ONKYO® SERVICE MANUAL

COMPACT DISC PLAYER
MODEL DX-330

Black and Silver models

BUDN, BUD	120V AC, 60 Hz
BUG, UG	220V AC, 50Hz
BUU, BUUX	110/120/220/240V AC, 50/60Hz
BUQA, BUQB	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:	88.2kHz (two-times oversampling)
Number of channels:	2 (Stereo)
Frequency response:	5Hz~20kHz
Total harmonic distortion:	0.03% (at 1kHz)
Dynamic range:	93dB
Signal to noise ratio:	96dB
Channel separation:	90dB (at 1kHz)
Wow and Flutter:	Below threshold of measurability
Power comsumption:	14 watts
Output level:	2 volts r.m.s.
Dimensions (W x H x D):	435 x 92 x 359mm 17-1/8" x 3-5/8" x 14-1/8"
Weight:	4.8kg, 10.6 lbs.

Specifications are subject to change without notice.

ONKYO
AUDIO COMPONENTS

TABLE OF CONTENTS

SERVICE PROCEDURES

1. Removing the Locking Plate

Locking plate is located on the bottom panel of this unit. Before using this unit for the first time, the plate must be removed. If power is switched on while this part is still in place, the unit will not operate properly

1. Locking plate
2. Tapping screw

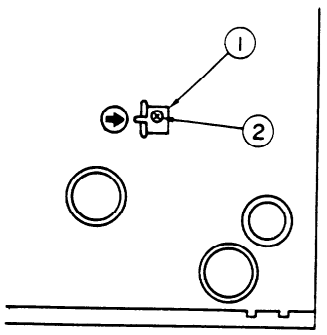


Fig. 1

2. Safety-check out (U.S.A. model)

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. Procedures for replacement of flat packaged ICs

1. Tools to be used:

(1) Soldering iron . . . . Grounded soldering iron or soldering iron with leak resistance of 10 Mohms or more.

Form of soldering iron's tip:

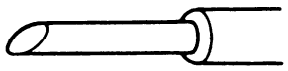


Fig. 2

(2) Magnifying glass . . . for checking of finished works

(3) Tweezers . . . . . for handling of IC and forming of leads

(4) Grounding ring . . . . Countermeasure for electrostatic breakdown

(5) Nipper . . . . . for removing defective IC

(6) Small brush . . . . . for application of flux

2. Work Procedures:

(1) Remove the defective IC

Cut all leads of the defective IC one by one using a nipper and remove the IC.

(2) Clean the pattern surface of the PC board.

Get rid of the remaining leads and solder.

(3) Check and from the leads of the new flat packaged IC to be installed.

From every lead on the new IC using a pair of tweezers, so that all of them are aligned neatly without being risen, twisted or inclined toward one side. Especially the rising portion of every lead must be formed with greatest care.

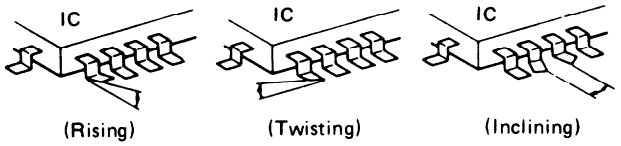


Fig. 3

(4) Apply flux to the PC board.

Apply flux to the pattern surface of the PC board which has been cleaned, as shown in the illustration. The area to be applied with flux is the portion of about 2.5mm in width where the IC's leads are to be soldered.

Be careful to apply minimum amount of flux required so as not to smear it on unwanted areas.

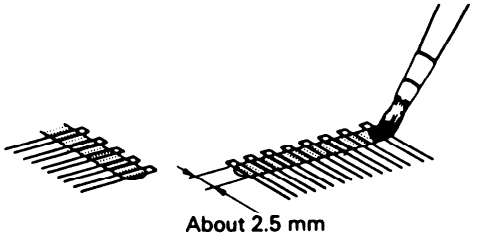


Fig. 4

(5) Temporarily tighten the IC

Carefully align the pattern and IC's leads, so that the IC will be temporarily tightened to the pattern on the four leads at the corners. At this time, soldering is required, but no need to apply soldering material.

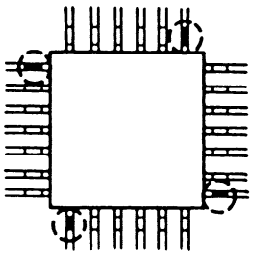


Fig. 5

(6) Apply flux to IC's leads

Apply flux to the areas of IC's leads where soldering is to be performed. Be careful not to smear flux on the root portion of any lead or the body of IC.

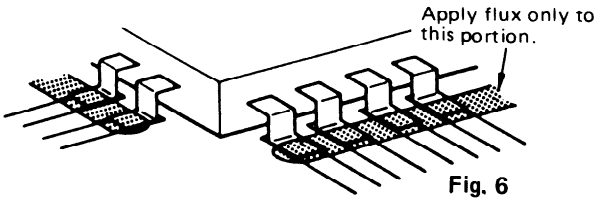


Fig. 6

(7) Soldering

While attaching the tip of the soldering iron to the soldering point as shown in the illustration, feed 2 –5mm of soldering wire. Then, slowly move the iron in the direction indicated by the arrow in the illustration, so that the leads will be soldered to the pattern. Move the iron in the rate of approximately 1cm in 5sec. Proceed with your work while confirming a clean fillet of solder is fomed on each lead, subsequent to the melting of flux.

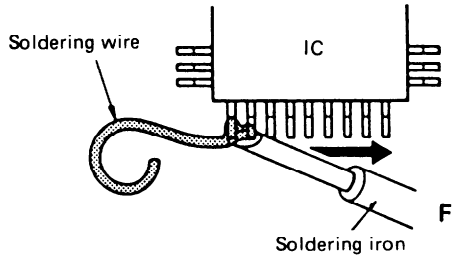


Fig. 7

CAUTION

1) If you move the iron too quickly, loose soldering is likely to result.
2) Be especially careful when soldering the first lead where loose soldering is most liable to be formed.

(8) Check the results

When soldering of all leads is finished, check the soldered portion on every lead with a magnifying glass. A tester must not be used or checking of any soldered position

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.

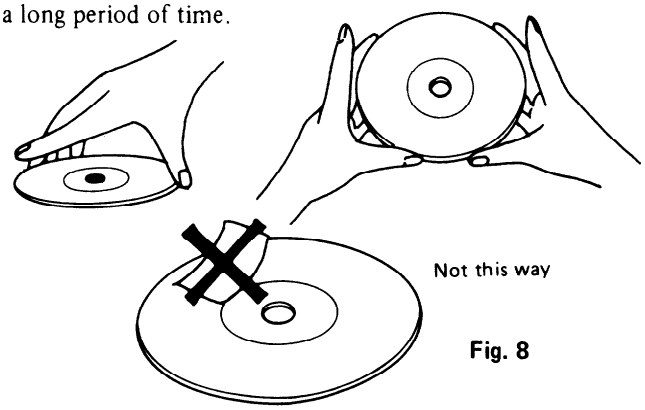


Fig. 8

- **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.

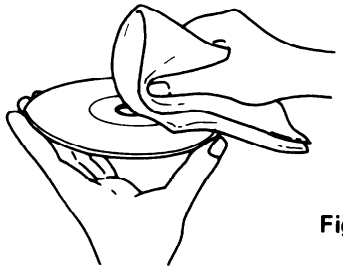


Fig. 9

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.

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 EMMISION, BE SURE TO OBSERVE FROM A DISTANCE OF MORE THAN 30cm FROM THE SURFACE OF THE OBJECTIVE LENS ON THE OPTICAL PICK-UP BLOCK.

Laer Diode Properties

- Material: GaAS/GaAlAs
- Wavelength: 780nm
- Emission Duration: continuous
- Laser output: max. 0.4mW*

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

LASER WARNING LABELS

The labels shown below are affixed.

1. Warning labels

120V model

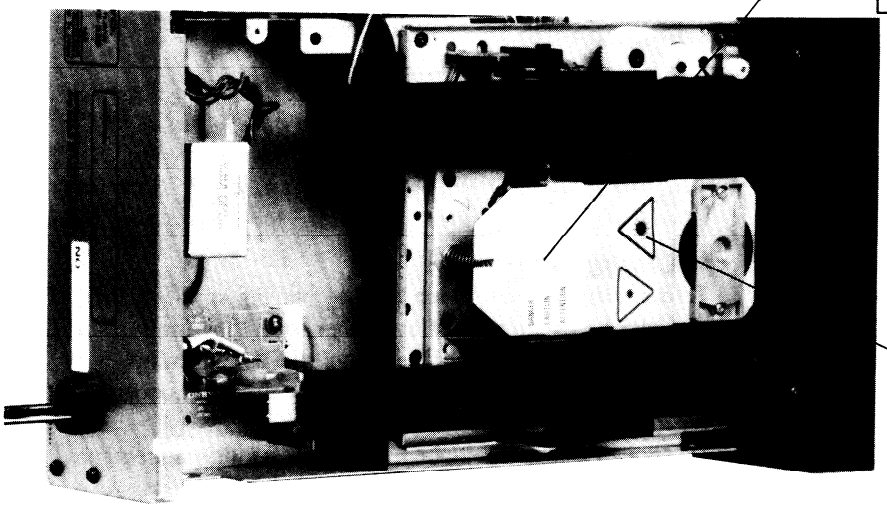


Photo 1

Other models

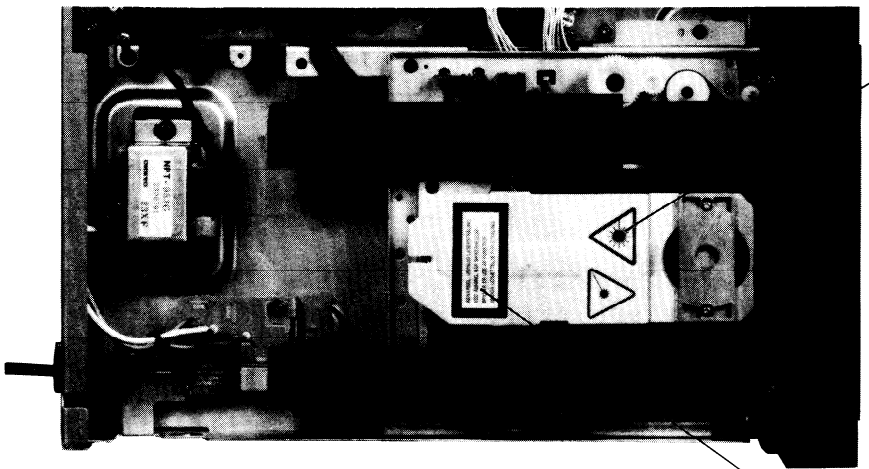
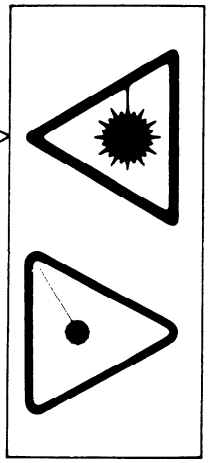


Photo 2



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

CAUTION — HAZARDOUS LASER AND ELECTROMAGBETIC RADIATION WHEN OPEN AND INTERLOCK DEFEATED.

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

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

2. Certification label (UD: 120V model)

This label is located on the back panel.

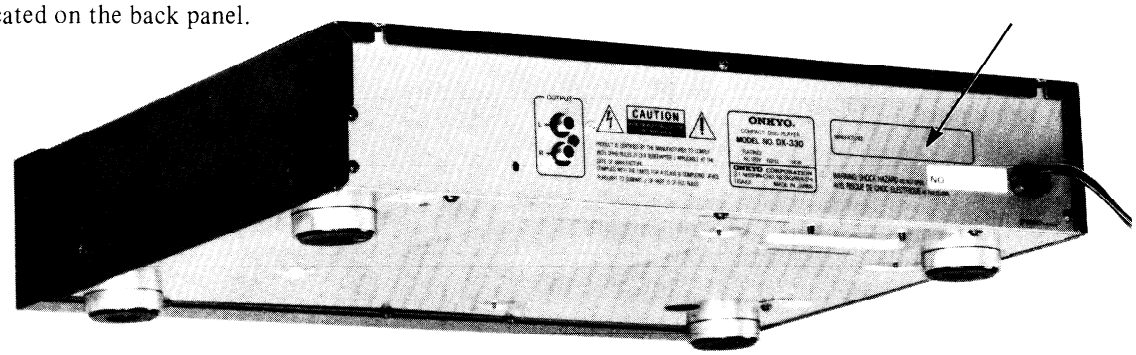


Photo 3

3. Class 1 label (Other models)

This label is located on the back panel.

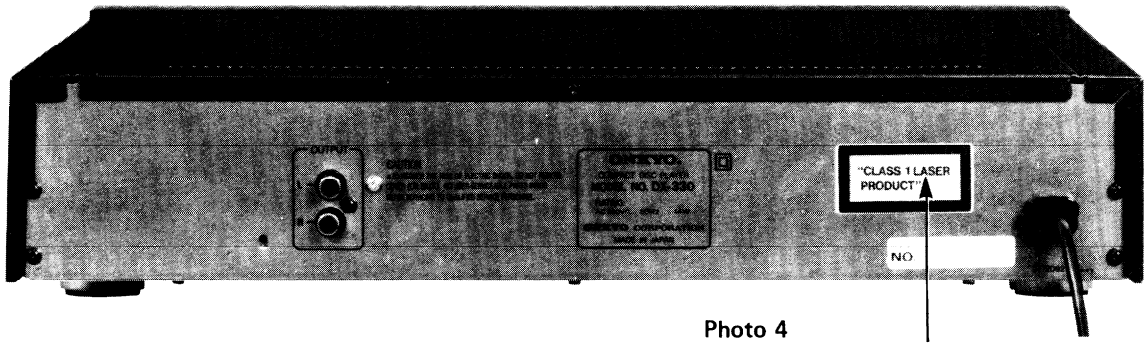
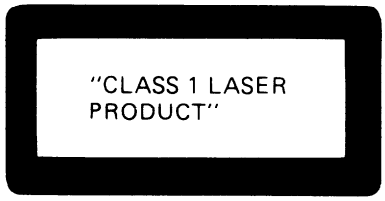


Photo 4

ADVARSEL



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 advarselsmærkning, som advarer imod at foretage sådanne indgreb i apparatet, at man kan komme til at udsætte sig for laserstråling.

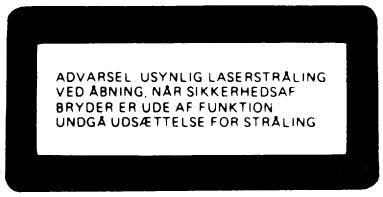


Fig. 10

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

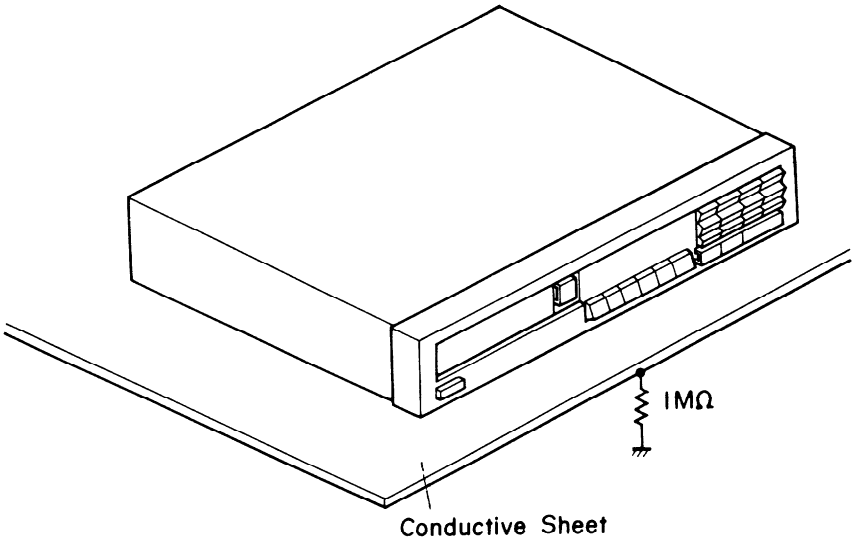
CAUTIONS ON REPLACEMENT OF PICK-UP

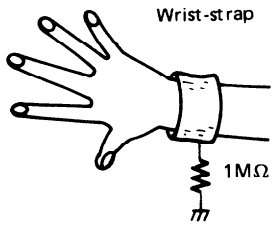
The laser diode in the optical pick-up block is so sensitive to static electricity, surge current and etc. that the components are liable to be broken down or its reliability remarkably deteriorated.

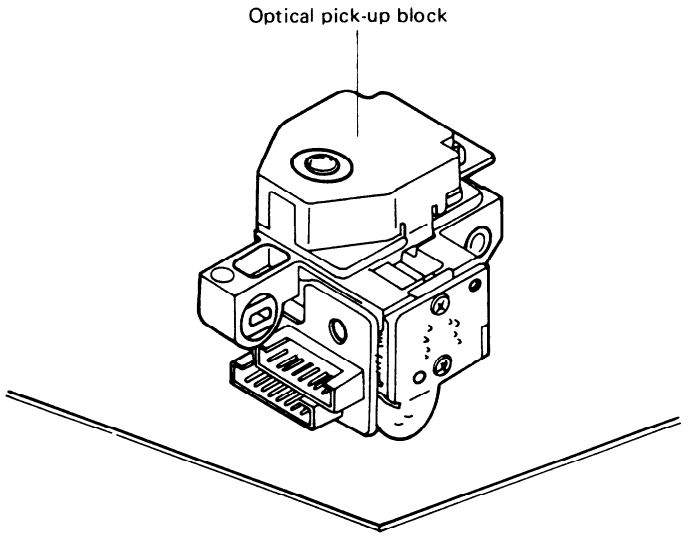
During repair, carefulley take the following precautions. (The following precautions are included in the service parts).

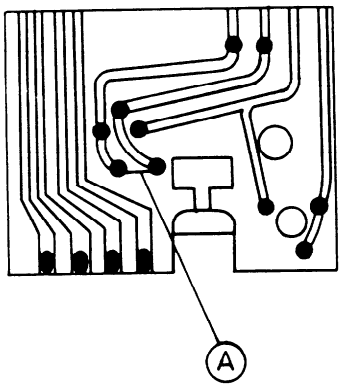
PRECAUTIONS

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.**







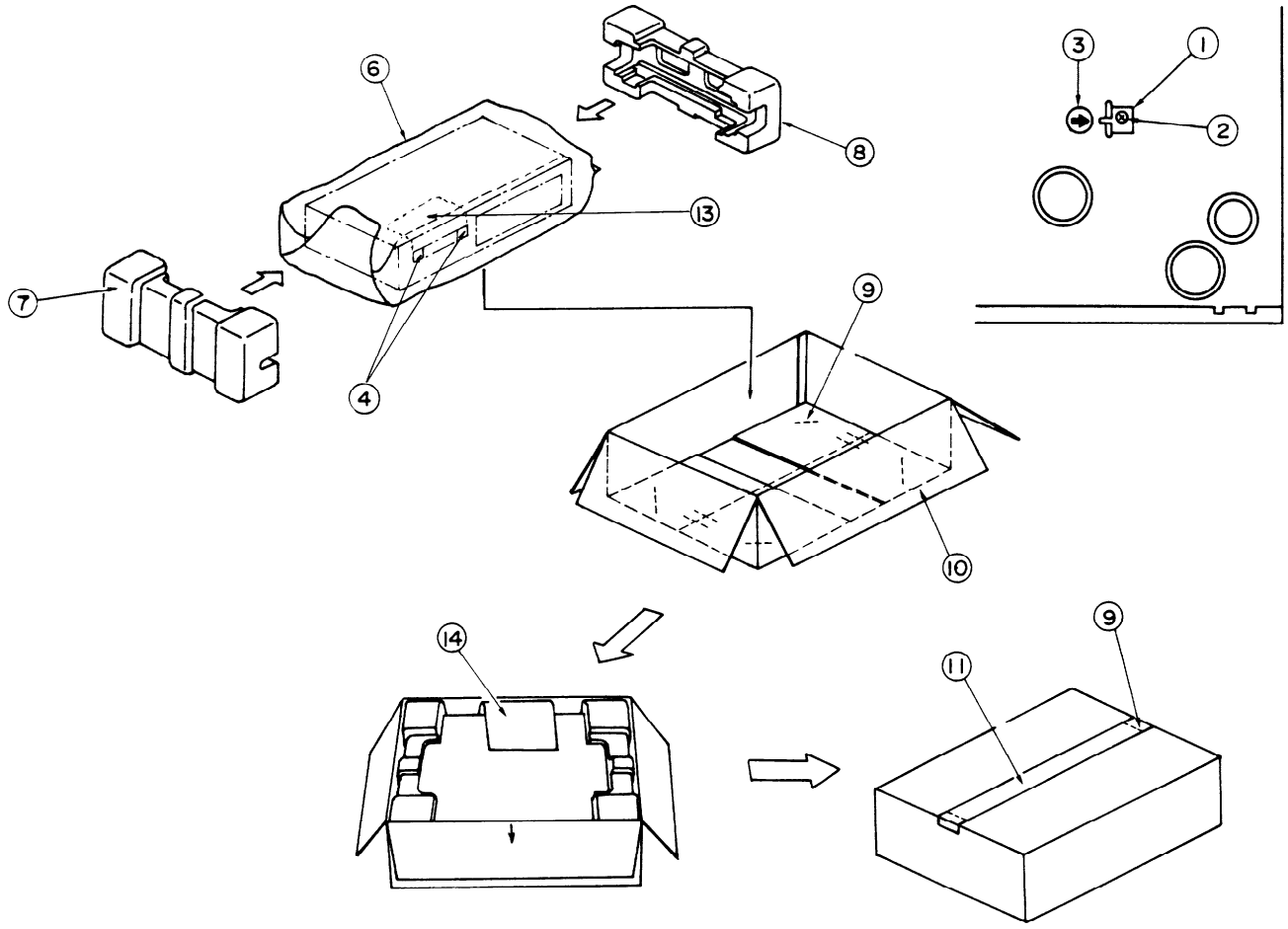


To solder Ⓐ position before removing the optical pick-up.

The optical pick-up KSS-123A of service part has a protective solder bridge for Ⓐ position.
That must be removed after connecting the pick-up.

Fig. 11

PACKING VIEW



REF.NO.	PART NO.	DESCRIPTION
1	27141103A	Locking plate
2	834430068	3TTS+6B(BC), Tapping screw
3	29360833	Label
4	29095453A	Pad sheet
6	29100036A	550 x 850mm, Poly-vinyl bag
7	29091110A	Pad L
8	29091111A	Pad R
9	282301	Sealing hook
10	29051428	Master carton box [S]
	29051429A	Master carton box [B]
	29051429-1	Master carton box [PX model]
11	260012	Damplon tape
13	29360907	Label, locking plate
14	Accessary bag ass'y	

U.S.A. model

2010097	Connection cord
24140001	RC-104C, Remote control unit
3010054	UM-3, Two batteries
29341086	Instruction manual
29100006A	350 x 250mm, Poly-vinyl bag
29365006-7	Warranty card
29358002D	Service station list

120V model

2010097	Connection cord
24140001	RC-104C, Remote control unit
3010054	UM-3, Two batteries
29341086	Instruction manual
29100006A	350 x 250mm, Poly-vinyl bag

220V model/240V model

2010097	Connection cord
24140001	RC-104C, Remote control unit
3010054	UM-3, Two batteries
29341087	Instruction manual
29100006A	350 x 250mm, Poly-vinyl bag

Universal model

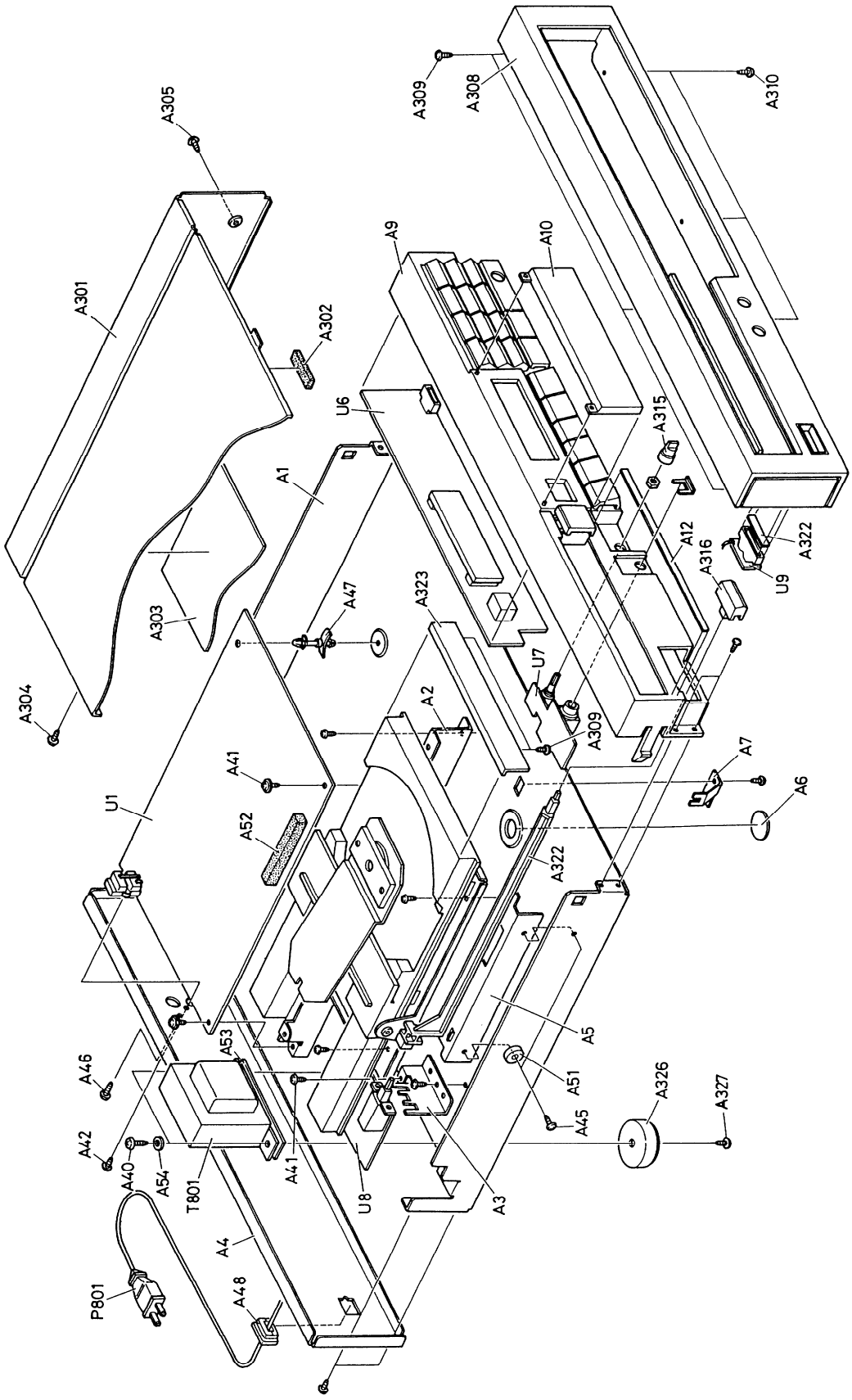
2010097	Connection cord
24140001	RC-104C, Remote control unit
3010054	UM-3, Two batteries
29341087	Instruction manual
25055040	CV-K-2, Conversion plug
29100006A	350 x 250mm, Poly-vinyl bag

PX model

2010097	Connection cord
24140001	RC-104C, Remote control unit
3010054	UM-3, Two batteries
29341086	Instruction manual
25055251	CV-CP, Conversion plug
29100006A	350 x 250mm, Poly-vinyl bag
29365012A	Warranty card
29358002D	Service station list
28185266	Side panel ass'y
29091098	Pad

Note: [S] : Only Silver model
[B] : Only Black model

EXPLODED VIEW



PARTS LIST

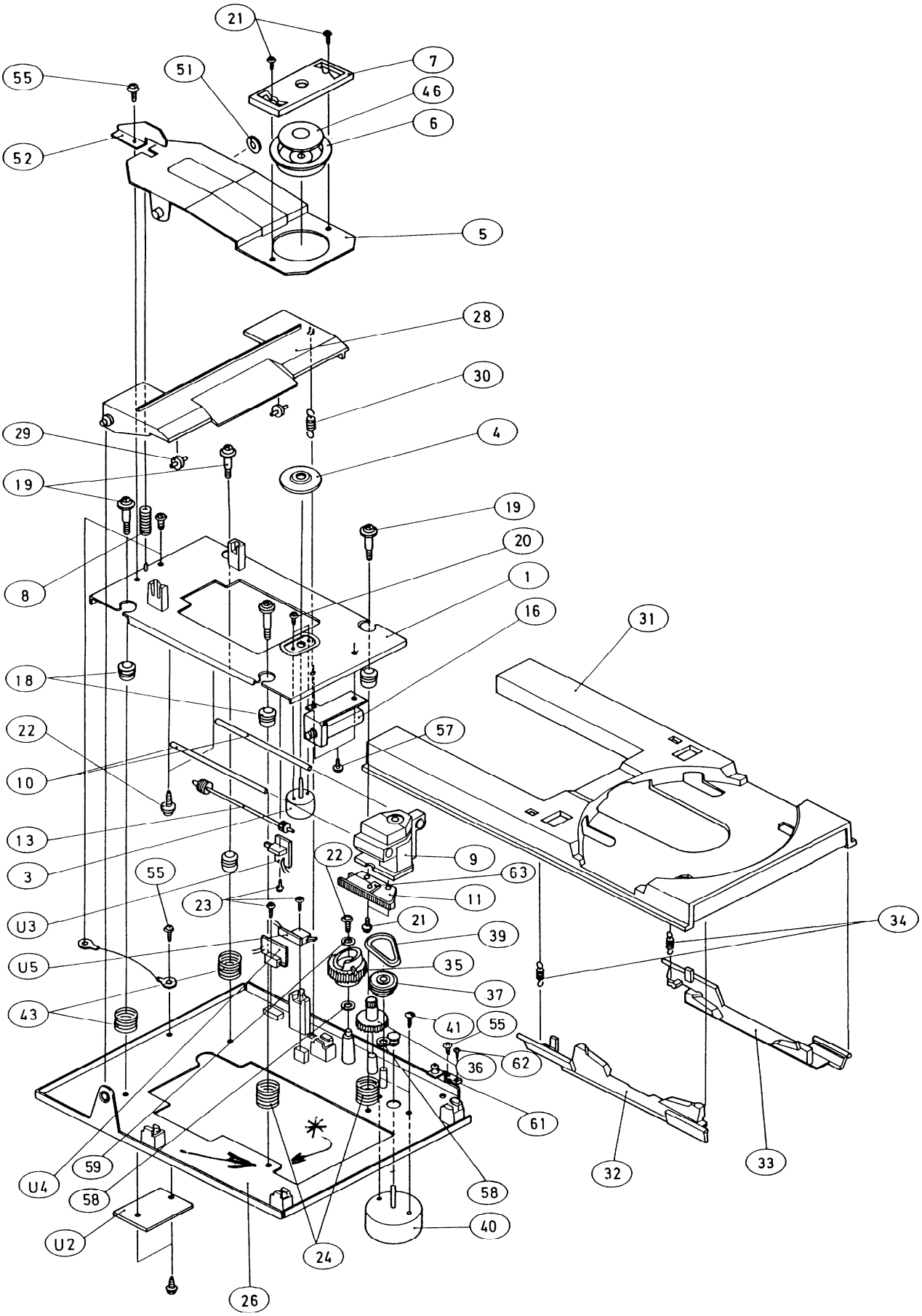
REF.NO.	PART NO.	DESCRIPTION
A1	27100108C	Chassis
A2	27130454A	Bracket
A3	27141087A	Bracket, Power
A4	27120920	Back panel [D]
	27120921	Back panel [G]
	27120961	Back panel [Q]
	27120950	Back panel [U]
A5	27130459A	Bracket, Mechanism
A6	27270201	Spacer
A7	27141103A	Bracket P
A9	~~27110316~~	~~Front bracket ass'y [S]~~
	27110309B	Front bracket ass'y [B]
A10	28191383	Clear plate
A11	28140717	5 x 22 x 6, Cushion
A12	28140718	0.5 x 7 x 150, Cushion
A39	834430068	3TTS+6B(BC), Tapping screw
A40	830440109	4TTC+10C(BC), Tapping screw
A41	831130088	3TTW+8B, Tapping screw
A42	834430108	3TTS+10B(BC), Tapping screw
A43	801364	Special screw
A44	834430080	3TTP+8P(BC), Tapping screw
A45	838430068	3TTB+6B(BC), Tapping screw
A46	834230108	3TTS+10B(Ni), Nickel screw
A47	27190011	Holder
A48	27300750	⚠ Strainrelief
A51	27175011C	Cushion
A52	28140559	Cushion
A53	27270210	Spacer
A54	870065	Special washer
A301	28184341	Top cover [S]
	28184339	Top cover [B]
A302	28140020	40 x 10 x 4, Cushion
A303	28140740	Cushion
A304	834430068	3TTS+6B(BC), Tapping screw
A305	838440089	4TTB+8C(BC), Tapping screw
A308	10518121	Front panel ass'y [S]
	10528121	Front panel ass'y [B]
A309	833430080	3TTP+8P(BC), Tapping screw
A310	834430088	3TTS+8B(BC), Tapping screw
A315	28322772	Knob LEVEL [S]
	28322437	Knob LEVEL [B]
A316	28322771	Knob POWER [S]
	28322747A	Knob POWER [B]
A320	27273057A	Joint
A322	28199164	Film
A323	27210772	Front panel, Door [S]
	27210771	Front panel, Door [B]
A326	27175136	Leg
A327	831430088	3TTW+8B(BC), Tapping screw
	27141090A	Bracket [U]
	834430088	3TTS+8B(BC), Tapping screw [U]
	834430068	3TTS+6B(BC), Tapping screw [U]

REF. NO.	PART NO.	DESCRIPTION
P801	253123,	⚠ AS-UC-6#18, Power supply
	253136 or	cord [D/UX]
	253140	
	253127 or	⚠ AS-CEE 250V, 2.5A, Power
	253129	supply cord [G/U]
	253118	⚠ AS-SAA, Power supply cord [QA]
	728328	⚠ Power supply cord [QB]
S802	25065168	⚠ HXW0131-01-060, Voltage selector switch [U]
SC801	2000627D	NSAS-8P583, Socket
SC802	2000581D	NSAS-8P537, Socket
T801	2300190	⚠ NPT-953D, Power transformer [D]
	2300191	⚠ NPT-953G, Power transformer [G]
	2300202	⚠ NPT-953ADGQ, Power transformer [U]
	2300193	⚠ NPT-953Q, Power transformer [Q]
U1	10518529-3	NAAR-2729-3, Main circuit pc board ass'y
	10514529-3A	NAAR-2729-3A, Main circuit pc board ass'y [G/Q/U]
U6	10518501-2	NADIS-2801-2, Display pc board ass'y
U7	10518503-2	NAHP-2803-2, Headphone terminal pc board ass'y [G/Q/U]
	10528503-2A	NAHP-2803-2A, Headphone terminal pc board ass'y [D]
U8	10518502-2	NAPWI-2802-2, Power indicator pc board ass'y
U9	10518543-2	NAPS-2843-2, Power supply circuit pc board ass'y
	29360806A	Label LASER
	29360807	Label DANGER [D]
	29360811A	Label [G/Q/U]
	29360687	Label CLASS 1 [G/Q/U]

NOTE: [B]: Only Black model
[S]: Only Silver model
[D]: Only 120V model
[G]: Only 220V model
[U]: Only Universal model
[Q]: Only 240V model
[QA]: Only Australian model
[QB]: Only U.K. model
[UX]: Only PX model

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

MECHANISM EXPLODED VIEW



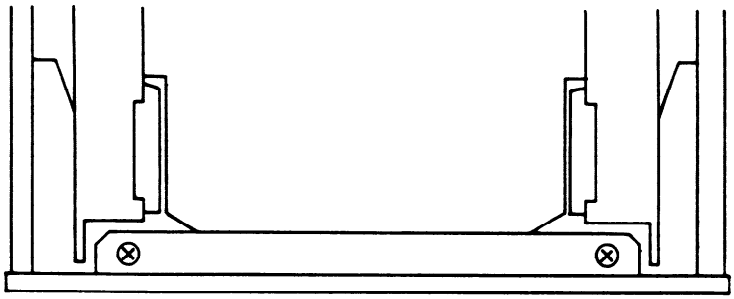
PARTS LIST

REF.NO.	PART NO.	DESCRIPTION
1	27100098F	Chassis
3	24502203	Spindle motor
4	27300889B	Turntable platter
5	27300847B	Arm P
6	27300848A	Cap CH
7	27300849B	Holder, cap
8	27180327	Spring –
9	241065	KSS-123A, Optical pick-up
10	27260222	Shaft
11	27300850B	Rack PU
13	10498902	Shaft ass'y
16	10498903	Motor ass'y
18	27300854A	Cushion rubber
19	801364	Special screw
20	82142003	2P+3F(BC), Pan head screw
21	82112605	2.6P+5F, Pan head screw
22	831430100	3TTW+10P(BC), Tapping screw
23	833420108	2TTP+10B(BC), Tapping screw
24	27180319	Spring
26	27100099F	Chassis L
28	27300855E	Arm L
29	27185019A	Roller
30	27180310B	Spring
31	[illegible]	Disc tray
32	27300862E	Disc lifter L
33	27300863E	Disc lifter R
34	27180311C	Spring
35	27300856B	Cam gear
36	27300857A	Flat wheel
37	27300858	Pulley gear
39	27300860	Belt
40	10498901	Motor ass'y
41	82142604	2.6P+4F(BC), Pan head screw
43	27180320	Spring
44	833430080	3TTP+8P(BC), Tapping screw
46	27270206	Spacer
51	27270203	510, Spacer
52	27141098	Bracket, holder
53	223004-1	Terminal
55	834430068	3TTS+6B(BC), Tapping screw
57	834426068	2.6TTS+6B(BC), Tapping screw
61	27180328	Roller spring
62	833420068	2TTP+6B(BC), Tapping screw
U3	10498544-1	NATRM-2844-1, Terminal pc board ass'y
U4	10498545-1	NASW-2845-1, Start switch pc board ass'y
U5	10498546-1	NASW-2846-1, Open switch pc board ass'y
U6	10498547-1	NASW-2847-1, Close switch pc board ass'y

DISASSEMBLING PROCEDURES

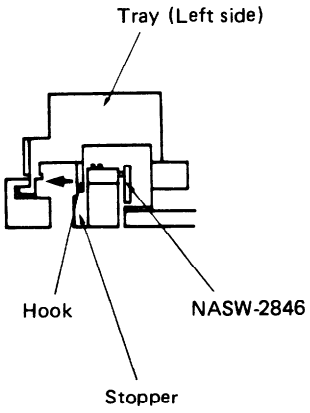
1. Tray panel removal

1) Remove the tray with pressing the OPEN/CLOSE button.
2) Turn the unit over and put it on the soft cloth.
3) Remove the two screws from the tray.



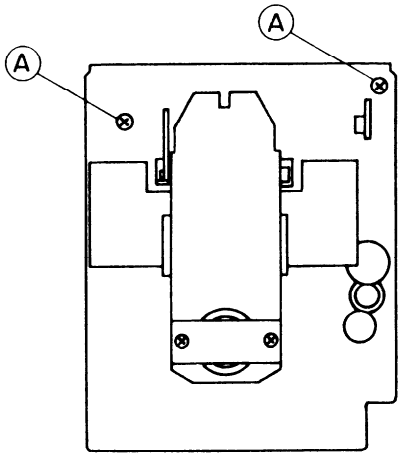
2. Tray removal

1) Remove the top cover.
2) Open the tray with pressing the OPEN/CLOSE button.
3) Release the hook of tray from stopper and pull the tray out.



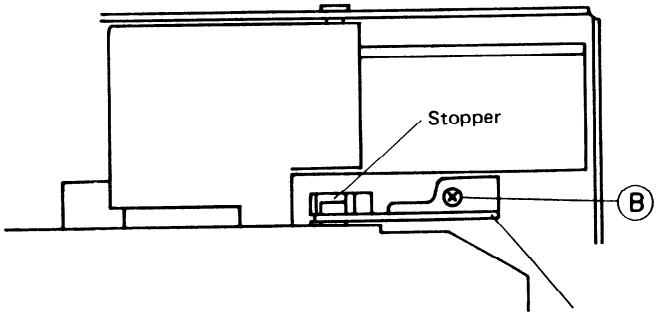
3. Mechanical chassis removal

1) Remove the top cover and tray.
2) Remove the two screws A from the mechanical chassis.
3) Remove the two connectors (P101 & P102) from the main pc board.
4) Pull the mechanical chassis out carefully.
5) Remove the two connectors (P201 & P202) from the terminal pc board.



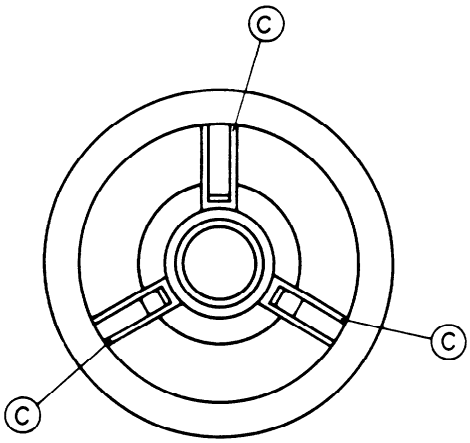
4. Arm P removal

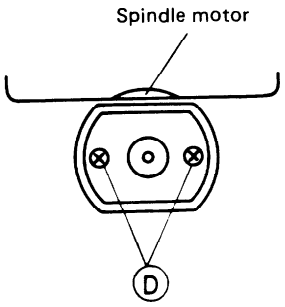
1) Remove the top cover.
2) Remove a screw B from the bracket, holder.
3) Remove the arm P from the stopper.



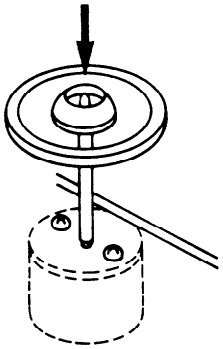
5. Replacing the spindle motor and turntable platter

1) Remove the tray and arm P.
2) Cut the points C of turntable platter with the pincers and pull it out from the shaft of spindle motor.
3) Remove the two screws D from the mechanical chassis.

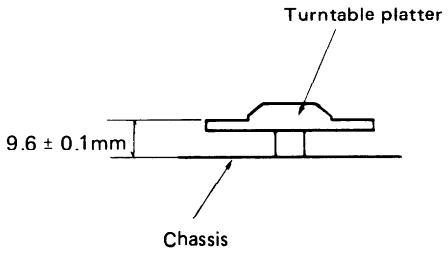




Press the center of turntable platter and insert the turntable platter in the shaft of spindle motor.

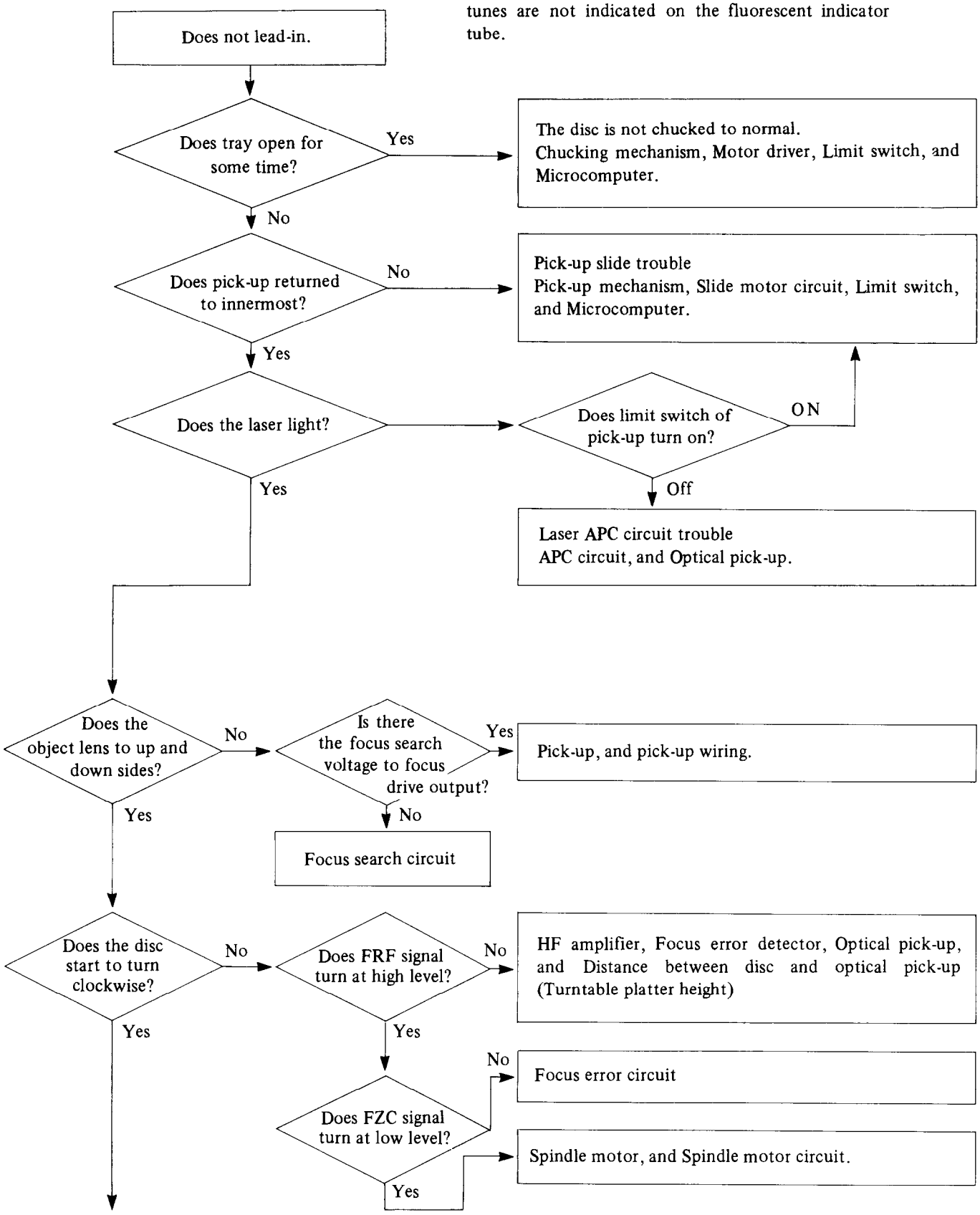


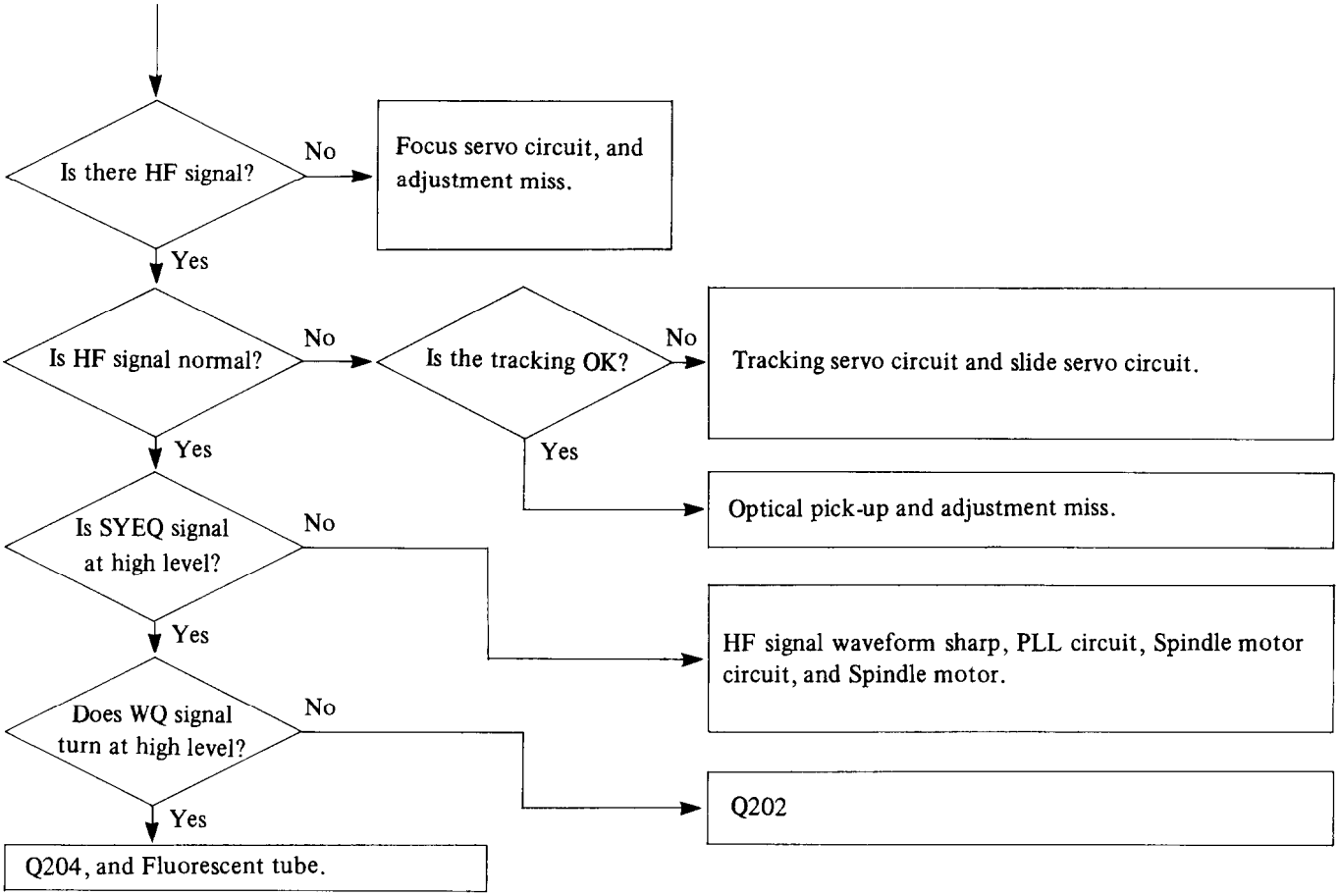
Height of turntable platter.



TROUBLE SHOOTING GUIDE

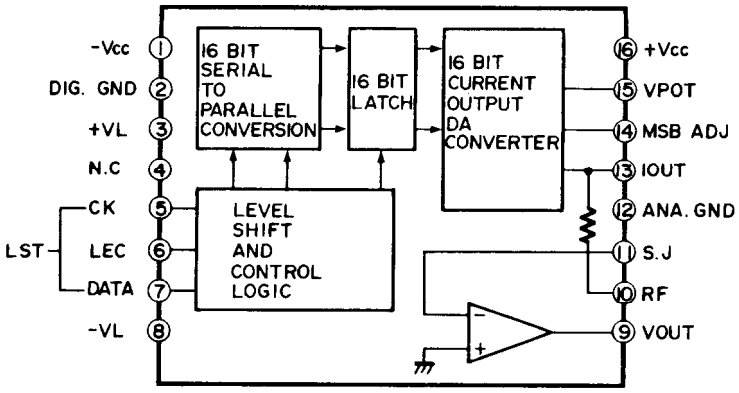
Load the disc on the tray, press OPEN/CLOSE key and close the tray. But, total play time and total number of tunes are not indicated on the fluorescent indicator tube.





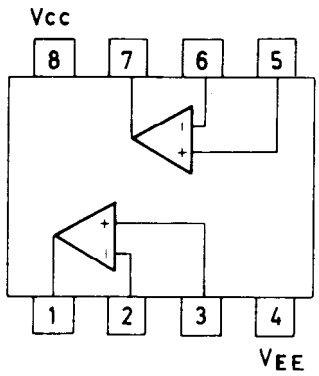
IC BLOCK DIAGRAM

PCM-56HP(D/A Converter)

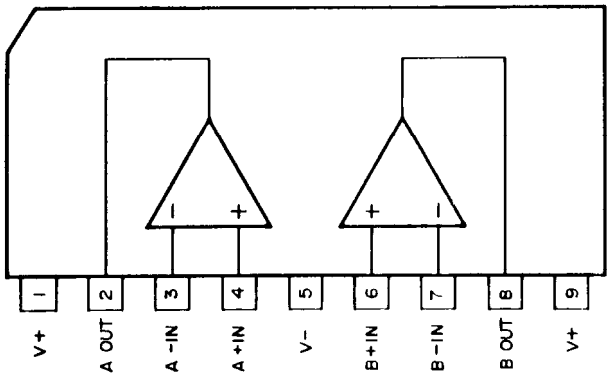


Pin No.	Designation	Function
1	-Vcc	Analog negative voltage
2	DIG GND	Digital circuit ground
3	+VL	Logic positive voltage
4	N.C	No connection
5	CK	Clock input
6	LEC	Latch enable control input
7	DATA	Data input
8	-VL	Logic negative voltage
9	Vout	Voltage output
10	RF	Feedback resistor
11	S.J	Summing junction (Op amp input)
12	ANA GND	Analog circuit ground
13	Iout	Current output
14	MSB ADJ	MSB adjustment terminal
15	VPOT	Potential meter terminal
16	+Vcc	Analog positive voltage

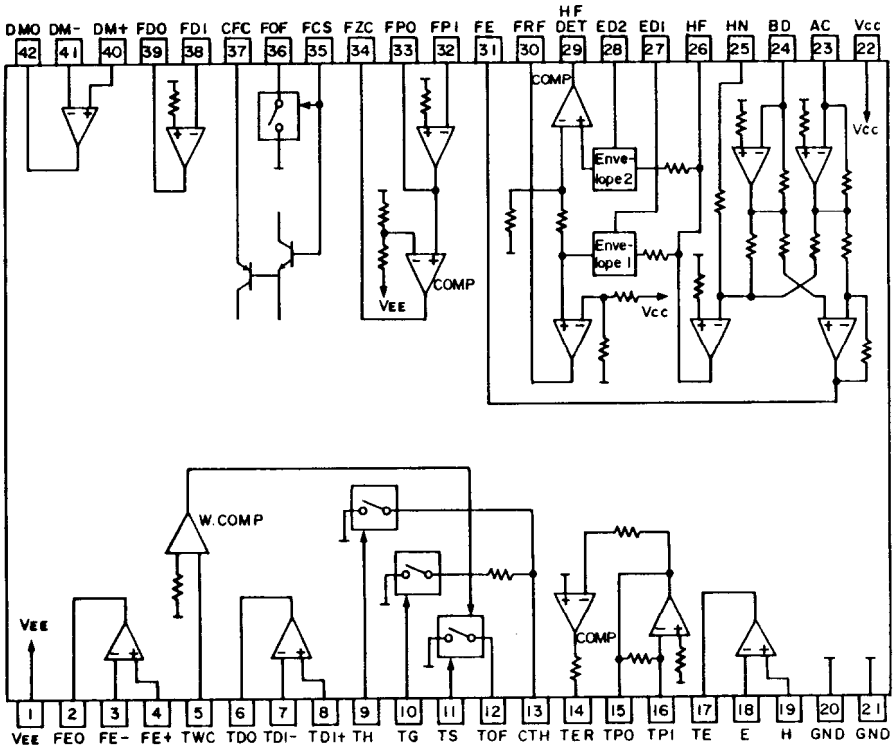
NJM-4558D(Operation Amplifier)



NJM-072BS(Operation Amplifier)



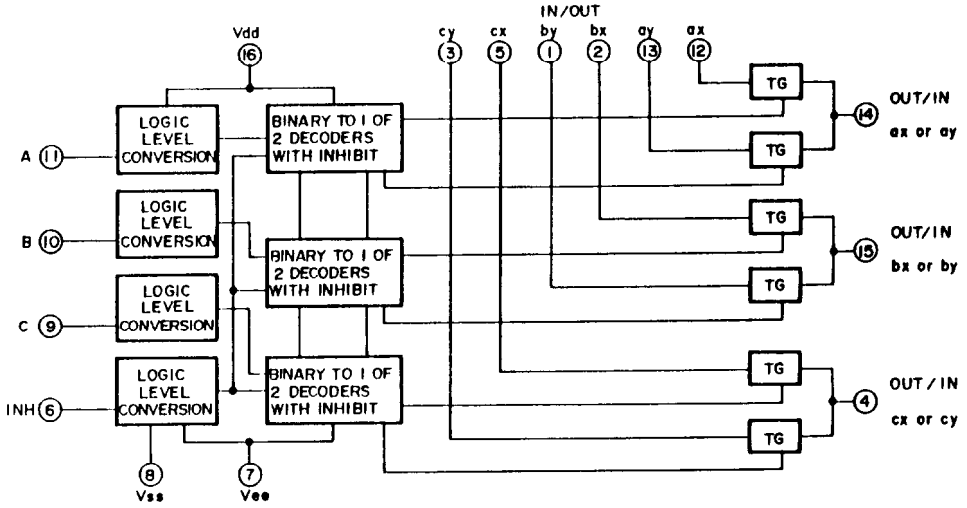
XB087A0(Servo Linear Circuit)



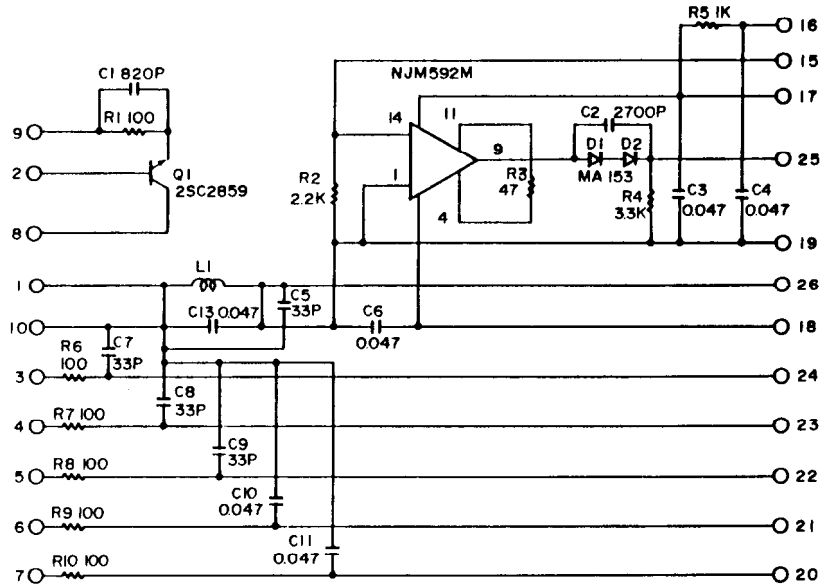
Pin No.	Designation	Function
2~4	FEO, FE−, FE+	Feed drive amplifier dvives the feed power amplifier and is rotated the feed motor.
5	TWC	Terminal of tracking drive limiter to tracking coil. The reference voltage of this circuit is about ±0.67V.
6~19		Tracking servo system terminals.
6~8	TDo, TDi−, TDi+	Tracking drive amplifier drives the tracking power amplifier and actuates the tracking actuator.
9~11	TH, TG, TS	Tracking jump control switches. TH: Tracking hold switch TG: Gain control switch TS: Tracking offset switch
12~13	TOF, CTH	These terminals are controlled the tracking loop by TH,TG and TS (pins 9,10,and 11).
14	TER	The output terminal of comparator of tracking zero cross.
15~16	TPo, TPi	Input/Output terminals of tracking preamplifier.
17~19	TE, E, F	This circuit is constituted by I-V conversion and differential amplifier. The reflected sub beams are converted into electric signals by the E and F, and the mutual differnces are obtained as a tracking error signal.
23~39		Focus servo system terminals.
23~24	AC, BD	Input terminals from main spot of photo diode.
25~26	HN, HF	Feedback terminal and output terminal of HF (RF) signal.
27~28	ED1, ED2	Terminals for peak hold (pin 27) and bottom hold (pin 28)of HF (RF) signal.
29, 30, 34		Output terminals of servo IC to control the focus tracking.
29	HF	HF output is L level on the track of disc and H level on mirror section.
30	FRF	This circuit is the focus servo to on when comes the focus point from focus search condition.

Pin No.	Designation	Function
34	FZC	Use when the focus search. Same as above.
35	FCS	Signal input terminal to pull the focus.
36	FOF	Attenuator terminal.
37	CFC	Terminal to make the ramp waveform of focus search ramp circuit.
38~39	FDi, FDo	Input/output terminals of focus drive amplifier.
40~42	DM+, DM−, DMo	Input/output terminals of disc drive amplifier.

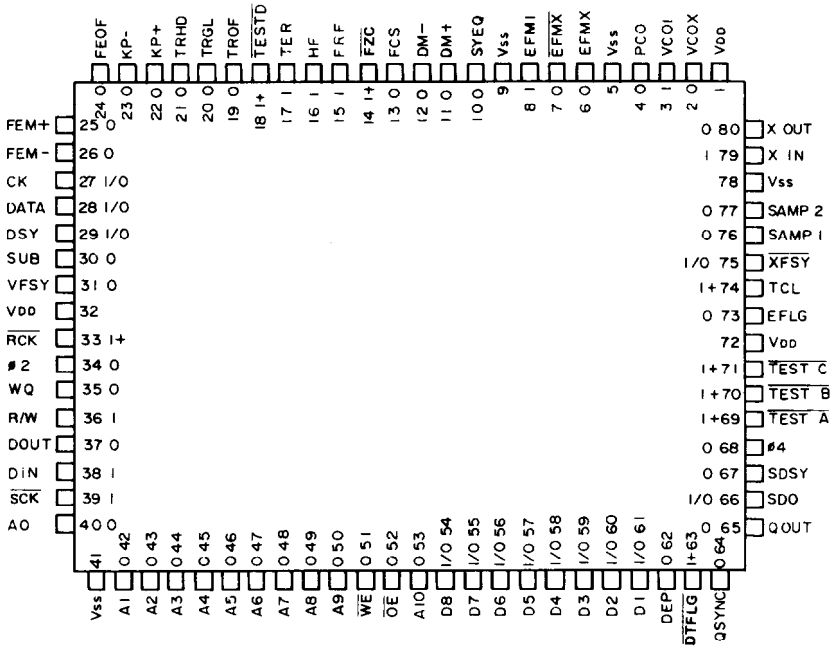
μPD4053BC(Analog Switch)



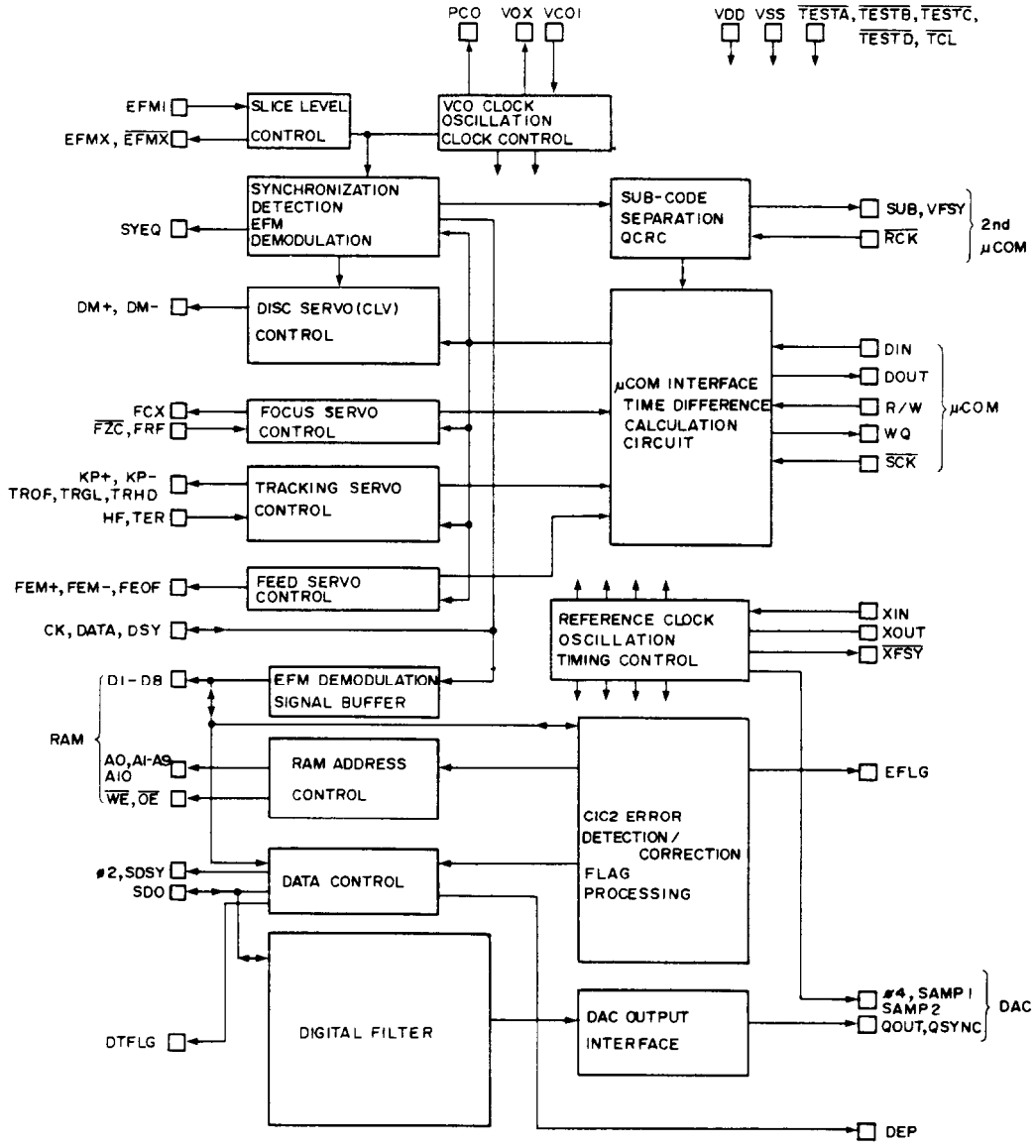
TP-1091 (Optical Device)



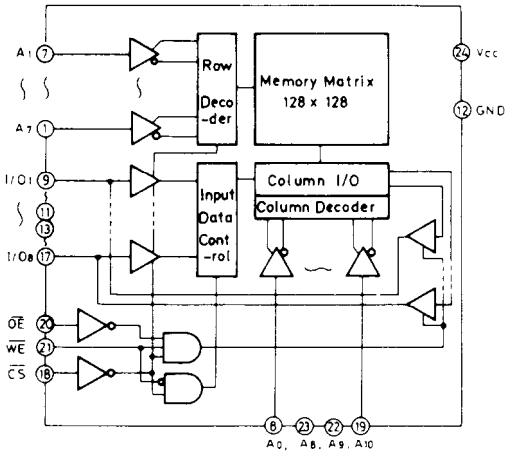
YM3815(Signal Processor & Controller)



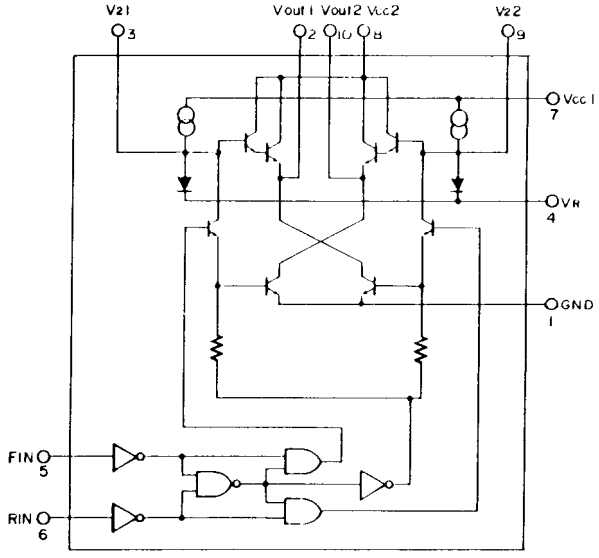
Pin No.	Designation	Function
79, 80	79 x IN and 80 x OUT	Clock Oscillator (8.6436MHz)
6~8	8 EFMI, 7 $\overline{\text{EFMX}}$, and 6 EFMX	EFM External Circuit
2~4	4 PCO, 3 VCO1, 2 VCOX	Clock Regeneration Circuit
10	SYEQ	WYNC Match Signal
27~29	27 CK, 28 DATA, and 29 DSY	FM Demondulation Signal Check Output
30, 31, 33	30 SUB, 31 VFSY, and 33 $\overline{\text{RCK}}$	Sub-code Output
35~37, 39	35 WQ, 36 R/W, 37 DOUT, and 39 $\overline{\text{SCK}}$	Q-code Output related Pins
36, 38, 39	36 R/W, 38 DIN, and 39 $\overline{\text{SCK}}$	μ COM Command related Pins
13~15	Input 14 $\overline{\text{FZC}}$ – 15 FRF, and Output 13 FCS	Focus Servo-mechanism related Pins
11, 12	11 DM+, and 12 DM–	Disc Servo-mechanism Pins
16, 17 19~23	Input 16 HF, and 17 TER Output 19 TROF, 20 TRGL, 21 TRHD, 22 KP+, and 23 KP–	Tracking Servo-mechanism related Pins
24~26	24 FEOF, 25 FEM+, and 26 FEM–	Feed Servo-mechanism related Pins
40, 42~61	40A0–53A10, 51 $\overline{\text{WE}}$, 52 $\overline{\text{OE}}$, and 54D8–61D1	RAM Connection
75	75 $\overline{\text{XFSY}}$	Crystal Clock SYNC Signal
73	73 EFLG	C1 and C2 Error Correction Check Signal
34, 66, 67 69, 71, 63	34 ϕ2, 66 SDO, SDSY, 63 DTFLG 69 $\overline{\text{TEST A}}$, and 71 $\overline{\text{TESTC}}$	DATA Control Circuit-Serial Signal Output
64, 65 68, 76, 77	65 Q OUT, 64 Q SYNC, 76 SAMP1, 77 SAMP, 2 and 68 ϕ4	DAC Interface
62	62 DEP	De-emphasis Signal
8, 18 69~71	69 $\overline{\text{TEST A}}$, 70 $\overline{\text{TEST B}}$, 71 $\overline{\text{TEST C}}$, 18 $\overline{\text{TEST D}}$, and 8 $\overline{\text{TCL}}$	Test Pins



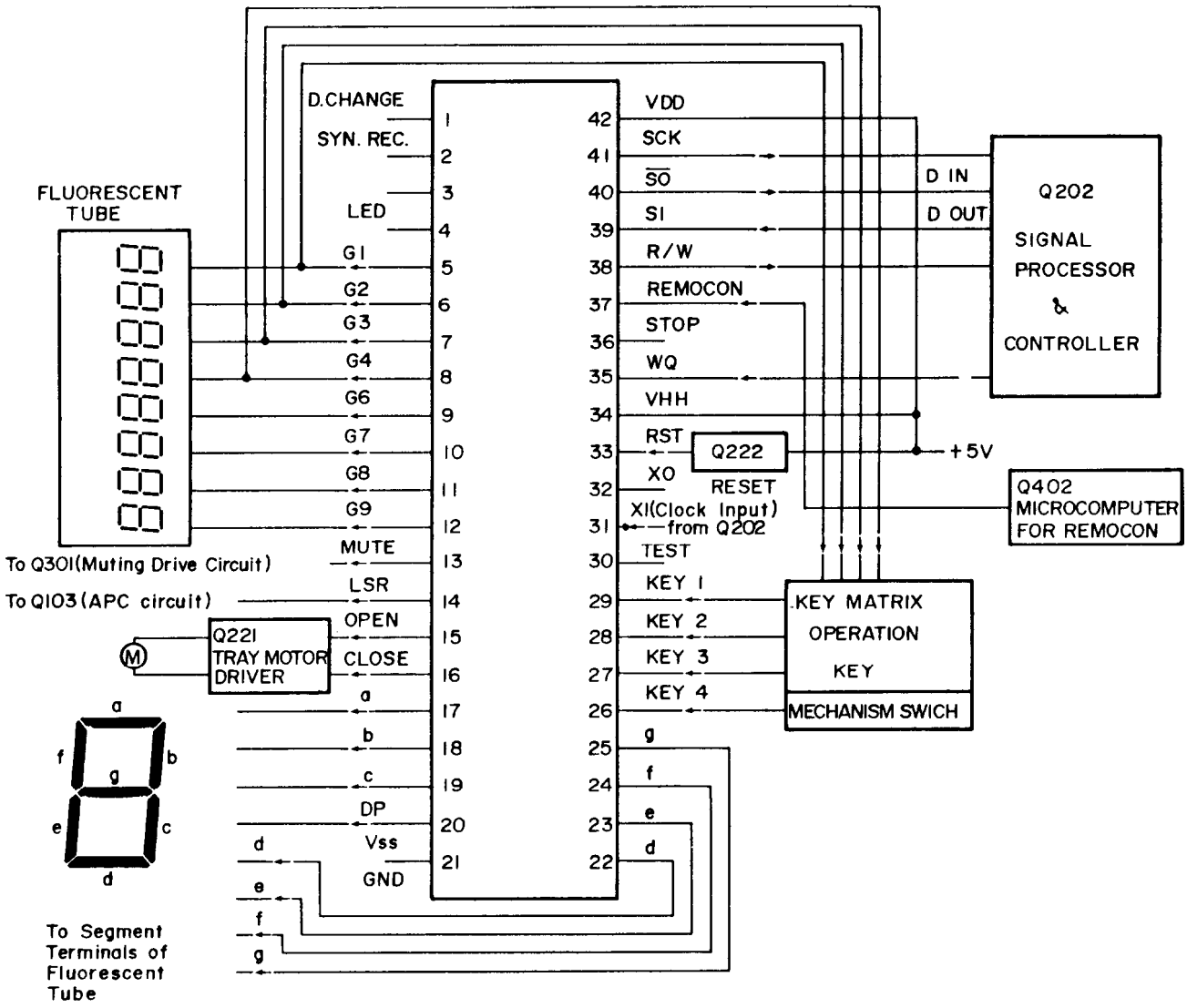
CXK5816M-15/HM6116P-4(16bit RAM)

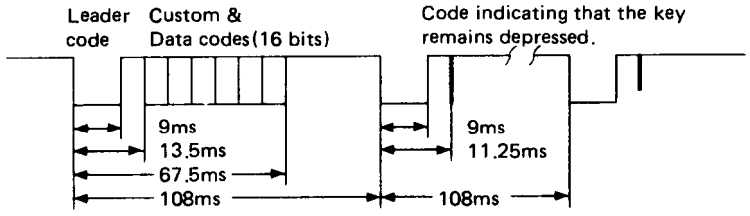


BA-6109(Motor Driver)



Connection of Micro Computer



Pin NO.	Terminal	Description
5~8 9~12 17~19 20 22~25	G1-G4 G6-G9 a-c DP d-g	Control of fluorescent display tube is used the dynamic driver method.The digit datas of eight figures and eight segment datas are output from microcomputer.
13	MUTE	Audio muting control output for audio muting when the disc is stopped, and during accessing operations and pause mode. Muting is applied when the output is at high level.
14	$\overline{\text{LSR}}$	Optical pick-up laser on/off control output. Laser is on when the output is at low level.
15 16	OPEN CLOSE	These signals used to control disc tray openning and closing operations. Control signals are passed direct from the microcomuter to pins 5 and 6 of the Q221 tray motor driver.
26	KEY 4	The condition of mechanical switches (open, close, and start) is processed, and data of switches is read by KEY 4 input port.
27~29	KEY 3-KEY 1	A 12(4x3) matrix is formed by using the digit datas. (Positive logic)
31	X1	Clock input from Q202.
33	RST	Using an IC designed specifically for microcomputer resetting, a reset output (low level) is applied to the microcomputer RST terminal when +5V line voltage drops below 4V reference voltage. This pin is normally switched on, and subsequently kept at high level.
37	REMOCON	Remote control input terminal. 
35	WQ	Write request: High level when transmit the information to micro computer.
38	R/W	Read/Write: High level when transmit the command from micro computer.
39	SI	Serial input: Transmit the servo system condition and sub-code data to micro computer.
40	$\overline{\text{SO}}$	Serial output: Transmit the command data from micro computer to servo system.
41	SCK	Serial clock: Clock of serial data.Data is shifted at trailing edge.

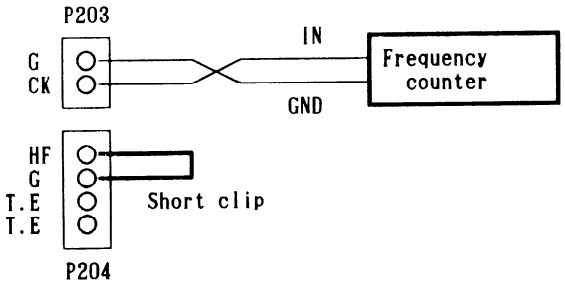
ADJUSTMENT PROCEDURES

Instruments required

Dual trace oscilloscope, Frequency counter, CR oscillator, Test disc (SONY YEDS-18 TYPE4), Short clip, Resistor 1kohm

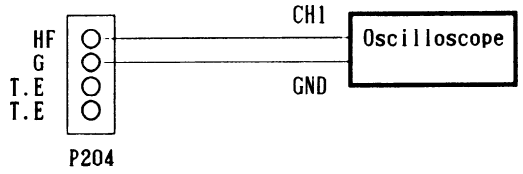
1. VCO frequency adjustment

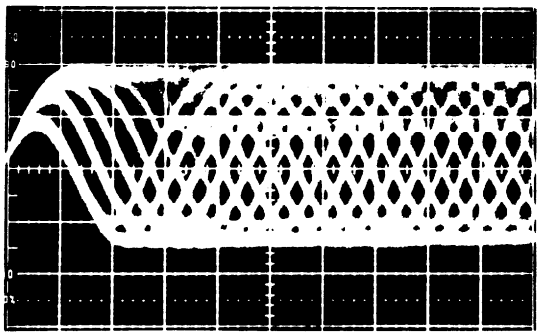
Turn the power switch to ON.
Connect the frequency counter to the pin 2 (CK) of P203.
Connect the pins 1 (HF) and 2 (GND) with the short clip.
Adjust L201 until the frequency counter reading 4.35MHz.
After adjustment, remove the frequency counter and short clip.



2. Focus offset adjustment

Load the test disc YEDS-18 and play back the track 2.
Connect the oscilloscope to pin 1 of P204.
Set R217 to mechanical center.
Adjust R217 until a clear trace of waveform pattern as shown photo 1 appear on the oscilloscope.
After adjustment, remove the oscilloscope.



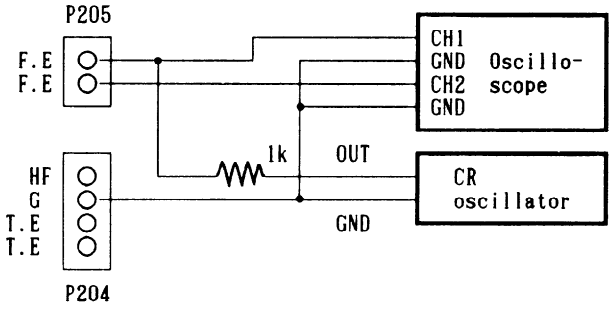


0.5V/div.
0.5μs/div.

Photo 1

3. Focus gain adjustment

Connect the dual trace oscilloscope to pins 1 (CH1) and 2 (CH2) of P205 at play condition.
Apply a sine wave 500mVp-p at 1kHz via resistor 1kohm from CR oscillator to pin 1 of P205.
Adjust R219 so that the waveforms of channel 1 and channel 2 become same level. (Refer photo 2).
After adjustment, remove the CR oscillator and oscilloscope.



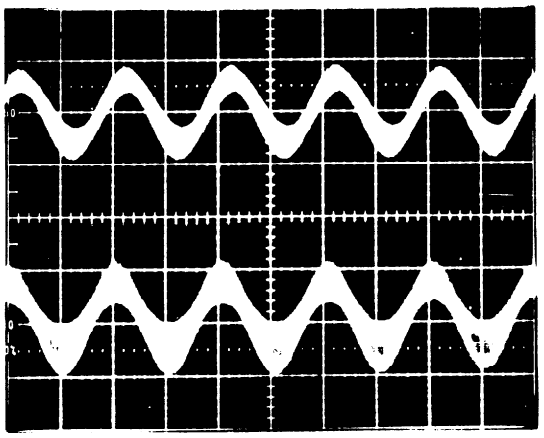
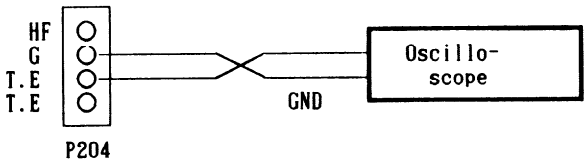


Photo 2

4. Tracking balance adjustment

Turn R269 to minimum position (counter-clockwise) at play condition.
Connect the oscilloscope to pin 3 (TE) of P204.
Adjust R279 until both positive and negative peaks of the waveform becomes equal at 0V level. (Refer photo 3)
After adjustment, set R269 to mechanical center and remove the oscilloscope.



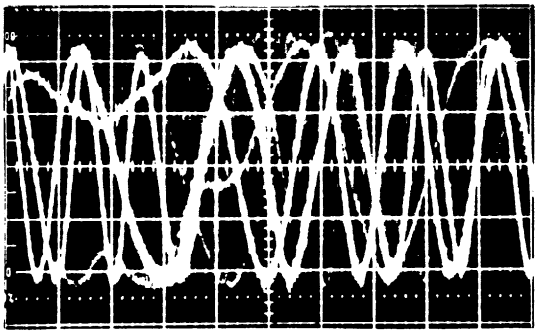
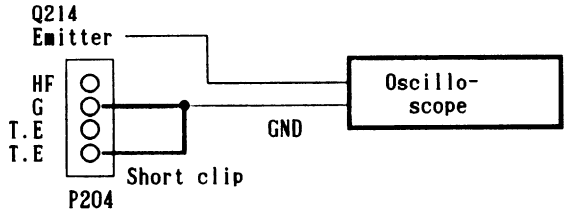


Photo 3

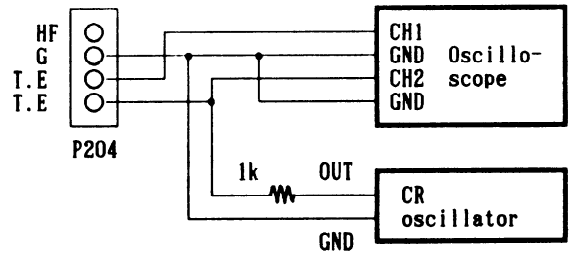
5. Tracking offset adjustment

Connect the oscilloscope to the emitter of Q214 (Output of slide motor) at play condition.
Connect the pins 4 (T.E) and 2 (GND) of P204 with the short clip.
Adjust R273 until both positive and negative peaks of the waveform becomes equal at 0V level.
After adjustment, remove the oscilloscope and short clip.



6. Tracking gain adjustment

Connect the dual trace oscilloscope to pins 3 (CH1) and 4 (CH2) of P204 at play condition.
Apply a sine wave 1 Vp-p at 1.2kHz via resistor 1kohm from CR oscillator to pin 4 of P204.
Adjust R269 so that the waveforms of channel 1 and channel 2 become same level. (Refer photo 4).
After adjustment, remove the CR oscillator and oscilloscope.



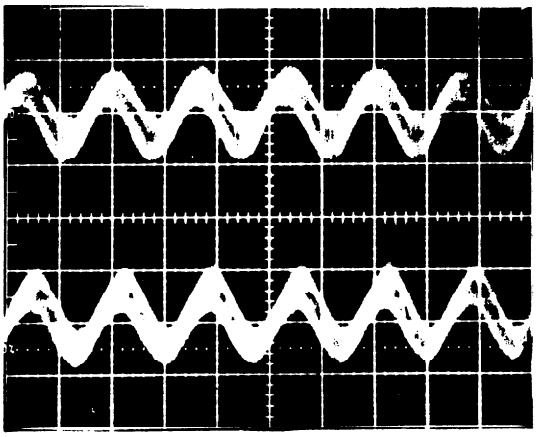


Photo 4

7. **Optical coupling adjustment**

Connect the oscilloscope to test point DATA.
Turn R301 to minimum position (counter-clockwise).
Load the test disc (YEDS-18) and play back the track 2.
Adjust R301 so that a point of inter section of waveform DATA becomes 2.5V.

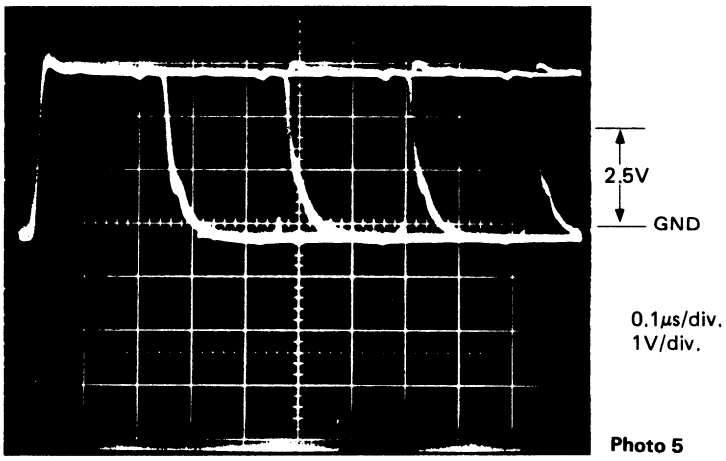
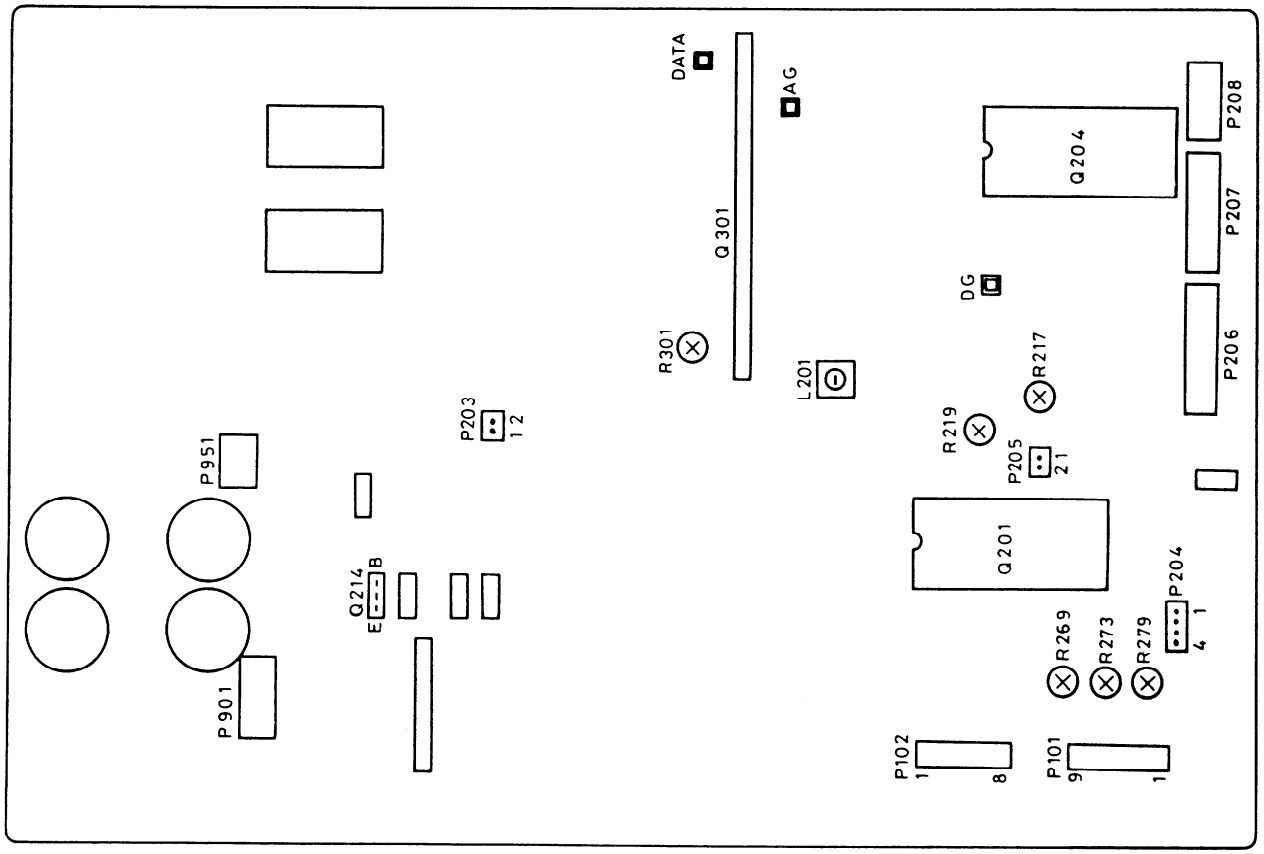
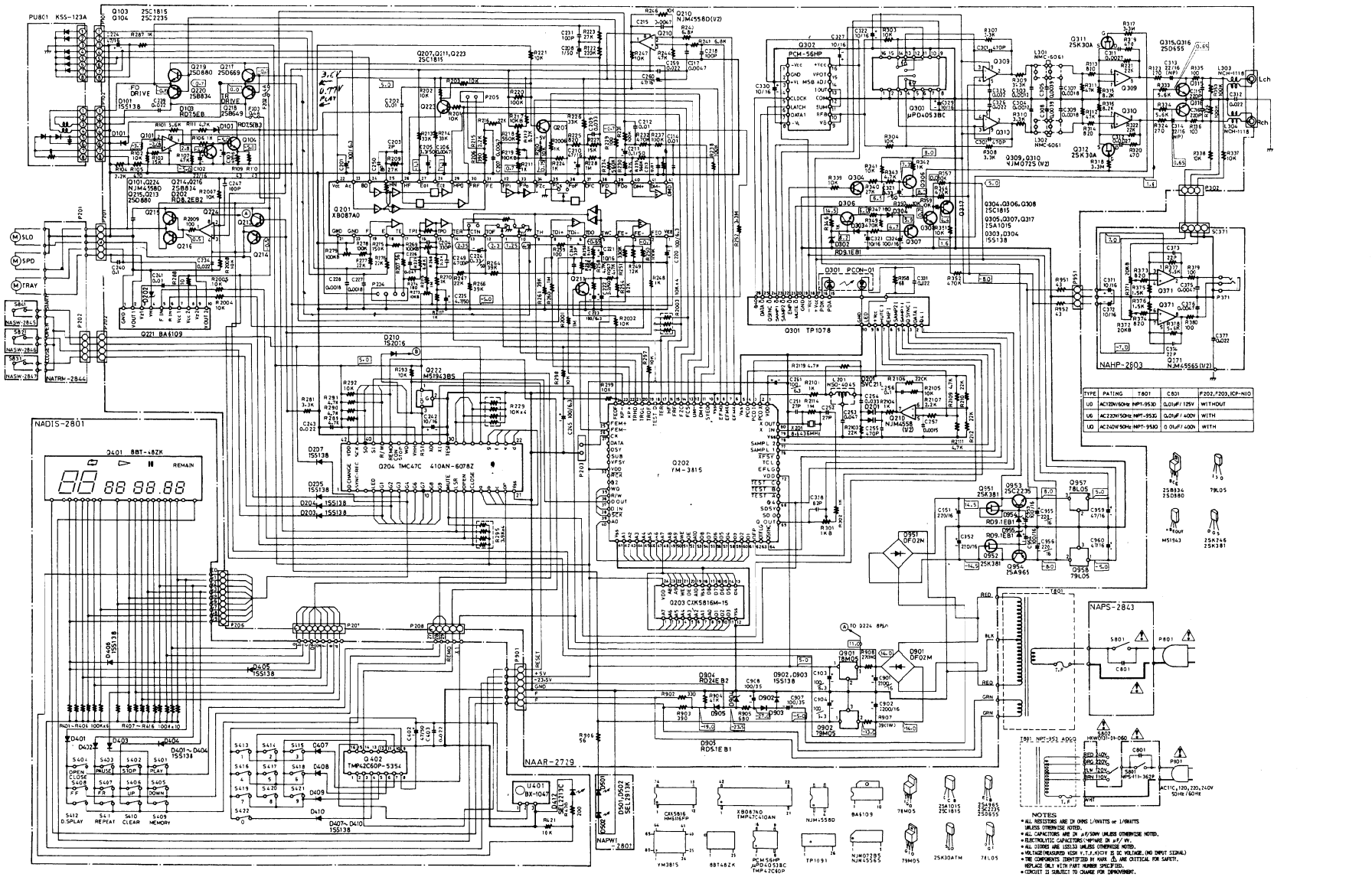


Photo 5



Adjustment Point

SCHEMATIC DIAGRAM



PRINTED CIRCUIT BOARD-PARTS LIST

MAIN CIRCUIT PC BOARD(NAAR-2729-3/3A)

CIRCUIT NO.	PART NO.	DESCRIPTION
	ICs	
Q101, Q210	222465	NJM4558D
Q201	222984	XBO87AO
Q202	222985	YM-3815
Q203	222990 or	CXK5816M-15 or
	222882	HM6116FP-4
Q204	222986	TMP47C410AN-6078Z
Q221	222894	BA6109
Q222	222951	M51943BS
Q224	222465	NJM4558D
Q301	222058	TP1091
Q302	222988	PCM-56HP
Q303	222717	μPD4053BC
Q309, Q310	22240010	NJM072BS
Q901	222780052	78M05
Q902	222790052	79M05
Q957	222780053	78L05
Q958	222790053	79L05
	Transistors	
Q103, Q207	2211254 or	2SC1815(Y) or
Q211, Q223	2211255	2SC1815(GR)
Q104	2211653 or	2SC2235(O) or
	2211654	2SC2235(Y)
Q213, Q215	2201074 or	2SD880(Y) or
Q219	2201073	2SD880(O)
Q214, Q216	2201244 or	2SB834(Y) or
Q220	2201243	2SB834(O)
Q217	2200783 or	2SD669(C) or
	2200784	2SD669(D)
Q218	2200793 or	2SB649(C) or
	2200794	2SB649(D)
Q304, Q306	2211254 or	2SC1815(Y) or
Q308	2211255	2SC1815(GR)
Q305, Q307	2211454 or	2SA1015(Y) or
Q317	2211455	2SA1015(GR)
Q311, Q312	2212375	2SK30ATM(GR)
Q315, Q316	2211705 or	2SD655(E) or
	2211706	2SD655(F)
Q951, Q952	2212303,	2SK381(C),
	2212304,	2SK381(D),
	2211944 or	2SK246(Y) or
	2211945	2SK246(GR)
Q953	2211653 or	2SC2235(O) or
	2211654	2SC2235(Y)
Q954	2211643 or	2SA965(O) or
	2211644	2SA965(Y)
	Diodes	
D101	223155	1SS138
D103	2239533 or	RD7.5EB3 or
	2243183	MTZ7.5C
D201	225181	SVC211, Variable capacitor
D202	2239552 or	RD8.2EB2 or
	2243192	MTZ8.2B
D203-D205	223155	1SS138
D207	223155	1SS138
D302	2239552 or	RD9.1EB1 or
	2243201	MTZ9.1A
D303, D304	223155	1SS138
D901, D951	223892	DF02M
D902, D903	223155	1SS138
D904	2243302 or	MTZ24B or
	2239772	RD24EB2
D905	2243141 or	MTZ5.1A or
	2239451	RD5.1EB1
D951	223892	DF02M
D954, D955	2239751 or	RD9.1EB1 or
	2243201	MTZ9.1A
	IC protector	
F202, F203	252111	ICP-N10 [G/Q/U]
	Photocoupler	
D301	225234	PCON-01(C), Opto. device
	X'tal	
X201	3010084	KD3492D-A, 8.6436MHz
	Coils	
L201	232129	NSO-4045
L301, L302	232132-1	NMC-6061
L303, L304	231066	NCH-1118
	Capacitors	
C102	354742209	22μ, 16V, Elect.
C103	354744709	47μ, 16V, Elect.
C201	354721019	100μ, 6.3V, Elect.
C205	354780339	3.3μ, 50V, Elect.
C210	354744709	47μ, 16V, Elect.
C211	354781099	0.1μ, 50V, Elect.
C220	354721019	100μ, 6.3V, Elect.
C221	354741009	10μ, 16V, Elect.
C222	354780229	2.2μ, 50V, Elect.
C223	354744709	47μ, 16V, Elect.
C224	354783399	0.33μ, 50V, Elect
C225	354780479	4.7μ, 50V, Elect.
C242	352780109	1μ, 50V, Elect.
C244	354744709	47μ, 16V, Elect.
C245	354721019	100μ, 6.3V, Elect.
C260	354744709	47μ, 16V, Elect.
C261	354721019	100μ, 6.3V, Elect.
C301, C302	372524714	470μ ±5%, 50V, Styrol
C313, C314	352784709	47μ, 50V, Elect.
C315, C316	372522214	220μ ±5%, 50V, Styrol
C321	354783399	0.33μ, 50V, Elect.
C322, C323	354741009	10μ, 16V, Elect.
C324	354741019	100μ, 16V, Elect
C327	354741009	10μ, 16V, Elect.
C329, C330	354741009	10μ, 16V, Elect.
C901, C902	354742229	2, 200μ, 16V, Elect.
C903, C904	354721019	100μ, 6.3V, Elect.
C907, C908	354761019	100μ, 35V, Elect.
C951, C952	354742219	220μ, 16V, Elect.
C953, C954	354741019	100μ, 16V, Elect.
C955, C956	354742219	220μ, 16V, Elect.
C959, C960	354744709	47μ, 16V, Elect.
	Resistors	
R217, R273	5210064	N06HR103BD, Semi-fixed
R219, R269	5210070	N06HR104BD, Semi-fixed
R279	5210070	N06HR104BD, Semi-fixed
R294	49163103404	10kohm x 4, 1/10W, Network
R295	49163392404	3.9kohm x 4, 1/10W, Network
R2003	49163103404	10kohm x 4, 1/10W, Network
R301	5210007	N06HR1KBDM, Semi-fixed
R907	441623904	39ohm, 1W, Metal oxide film
R908	441622704	27ohm, 1W, Metal oxide film

	Plugs	
P101	25055153	NPLG-9P-137
P102	25055152	NPLG-8P-136
P203	25055146	NPLG-2P-130
P204	25055148	NPLG-4P-132
P205	25055146	NPLG-2P-130
P302	25055133	NPLG-3P-117
	Sockets	
P201	2000444	NSAS-5P-403
P202	2000583	NSAS-4P-539
P206	25050273	NSCT-9P-101
P207	25050272	NSCT-8P-100
P208	25050270	NSCT-6P-97
P901	25050269	NSCT-5P-97
P951	25050267	NSCT-3P-95
	Terminal	
P301	25045190	NPJ-2PDBL74, Output
	Bracket	
	27141059	Ground

HEADPHONE AMPLIFIER PC BOARD (NAHP-2803-2/2A)

CIRCUIT NO.	PART NO.	DESCRIPTION
Q371	222887	NJM4556S, IC
C371, C372	354741009	10μ, 16V, Elect. capacitor
R371, R372	5104172-1	N09RGL20KB15, Variable resistor
P371	25045139	HLJ0540-01-010, Headphone terminal
SC371	2000538B	NSAS-3P494, Socket

DISPLAY PC BOARD(NADIS-2801-2)

CIRCUIT NO.	PART NO.	DESCRIPTION
U401	241068	BX-1407, Photo receiving unit, remote control
Q401	212035	8BT-48ZK, Fluorescent indicator tube
Q402	222989	TMP42C60P-5354, IC
D401-D410	223155	1SS138, Diodes
D412	225141	SEL2213C, LED
R401-R406	49421104406	100kohm x 6, 1/8W, Network resistor
R407-R416	49121104410	100kohm x 10, 1/8W, Network resistor
S401-S422	25035291	NPS-111-S257, Push switches
C402	353744709	47μ, 16V, Elect.
	28140694	Cushion
	27190498	Holder

POWER SWITCH PC BOARD(NAPS-2843-2)

CIRCUIT NO.	PART NO.	DESCRIPTION
C801	3500065A	⚠ DE7150FZ103PCSA (AC400V/125V), Capacitor IS
S801	25035398	⚠ NPS-111-S362P, Power switch
	27300601	⚠ Cover for C801
	25060092	NTM-1S33, Terminal

POWER INDICATOR PC BOARD (NAPWI-2802-2)

CIRCUIT NO.	PART NO.	DESCRIPTION
D501, D502	225142	SEL2913K, LEDs
	27190499	Holder

SWITCH PC BOARDS (NASW-2845-1/2846-1/2847-1)

CIRCUIT NO.	PART NO.	DESCRIPTION
S841	25065261	NMS-1212, Microswitch, start
S821	25065260	NMS-1211, Microswitch, open
S831	25065260	NMS-1211, Microswitch, close

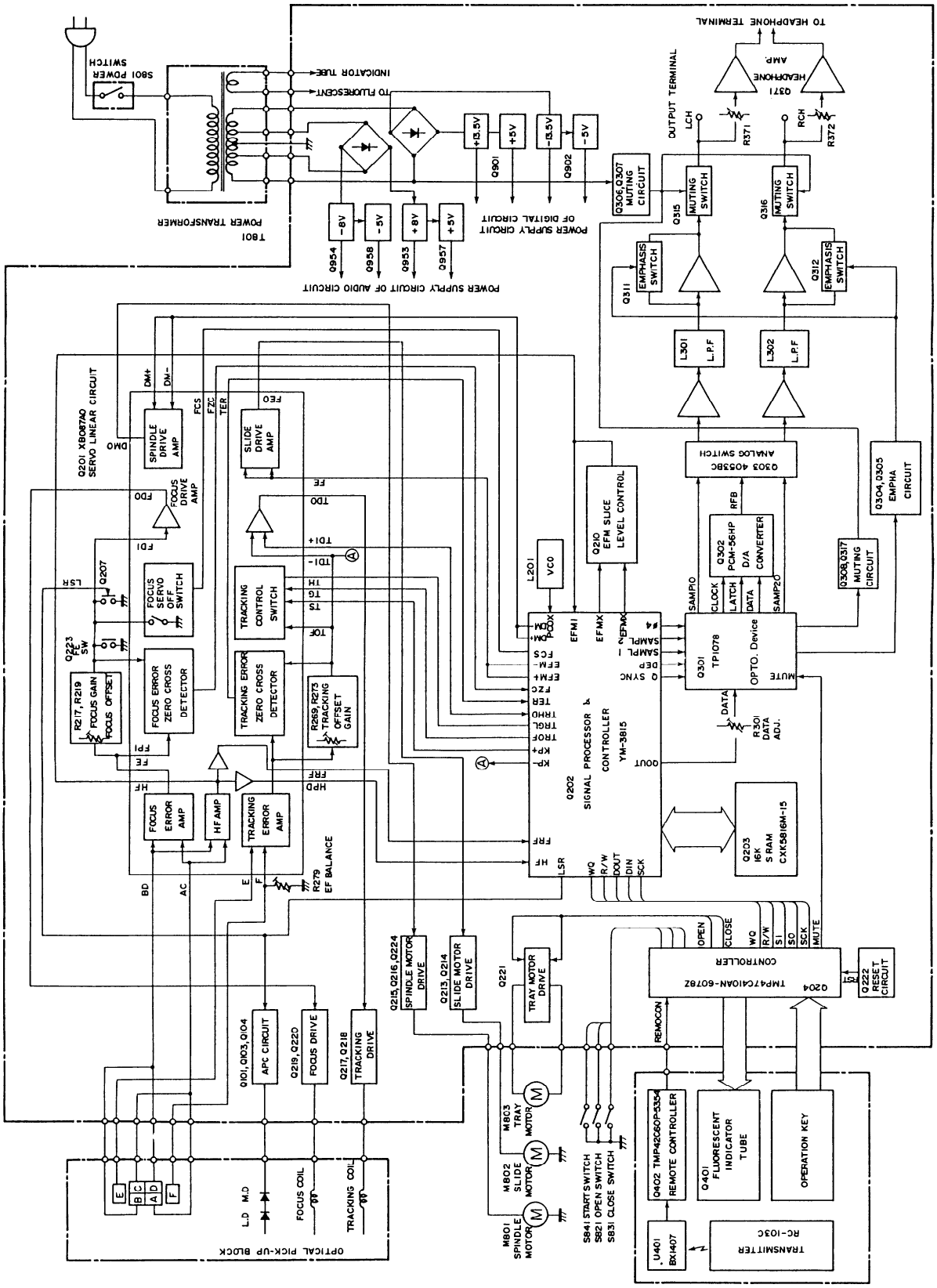
TERMINAL PC BOARD (NATRM-2844-1)

CIRCUIT NO.	PART NO.	DESCRIPTION
P201	25055135	NPLG-5P-119, Plug
P202	25055148	NPLG-4P-132, Plug

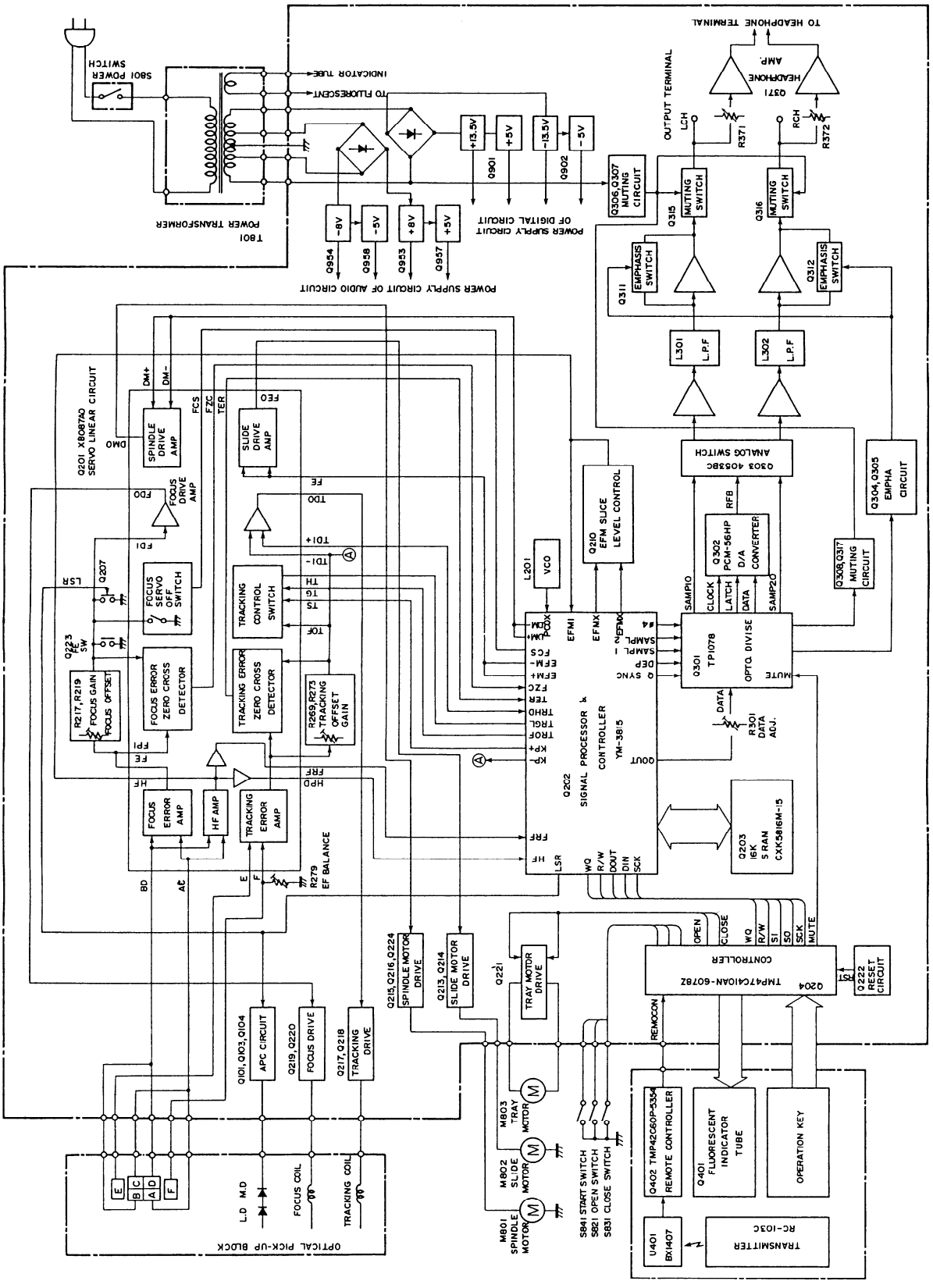
NOTE: THE COMPONENTS IDENTIFIED BY MARK ⚠ ARE CRITICAL FOR RISK OF FIRE AND ELECTRIC SHOCK. REPLACE ONLY WITH PART NUMBER SPECIFIED.

NOTE: G: Only 220V model
Q: Only 240V model
U: Only Universal model

BLOCK DIAGRAM



BLOCK DIAGRAM



Circuit Description

1. Focuse Servo Circuit

The focuse servo ensures that the laser beam emitted by the optical pickup is always focused on the reflective surface of the disc. It does this by moving the optical pickup's objective lens in response to oscillations in the disc surface.

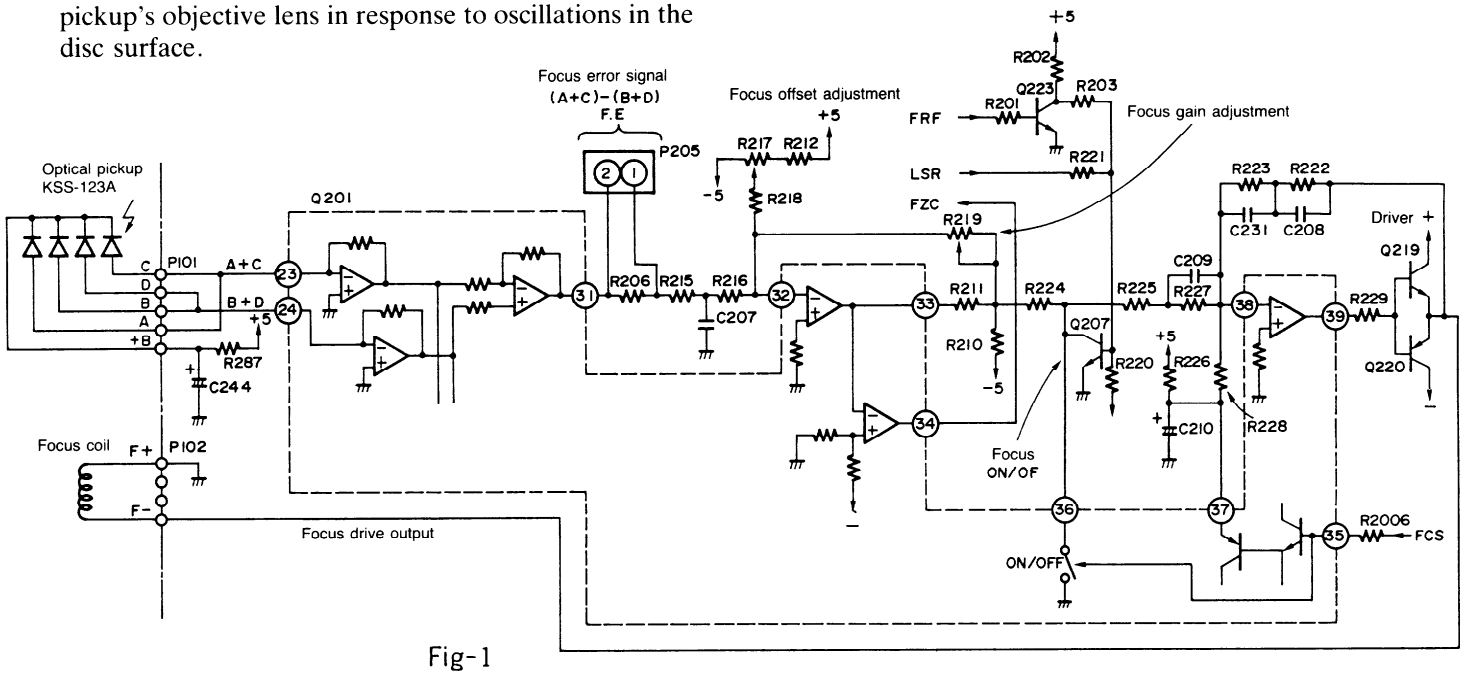


Fig-1

1-1. Focuse Error Detector

The detector obtains the difference between the signals produced by the diagonal elements of a four-section photodiode housed in the pickup and utilizes an astigmatic method to detect focusing errors.

FE (focus error) = (A + C) − (B + D)

(A + C) and (B + D) are input into pin 23 and pin 24 of Q201 respectively. The FE signal is calculated by the three opamps in Q201 and output via pin 31.

1-2. Phase Correctors – Drivers

The focus error signal is relayed from Q201 pin 31 to pins 32, 33, 38 and 39 in succession. Then, after passing through drivers Q219 and Q220, it is fed back to the focus coil of the pickup.

C207, C209 and C208 are phase correctors which enhance the servo's stability. Semi-fixed resistors R217 and R219 are used to regulate offset and gain in the servo circuitry. Q207 and the switch in pin 36 turn the servo loop on and off. Control is maintained by means of the following three signals: the FCS signal sent from Q202, the FRF signal which indicates that the servo is engaged and the LSR (laser) signal sent from microprocessor Q204.

1-3. FZC (Focus Zero Cross) and FCS (Focus Search) Circuits

The focusing servo's capture range is only approximately 10μm, so, when the objective lens is being moved up or down, the above-mentioned servo on/off switch must be controlled to close the loop when the point of focus of the laser beam is positioned precisely. When a focus search command is received from the microprocessor, the LSR signal switches to LOW and a laser beam is emitted (see fig. 2). At the same time, the FCS signal switches to HIGH. C210 and R226 integrate the FCS signal creating a chopping wave, and raise the objective lens into position.

As the laser beam approaches the point of focus, the FRF signal (see fig. 2) changes to HIGH, and the FE signal builds up (+) electrical potential which falls when optimum focus is reached. This comparator's output FZC signal is output from pin 34 of Q201. According to this timing, FCS changes to LOW, and Q207 and the switch of pin 36 shut off, closing the servo loop. Fig. 2 illustrates the timing. The dotted lines show the waveforms produced by focus capture errors.

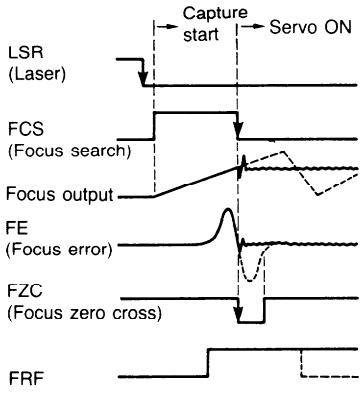


Fig-2

2. Tracking servo

This control circuit moves the objective lens radially to keep the laser beam precisely centered in the tracks on the disc surface (which are only 1.6μm wide).

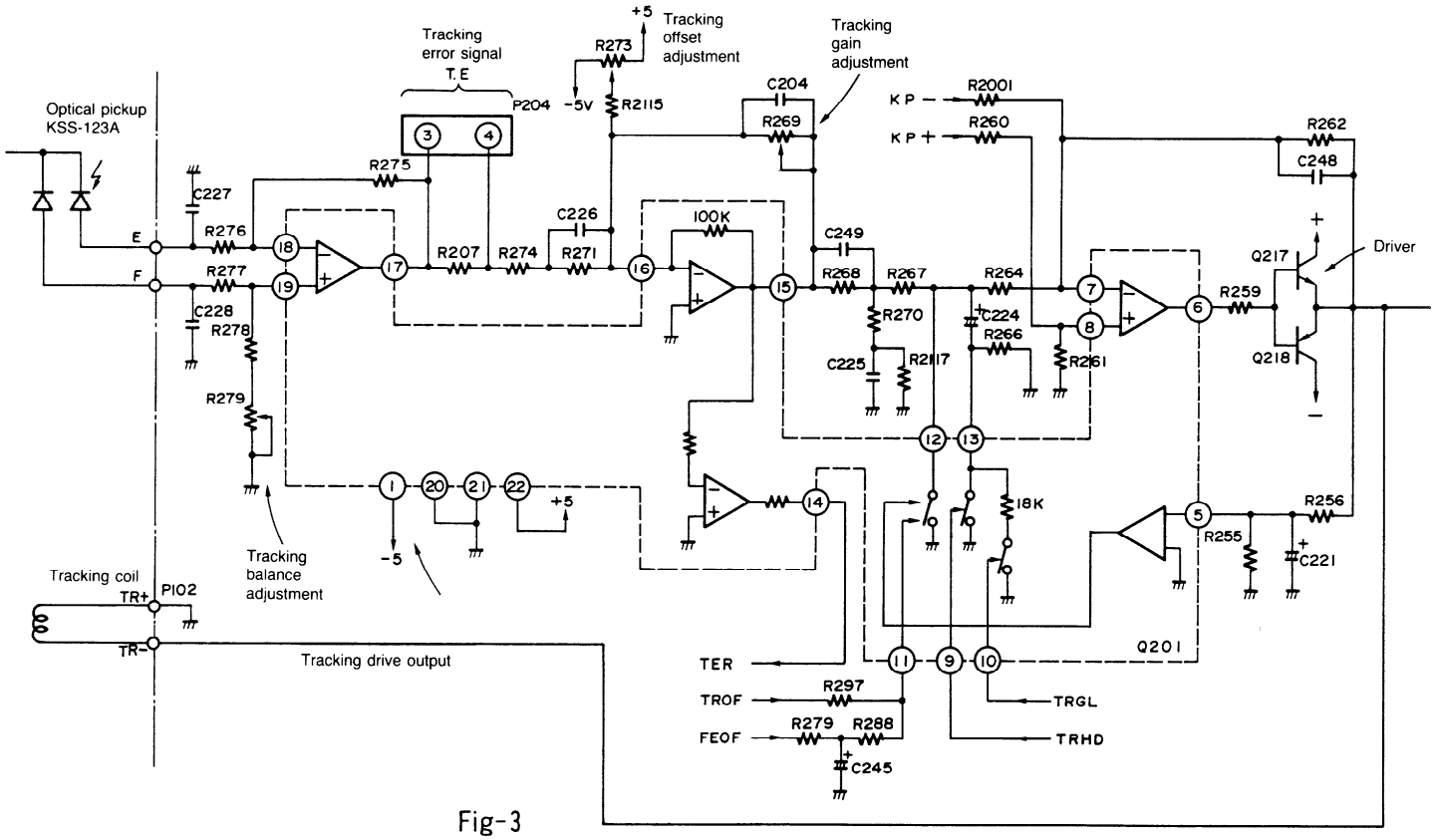


Fig-3

2-1. Tracking Error Sensor

This unit uses a three-beam laser pickup. The error signal is obtained from the difference between the E and F output from both sides of a four-section photodiode housed in the pickup.

T.E. (tracking error) = F − E

The E and F signals are input into pins 18 and 19 of Q201, the difference is obtained by an internal opamp, and the T.E. signal is output from pin 17.

2-2. Phase Correctors – Drivers

The tracking error signal is relayed from Q201 pin 17 to pins 16, 15, 7 and 6 in succession. After passing through drivers Q217 and Q218 it drives the tracking coil of the pickup. C226, C249, C225 and C224 are capacitors which perform phase corrections. Balance, offset and gain are regulated by semi-fixed resistors R279, R273 and R269 respectively.

The switches incorporated in pins 12 and 13 of Q201 turn the servo on and off and switch the high frequency range loop gain on and off, thereby helping to stabilize transient operation during access times. The timing of these switches is determined by the input into pins 9 – 11 of Q201. The commands are as follows:

TROF (tracking OFF) FEOF (feed OFF)
TRGL (tracking gain low) TRHD (tracking high down)

Signals are output from Q202 in response to commands from microprocessor Q204.

2-3. TER circuit

The TER signal is one of the sensors that determines the switch timing mentioned above. It is produced by running the tracking error signal output from pin 15 through a comparator at the ground level and then output through pin 14.

2-4. Track Kick Circuit

This circuit is used to move the laser beam to a target pit over relatively short distances (approximately 1 – 100 tracks) during such operations as disc access and cue review. In conjunction with the on/off switching discussed above, it sends positive and negative "kick pulses" (KP+ and KP−) to pins 7 and 8, thereby shifting the tracking coil by the desired amount.
The timing is determined by signals such as the TER signal and the HFD signal (see below). Fig. 4 illustrates the timing during a typical "kick" operation (forward).

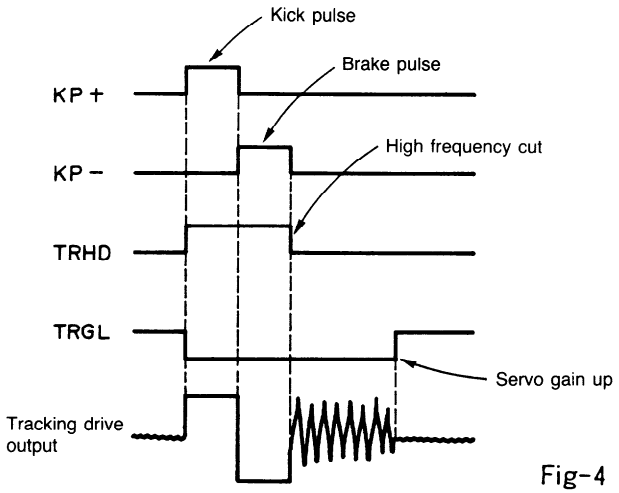


Fig-4

3. HF (RF) Amp

The HF (RF) amplifier block amplifies the HF (RF) data encoded on the disc (in other words the entire output from the four-section photodiode) and sends it to the processing circuit block. In addition, it constantly checks the status of the servo and detects the signals which determine timing.

H.F. (R.F.) = A + B + C + D ← Eye-Pattern

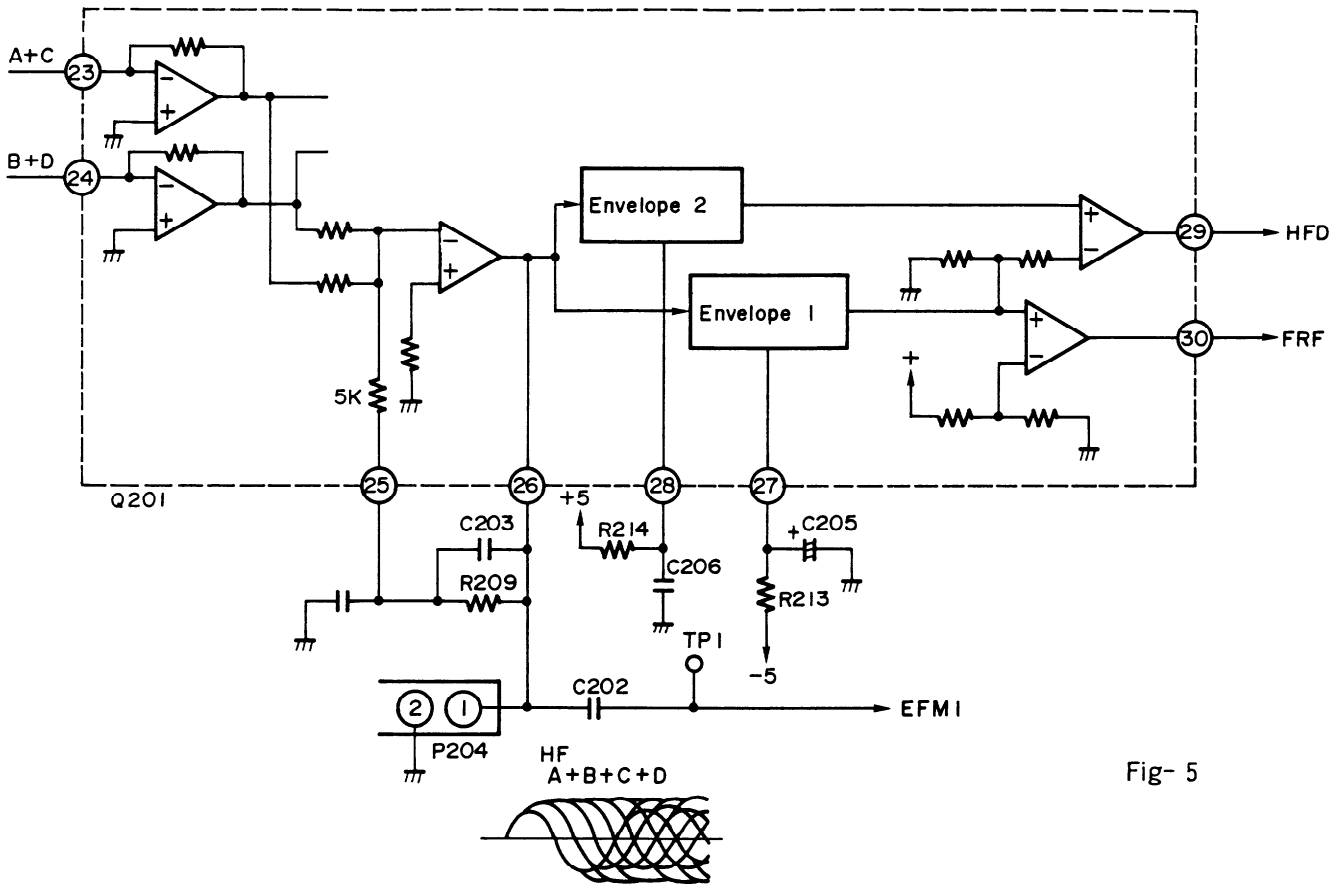


Fig- 5

3-1. HF Amp

The A + C and B + D signals are input from pins 23 and 24 of Q201. They are added together by an opamp and the resulting signal (the HF signal) appears at pin 26. The HF signal is then passed through C202 and sent to the EFMI terminal of Q202 for signal processing.

3-2. HFD and FRF Signals

The HF signal is input into C205 and C206, two envelope detection circuits with different time constants. The output is put through a comparator at a certain level and the HFD and FRF signals are then output via pins 29 and 30. The FRF signal indicates that focus in on; it is HIGH when focus is on. The HFD (HF detector) detects such things as the flat sections between pits and scratches on the disc surface. Together with the TER signal, it determines switching timing during disc access, etc.

4. Slide Motor (Feed Motor) Circuit

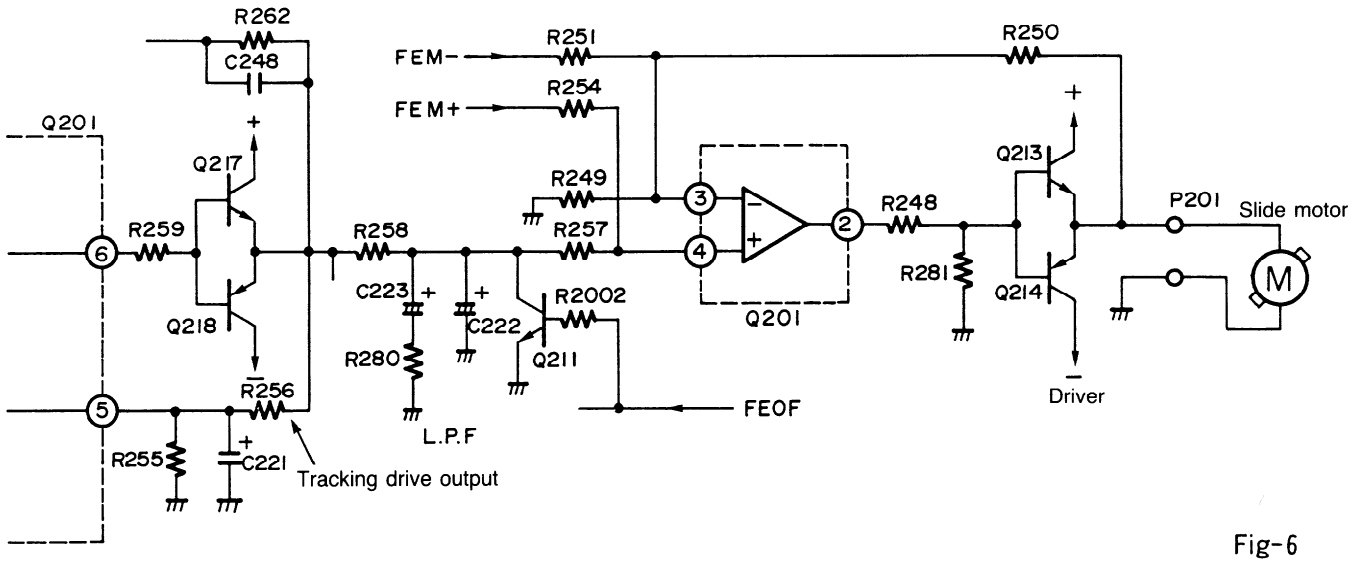


Fig-6

This servo circuit moves the entire pickup assembly from the disc's hub to its outer edge, ensuring that the objective lens stays close to the optical axis.
C222, C223, etc. remove low-frequency elements from the tracking drive's output. It then passes successively through pins 4 and 2 of Q201 and then drives the motor via drivers Q213 and Q214.
Q211 is the transistor that turns the slide servo on and off. It is controlled by the FEOF (feed off) signal sent from Q202.
Motor fast forward and reverse are initiated by FEM− (feed motor −) and FEM+ (feed motor +) signals input into pins 3 and 4 of Q201 for smooth disc access.

5. Spindle Motor Servo

This servo consists of a PLL circuit which extracts the clock signal from the HF signal the pickup reads from the disc and a circuit which controls the spindle motor based on this clock signal.

5-1. PLL Circuit

The PLL circuit consists of VCO, LPF and a phase comparator in Q202 as shown in fig. 7.
The 8.64MHz VCO oscillator output is divided in half inside Q202. The phase of the HF signal and the waveformshaped EFM signal edge are compared and the result output through pin 4.
When PLL is locked, LPF output from pin 7 of Q210 is approximately 2.5V and the SYEQ (sync equal) terminal (Q202, pin 10) changes to HIGH.

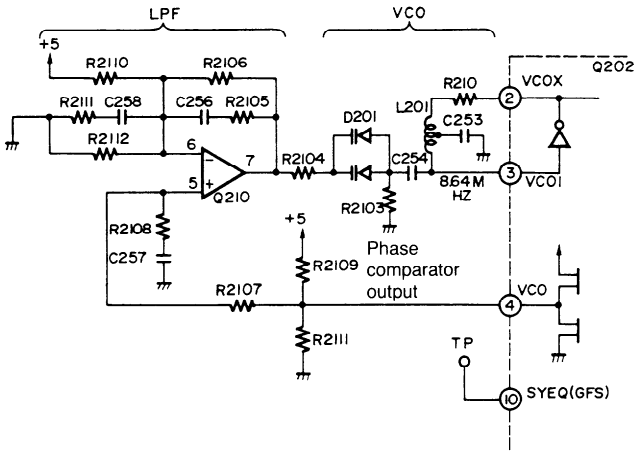


Fig-7

5-2. Spindle Motor Circuit

The spindle motor is controlled by DM+ (disc motor +) and DM− (disc motor −) commands output from pins 11 and 12 of Q202. Two opamps perform phase correction and amplify the signals which are then sent to the spindle motor via drivers Q215 and Q216.

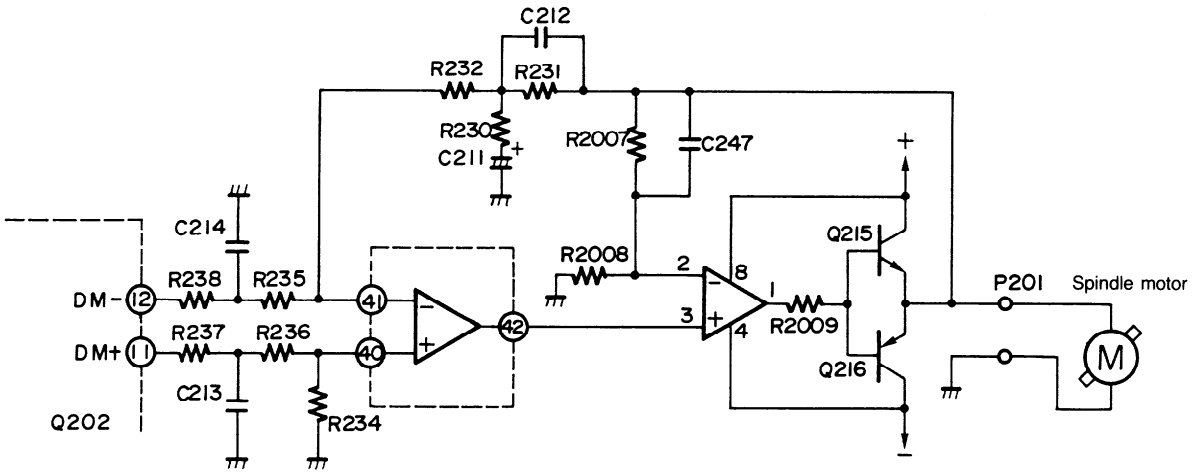


Fig-8

6. HF Signal Waveform-shaping Circuit

This circuit shapes the HF signal and converts it into a binary value. However, since asymmetry (i.e. lack of symmetry between the top and bottom of the HF signal which can adversely affect the DC balance) caused by dispersion during disc manufacture cannot be eliminated by AC linking alone, DC components from the EFM (eight to fourteen modulation) signal are fed back after shaping for slice level processing.
The slice level output from Q210 pin 1 is approximately 2.5V during normal operation.

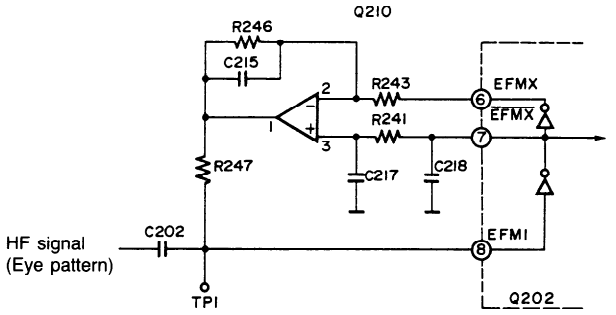


Fig-9

7. APC Circuit

The laser diode is extremely temperature sensitive. For this reason, the APC (auto power control) circuit, which continuously monitors the laser output and feeds it back, is essential.
Negative feedback control is performed on the output signal from the monitor diode inside the laser pickup by Q101. Q103 switches the laser on and off in response to the LSR (laser) command from the microprocesor.

8. Microprocessor (Q204) Peripheral Circuit

8-1. Display Controller (Q204)

The dynamic scan technique used by the display controller is driven directly by 8-digit output from pins 5 – 12 of Q204 and 8-segment data output from pins 17 – 20 and 22 – 25. The duration of each digit is approximately 1ms with cycles of $1 \times 8 = 8$ ms (125Hz).

8-2. Key Input Processor (Q204)

The processor uses the display digits as is without alteration. Q204 uses a 4×3 matrix configuration and accepts key input through pins 26 – 29 (regular logic).
This matrix also controls three remit switches (open/close, pickup reset) as well as timer switches, etc.

8-3. Remote Control Signal Processing (Q402, Q204)
Output from infrared sensor U401 is sent to pin 15 of Q402 where noise from sources such as fluorescent lights is removed. Then it is output from pin 14 and sent to Q203 pin 37. Fig. 10 shows a typical remote control waveform.
In the DX-330, Q402 also includes the 10-key matrix on the panel.

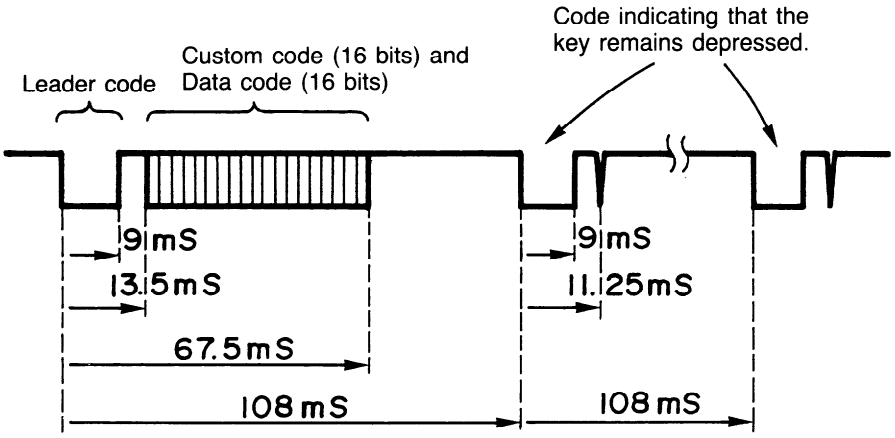


Fig-10