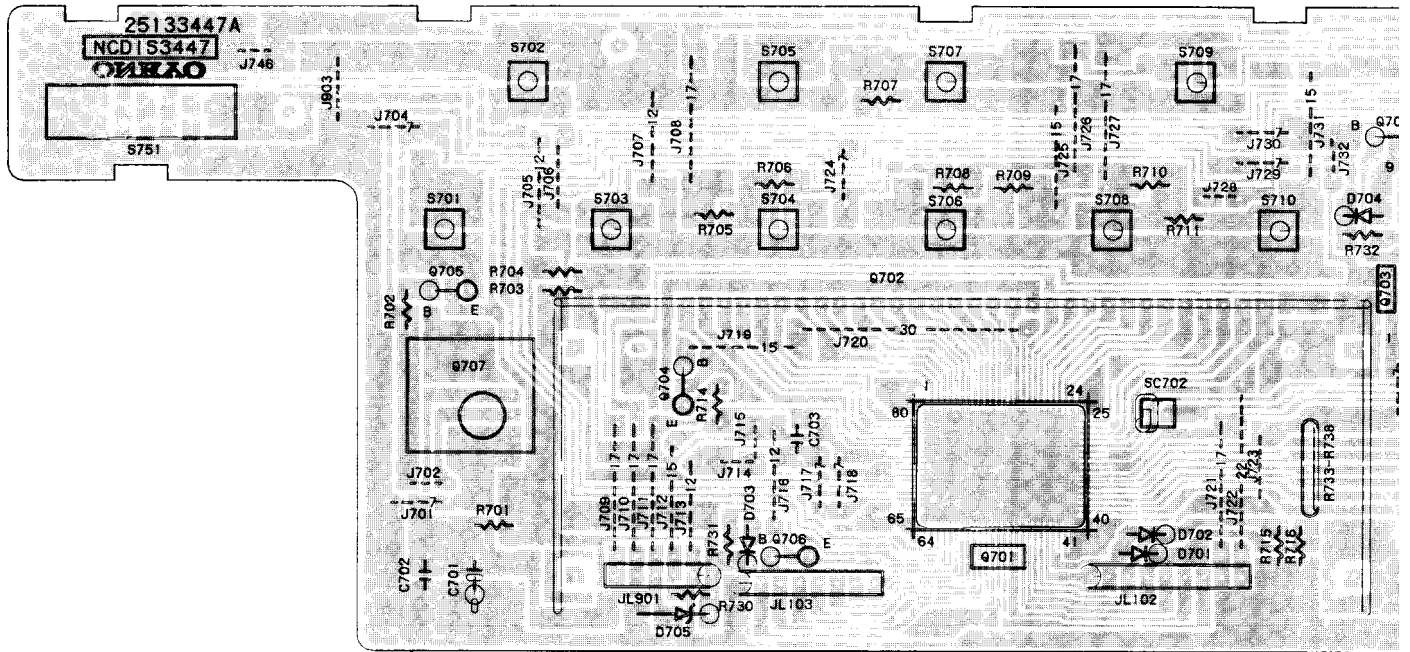


Adjustment Point

# PRINTED CIRCUIT BOARD – PARTS LIST

## MAIN CIRCUIT PC BOARD (NAAR-3485-2/2A)

CIRCUIT NO.	PART NO.	DESCRIPTION
<b>ICs</b>		
Q102	22240029	CXA1081M
Q104	22240223	CXA1082BQ
Q107	22240036	STA341M
Q109	22240130	CXD1125Q
Q110	22240142, 22240203, 22240233, 222990 or 22240032	CXK5816MS-15, LH5116N-15, LC3517BM-15 CXK5816M-15 or LC3517M-15
Q111	226027	HCPL-2601
Q112	22240034	LA6510
Q113	22240176	YM3414
Q114	222755	74HCU04P
Q115	22240018	M51943ASL
Q203	222755	74HCU04P
Q401, Q402	<u>22240096</u>	PCM56P-L
Q403, Q404	222652	M5218L
Q417	24120012	PC713V
Q418	222465	NJM4558D
Q901	222780052	78M05
Q902	222790053	79L05
Q911	222780085MIT	M5F78M08L
Q912	222790085MIT	M5F79M08L
<b>Transistors</b>		
Q101, Q416	2211503 or	2SA950-O or
Q903, Q914	2211504	2SA950-Y
Q120	221281	DTC114YS
Q405, Q406	2212524 or 2212525	2SK363-GR or 2SK363-BL
Q407, Q408	2211705 or 2211706	2SD655-E or 2SD655-F
Q411, Q412	2211254 or 2211255	2SC1815-Y or 2SC1815-GR
Q413, Q414	2211454 or 2211455	2SA1015-Y or 2SA1015-GR
Q415, Q913	2211163 or 2211164	2SC2120-O or 2SC2120-Y
<b>Diodes</b>		
D101, D102	223163	1SS133
D401, D402	223163	1SS133
D901	223892	DF02M
D902	223880 or 223896	GP101N4003 or 1N4003F
D903	224653302 or 224453302	HZ33EB2 or MTZ33B
D904	224650511 or 224450511	HZ5.1EB1 or MTZ5.1A
D953, D954	224650562 or 224450562	HZ5.6EB2 or MTZ5.6B
<b>Photo coupler</b>		
Q201	24120014	DF-1111/T
<b>X'tal</b>		
X102	3010112	KD6586FFB
<b>Coils</b>		
L101	231023	NCH1062
L201	232143 or 232136	NSRF-2047 or NSRF-2046
<b>Capacitors</b>		
C101, C113	354742209	22 $\mu$ F, 16V, Elect.
C102	354721019	100 $\mu$ F, 6.3V, Elect.
C103, C107	371121034	0.01 $\mu$ F $\pm$ 5%, 50V, Mylar
C108	371124724	4700pF $\pm$ 5%, 50V, Mylar
C109, C111	371121034	0.01 $\mu$ F $\pm$ 5%, 50V, Mylar
C110	371122224	2200pF $\pm$ 5%, 50V, Mylar
C114	354722219	220 $\mu$ F, 6.3V, Elect.



**CIRCUIT NO. PART NO.**

C115	371121034
C121	371122224
C122	371121024
C123	371122234
C125-C127	371121044
C129	354780479
C130, C140	371123334
C131	352980106
C132, C138	354744709
C133, C136	354780109
C135	371121034
C139	354782299
C141, C142	354744709
C146, C148	354744709
C150, C152	354744709
C153	371123334
C157	371121044
C158, C159	354744709
C202, C405	354744709
C205	352942206
C407-C410	354744709
C415-C418	354742209
C419, C420	373301514
C421, C422	371123934
C423, C424	371121524
C425, C426	373302214
C427, C428	371123924
C429-C436	391242207
C437, C438	371122224
C439-C442	354744709
C443	354780479
C444	354724719
C445	352981096
C446	354783399
C451, C452	371121034
C453, C454	354744709
C455, C481	391241017
C456-C459	373305614
C901, C902	352742229

**DESCRIPTION**

0.01 $\mu$ F $\pm$ 5%, 50V, Mylar
2200pF $\pm$ 5%, 50V, Mylar
1000pF $\pm$ 5%, 50V, Mylar
0.022 $\mu$ F $\pm$ 5%, 50V, Mylar
0.1 $\mu$ F $\pm$ 5%, 50V, Mylar
4.7 $\mu$ F, 50V, Elect.
0.033 $\mu$ F $\pm$ 5%, 50V, Mylar
1 $\mu$ F, 50V, Non-polar elect.
47 $\mu$ F, 16V, Elect.
1 $\mu$ F, 50V, Elect.
0.01 $\mu$ F $\pm$ 5%, 50V, Mylar
0.22 $\mu$ F, 50V, Elect.
47 $\mu$ F, 16V, Elect.
47 $\mu$ F, 16V, Elect.
47 $\mu$ F, 16V, Elect.
0.033 $\mu$ F $\pm$ 5%, 50V, Mylar
0.1 $\mu$ F $\pm$ 5%, 50V, Mylar
47 $\mu$ F, 16V, Elect.
22 $\mu$ F, 16V, Non-polar elect.
47 $\mu$ F, 16V, Elect.
22 $\mu$ F, 16V, Elect.
150pF $\pm$ 5%, 125V, PP
0.039 $\mu$ F $\pm$ 5%, 50V, Mylar
1500pF $\pm$ 5%, 50V, Mylar
220pF $\pm$ 5%, 125V, PP
3900pF $\pm$ 5%, 50V, Mylar
22 $\mu$ F, 16V, Elect.
2200pF $\pm$ 5%, 50V, Mylar
47 $\mu$ F, 16V, Elect.
4.7 $\mu$ F, 50V, Elect.
470 $\mu$ F, 6.3V, Elect.
0.1 $\mu$ F, 50V, Non-polar elect.
0.33 $\mu$ F, 50V, Elect.
0.01 $\mu$ F $\pm$ 5%, 50V, Mylar
47 $\mu$ F, 16V, Elect.
100 $\mu$ F, 16V, Elect.
560pF $\pm$ 5%, 125V, PP
2200 $\mu$ F, 16V, Elect.

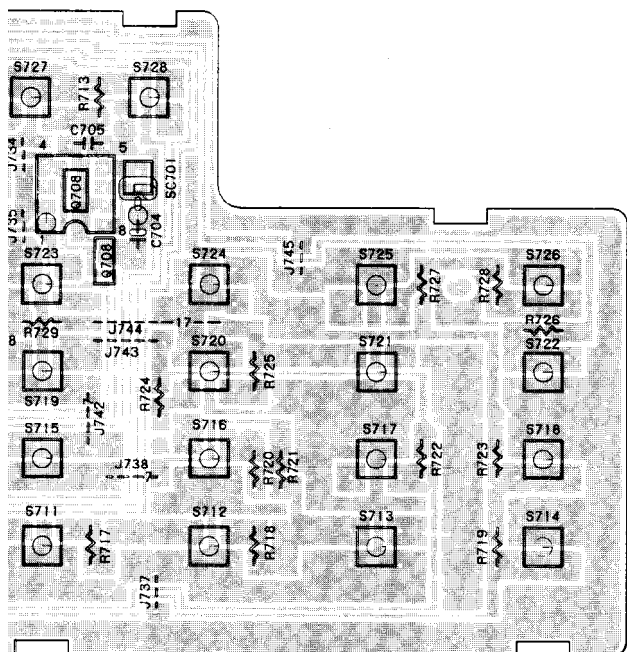
**CIRCUIT NO. PART NO.**

C907	354784709
C908	354762209
C909	354744709
C923, C924	354741009
C934, C935	354744709
<b>Resistors</b>	
R108	5210066
R110	5210060
R122, R125	5210066
R147	5210058
R425, R426	5210070
R904	441621504
<b>Themistors</b>	
R456, R460	4000099
<b>Plugs</b>	
P101	25055153
P102	25055152
P103, P104	25055150
P105	25055146
P108	25055045
P109, P110	25055038
P403	25055150
<b>Sockets</b>	
JL102	25050273
JL103	25050272
JL901	25050270
JL902	25050268
<b>Terminals</b>	
P114	25045220
P401	25045201
<b>Radiator</b>	
27160211-1	
<b>Screw</b>	
82143006	3P+6FN(BC), Pan head
<b>fuses</b>	
QF101, QF102	252112

**DESCRIPTION**

47 $\mu$ F, 50V, Elect.
22 $\mu$ F, 35V, Elect.
47 $\mu$ F, 16V, Elect.
10 $\mu$ F, 16V, Elect.
47 $\mu$ F, 16V, Elect.
N06HR22KBD, Semi-fixed
N06HR2.2KBD, Semi-fixed
N06HR22KBD, Semi-fixed
N06HR1KBD, Semi-fixed
N06HR100KBD, Semi-fixed
15 $\Omega$ , 1W, Metal oxide film
TD5-C230D
NPLG-9P137
NPLG-8P136
NPLG-6P134
NPLG-2P130
NPLG-4P33
NPLG-2P29
NPLG-6P134
NSCT-9P101
NSCT-8P100
NSCT-6P98
NSCT-4P96
NPJ-1PDOR97
NPJ-4PDBL82
RAD68B
3P+6FN(BC), Pan head
ICPN15, IC protector (G)

NOTE: (G): Only 220V models



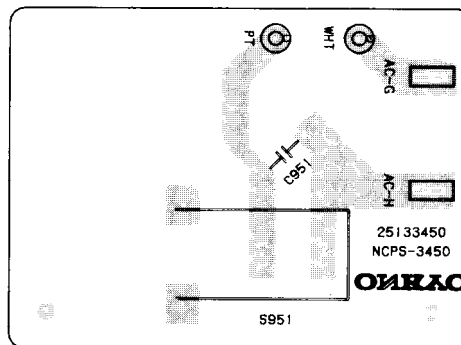
DISPLAY CIRCUIT PC BOARD

## DISPLAY CIRCUIT PC BOARD (NADIS-3447-2)

CIRCUIT NO.	PART NO.	DESCRIPTION
<b>ICs</b>		
Q701	22240212	CXP5058H-174Q
Q703	22240173	LC6527H-3722
Q708	222963	LB1630
<b>Fluorescent tube</b>		
Q702	212046	14BT-06GK
<b>Remote sensor</b>		
Q707	24130001	GP1U501S
<b>Transistors</b>		
Q704	2212132 or 2212133	2SC2021-R or 2SC2021-S
Q706, Q709	2212600	DTA124ES
<b>Diodes</b>		
D701-D704	223163	1SS133
D705	224650562 or 2243152	HZ5.6EB2 or MTZ5.6B
<b>Capacitors</b>		
C701	354721019	100 $\mu$ F, 6.3V, Elect.
C704	354744709	47 $\mu$ F, 16V, Elect.
<b>Resistors</b>		
R733-R738	49163472406	4.7k $\times$ 6, 1/10W, Network
<b>Switches</b>		
S701-S728	25035548	NPS-111-S510
S751	25065325	NSS-23128
<b>Sockets</b>		
SC701	2000893	NSAS-4P-849
SC702	2000732	NSAS-4P-688
<b>Holder</b>		
	27190567B	Display

## HEADPHONE AMPLIFIER PC BOARD (NAAF-3448-2)

CIRCUIT NO.	PART NO.	DESCRIPTION
Q451	222887	NJM4556S, IC
C451, C452	354744709	47 $\mu$ F, 16V, Elect. capacitors
R451	5104247	N16RGM20KB25F, Variable resistor



POWE SWITCH PC BOARD

CIRCUIT NO.	PART NO.	DESCRIPTION
R461, R462	442521014	100 $\Omega$ , 1/2W, Metal oxide film resistors
SC451	2000956	NSAS-10P-908, Socket
P451	25055146	NPLG-2P130, Plug

## HEADPHONE TERMINAL PC BOARD (NAAF-3449-2)

CIRCUIT NO.	PART NO.	DESCRIPTION
P451	25045139	HLJ-0540-01-010, Heaphone terminal

## POWER SWITCH PC BOARD (NAPS-3450-2)

CIRCUIT NO.	PART NO.	DESCRIPTION
C951	3500065A	DE7150FZ103PCSA(400V/125V), Capacitor IS
P951	25035558	NPS-111-L520P, Power switch
	27300601	Cover for C951
	25060092	NTM-1S33, Terminals

## TERMINAL PC BOARD (NAETC-3451-2)

CIRCUIT NO.	PART NO.	DESCRIPTION
P191	25045172	HSJ1003-01-020, Terminal
JL101	25050267	NSCT-3P95, Socket



# OPERATION WHEN POWER IS TURNED ON

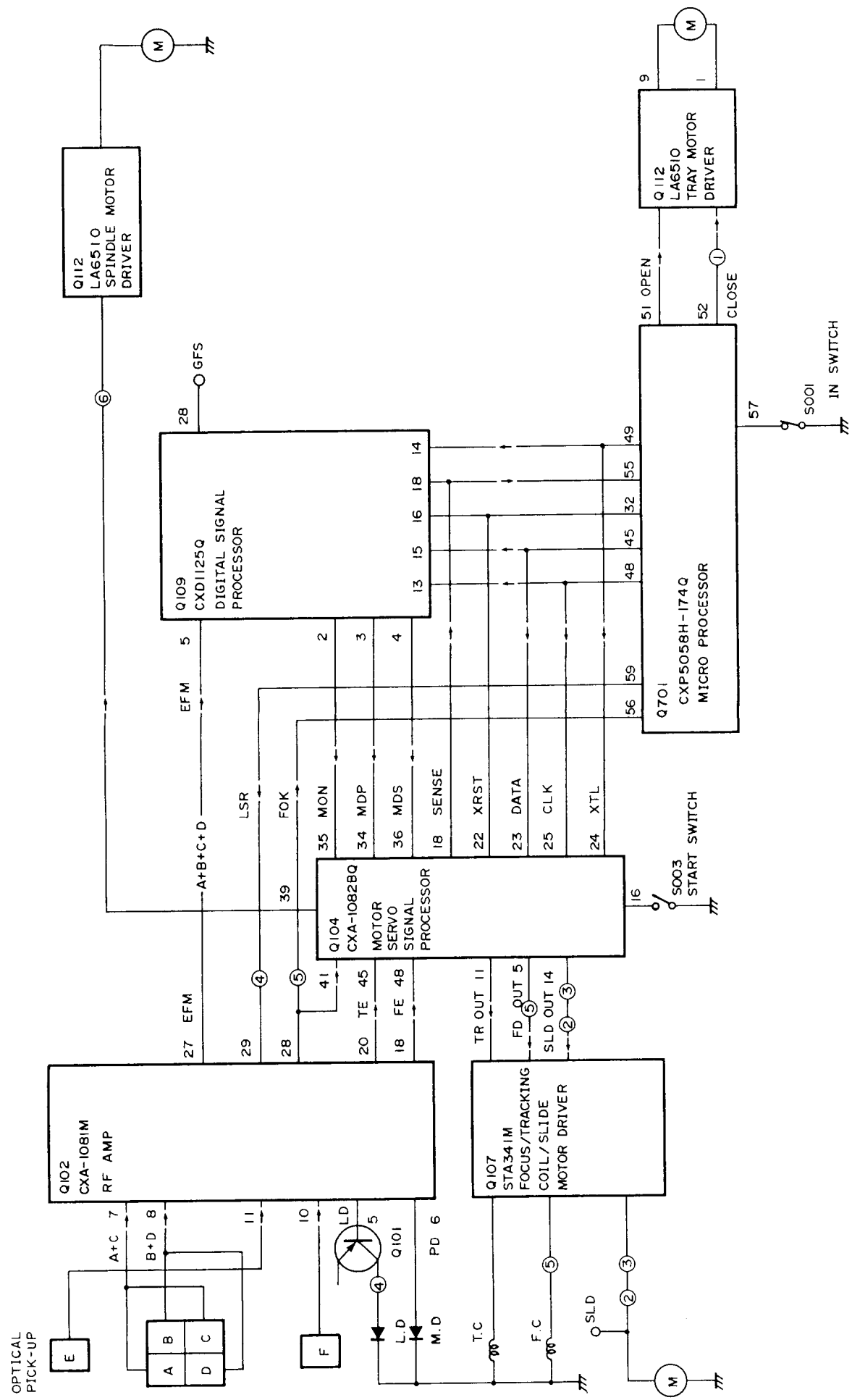


Fig.25

**1. Close the tray (even if the tray is shut, the operation is the same).**  
About 1 second after power is turned ON, the Q701 close terminal goes low, Q112 pin 1 goes high (4V), pin 9 goes low, and the tray IN switch turns ON.

**2. Optical pickup return to innermost circumference**

When Q701 receives the data of the IN switch being ON, the command is given from Q701 (XTL, CLK, DATA) to Q104 to return the pickup to the inner circumference, SLD terminal goes low (-5V), the slide motor turns ON, the pickup returns to the innermost circumference, and the start switch turns ON.

XTL: Command execution CLK: Clock for command

DATA: Command content

**3. Return of optical pickup to top area**

The S.SW terminal interprets the data of the start switch going ON, and in order to return the pickup to the top area, the SLD OUT terminal goes high momentarily, the slide motor goes ON when the SLD OUT becomes high, the pickup returns to the top area, and the start switch goes OFF. This data is transmitted to Q701 sense terminal from Q104.

**4. Optical pickup light emission**

The LSR terminal goes from 5V to 0V, the APC circuit operates, the Q101 collector goes to 2V, and the pickup emits light.

**5. In order to confirm the existence or non-existence of a disc, the focus coil moves up and down 3 times.**

The moment the pickup emits light, a command is given from Q701 to Q104 to move the focus coil, 3 triangular wave pulses are issued from the FO OUT terminal, 3 triangular wave pulses are issued from the Q107 FO terminal, and the focus coil moves up and down 3 times. (When there is no disc, the operation ends.)

When there is a disc, with the A + C and B + D and signals internal to the IC of Q102, addition and subtraction are carried out, and at the point that is obtained for focus, FOK goes high, and that data is given to Q701 from Q102.

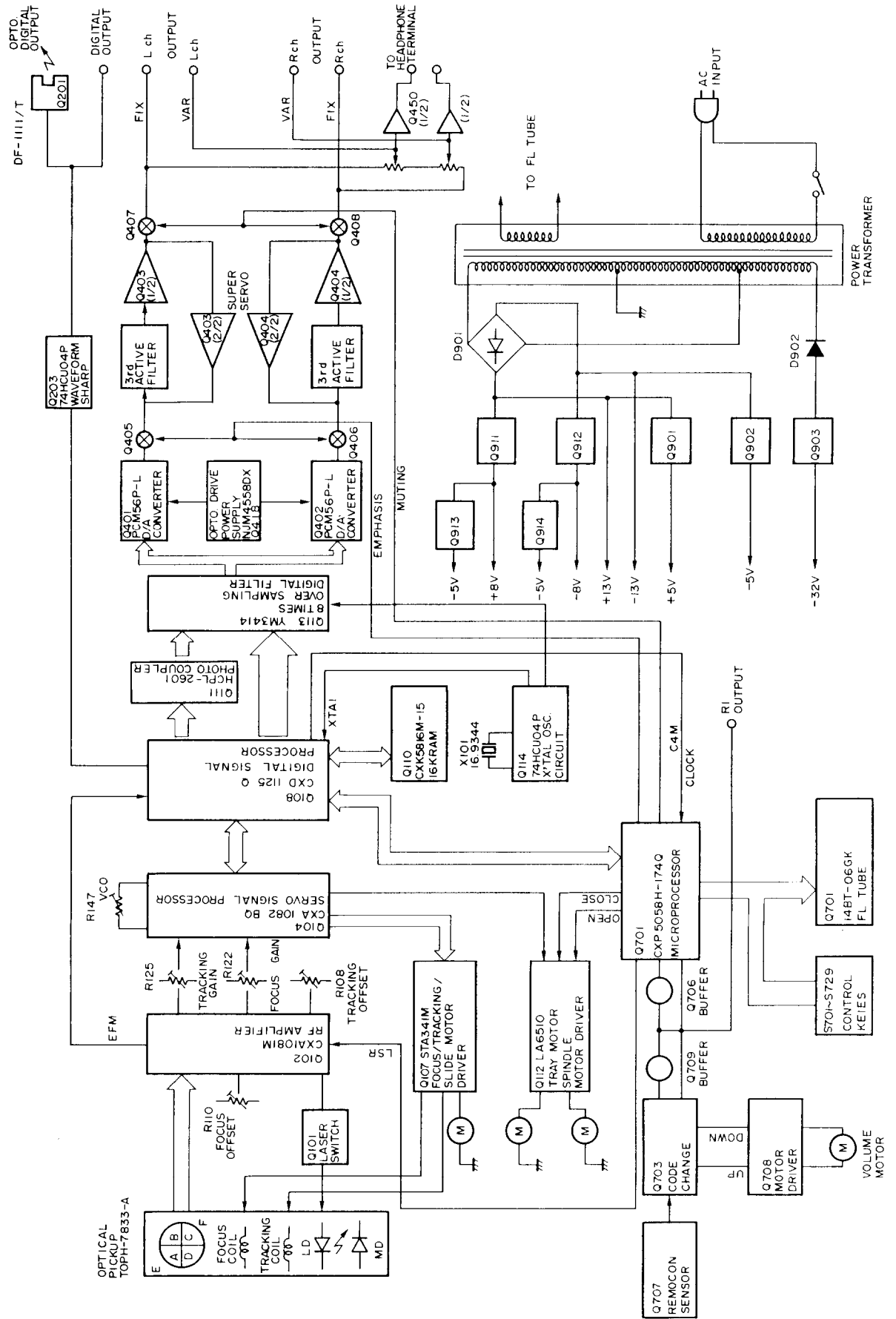
**6. Making spindle motor rotate**

Next, when the command is given from Q701 to Q109 to make the spindle rotate, the MDS terminal goes high, the SPD OUT terminal goes high (+4V), the spindle begins to rotate, the tracking servo and PLL lock, CLV starts, and TOC is read from the HF signal.

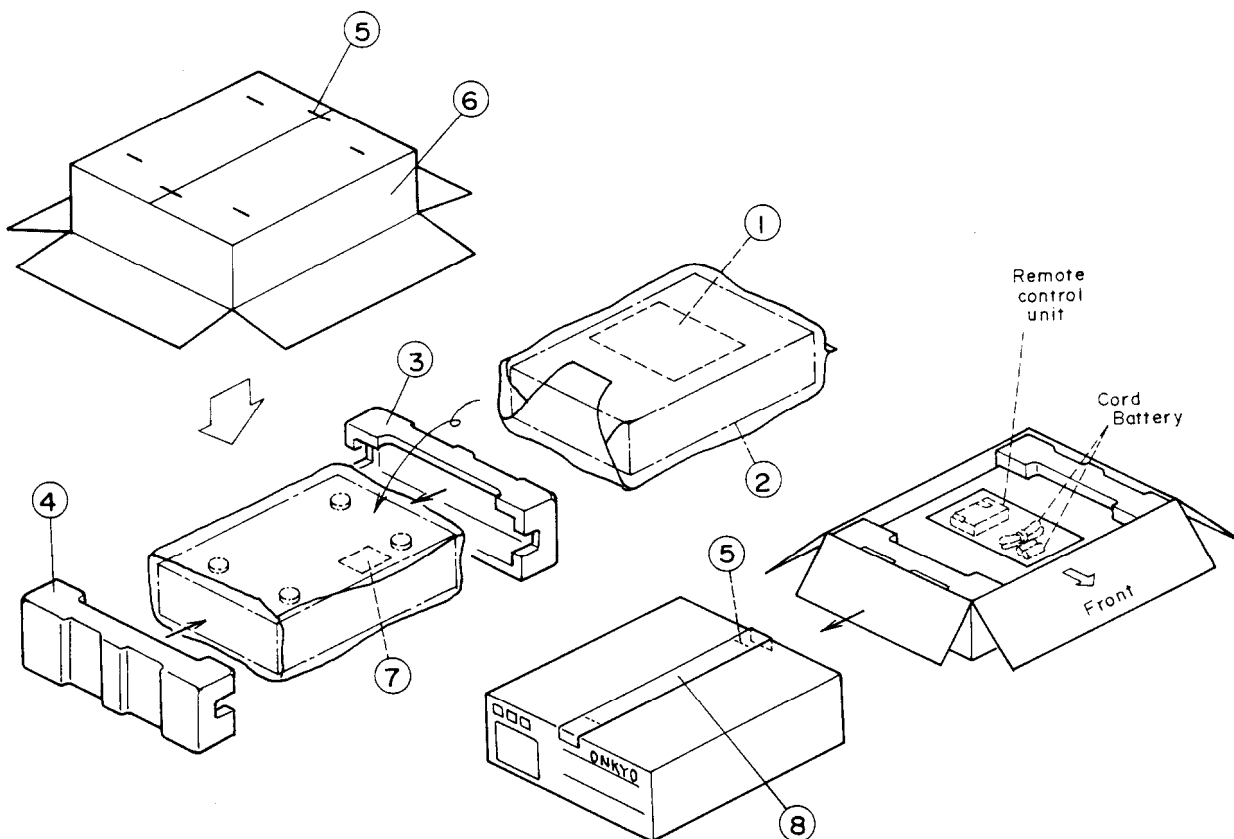
(GFS terminal goes high: 5V)

When the TOC is read, the display use data (sub codes) is fed from Q109 to Q701, the entire number of musical selections and the entire performance time is displayed.

# BLOCK DIAGRAM



## PACKING VIEW



REF.NO.	PART NO.	DESCRIPTION
1	29361109	Caution sheet
2	29100037A	500×650mm, Poly-vinyl bag
3	29091304	Pad R
4	29091303	Pad L
5	282301	Sealing hook
6	29051839	Master carton box
7	29361110	Caution label
8	260012	50×500mm, Damplon tape
<b>Accessory bag ass'y</b>		
<b>- 120V models -</b>		
	2010097	Connection cord
	24140121	RC-121C, Remote control unit
	3010054	UM-3, Two batteries
	29341356	Instruction manual
	29100097	350×250mm, Poly-vinyl bag
	2010169	Connection cord for remote control
	29365019	Warranty card (Only U.S.A. model)
	29358002F	Service station list (Only U.S.A. model)
<b>- 220/240V models -</b>		
	2010097	Connection cord
	24140121	RC-121C, Remote control unit
	3010054	UM-3, Two batteries
	29341358	Instruction manual
	29100097	350×250mm, Poly-vinyl bag
	2010169	Connection cord for remote control
	25055040	CV-K-2, Conversion plug
<b>- Universal models -</b>		
	2010097	Connection cord
	24140121	RC-121C, Remote control unit
	3010054	UM-3, Two batteries
	29341358	Instruction manual
	29100097	350×250mm, Poly-vinyl bag
	2010169	Connection cord for remote control

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 Telex: 2423551 ONKYO J. Phone: 03-432-6981

**ONKYO U.S.A. CORPORATION**

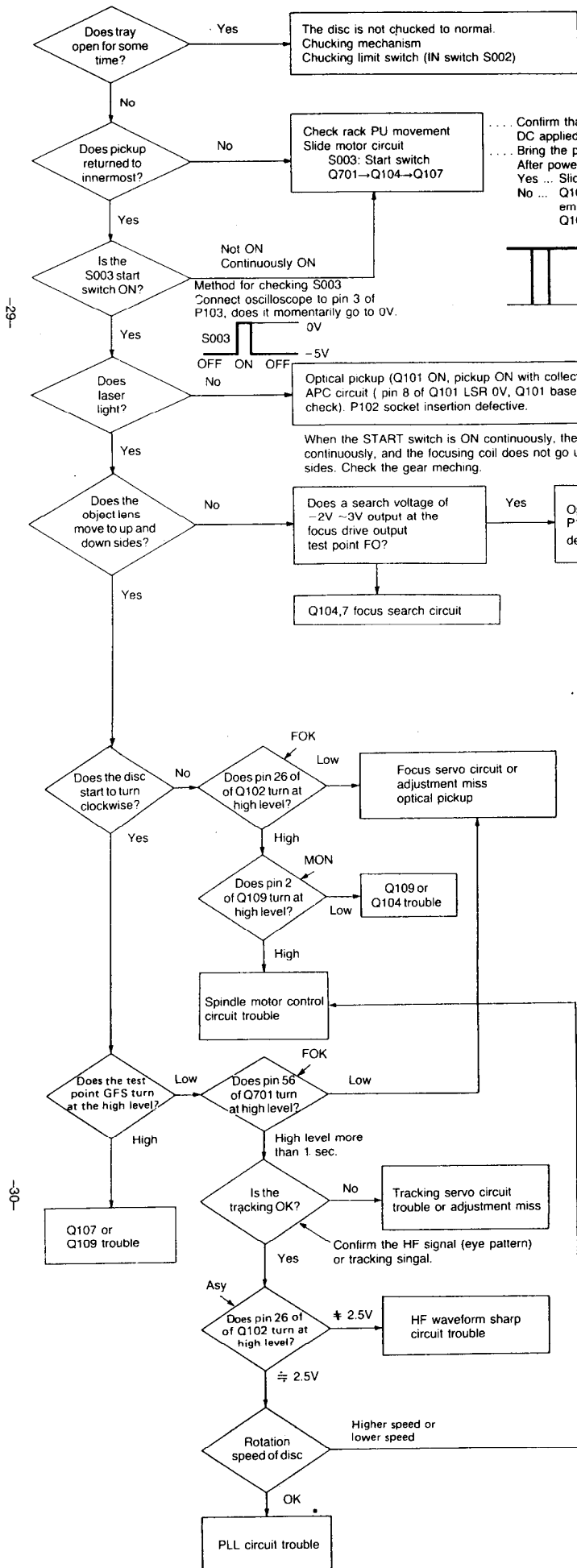
200 Williams Drive, Ramsey, N.J. 07446 Tel. 201-825-7950

# TROUBLESHOOTING GUIDE

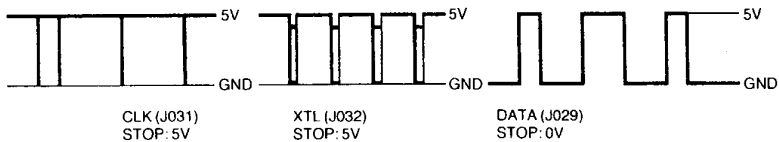
## Symptom: Defective reading (No RF signal emitted)

Load the disc on the tray, press OPEN/CLOSE key and close the tray. But, the total number of tunes are not indicated on the fluorescent indicator tube.

1. Remove the top cover.
2. Does the disc turn clockwise? . . . . . Yes . . . . . Next page  
No . . . . . Remove the bracket holder and arm ass'y. Check the following when turning on power without the disc.

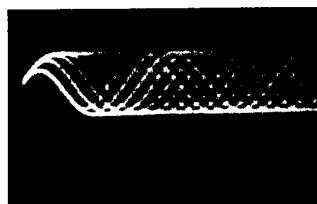


... Confirm that the slide motor runs smoothly with the tester (ohm range) or 1V DC applied to both ends of the motor.  
... Bring the pickup to the outermost circumference.  
After power source is applied to SLD terminal, is the voltage -2V to 4V?  
Yes ... Slide motor defective  
No ... Q104 pin 14 (check at leads of R139): when low, Q104 is defective, if pulse emitted at CLK (J031), XTL (J032), DATA (J029) and when not emitted at Q104, Q107 is defective.



NOTE: There is the possibility that the pickup lens is so dirty that it is impossible to read. Clean with a lens cleaner.

- Use the high impedance probe. (10:1)
- Play the track 2 of test disc. (YEDS-18)



RF signal  
P109 pin 2 (HF)  
V: 50mV/div  
H: 0.5μS/div



Tracking signal  
P108 pin 4 (HF)  
V: 20mV/div  
H: 0.5mS/div