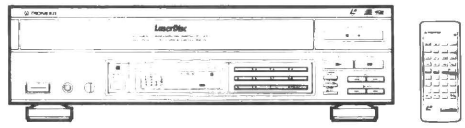
PIONEER®
The future of sound and vision.

Service Manual



ORDER NO.
ARP1750

CD CDV LD PLAYER

CLD-1070

MODEL CLD-1070 HAS TWO VERSIONS:

Type	Power requirement	Export destination
KU/CA	AC 120V only	U. S. A. and Canada
SD/G	AC 110V, 120V—127V, 220V, 240V (Switchable)	U. S. Military

- **This manual is applicable to the KU/CA type.**

CONTENTS

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FI APR. 1989 Printed in Japan

1. SAFETY INFORMATION

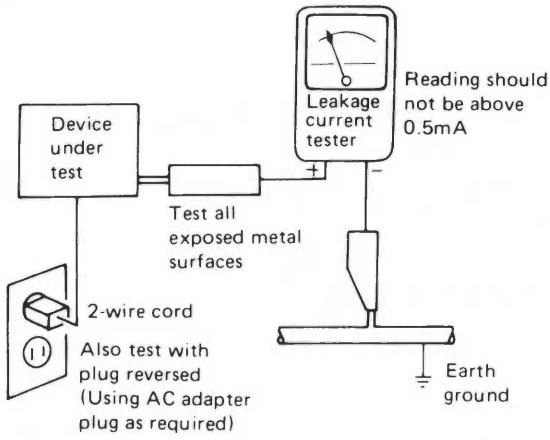
(FOR USA MODEL ONLY)

1. SAFETY PRECAUTIONS

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

LEAKAGE CURRENT CHECK

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



AC Leakage Test

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

2. PRODUCT SAFETY NOTICE

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

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

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

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

(FOR EUROPEAN MODEL ONLY)

VAROITUS!

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

LASER
Kuva 1
Lasersateilyn varoitusmerkki

WARNING!

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

LASER
Picture 1
Warning sign for laser radiation

ADVERSEL:

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

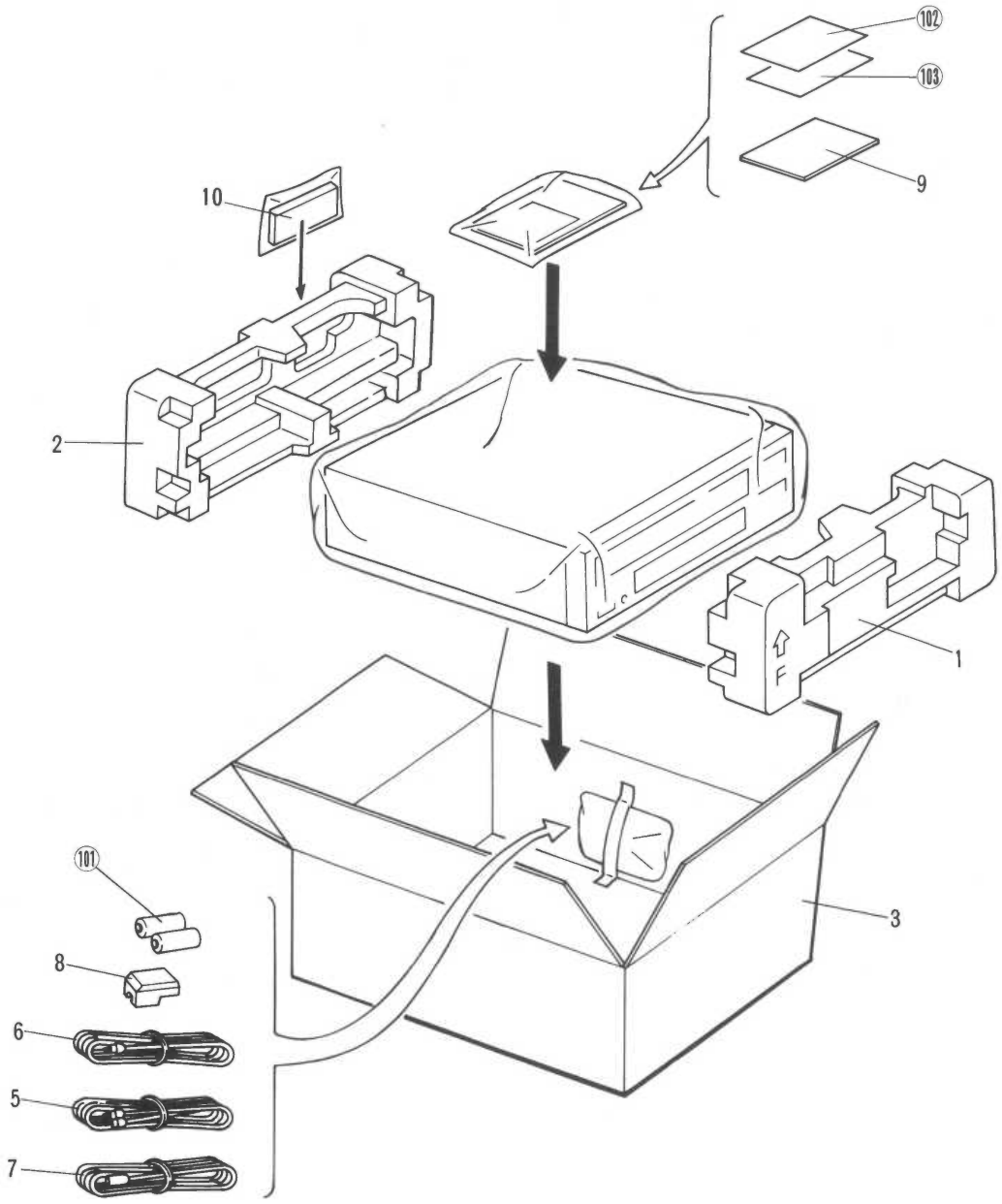
IMPORTANT

THIS PIONEER APPARATUS CONTAINS LASER OF HIGHER CLASS THAN 1. SERVICING OPERATION OF THE APPARATUS SHOULD BE DONE BY A SPECIALLY INSTRUCTED PERSON.

VIKTIGT

APARATEN INNEHÅLLER LASER AV HÖGRE KLASS ÄN 1. INGREPP I APPARATEN BÖR GÖRAS AV SPECIELLT UTBILDAD PERSONAL.

2. PACKING

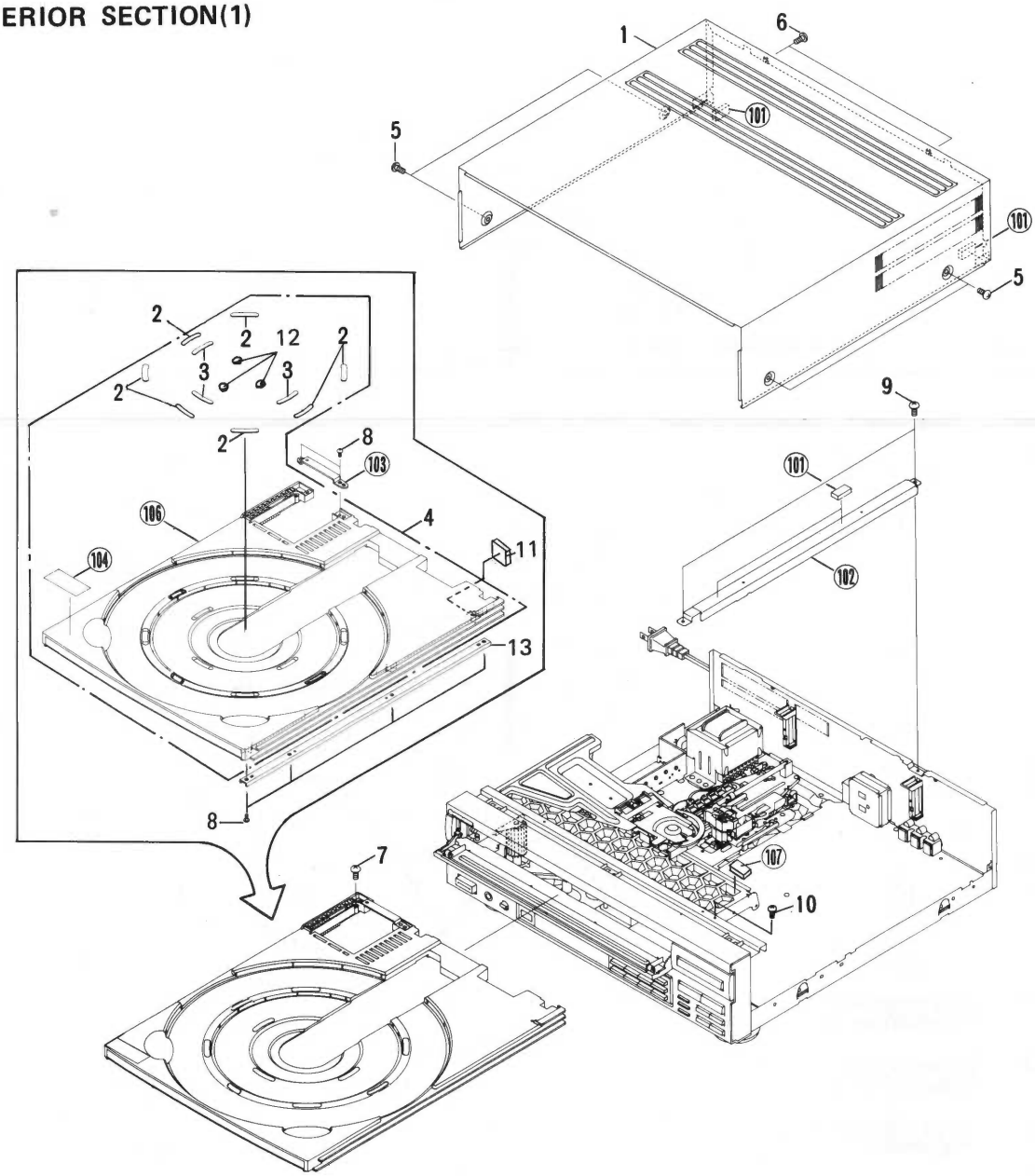


• Parts List of Packing

Mark	No.	Part No.	Description	Mark	No.	Part No.	Description
	1.	VHA1039	Pad (F)		101.		Battery UM-4
	2.	VHA1040	Pad (R)		102.		Caution card
	3.	VHG1058	Packing case		103.		Card
	4.	VHL1006	Packing mat				
	5.	VDE-055	Connection cord				
	6.	VDE-056	Video cable				
	7.	VDE1001	RF antenna cable				
	8.	VKX1001	Antenna adaptor				
	9.	VRB1017	Operating instructions				
	10.	VXX1249	Remote control unit				

3. EXPLODED VIEWS AND PARTS LIST

3.1 EXTERIOR SECTION(1)

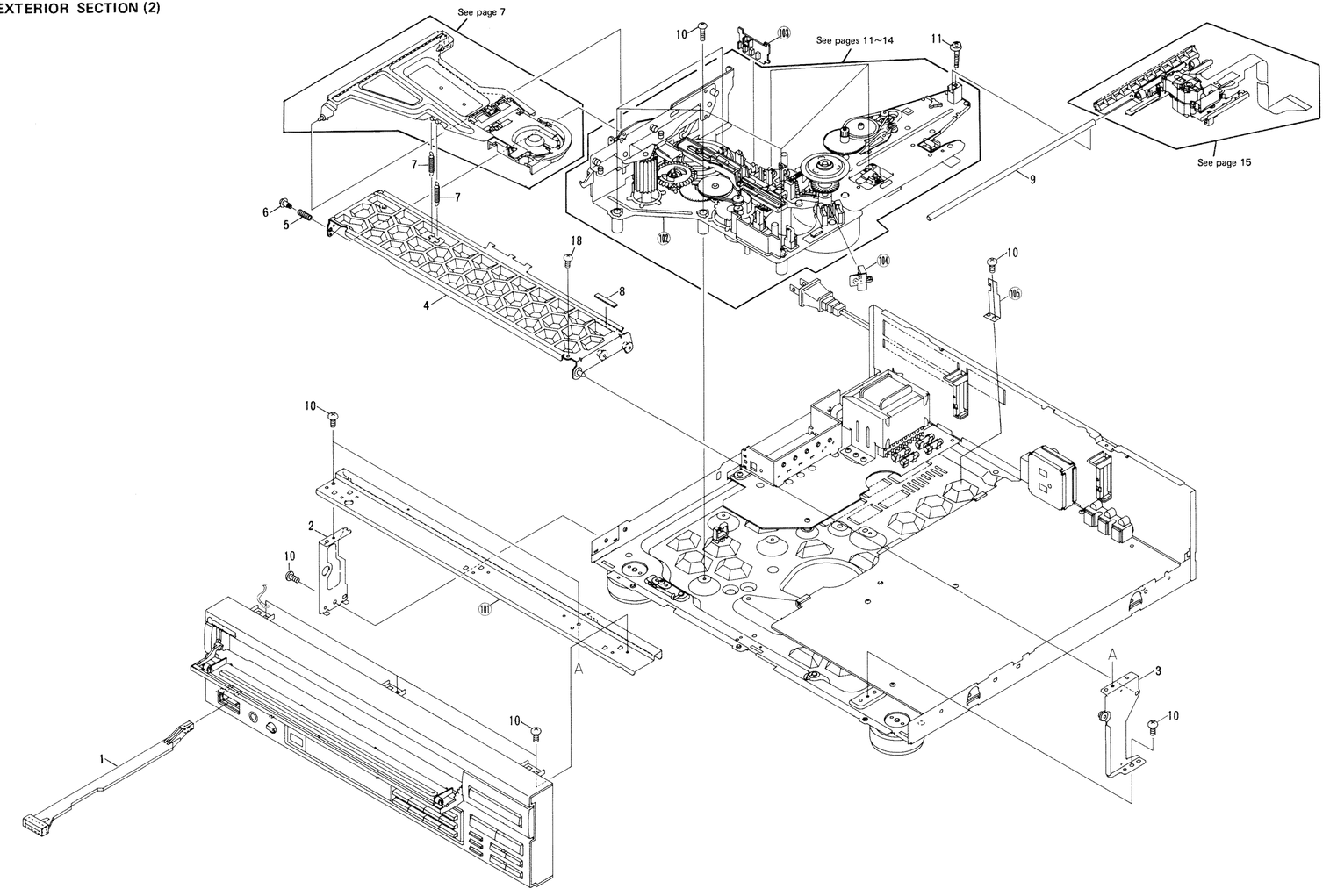


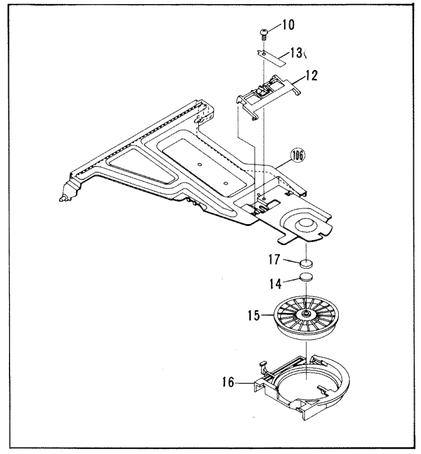
• Parts List of Exterior Section (1)

Mark	No.	Part No.	Description
	1.	VXX1267	Bonnet S
	2.	VEC1191	Disc pad (L)
	3.	VEC1192	Disc pad (S)
	4.	VXX1263	Tray assembly
	5.	BCZ40P080FZK	Screw
	6.	BBZ30P080FZK	Screw
	7.	BPZ30P140FMC	Screw
	8.	BPZ30P080FMC	Screw
	9.	BBZ30P060FMC	Screw
	10.	VCZ30P080FMC	Screw
	11.	VEB1089	Tray rubber
	12.	VEC1252	CD pad
	13.	VXA1320	Reinforced plate assembly

Mark	No.	Part No.	Description
	101.		Insulator cushion
	102.		Center angle
	103.		Tray metal
	104.		Carry label
	105.		. . . .
	106.		Tray
	107.		Dump rubber

3.2 EXTERIOR SECTION (2)





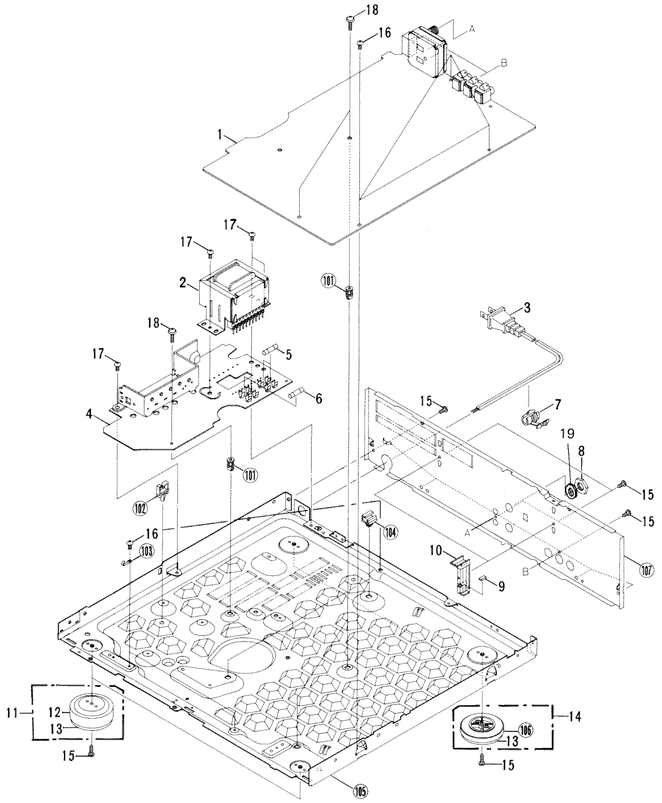
NOTES:

- *Parts without part number cannot be supplied.*
- *The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.*
- *Parts marked by "◉" are not always kept in stock. Their delivery time may be longer than usual or they may be unavailable.*

• Parts List of Exterior Section (2)

Mark	No.	Part No.	Description	Mark	No.	Part No.	Description
	1.	VNK1267	Power knob		101.		Front angle
	2.	VNE1306	Side stay (L)		102.		Mechanism assembly
	3.	VXA1280	Side stay (R) assembly		103.		SW board assembly
	4.	VXA1281	Clamper arm (A) assembly		104.		FG board assembly
	5.	VBH1093	Arm spring		105.		SM head stopper
	6.	VBA1008	Screw		106.		Clamper arm (B)
	7.	VBH1094	Clamper spring				
	8.	VEB1084	Dump rubber (A)				
	9.	VLL1177	Carriage shaft				
	10.	BBZ30P060FMC	Screw				
	11.	IPZ30P200FMC	Screw				
	12.	VNL1203	Parallel link				
	13.	VBK1014	Plate spring				
	14.	VNL1206	Ball catcher				
	15.	VNL1207	Clamper				
	16.	VNL1205	Clamper holder				
	17.	VEB1078	Rubber sheet				
	18.	BPZ30P140FMC	Screw				

3.3 BASE SECTION

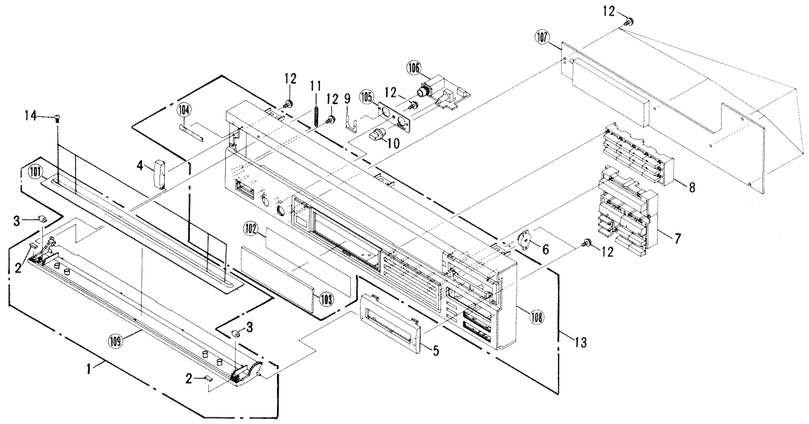


• Parts List of Base Section

Mark	No.	Part No.	Description
	◉ 1.	VWX1002	Mother board assembly
⚠	2.	VTT1050	Power transformer (120V)
⚠	3.	PDG1015	AC power cord
	◉ 4.	VWR1007	Power supply board assembly
⚠	5.	VEK-018	Fuse (FU201, FU202) (3A)
⚠	6.	REK-080	Fuse (FU203, FU204) (1A)
⚠	7.	CM-22C	Strain relief
	8.	VLL-082	F-nut
	9.	VEB1033	Door dump rubber
	10.	VNL1202	Tray stopper
	11.	VXA1289	Insulator assembly (F)
	12.	VNK1095	Insulator (A)
	13.	VEC1224	Felt
	14.	VXA1290	Insulator assembly (B)
	15.	BBZ30P080FZK	Screw
	16.	BBZ30P060FMC	Screw
	17.	BCZ40P080FZK	Screw
	18.	IPZ30P160FMC	Screw
	19.	WA96F130N050	F-washer

Mark	No.	Part No.	Description
	101.		PCB spaser
	102.		Wire clip (B)
	103.		Cord holder
	104.		P board holder
	105.		Base chassis
	106.		Insulator (B)
	107.		Rear panel

3.4 FRONT PANEL SECTION

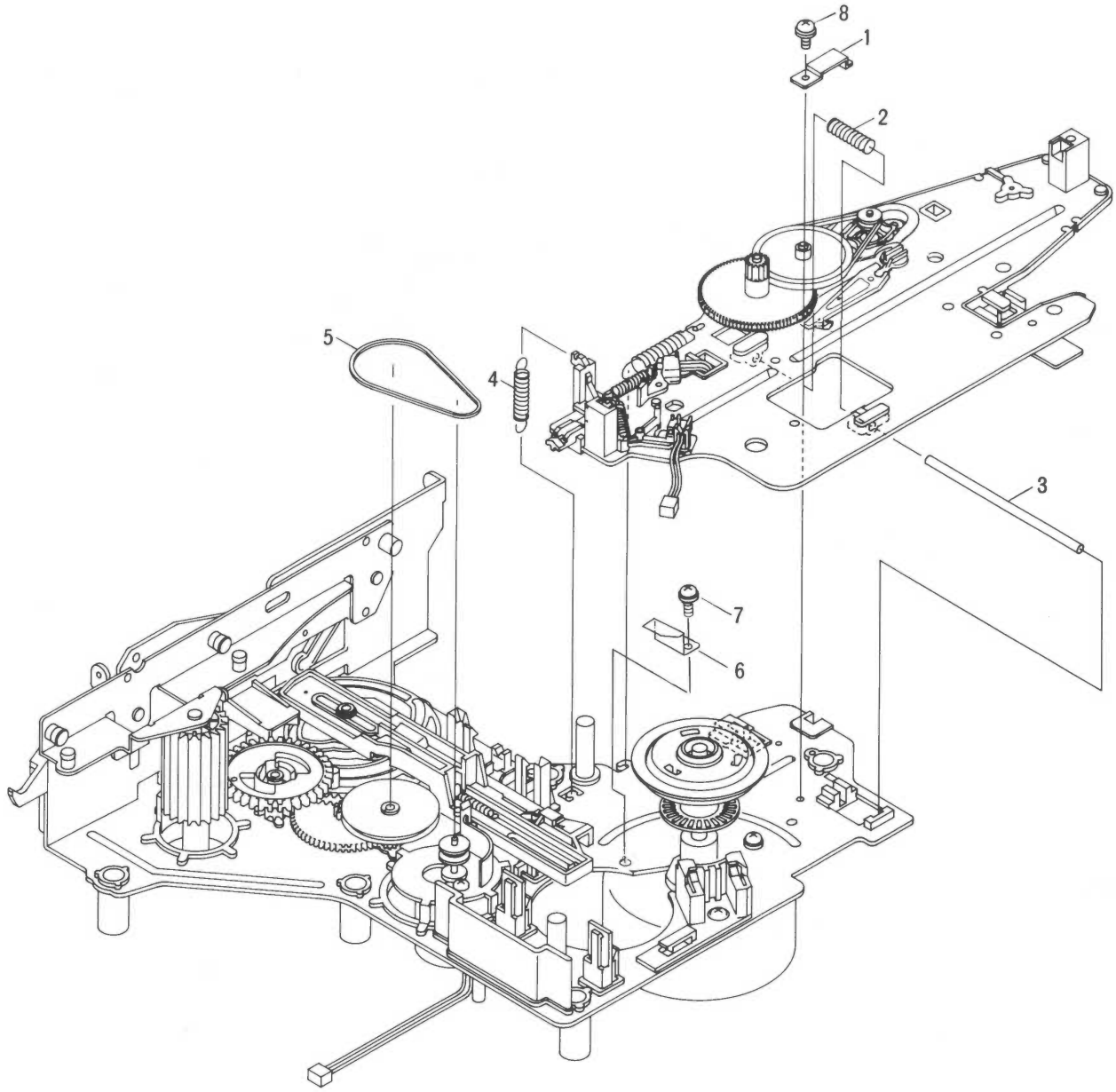


• Parts List of Front panel Section

Mark	No.	Part No.	Description
	1.	VXX1265	Door assemblyS
	2.	VEB1033	Door dump rubber
	3.	VNL1042	Roller
	4.	VNK1270	Sub panel (L)
	5.	VNK1271	Sub panel (R)
	6.	VXA1053	Dumper assembly
	7.	VNK1265	Main key
	8.	VNK1266	Ten key
	9.	VNE1102	Snap plate
	10.	VNK1262	Headphone knob
	11.	VBH1085	Door spring
	12.	IPZ26P060FMC	Screw
	13.	VXX1264	Front panel assemblyS
	14.	BPZ20P040FZK	Screw

Mark	No.	Part No.	Description
	101.		Door plate
	102.		FL filter
	103.		FL lens
	104.		Name plate
	105.		Jack holder
	106.		Headphone board assembly
	107.		Operation board assembly
	108.		Front panel
	109.		Door assembly

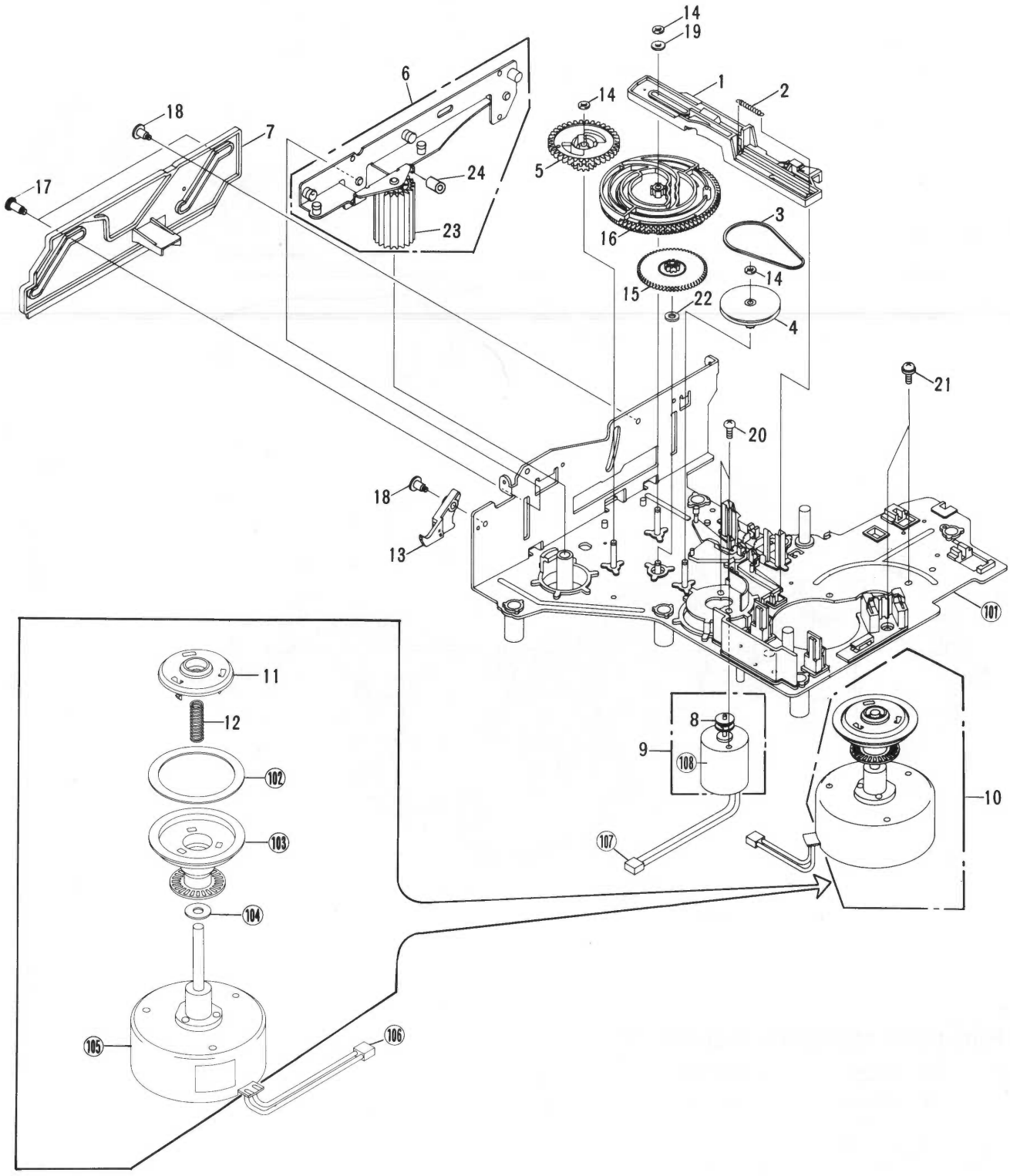
3.5 MECANISM ASSEMBLY (1)



• Parts List of Mechanism Assembly (1)

Mark	No.	Part No.	Description
	1.	VBK1013	Plate spring
	2.	VBH1073	Thrust spring
	3.	VLL1175	Tilt shaft
	4.	VBH1074	Tilt pulling spring
	5.	PEB1013	Belt
	6.	VNE1331	Cam head stopper
	7.	PMA30P050FMC	Screw
	8.	ABZ26P050FMC	Screw

3.6 MECANISM ASSEMBLY (2)

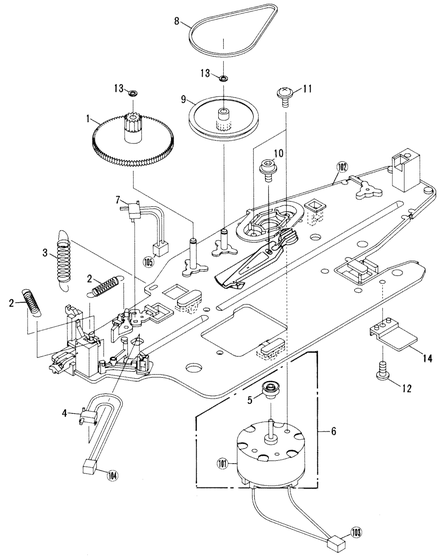


• Parts List of Mechanism Assembly (2)

Mark	No.	Part No.	Description
	1.	VNL1191	Spring slanting cam
	2.	VBH1082	Cam spring
	3.	PEB1013	Belt
	4.	VNL1192	Gear pulley
	5.	VNL1194	Follow gear
	6.	VXA1275	Roller plate assembly
	7.	VNL1188	Slide cam
	8.	VLL1176	Motor pulley
	9.	VXX1262	Loading motor assembly
	10.	VXX1260	Spindle assembly
	11.	VNL1174	Centering hab
	12.	VBH1083	Centering spring
	13.	VNL1208	Door lever
	14.	WT26D047D025	Washer
	15.	VNL1193	Two stair gear
	16.	VNL1190	Cam gear
	17.	VBA1006	Screw (A)
	18.	VBA1008	Screw (B)
	19.	WA32N080W050	Nylon washer
	20.	PMZ30P040FMC	Screw
	21.	PMA30P050FMC	Screw
	22.	WA32D060D025	Washer
	23.	VNL1189	Slider gear
	24.	VEB1091	Stopper ring

Mark	No.	Part No.	Description
	101.		Chassis assembly
	102.		Rubber sheet
	103.		Turn-table assembly
	104.		Oil stopped washer
	105.		Spindle motor
	106.		Housing assembly
	107.		Housing assembly
	108.		Loading motor

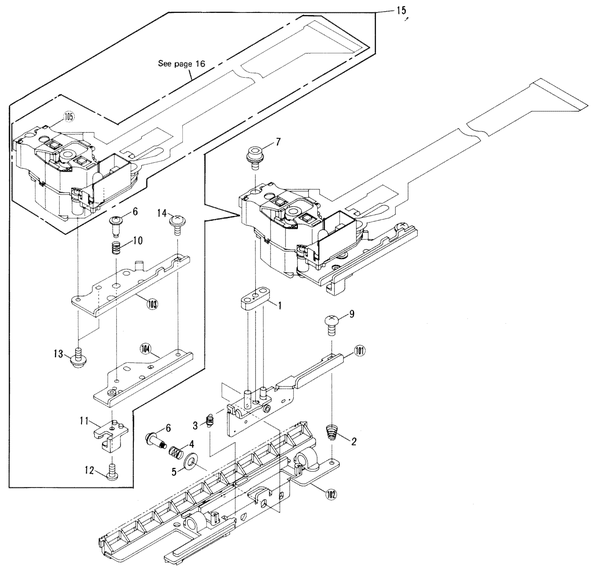
3.7 MECANISM ASSEMBLY (3)



• Parts List of Mechanism Assembly (3)

Mark	No.	Part No.	Description
	1.	VNL1196	CA gear (3)
	2.	VBH1079	Switch pulling spring
	3.	VBH1080	TC pulling spring
	4.	PSH1003	Slide switch (S5: LD/CD)
	5.	VNL1197	CA pulley (1)
	6.	VXX1261	Carriage motor assembly
	7.	PSH1003	Slide switch (S4: CD/CDV)
	8.	VEB1077	CA belt
	9.	VNL1198	CA pulley (2)
	10.	SMF30H080FBT	Bolt
	11.	PMA26P050FMC	Screw
	12.	BPZ26P050FMC	Screw
	13.	WT26D047D025	Washer
	14.	VNL1210	FLE base
	101.		Carriage motor
	102.		Sorvo mechanism base assembly
	103.		Housing assembly
	104.		Housing assembly
	105.		Housing assembly

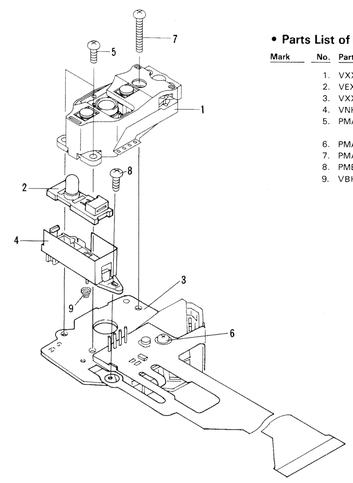
3.8 RACK SECTION



• Parts List of Rack Section

Mark	No.	Part No.	Description
	1.	VNL1209	PU base
	2.	VBH1075	LP center spring
	3.	VBH1089	PU pulling spring
	4.	VBH1090	L-2 spring
	5.	WC30FMC	Washer
	6.	VBA1007	Screw
	7.	VLL1192	Screw
	8.	- - -	- - -
	9.	BMZ26P080FMC	Screw
	10.	VBH1081	TAN spring
	11.	VNL1199	TAN base
	12.	PMZ20P040FMC	Screw
	13.	PMA20P040FMC	Screw
	14.	AMZ20P050FMC	Screw
	15.	VWT1048	Slider assembly
	101.		PU mount base assembly
	102.		Rack
	103.		TAN plate (2)
	104.		TAN plate (1)
	105.		Pick-up assembly

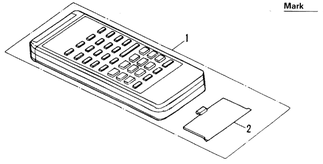
3.9 PICK-UP ASSEMBLY



• Parts List of Pick-up Assembly

Mark	No.	Part No.	Description
	1.	VXX1266	Actuator assembly
	2.	VEX1018	Sensor assembly
	3.	VXX1274	Pre pick-up assembly
	4.	VNH1024	Sensor stay
	5.	PMA20P060FMC	Screw
	6.	PMA20P080FMC	Screw
	7.	PMA20P140FMC	Screw
	8.	PMB20P050FMC	Screw
	9.	VBH1087	Sensor spring

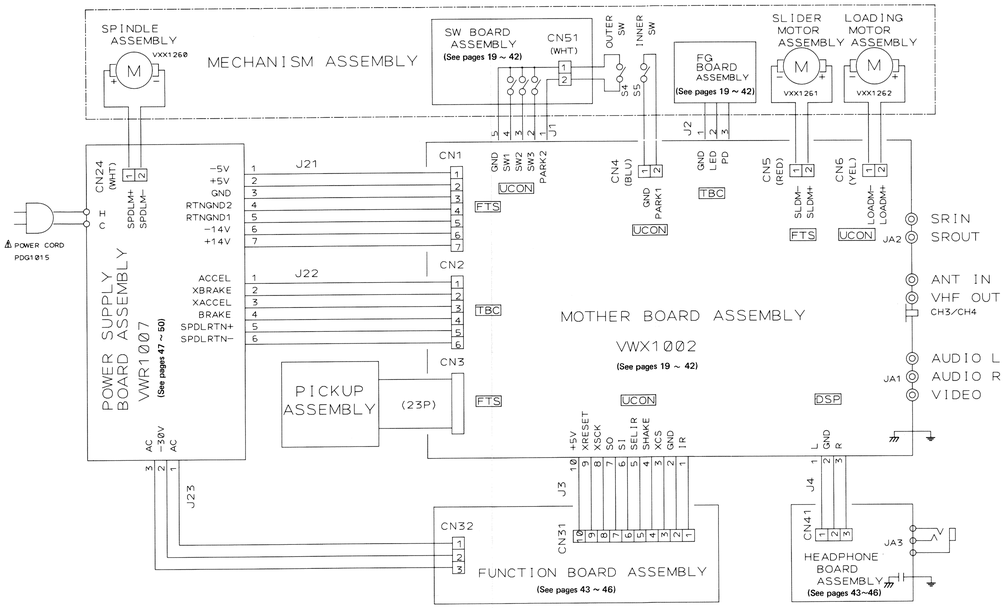
3.10 REMOTE CONTROL UNIT



• Parts List of Remote Control Unit

Mark	No.	Part No.	Description
	1.	VXX1249	Remote control unit
	2.	VNK1293	Battery cover

4. CONNECTION DIAGRAM



CN3

NO.	NAME	NO.	NAME	NO.	NAME	NO.	NAME
1	-5V	7	B4	13	LD	19	TR DR
2	+5V	8	B3	14	LD GND	20	TILT OUT
3	RF	9	B2	15	NC	21	TILT GND
4	GND	10	B1	16	TR RT	22	TILT IN
5	C	11	VR	17	FO DR	23	TILT LED
6	A	12	MD	18	FO RT		

1. RESISTORS
Indicated in Ω, 1/8, 1/4W, ±5% tolerance unless otherwise noted k: kΩ, M: MΩ, (F): ±1%, (G): ±2%, (K) : ±10%, (M) : ±20% tolerance.

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

3. VOLTAGE, CURRENT
: DC voltage (V) at no input signal.
Value in ( ) is DC voltage at rated power.
⇦ mA: DC current at no input signal.

4. OTHERS
➡ : Signal route.
⊘ : Adjusting point.

The ⚠ mark found on some component parts indicates the importance of the safty factor of the part. Therefore, when replacing, be sure to use parts of identical designation.

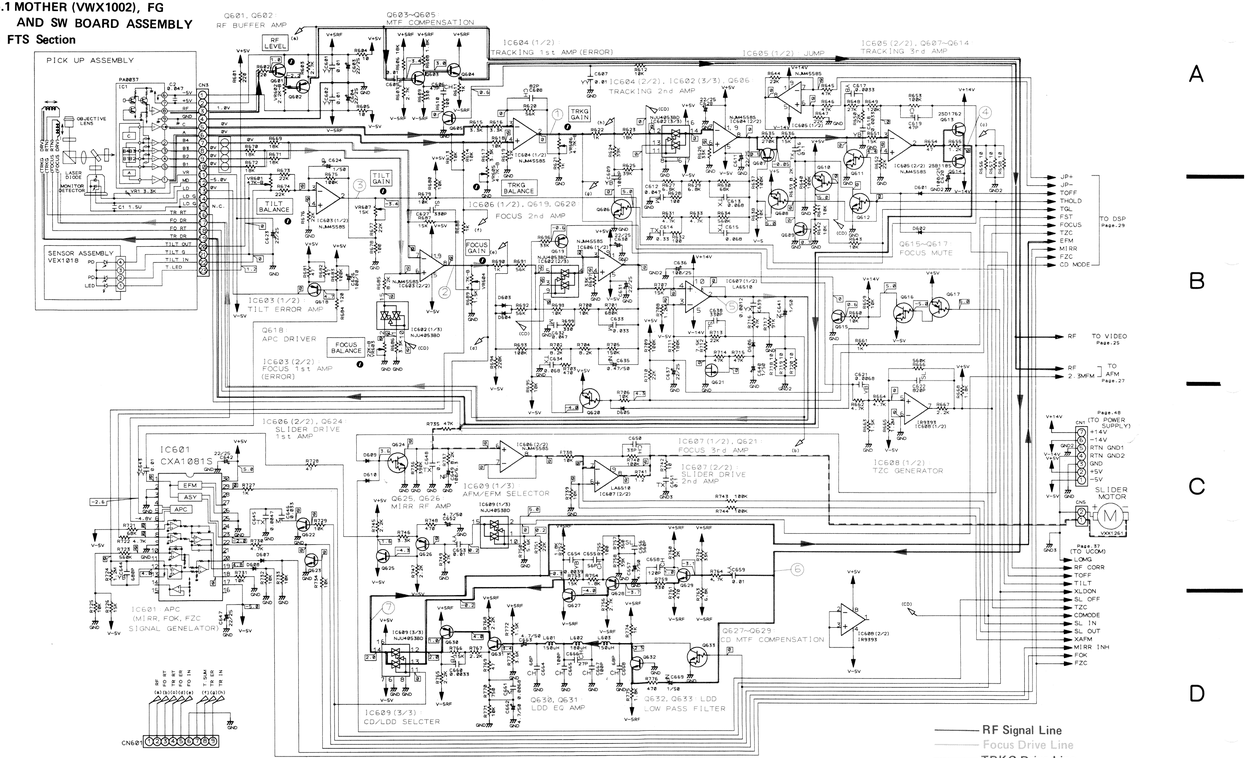
❊ marked capacitor and resistor have parts number.

This is the basic schematic diagram, but the actual circuit may vary due to improvements in design.

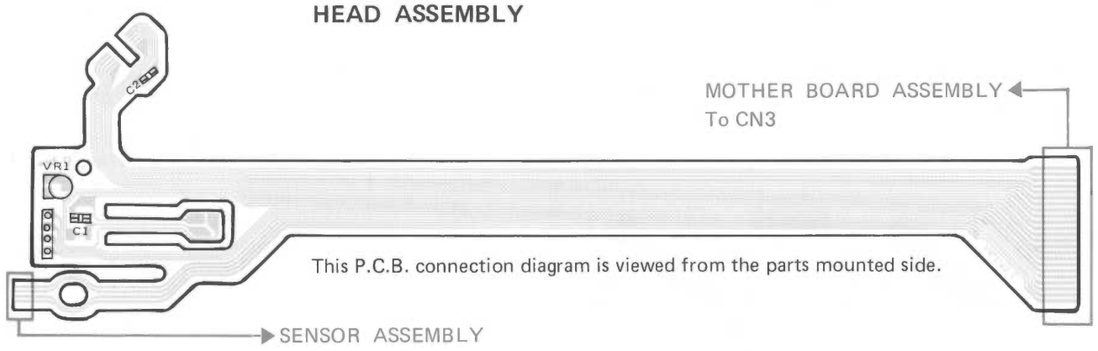
5. SCHEMATIC DIAGRAM AND P.C. BOARD PATTERNS

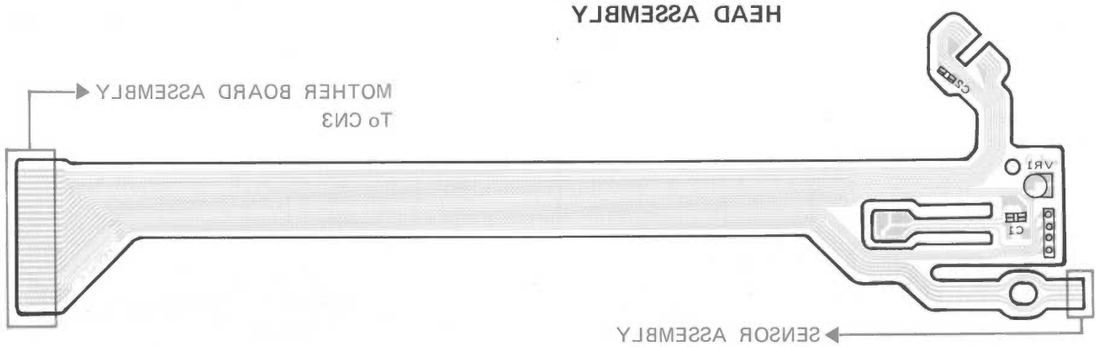
5.1 MOTHER (VWX1002), FG AND SW BOARD ASSEMBLY

- FTS Section



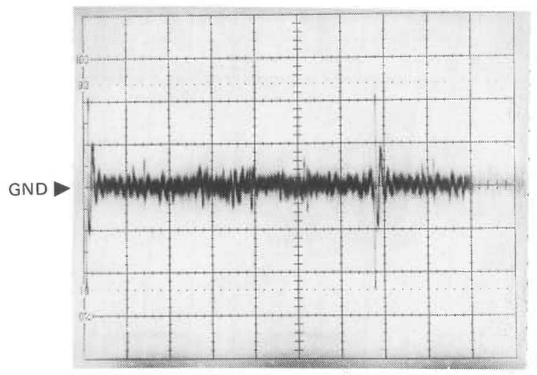
HEAD ASSEMBLY



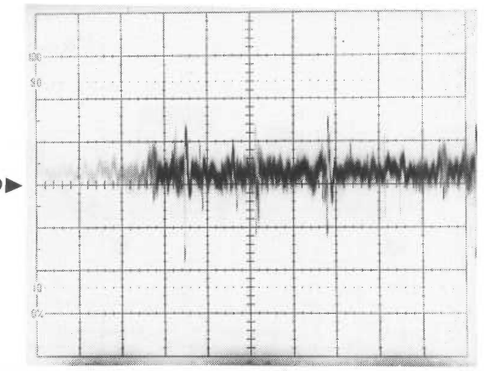


- **Wave Forms**

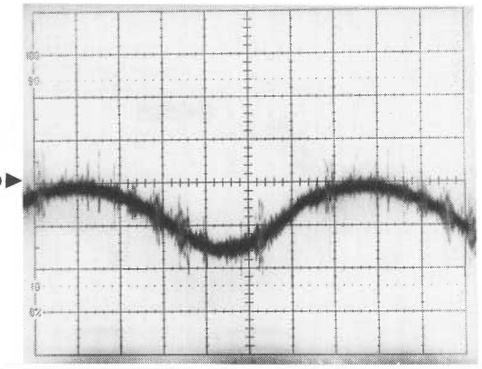
(1) IC604-Pin2 : Tracking error
V : 100mV/div, H : 5mS/div



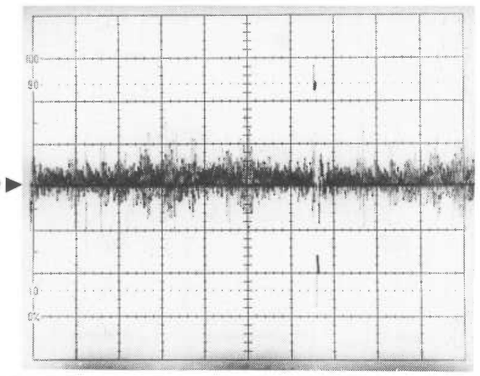
(2) IC603-Pin8 : Focus error
V : 100mV/div, 5mS/div



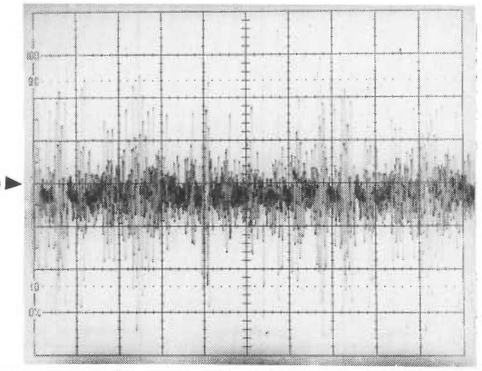
(3) IC603-Pin2 : Tilt error
V : 200mV/div, 5mS/div



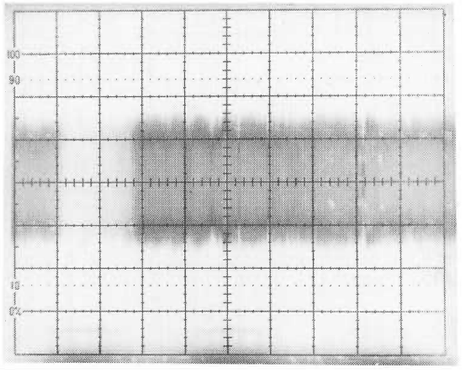
(4) Q613, Q614-E : Tracking drive
V : 2V/div, 5mS/div



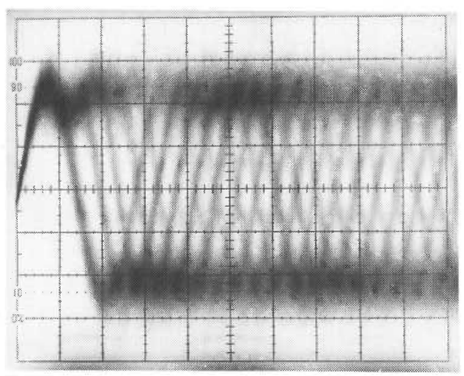
(5) IC607-Pin2 : Focus drive
V : 2V/div, 5mS/div



(6) Q602-E : RF
V : 100mV/div, 5mS/div

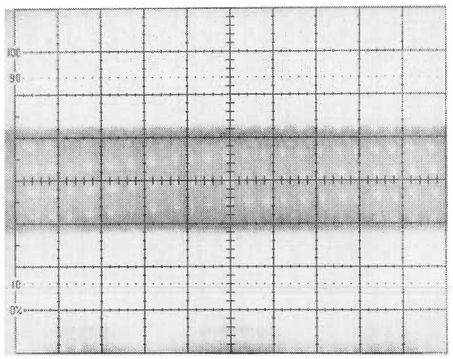


(7) IC609-Pin14 : EFM
V : 200mV/div, H : 0.5μS/div

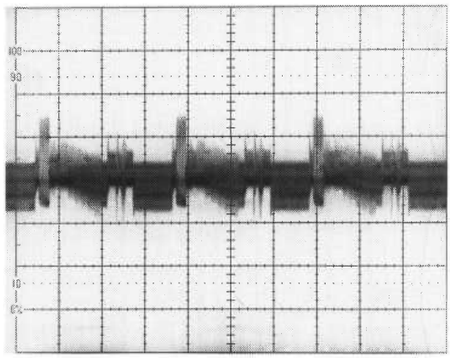


• Wave Forms

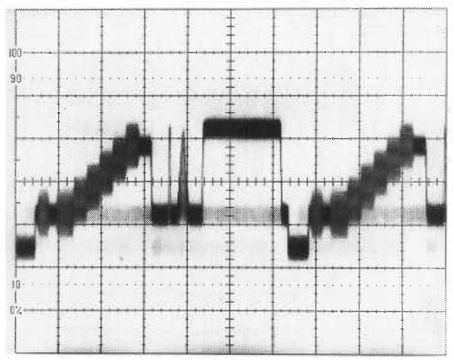
① IC402-Pin5 : RF signal
V : 200mV/div, H : 0.5mS/div



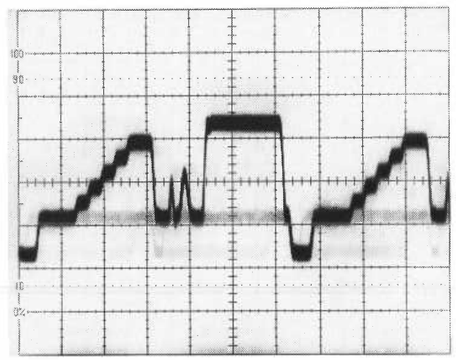
② IC402-Pin9 : Demoduleted video signal
V : 200mV/div, H : 20μS/div



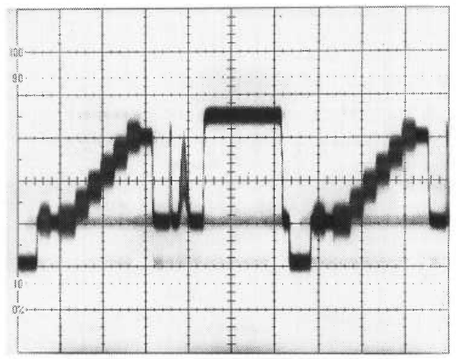
③ IC402-Pin18 : Main video
V : 200mV/div, H : 10μS/div
Pedestal level : +2.8V



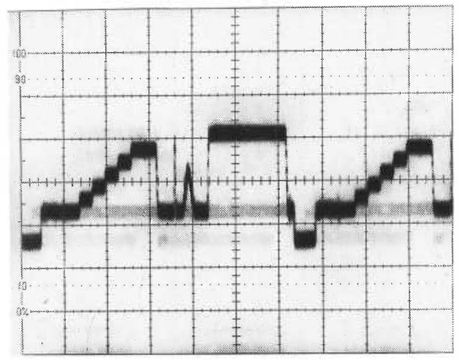
④ IC402-Pin20 : 1H Delay video
V : 200mV/div, H : 10μS/div
Pedestal level : +2.8V



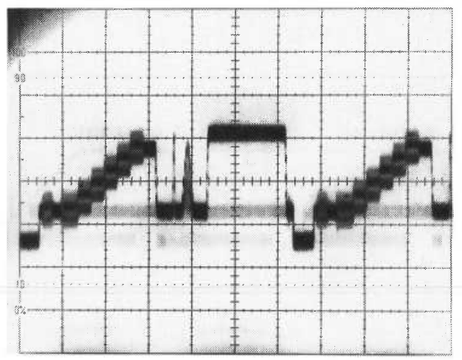
⑤ IC403-Pin16 : CCD out
V : 200mV/div, H : 10μS/div
Pedestal level : −2.0V



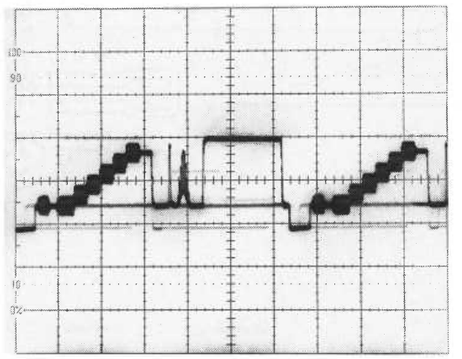
⑥ IC402-Pin28
V : 200mV/div, H : 10μS/div
Pedestal level : +2.8V



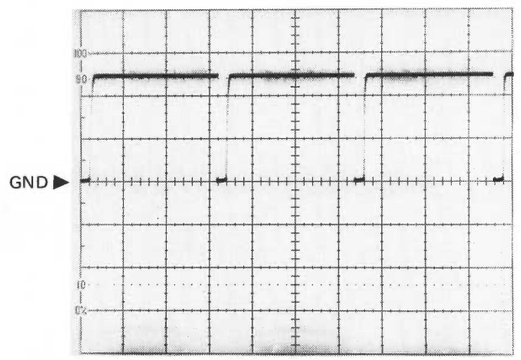
⑦ IC402-Pin30
V : 200mV/div, H : 10μS/div
Pedestal level : +2.8V



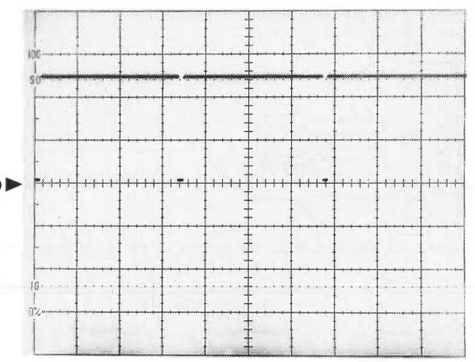
⑧ IC402-Pin38
V : 1V/div, H : 10μS/div
Pedestal level : +1.5V



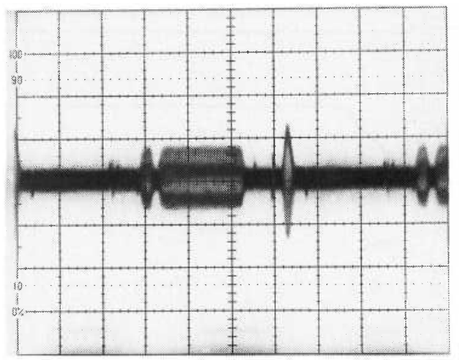
⑨ IC401-Pin30 : PBH
V : 2V/div, H : 20μS/div



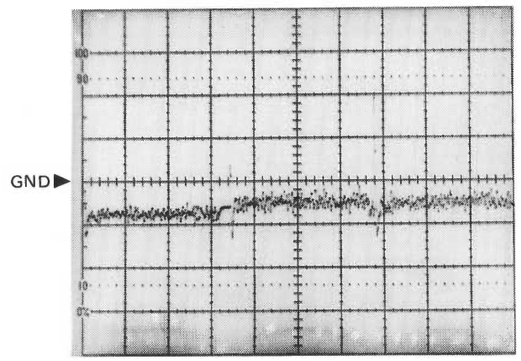
⑩ IC402-Pin23 : PBV
V : 2V/div, H : 5mS/div



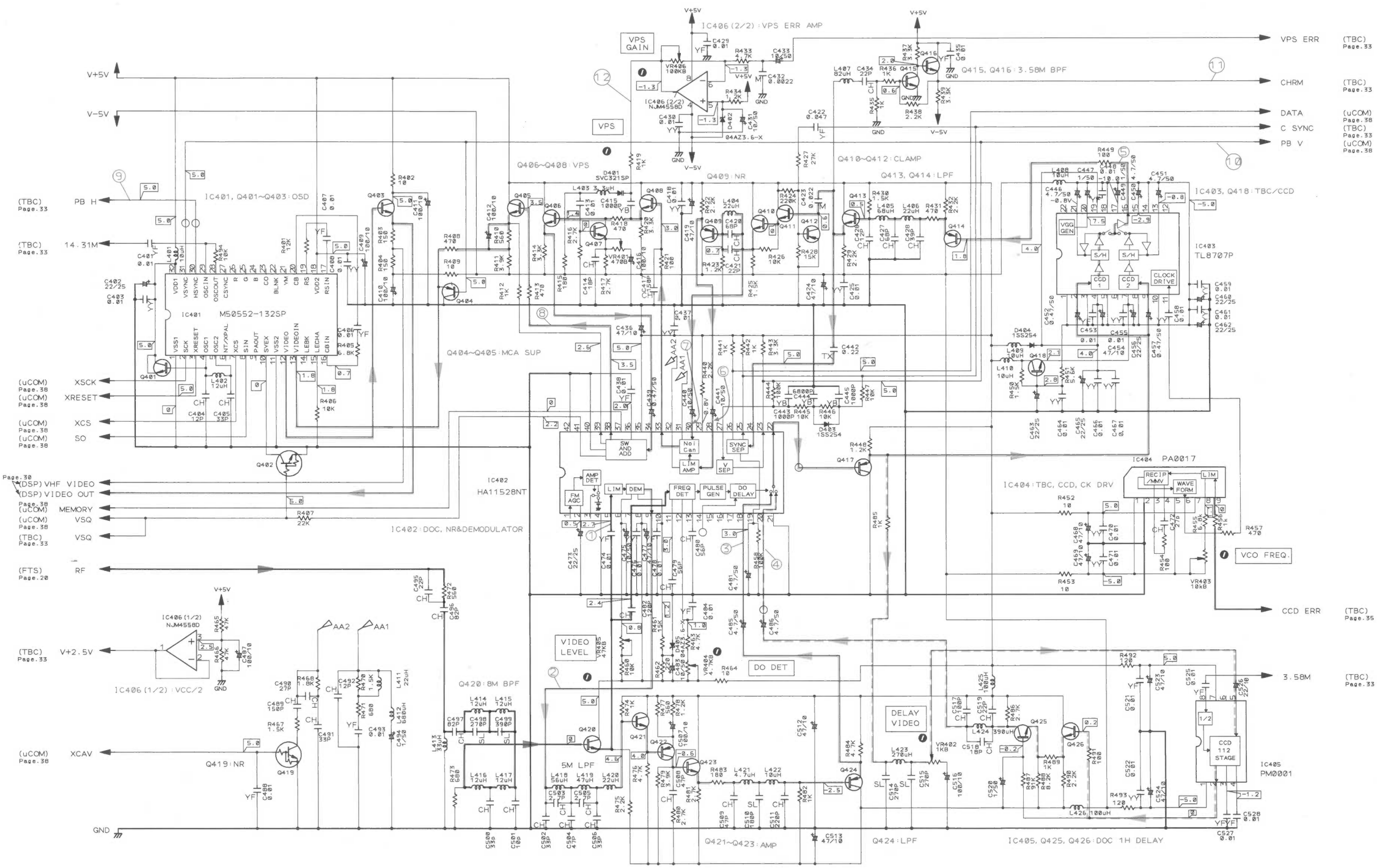
⑪ Q416-E CHRM for TBC
V : 200mV/div, H : 10μS/div



⑫ IC406-Pin7 : VPS error
V : 2V/div, H : 5mS/div



• Video Section



Q404, 409, 412, 414, 417
422, 424 : 2SA933S

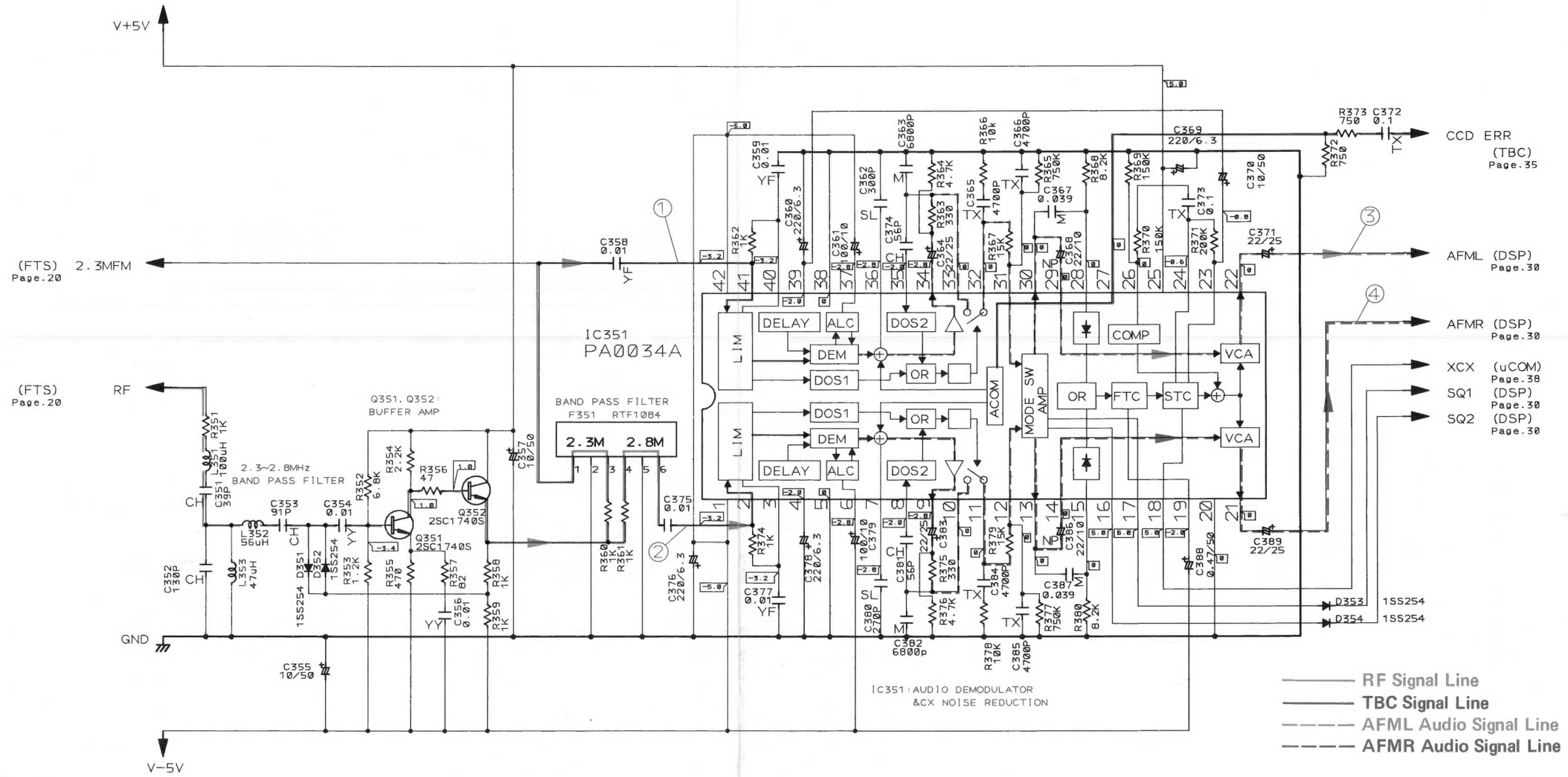
Q401, 403, 405, 406, 408
410, 411, 413, 415, 416
418, 420, 421, 423, 425
426 : 2SC1740S

Q407 : 2SC1674

Q402, 419 : DTC124ES

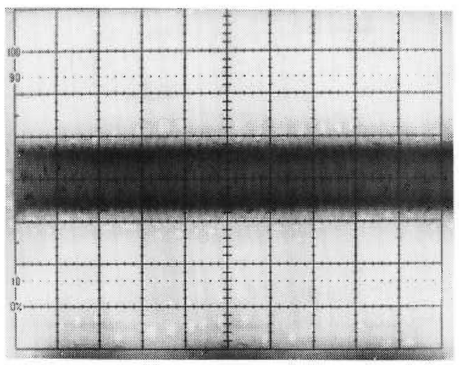
RF Signal Line
TBC Signal Line
VIDEO Signal Line
1H DELAY VIDEO Signal Line

• AFM Section

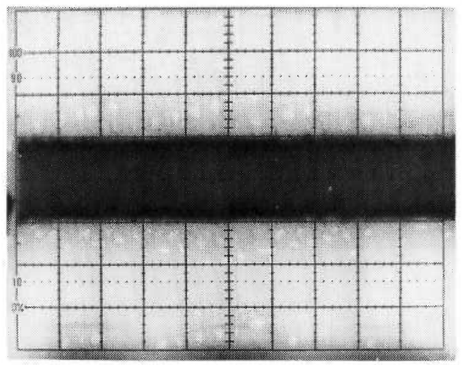


• Wave Forms

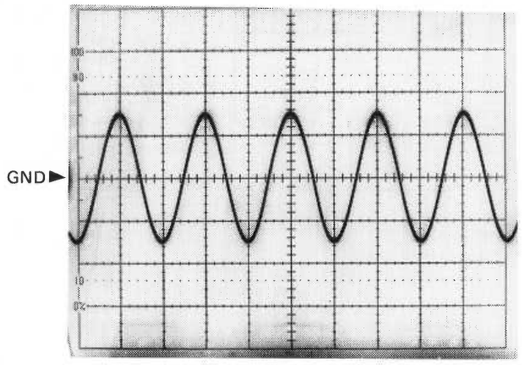
(1) IC351-Pin41 :
V : 100mV/div, H : 10μS/div



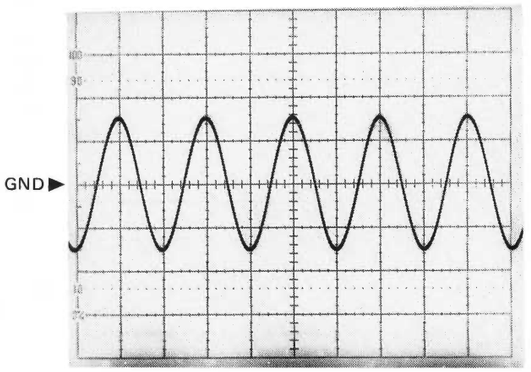
(2) IC351-Pin2 :
V : 100mV/div, H : 10μS/div



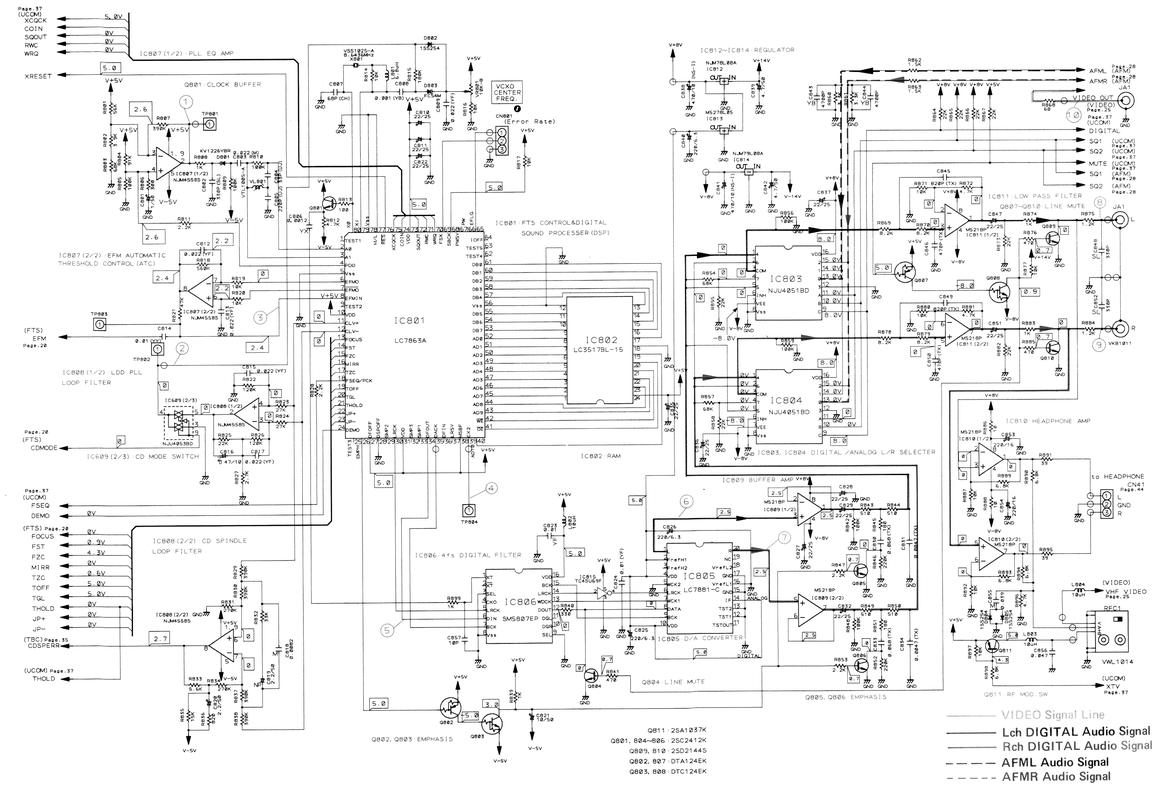
(3) C371 – + read side : AFM Lch
V : 0.5V/div, H : 0.5mS/div



(4) C387 – + read side : AFM Rch
V : 0.5V/div, H : 0.5mS/div

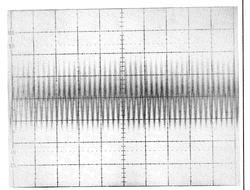


• DSP Section

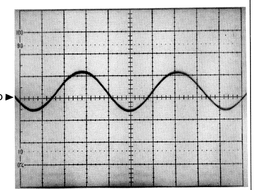


• Wave Forms

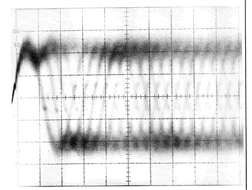
① TP801 : PLL EQ
V : 200mV/div, H : 0.5μS/div



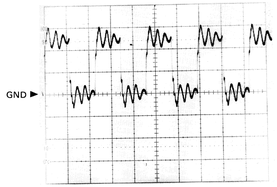
② TP802
V : 500mV/div, H : 10mS/div



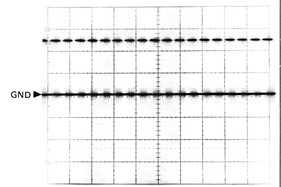
③ IC801-Pin : EFM
V : 200mV/div, H : 0.5μS/div



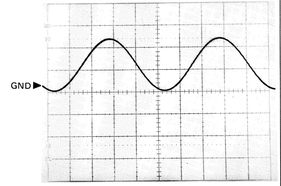
④ TP804
V : 200mV/div, H : 0.2μS/div



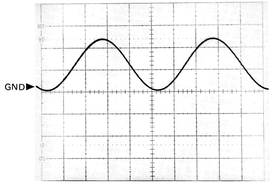
⑤ IC806-Pin6
V : 200mV/div, H : 20μS/div



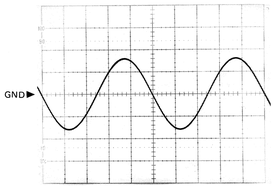
⑥ IC805-Pin1 : Lch, Digital 1KHz OdB
V : 2V/div, H : 0.2mS/div



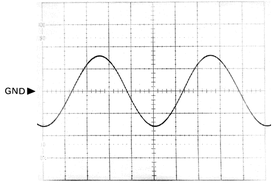
⑦ IC805-Pin20 : Rch, Digital 1KHz OdB
V : 2V/div, H : 0.2mS/div



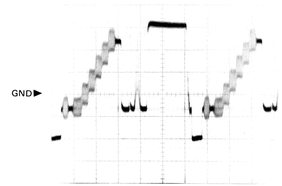
⑧ Audio out-Lch : Digital 1KHz OdB
V : 2V/div, H : 0.2mS/div



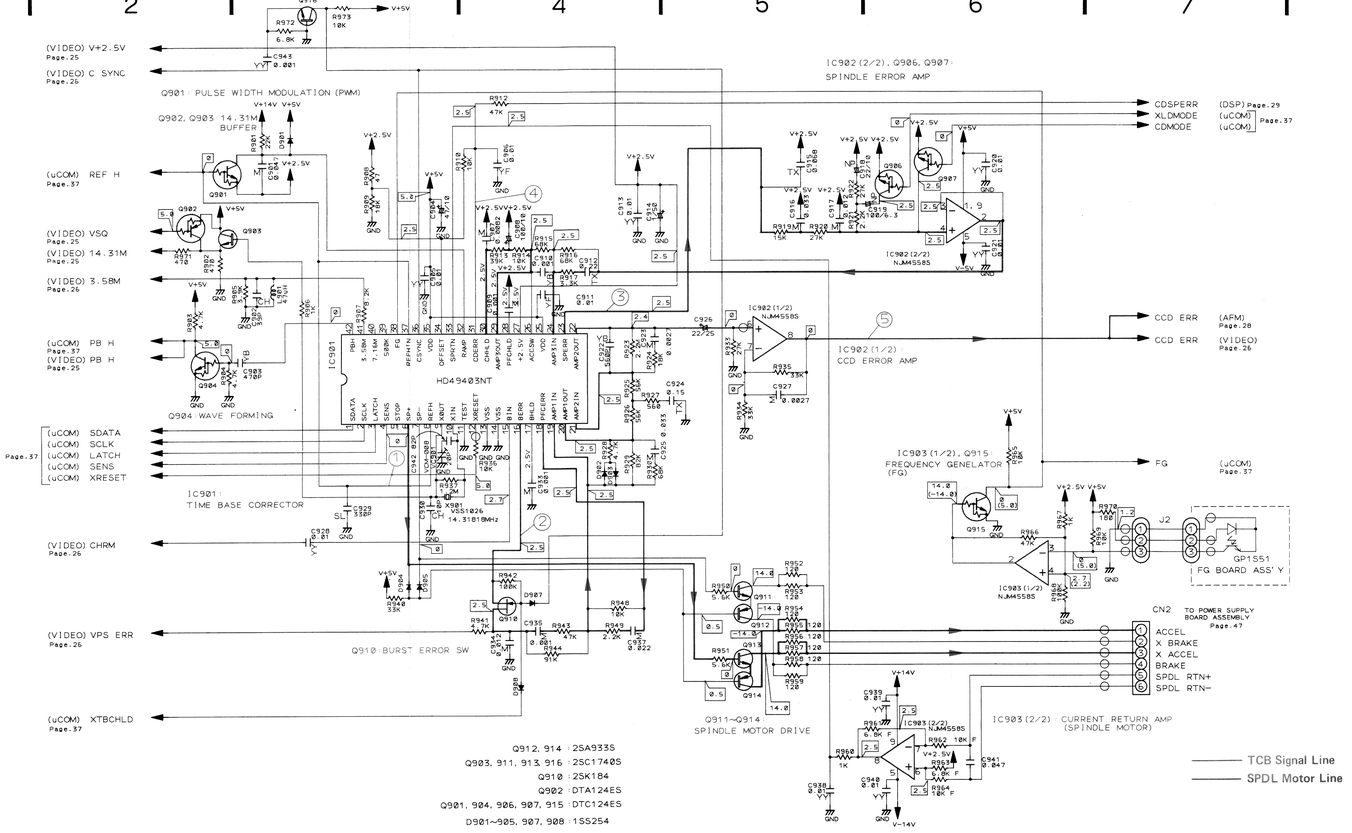
⑨ Audio out-Rch : Digital 1KHz OdB
V : 2V/div, H : 0.2mS/div



⑩ Video out : 75Ω Connecting
V : 200mV/div, H : 10μS/div

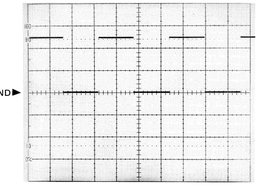


- **TBC Section**

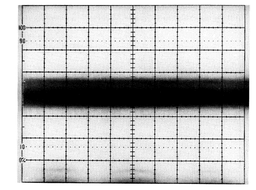


- **Wave Forms**

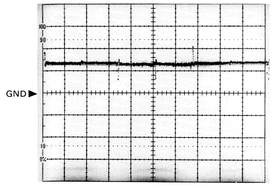
① IC901-Pin8 : REF H
V : 2V/div, H : 20μS/div



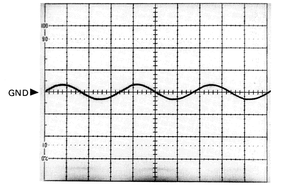
④ IC901-Pin31 : CD ERR
V : 100mV/div, H : 20μS/div



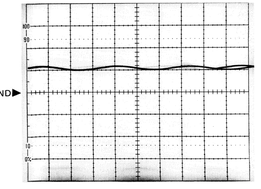
② IC901-Pin16 : BERR
V : 2V/div, H : 10mS/div



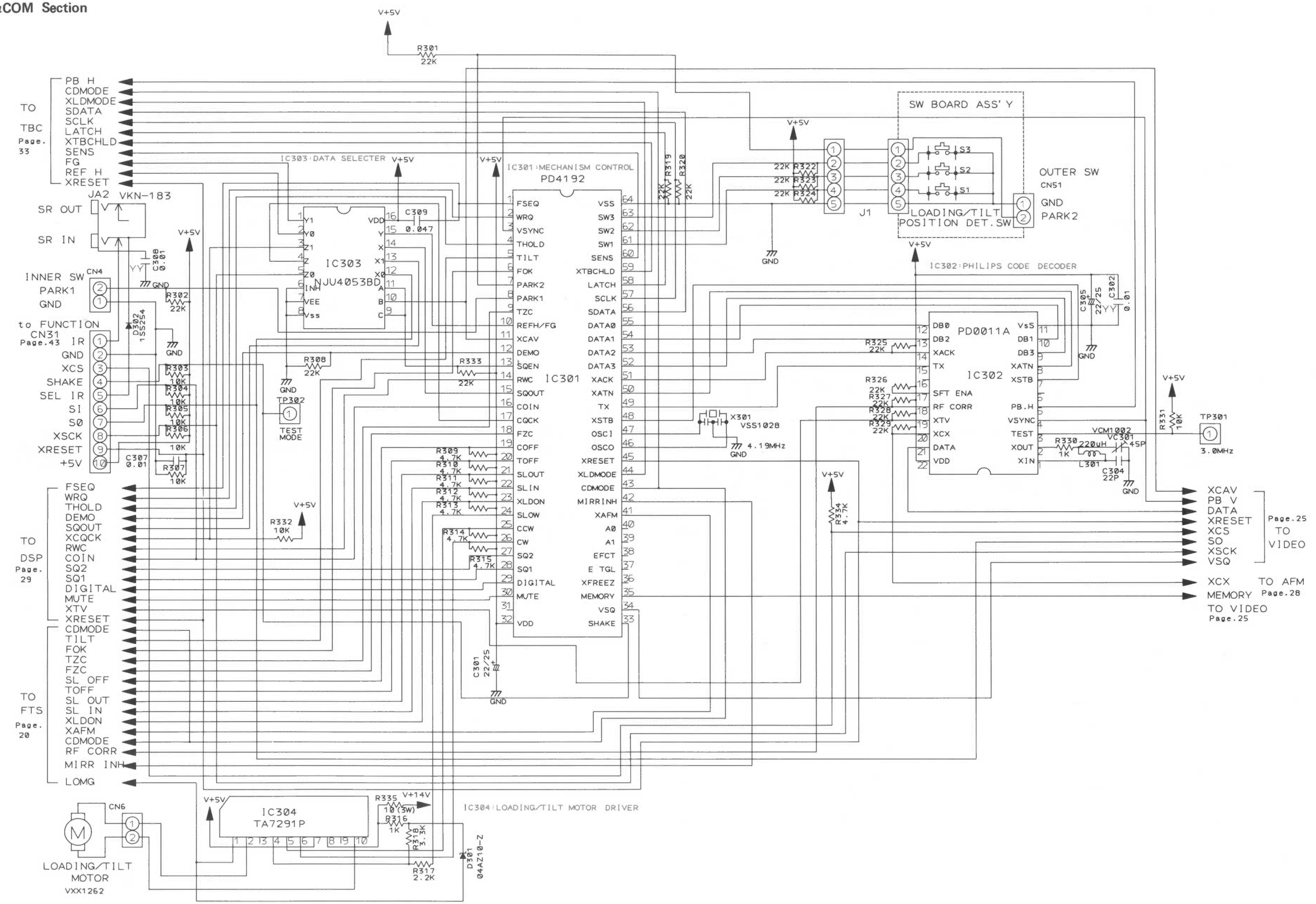
⑤ IC902-Pin8 : CCD ERR
V : 1V/div, H : 100mS/div



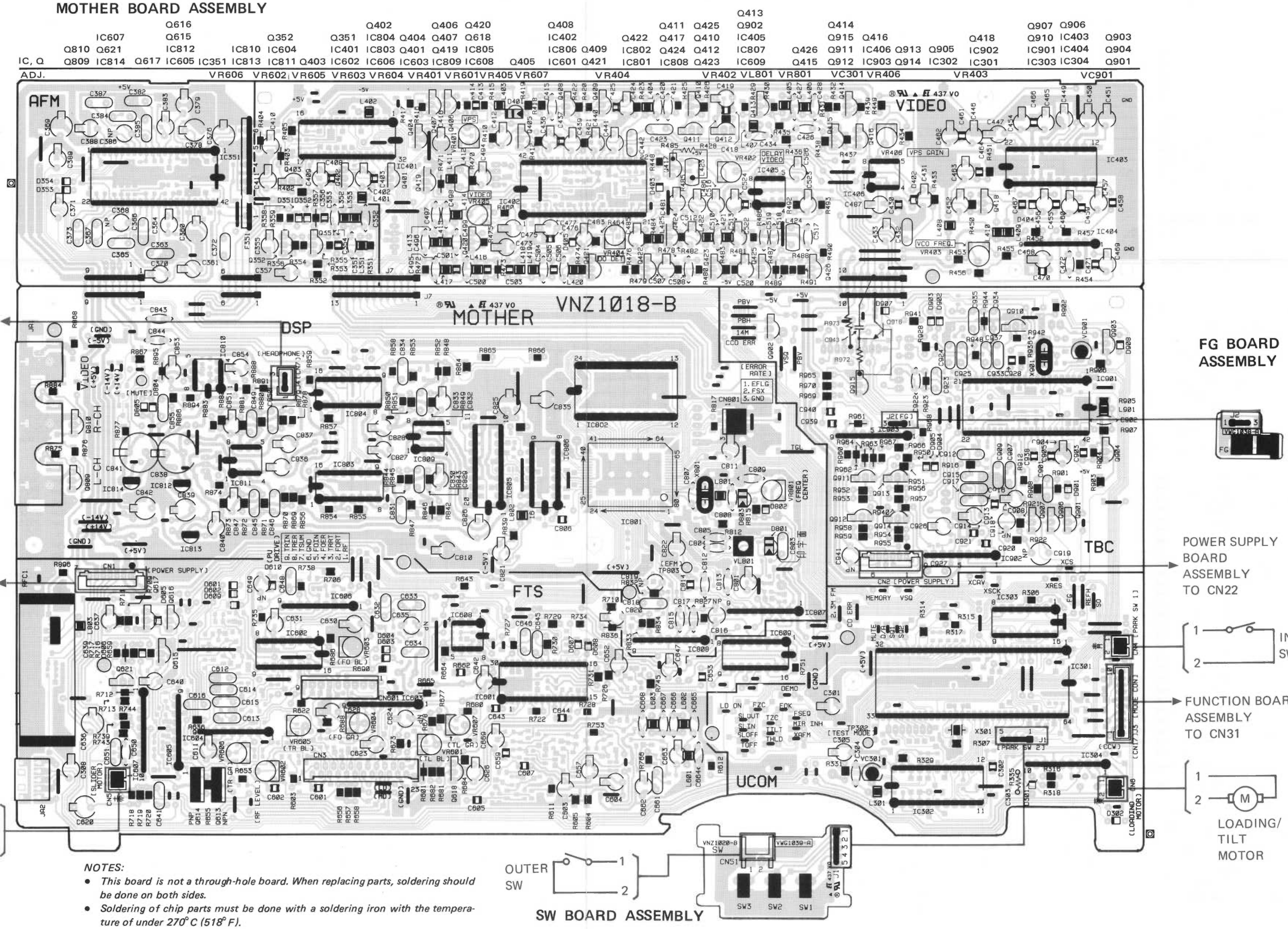
③ IC901-Pin23 : SP ERR
V : 2V/div, H : 10mS/div



- **μCOM Section**



- Top side (when installed into the set)



NOTES:

- *This board is not a through-hole board. When replacing parts, soldering should be done on both sides.*
- *Soldering of chip parts must be done with a soldering iron with the temperature of under 270° C (518° F).*

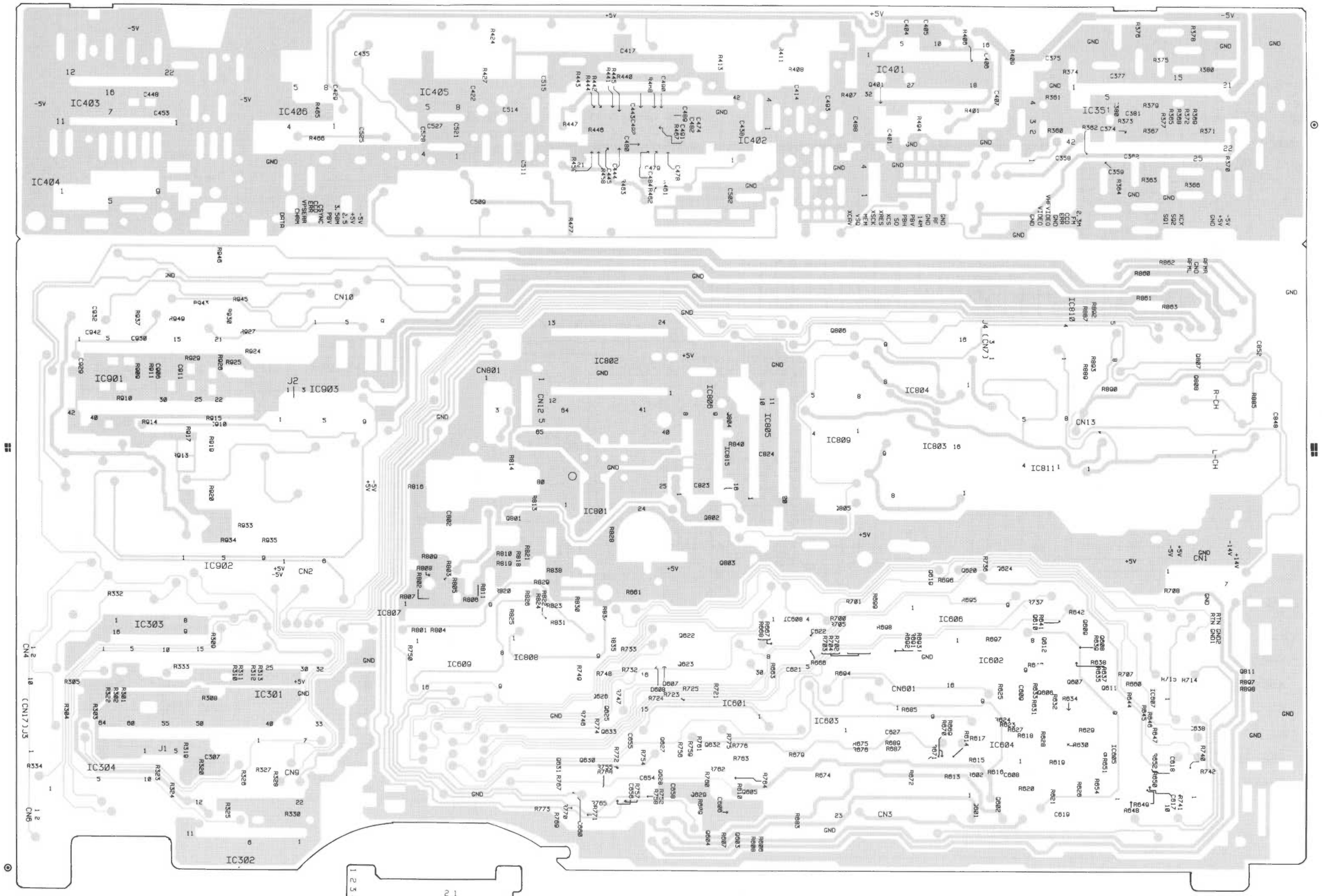
- Inside surface side (when installed into the set)

MOTHER BOARD ASSEMBLY

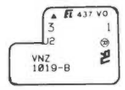
IC, Q

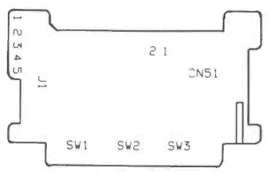
IC815
Q622 Q802 Q804
Q626 Q623 Q632 Q605
Q625 Q627 Q629 Q603
Q801 Q631 Q630 Q633 Q628 Q604 Q803

Q610 Q609
Q620 Q624 Q612 Q608 Q807
Q805 Q401 Q619 Q601 Q602 Q606 Q607 Q611 Q808 Q811



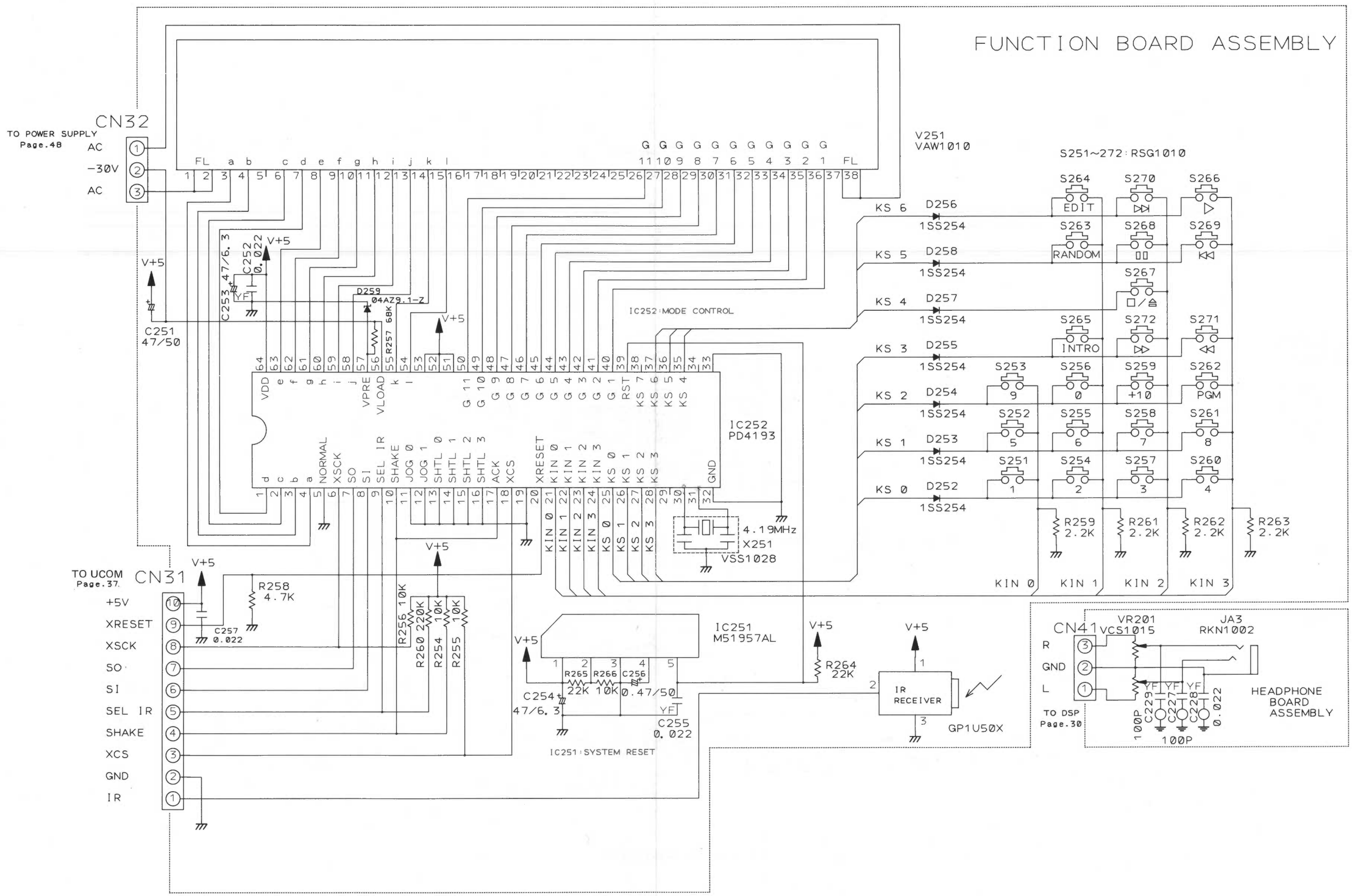
FG BOARD ASSEMBLY



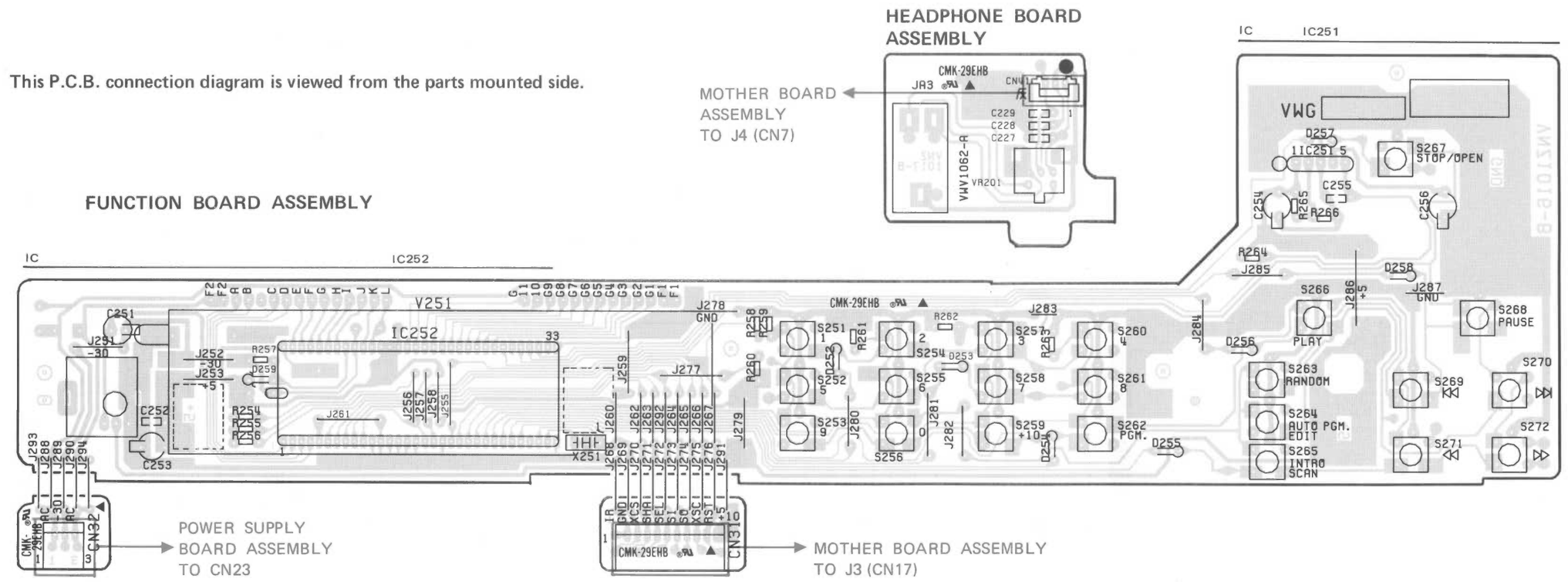


SW BOARD ASSEMBLY

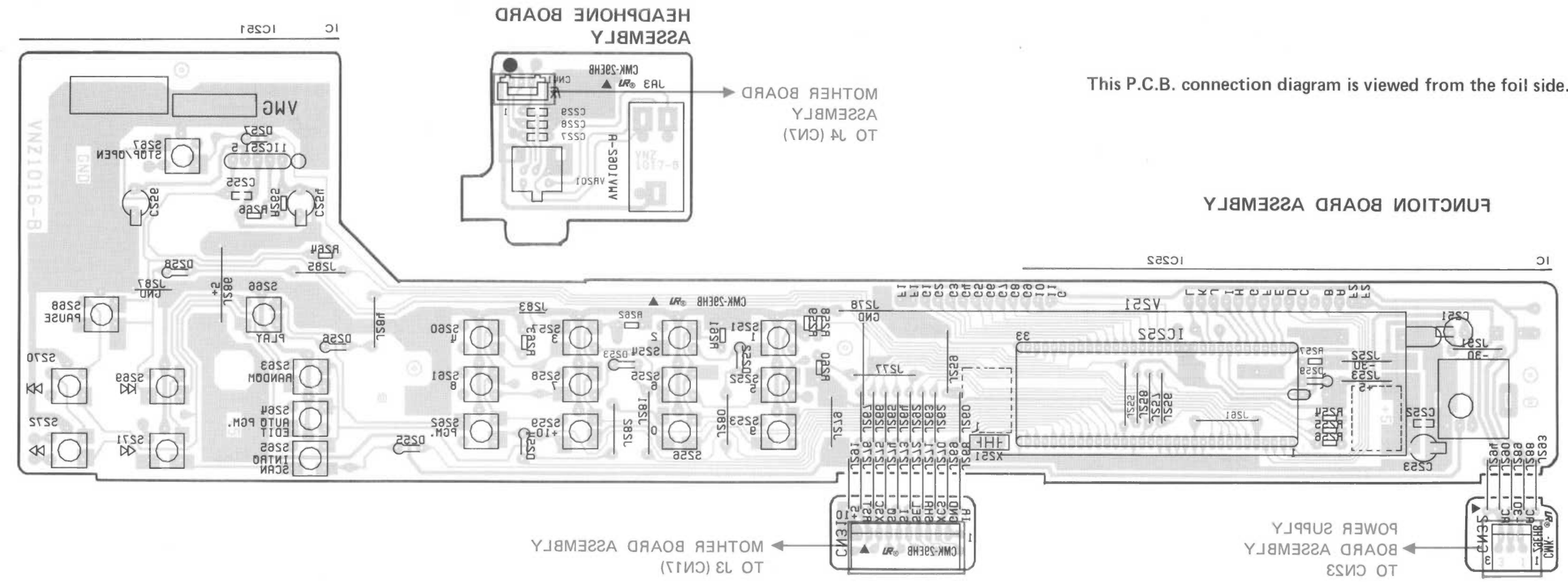
5.2 FUNCTION AND HEADPHONE BOARD ASSEMBLY



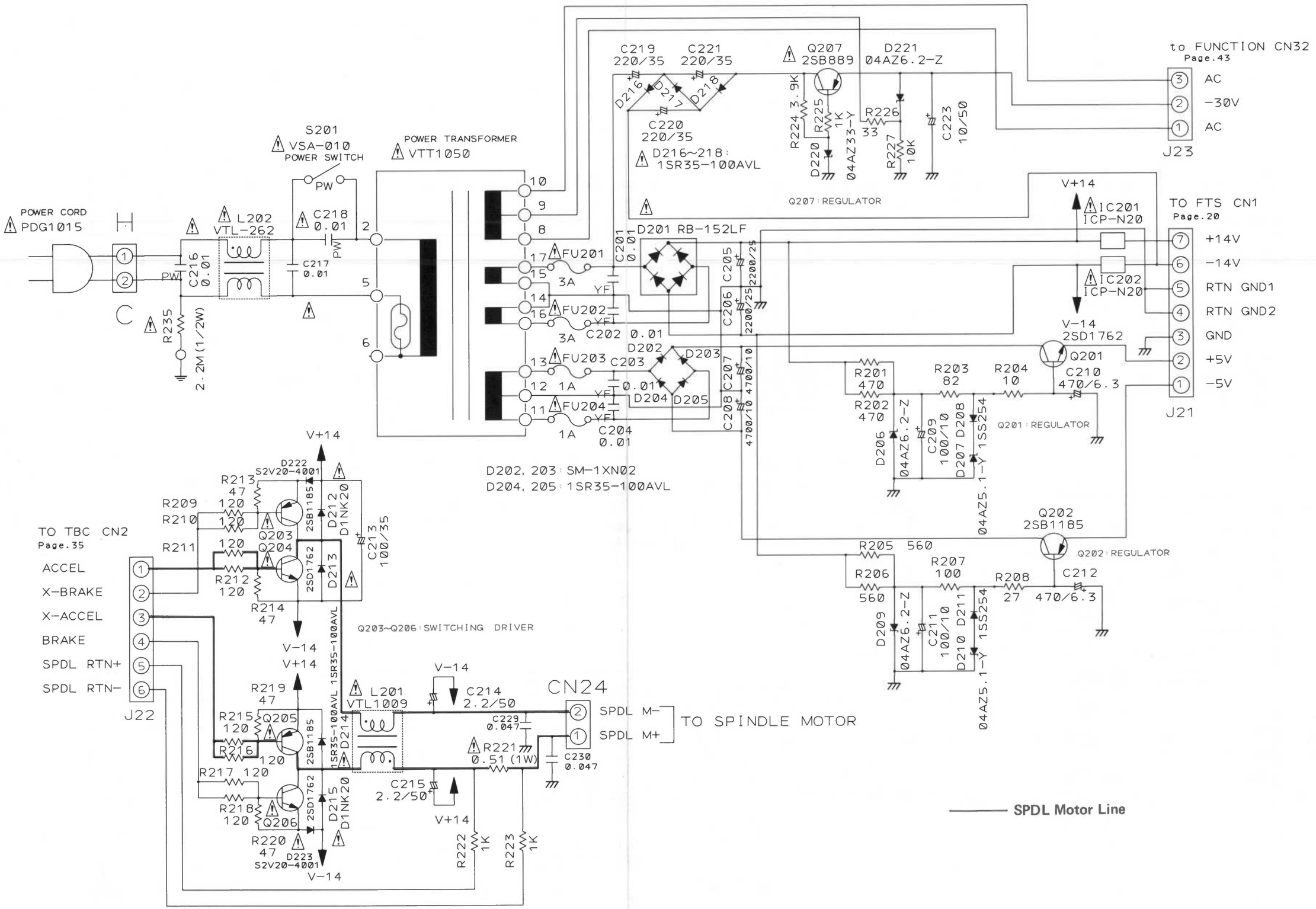
This P.C.B. connection diagram is viewed from the parts mounted side.



This P.C.B. connection diagram is viewed from the foil side.

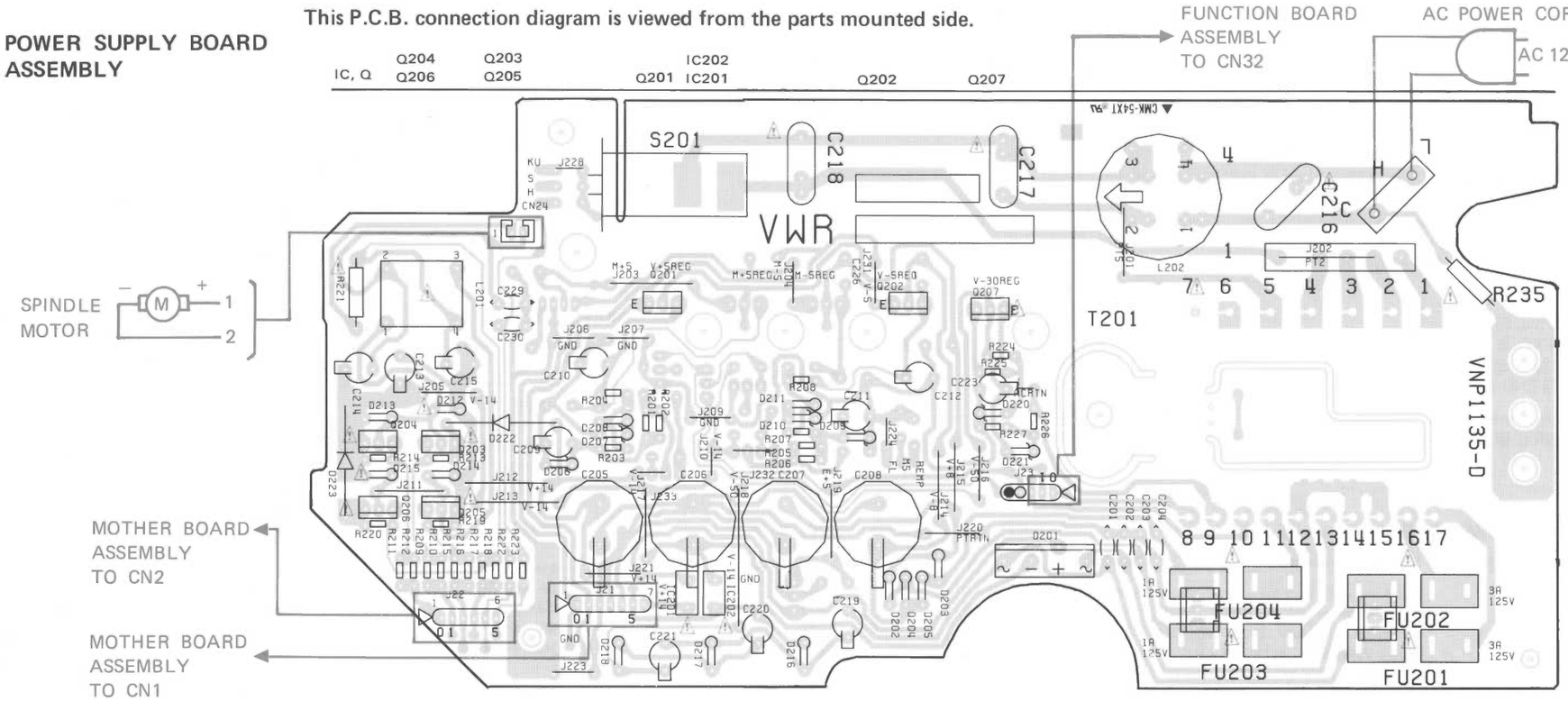


5.3 POWER SUPPLY BOARD ASSEMBLY (VWR1007)

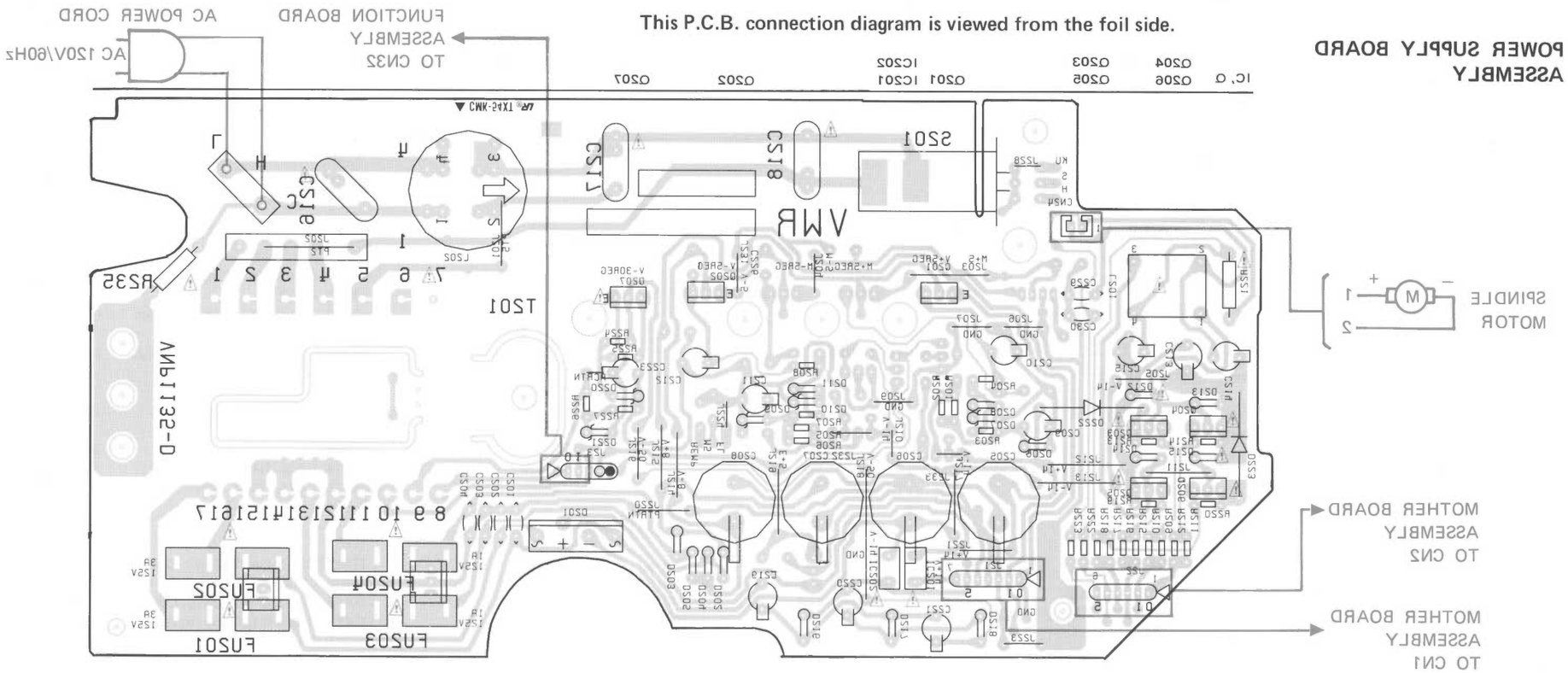


POWER SUPPLY BOARD ASSEMBLY

This P.C.B. connection diagram is viewed from the parts mounted side.



This P.C.B. connection diagram is viewed from the foil side.



P.C.B. pattern diagram indication	Corresponding part symbol	Part name
		Transistor
		FET
		Diode
		Zenner diode
		LED
		Ceramic capacitor
		Mylar capacitor
		Styrol capacitor
		Electrolytic capacitor (Non polarized)
		Electrolytic capacitor (Noiseless)
		Electrolytic capacitor (Polarized)
		Electrolytic capacitor (Polarized)
		Power capacitor
		Varactor
		Tact switch
		Inductor
		Coil
		Transformer
		Filter
		Semi-fixed resistor
		Resistor array
		Resistor
		Resonator
		Thermistor

1. This P.C.B. connection diagram is viewed from the parts mounted side.
2. The parts which have been mounted on the board can be replaced with those shown with the corresponding wiring symbols listed in the above Table.
3. The capacitor terminal marked with ▭ shows negative terminal.
4. The diode marked with ○ shows cathode side.
5. The transistor terminal marked with ▭ shows emitter.

6. ELECTRICAL PARTS LIST

NOTES:

- *Parts without part number cannot be supplied.*
- *Parts marked by "◉" are not always kept in stock. Their delivery time may be longer than usual or they may be unavailable.*
- *The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.*
- *When ordering resistors, first convert resistance values into code form as shown in the following examples.*

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

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

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

5.62kΩ	*562 × 10¹*	*5621*	*RN1/4SR 5 6 2 1 F*

Miscellaneous Parts

P.C. BOARD ASSEMBLIES

Mark	Symbol & Description	Part No.
	Operation board assembly	
	Headphone board assembly	
◉	Power supply board assembly	VWR1007
◉	Mother board assembly	VWX1002
	FG board assembly	
	SW board assembly	
	HEAD assembly	

OTHERS

Mark	Symbol & Description	Part No.
⚠	Strain relief	CM-22C
⚠	AC power cord	PDG1002
⚠	FU203, FU204 Fuse (1A)	REK-080
⚠	FU201, FU202 Fuse (3A)	VEK-018
⚠	Power transformer	VTT1050
	S4, S5 Slide switch (CD/CDV, LD/CD)	PSH1003
	Spindle assembly	VXX1260
	Carriage motor assembly	VXX1261
	Loading motor assembly	VXX1262
	Slider assembly	VWT1048

Operation Board Assembly

SEMICONDUCTORS

Mark	Symbol & Description	Part No.
	IC251	M51957AL
	IC252	PD4193
	D252 – D258	1SS254
	D259	04AZ9.1-Z

SWITCHES

Mark	Symbol & Description	Part No.
	S251 – S272 Tact switch (STOP/OPEN, PLAY, PAUSE, RANDOM, SKIP REV, SKIP FWD, AUTO PGM. EDIT, INTRO SCAN, REV SCAN, FWD SCAN, 0 – 10, +10, PGM.)	RSG1010

CAPACITORS

Mark	Symbol & Description	Part No.
	C251	CEAS470M50
	C256	CEJAR47M50
	C253, C254	CEJA470M6R3
	C252, C255, C257	CKPUYF223Z25

RESISOTRS

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

OTHERS

Mark	Symbol & Description	Part No.
	V251 Fluorescent tube	VAW1010
	IR sensor unit	GP1U50X
	FL spacer	VEB1080
	X251 Ceramic resonator	VSS1028

Headphone Board Assembly

CAPACITORS

Mark	Symbol & Description	Part No.
	C227, C229	CKPUYB101K50
	C228	CKPUYF223Z25

RESISTORS

Mark	Symbol & Description	Part No.
	VR201 Variable resistor	VCS1015

OTHERS

Mark	Symbol & Description	Part No.
	JA3 Headphone jack	RKN1002

◉ Power Supply Board Assembly (VWR1007)

SEMICONDUCTORS

Mark	Symbol & Description	Part No.
⚠	IC201, IC202	ICP-N20
	Q202	2SB1185
⚠	Q203, Q205	2SB1185
⚠	Q207	2SB889
	Q201	2SD1762
⚠	Q204, Q206	2SD1762
⚠	D212, D215	D1NK20
⚠	D201	RB-152LF-F
	D202, D203	SM-1XN02
	D220	04AZ33-Y
	D207, D210	04AZ5.1-Y
	D206, D209, D221	04AZ6.2-Z
	D204, D205	1SR35-100AVL
⚠	D213, D214, D216 – D218	1SR35-100AVL
	D208, D211	1SS254
	D222, D223	S2V20-4001

SWITCH

Mark	Symbol & Description	Part No.
⚠	S201 Power switch	VSA-010

COILS

Mark	Symbol & Description	Part No.
⚠	L202 Line filter	VTL-262
⚠	L201 Coil (6mH)	VTL1009

CAPACITORS

Mark	Symbol & Description	Part No.
	C209, C211	CEAS101M10
	C213, C223	CEAS101M35
	C214, C215	CEAS2R2M50
	C219 – C221	CEAS221M35
	C205, C206	CEAS332M16
	C210, C212	CEAS471M6R3
	C207, C208	CEAS472M10
	C201 – C204	CKCYF103Z50
⚠	C216 – C218 (0.01μF/120V)	RCG-009
	C229, C230	CGCYX473M25

RESISTORS

Mark	Symbol & Description	Part No.
⚠	R221	RS1PMFR51J
⚠	R235	RD1/2PM225J
	Other resistors	RD1/6PM□□□J

◉ Mother Board Assembly (VWX1002)

SEMICONDUCTORS

Mark	Symbol & Description	Part No.
	IC601	CXA1081S
	IC402	HA11528NT
	IC901	HD49403NT
	IC608	IR9393
	IC607	LA6510
	IC802	LC3517BL-15
	IC801	LC7863A
	IC805	LC7881-C
	IC401	**M50552-132SP**
	IC809 – IC811	M5218P
	IC813	M5278L05
	IC406	NJM4558D
	IC603 – IC606, IC807, IC808, IC902, IC903	NJM4558S
	IC812	NJM78L08A
	IC814	NJM79L08A
	IC803, IC804	NJU4051BD
	IC303, IC602, IC609	NJU4053BD
	IC404	PA0017
	IC351	PA0034A
	IC302	PD0011A
	IC301	PD4192
	IC405	PM0001
	IC806	SM5807EP
	IC304	TA7291P
	IC815	TC4SU69F
	IC403	TL8707P
	Q608, Q610, Q620, Q802, Q807	DTA124EK
	Q617, Q902	DTA124ES
	Q606, Q611, Q612, Q624, Q633, Q803, Q808	DTC124EK
	Q402, Q419, Q616, Q901, Q904, Q906, Q907, Q915	DTC124ES
	Q619, Q626, Q628, Q630, Q811, Q602	2SA1037K
	Q618	2SA1399
	Q404, Q409, Q412, Q414, Q417, Q422, Q424, Q912, Q914	2SA933S
	Q614	2SB1185
	Q407	2SC1674
	Q351, Q352, Q401, Q403, Q405, Q406, Q408, Q410, Q411, Q413, Q415, Q416, Q418, Q420, Q421, Q423, Q425, Q426, Q615, Q903, Q911, Q913, Q916	2SC1740S
	Q601, Q603 – Q605, Q607, Q609, Q622, Q623, Q625, Q627, Q629, Q631, Q632, Q801, Q804 – Q806	2SC2412K

Mark	Symbol & Description	Part No.
	Q613	2SD1762
	Q809, Q810	2SD2144S
	Q621, Q910	2SK184
	D803	FC54M
	D801	KV1225YBR
	D401	SVC321SP
	D301	04AZ10-Y
	D402, D405	04AZ3.6-X
	D302, D351 – D354, D403, D404, D601 – D610, D802, D804 – D806, D901 – D905, D907, D908	1SS254

COILS AND FILTER

Mark	Symbol & Description	Part No.
	L401, L408 – L410, L422, L802 – L804 Axial inductor	LAU100J
	L351, L425, L426 Axial inductor	LAU101J
	L402, L414 – L417 Axial inductor	LAU120J
	L601, L603 Axial inductor	LAU151K
	L602 Axial inductor	LAU181J
	L404, L406, L411, L420 Axial inductor	LAU220J
	L301 Axial inductor	LAU221J
	L403 Axial inductor	LAU3R3J
	L413 Axial inductor	LAU330J
	L421 Axial inductor	LAU4R7K
	L353, L419, L901 Axial inductor	LAU470J
	L352, L418 Axial inductor	LAU560J
	L405 Axial inductor	LAU680J
	L801 Axial inductor	LAU6R8K
	L407 Axial inductor	LAU820J
	L423 Radial inductor	LRA271K
	L424 Radial inductor	LRA391K
	L412 Radial inductor (680μH)	VTL1015
	F351 B.P.F. (2.30, 2.81MHz)	RTF1084
	VL801 Variable coil	VTL1005

CAPACITORS

Mark	Symbol & Description	Part No.
	C517, C665, C667	CCCCH101J50
	C426, C404, C492	CCCCH120J50
	C352	CCCCH131J50
	C421, C434, C495, C519	CCCCH220J50
	C472, C490, C666	CCCCH270J50
	C351, C428, C902	CCCCH390J50
	C420, C427, C664, C668, C807	CCSQCH680J50
	C304	CCCCH220J50
	C857, C930	CCSQCH100D50
	C496, C497, C608, C942	CCSQCH820J50
	C353	CCCCH910J50
	C510	CCCSL181J50
	C499	CCSQSL391J50
	C805	CCCUJ221J50
	C804	CCCUJ330J50
	C501	CCPUCH100J50
	C503, C505	CCPUCH2R7K50
	C857, C930	CCSQCH100D50
	C482, C658	CCSQCH121J50
	C417, C489	CCSQCH151J50
	C414, C518	CCSQCH180J50
	C511	CCSQCH221J50
	C405, C491, C500, C502, C506, C650	CCSQCH330J50
	C504, C508, C509, C606, C619	CCSQCH470J50
	C374, C381, C479, C480, C655	CCSQCH560J50
	C380, C498, C514, C515	CCSQSL271J50
	C362	CCSQSL301J50
	C627, C638, C802, C848, C852, C929	CCSQSL331J50
	C656	CCSQSL561J50
	C635	CEANPR47M50
	C624, C641, C669	CEANP010M50
	C649, C919	CEANP101M6R3
	C819	CEANP2R2M50
	C368, C386, C918, C526	CEANP220M10
	C816	CEANP470M10
	C388, C439, C452, C457	CEASR47M50
	C447, C449, C494, C520, C640, C801, C914	CEAS010M50
	C355, C357, C370, C431, C433, C440, C441, C475, C483, C821	CEAS100M50
	C361, C379, C409 – C412, C416, C487, C507, C516, C626, C908	CEAS101M10
	C820	CEAS2R2M50
	C301, C305, C364 C371, C383, C389, C402, C456, C460, C462, C463, C465, C473, C526, C603, C604, C611, C623, C628, C630, C631, C637, C642, C647, C810, C811, C822, C827 – C829, C832, C835 – C837, C847, C851, C926	CEAS220M25
	C620, C636	CEAS101M25
	C360, C369, C376, C378, C826, C840, C825	CEAS221M6R3
	C446, C450, C451, C481, C485, C486, C652, C657, C662, C663, C839, C842	CEAS4R7M50

Mark	Symbol & Description	Part No.
	C853, C854	CEAS221M16
	C419, C424, C436, C454, C468, C469, C477, C512, C513, C523, C524, C904	CEAS470M10
	C838 C841	CENA471M10
	C372, C373, C616, C648, C651	CFTXA104J50
	C924	CFTXA154J50
	C442, C912	CFTXA224J50
	C614	CFTXA334J50
	C846, C850	CFTXA471J50
	C365, C366, C384, C385, C645, C831, C834	CFTXA472J50
	C613, C615, C634, C830, C833	CFTXA683J50
	C845, C849	CFTXA821J50
	C843, C844	CKCYB472K50
	C922	CKCYB561K50
	C809, C812, C813, C815, C817	CKCYF223Z50
	C903	CKPUYB471K50
	C644	CKPUYB681K50
	C943	CKPUYB102K50
	C639, C806	CKPUYX122M16
	C302, C308, C354, C356, C403, C408, C413, C418, C425, C430, C437, C455, C458, C459, C461, C464, C466, C467, C470, C471, C476, C522, C601, C602, C605, C607, C643, C653, C659, C814, C905, C913, C920, C921, C928, C938 – C940	CKPUYY103N16
	C415, C443, C445, C609, C808, C910	CKSQYB102K50
	C617, C618 C660	CKSQYB332K50
	C654	CKSQYB392K50
	C444, C621	CKSQYB682K50
	C307, C358, C359, C375, C377, C401, C406, C407, C429, C435, C438, C448, C453, C474, C478, C484, C488, C493, C521, C525, C527, C528, C824, C906, C911	CKSQYF103Z50
	C622	CKSQYB821K50
	C309, C422, C823, C856	CKSQYF473Z50
	C909, C933, C935	CQMA102J50
	C917, C934	CQMA123J50
	C432	CQMA222J50
	C423, C803, C937	CQMA223J50
	C923, C927	CQMA272J50
	C633, C646, C916, C925	CQMA333J50
	C367, C387, C855	CQMA393J50
	C612, C632, C901, C941	CQMA473J50
	C363, C382, C661	CQMA682J50
	C818, C907	CQMA822J50
	C943	CQMA104J50
VC901	Ceramic trimmer (20pF)	VCM-008
VC301	Ceramic trimmer (45pF)	VCM1002

RESISTORS

Mark	Symbol & Description		Part No.
	VR402	Semi-fixed (1kΩ)	VRTB6VS102
	VR403, VR801	Semi-fixed (10kΩ)	VRTB6VS103
	VR406	Semi-fixed (100kΩ)	VRTB6VS104
	VR607	Semi-fixed (15kΩ)	VRTB6VS153
	VR602	Semi-fixed (2.2kΩ)	VRTB6VS222
	VR603	Semi-fixed (22kΩ)	VRTB6VS223
	VR401	Semi-fixed (470Ω)	VRTB6VS471
	VR404, VR604 – VR606	Semi-fixed (4.7kΩ)	VRTB6VS472
	VR405, VR601	Semi-fixed (47kΩ)	VRTB6VS473
	R335		RSM3FB100JU
	R961 – R964		RN1/6PQ□□□□F
		Chip resistors	RS1/10S□□□J
		Other resistors	RD1/6PM□□□J

OTHERS

Mark	Symbol & Description		Part No.
	CN3	Top connector (23pin)	VKN1073
		3P pin jack	VKB1011
	JA2	2P mini pin jack	VKN-183
	X801	Crystal resonator	VSS1025
	X901	Crystal resonator	VSS1026
	X301	Ceramic resonator	VSS1028
		RFMD	VWL1014

FG Board Assembly

OTHER

Mark	Symbol & Description	Part No.
	Photo inter ruptor	GP1S51

SW Board Assembly

SWITCHES

Mark	Symbol & Description	Part No.
	S1 – S3 Push switch (LOADING/TILT SW)	PSH1008

HEAD Assembly

CAPACITORS

Mark	Symbol & Description	Part No.
	C1	CKSQYF473Z50
	C5	CKSYF105Z16

RESISTOR

Mark	Symbol & Description		Part No.
	VR1	Semi-fixed (3.3kΩ)	PCP1006

7. DISASSEMBLY

7.1 REMOVING THE BONNET AND FRONT PANEL (Fig. 7-1, 2)

① Remove six screws Ⓐ to remove the bonnet.
② To remove the front panel assembly, unscrew three screws Ⓑ and lift the catches as shown in the figure and lower the front panel toward the front.
③ To remove the power knob, insert the flat-blade screwdriver into the slit on the side of the chassis as shown in Fig. 7-2, and push the protrusion of the knob. You can now remove the power knob easily.
(Check that the power switch is in the OFF position before removal.)

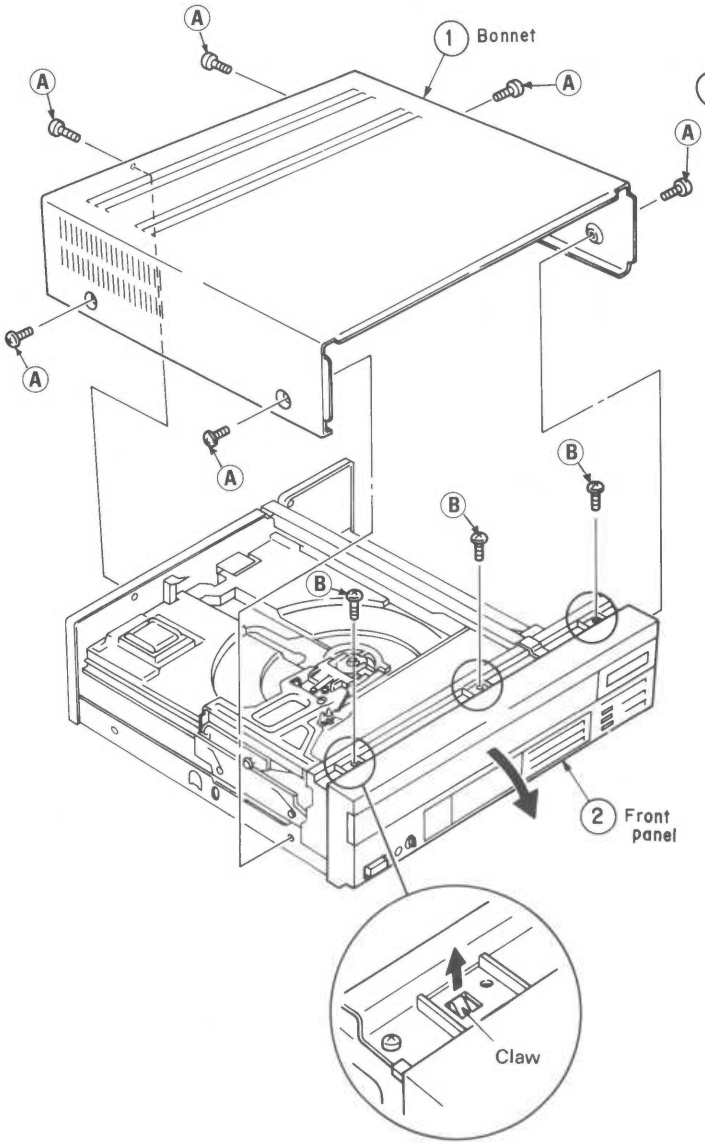


Fig. 7-1

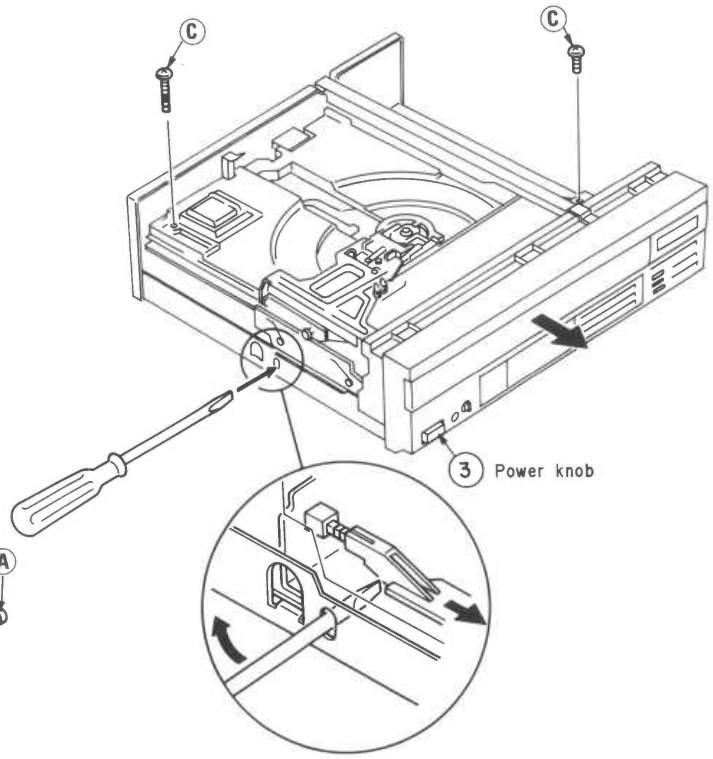


Fig. 7-2

7.2 REMOVING THE TRAY (Fig. 7-2, 3)

① Remove two stopper screws Ⓒ shown in Fig. 7-2. When the power can be turned ON, press the OPEN button then pull the tray out from the player.
② When the power cannot be turned ON, remove the front panel (Fig. 7-1), and turn the gear pulley shown in Fig. 7-3 counterclockwise, and the tray will slide out toward the front.

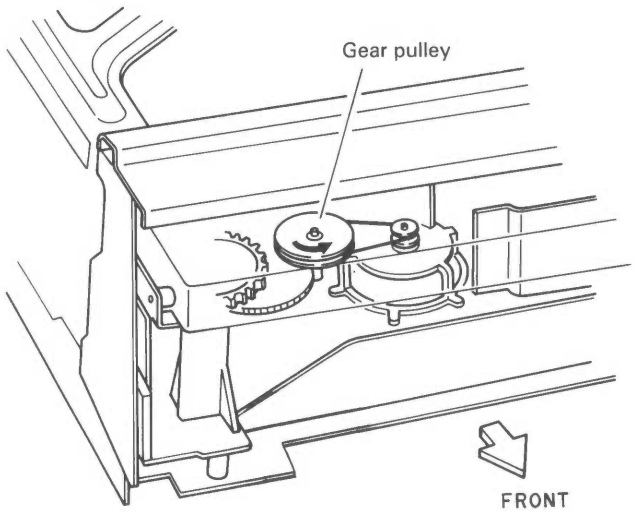


Fig. 7-3

7.3 REMOVING THE MOTHER BOARD ASSEMBLY (Fig. 7-4)

After removing the main binders, remove by the following procedure:

① Remove two screws Ⓐ to remove the center angle.
② Remove four screws Ⓑ holding the mother board assembly, and remove two screws Ⓒ on the sides of the rear panel with their nuts and washers.
③ The clamper can be removed by sliding the clamper holder in the direction of the arrow.
④ Pull the mother board assembly in the direction of the arrow.
⑤ While sliding the mother board assembly to the right, lift it upward, in the direction of the arrow.

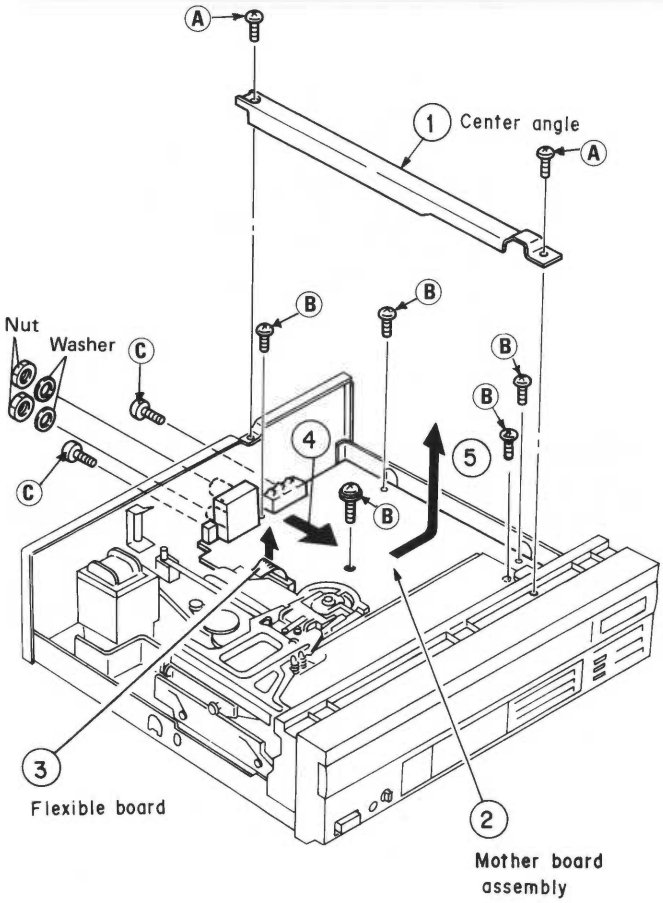


Fig. 7-4

7.4 REMOVING THE CLAMPER ARMS (B) AND (A) (Fig. 7-5)

Set the player with the tray moved up.

① Remove two clamper springs and raise clamper arm (B).
② clamper arm (B) can be removed by pulling it in the direction of the arrow.
③ Remove the screw Ⓐ with a spring holding clamper arm (A) assembly.
④ Remove clamper arm (A) assembly by pulling it in the direction of the arrow.

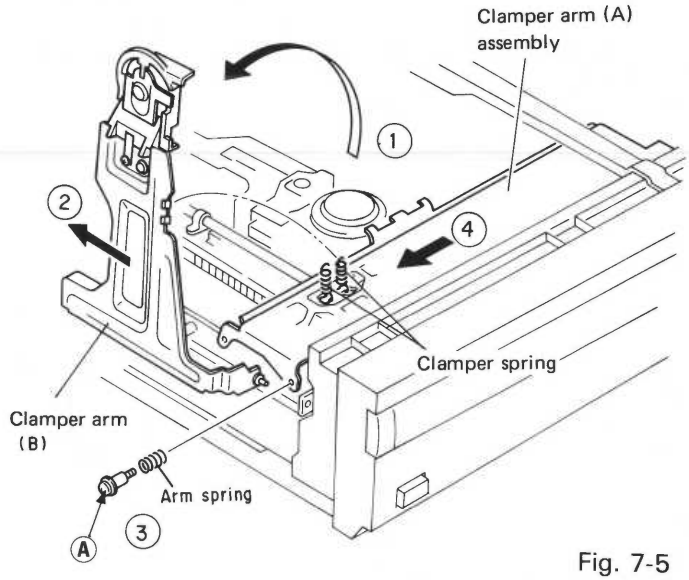


Fig. 7-5

7.5 REMOVING THE CLAMPER (Fig. 7-6)

① Remove the plate spring by unscrewing screw A.
② Remove the parallel link by sliding it in the direction of the arrow. (Be careful not to damage the claw located on one side of the link.)
③ The clamper can be removed by sliding the clamper holder in the direcction of the arrow.

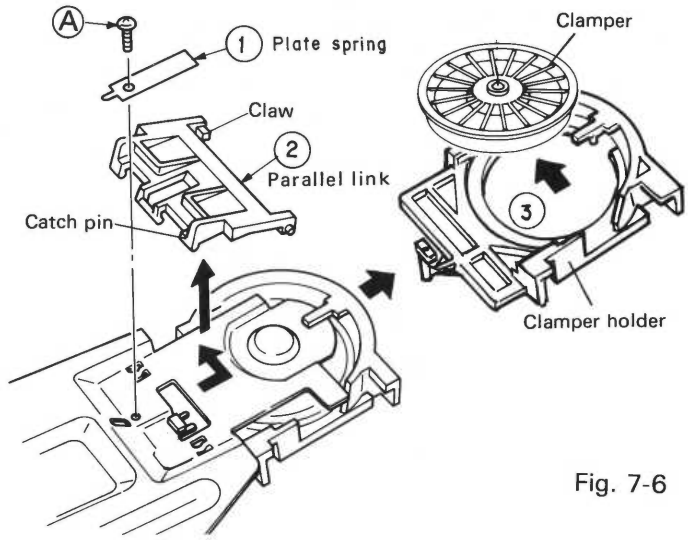


Fig. 7-6

7.6 REMOVING THE PICK-UP ASSEMBLY (Fig. 7-7)

① Remove the flexible board from the connector and also remove the flexible board installed at section ⓐ.
② Remove the screw Ⓐ holding the carriage shaft.
③ Raise the shaft in the direction of the arrow to remove the rack assembly.
④ Remove the hexagonal screw Ⓑ and lift up the pick-up assembly alightly and turn the pick-up assembly in the direction of arrow ⑤.
⑥ Remove two screws Ⓒ on the back of the pick-up assembly.

Note: Make sure that rack assembly is not close to the turntable when it is removed.

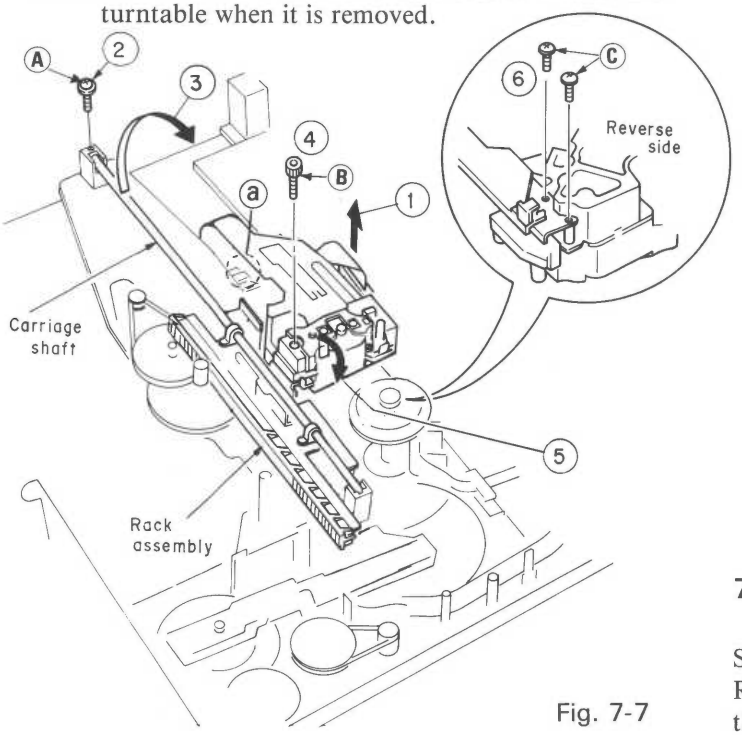


Fig. 7-7

7.7 REMOVING THE TILT SENSOR (Fig. 7-8)

Remove the connector of the flexible board (arrow Ⓐ) and release the catches to remove the tilt sensor board (arrow Ⓑ).

① Remove the connector (arrow Q) of the flexible board and claw (arrow Ⓑ) to remove the tilt sensor boards.

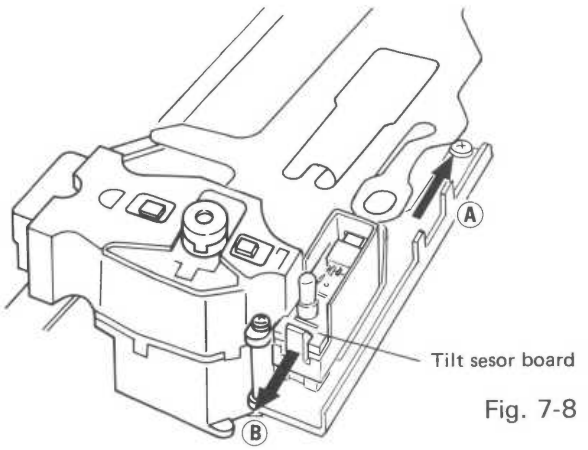


Fig. 7-8

7.8 REMOVING THE MECHANISM SECTION (Fig. 7-9)

Remove six screws Ⓐ, and the entire mechanism section can be removed.

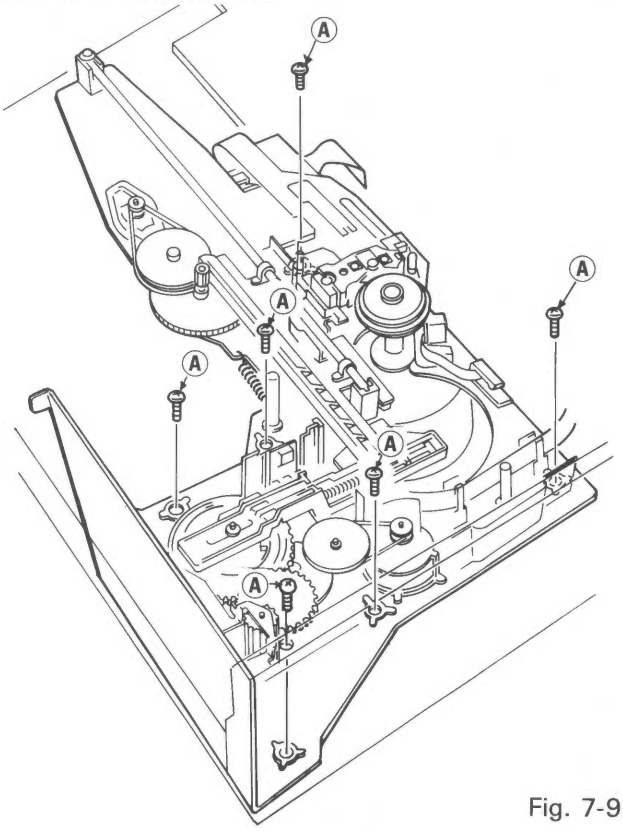


Fig. 7-9

7.9 REMOVING THE SLIDE CAM AND ROLLER PLATE ASSEMBLY (Fig. 7-10)

Set the player with the tray down.
Remove three screws Ⓐ and slide the slide cam toward the rear to remove it.
Remove clamper arms (B) and (A) (see page 56) after removing slide cam to remove the roller board assembly.

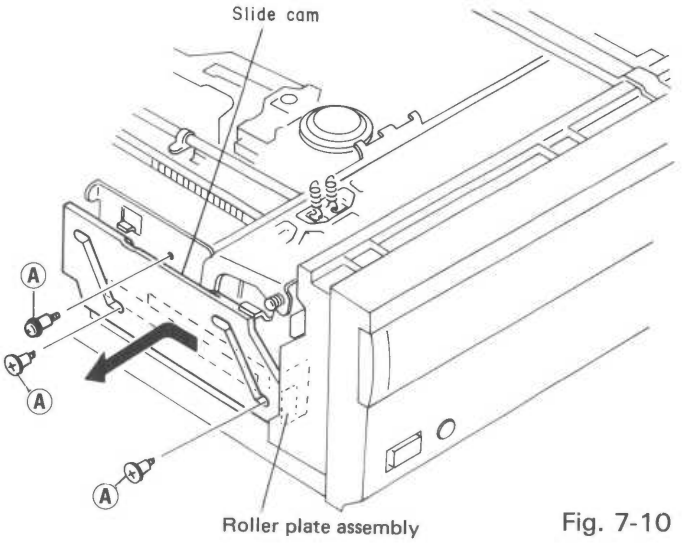


Fig. 7-10

7.10 ASSEMBLING THE MECHANISM SECTION

1. POSITONING THE GEARS

(Since the cam gears are used for the detection of all operation modes in this unit, the cam gears and the tray should be positioned correctly. Reassemble in the following procedure.)

① Position three switch levers so that they are nearly parallel (approx. 2mm), as shown in Fig. 7-10.

② Insert the cam gear so that the end of the spiral groove on the upper surface of the cam gear comes to the position nearest to the shaft located at the front, as shown in Fig. 7-11.
(In this case, the cam gear should be set in the position where the angle between the center line of the cam gear and the pin on the cam gear is 45°, by visual checking.)

③ Mount the Spring slanting cam by raising the rack assembly in the direction of the arrow so that the tilt slide section comes under the rack assembly. Then, mount the cam spring. (Fig. 7-12)

④ Insert the follow gear so that the "L"-shaped section of the follow gear comes to the end of the cam gear, as shown in Fig. 7-12.

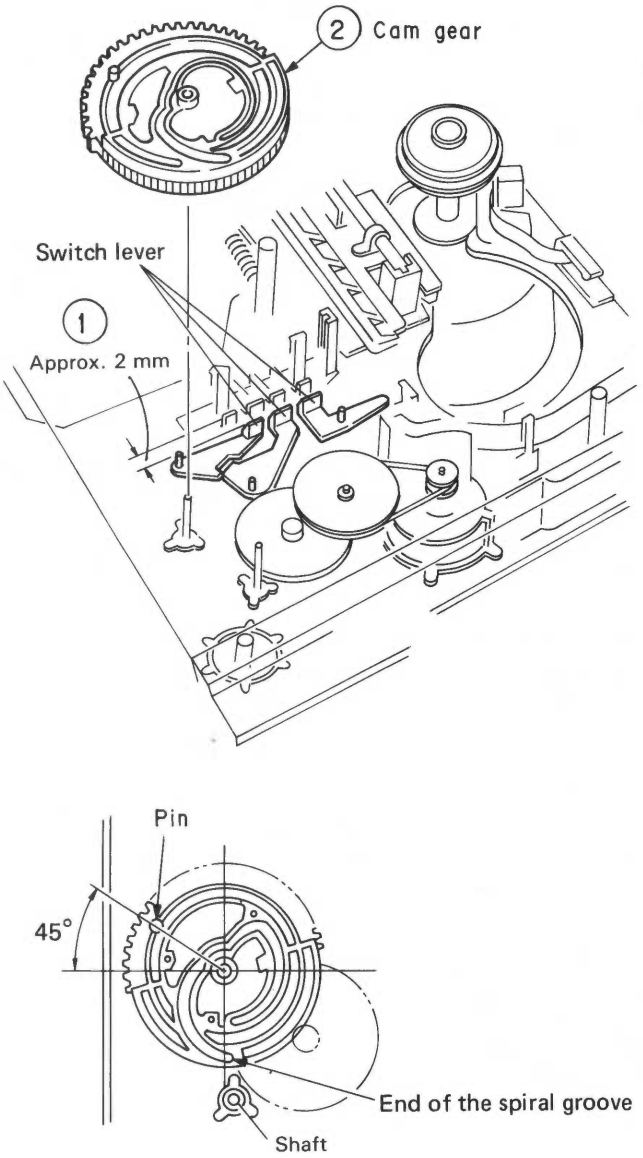


Fig. 7-11

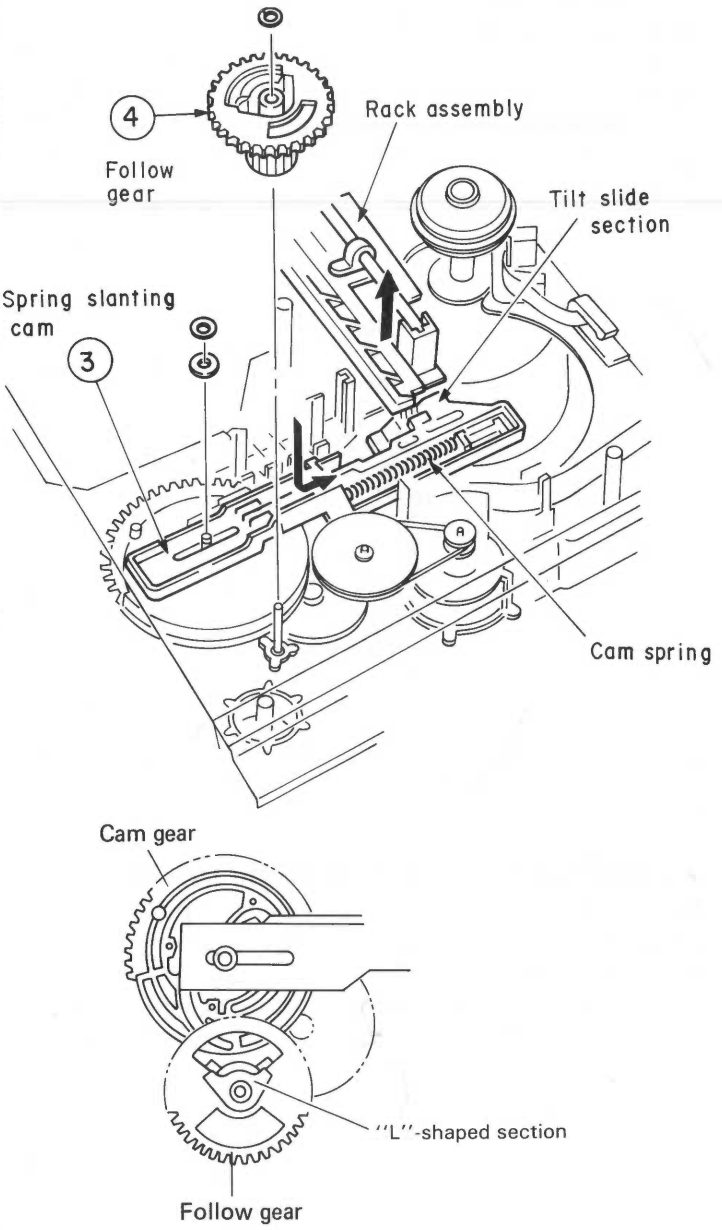


Fig. 7-12

⑤ Mount the roller plate assembly in the position where the tooth with the triangle mark of the follow gear is engaged with the dip of the gear with the short rib on the roller plate gear, as shown in Fig. 7-13.

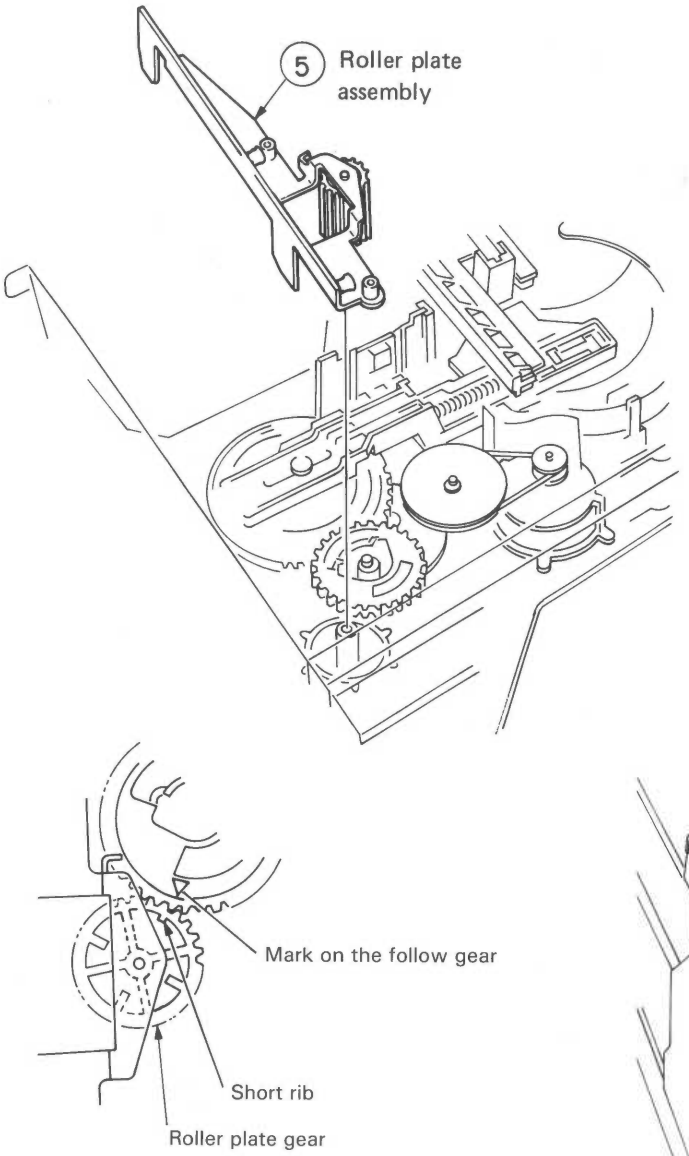


Fig. 7-13

2. POSITIONING THE TRAY (Fig. 7-14)

① Set the player with the tray open.

② Set the roller plate gear so that the roller plate line intersects with the mid-point of missing tooth of the roller plate gear.
(At this time, adjust the position by the method shown in Fig. 7-3, or turn the power ON and use the SKIP (I◄◄, ►►I) buttons in the test mode.)
Or you can turn it in the direction of OUT till it stops as shown in the fig.

③ Insert the tray.
At this time, the tray can be inserted only when the first missing tooth of the tray gear is engaged with the missing tooth section of the roller plate gear, as shown in the figure.

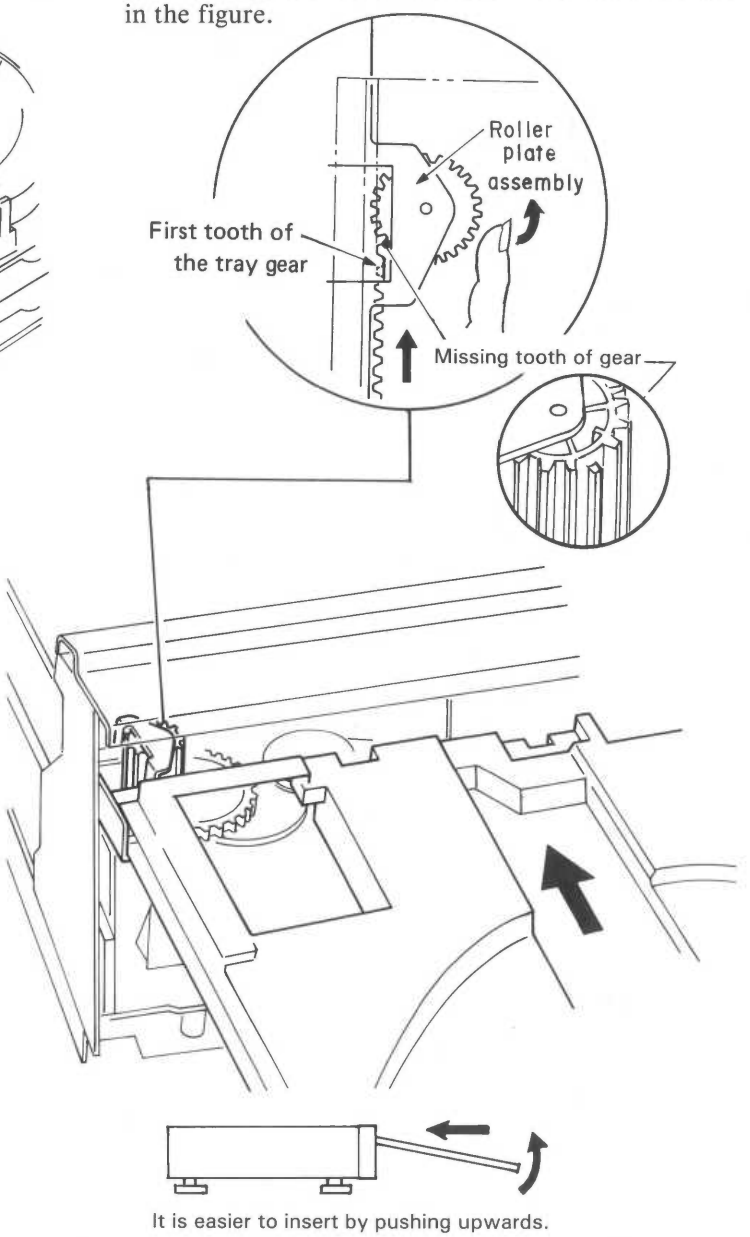


Fig. 7-14

3. ASSEMBLING THE SERVO MECHANISM BASE ASSEMBLY

When assembling the servo mechanism base assembly, pay special attention to the following points:

- After inserting the shaft in the position shown in Fig. 7-14 of mechanism chassis assembly, mount the servo mechanism base assembly in the direction of the arrow so that the tilt shaft does not come over the shaft holder as shown in Fig. 7-15.
- The thrust spring should not come over the shaft holder.
- Check that the end of the plate spring is inserted under the base.

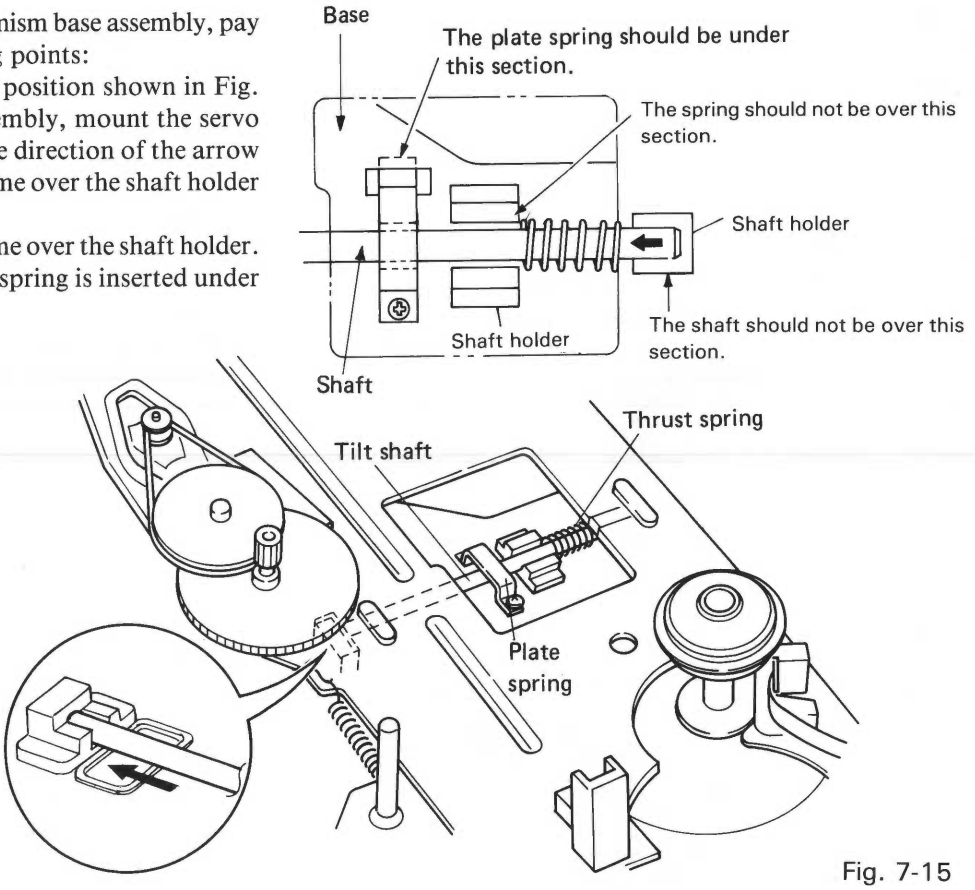


Fig. 7-15

4. FLEXIBLE STYLING OF THE PICK-UP (Fig. 7-16)

① Bend the flexible board of the pick-up assembly by about 45° at the ▲ mark.
② Inset the flexible board into the connector.
③ Set the flexible board under the protruding section.
④ Twist the flexible board by a half turn.
⑤ Insert the triangular section.
⑥ Further insert the flexible board under the protruding section.

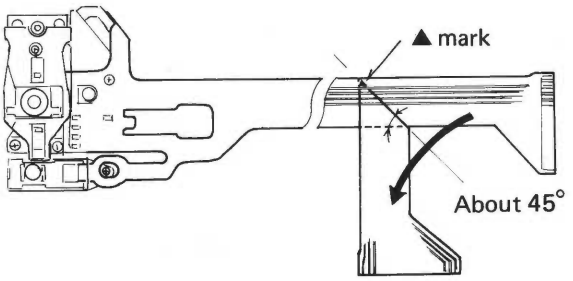


Fig. 7-16(1)

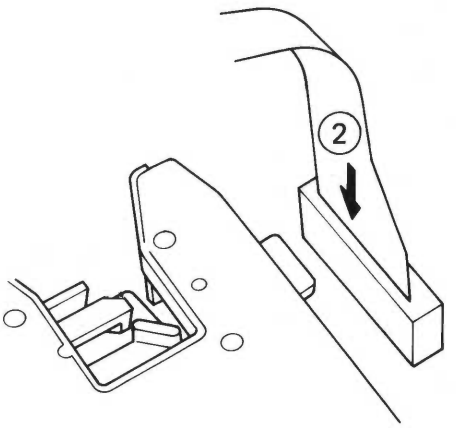


Fig. 7-16(2)

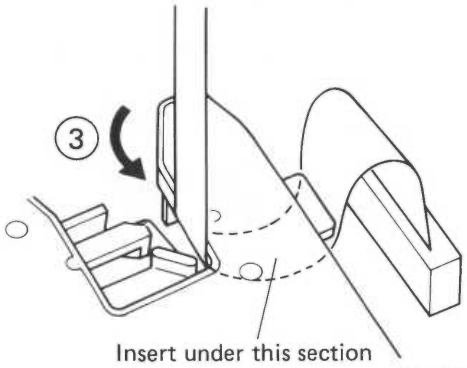


Fig. 7-16(3)

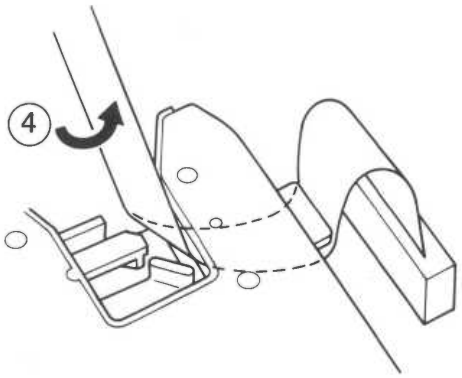


Fig. 7-16(4)

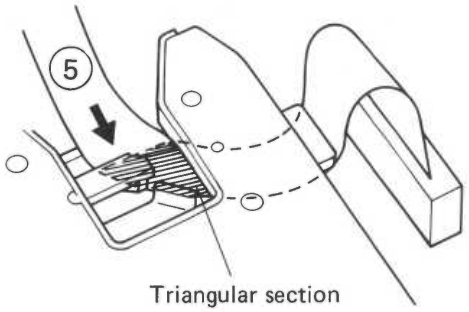


Fig. 7-16(5)

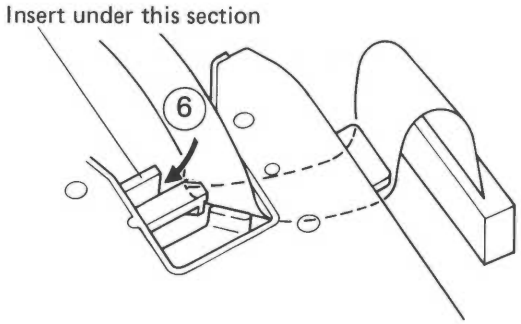


Fig. 7-16(6)

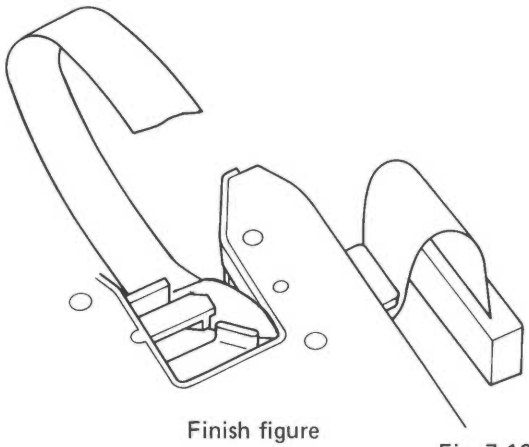


Fig. 7-16(7)

8. TEST MODE

• How to enter the test mode

1. Remove the bonnet and tray (refer to "7. DISASSEMBLY").
2. Using an alligator clip, etc., short-circuit TP302 and GND on the Mother Board assembly (refer to Fig. 8-1).

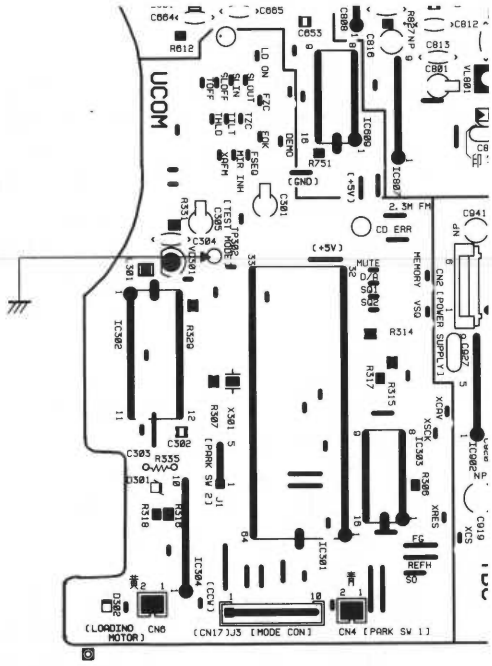


Fig. 8-1

3. Set the POWER switch to ON.
   - When the test mode is initiated, all segments of the FL display light until a key is operated (refer to Fig. 8-2).

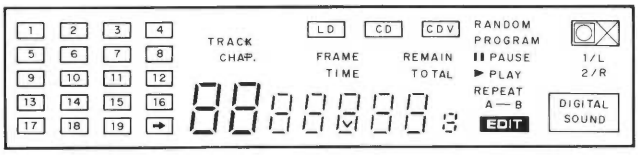


Fig. 8-2

   - In the test mode, the TV screen shows the test mode information against a blue background (refer to Fig. 8-3). However, during play and search with a LD or CDV (CD with Video), the blue background is replaced by the playback picture and the service mode information (the same information as that shown against the blue background) is shown against the playback picture (refer to Fig. 8-4).

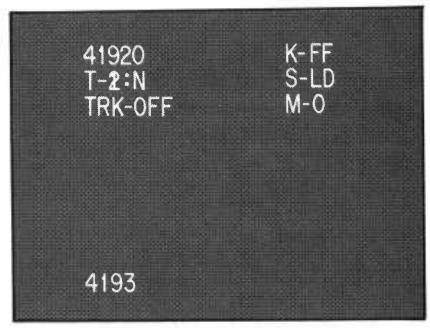


Fig. 8-3 Blue Background Display

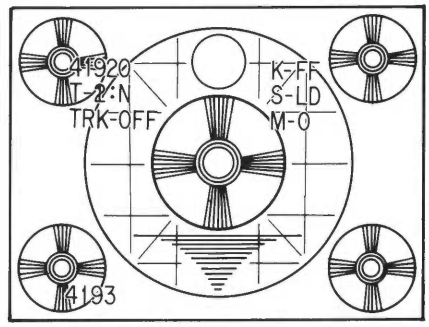


Fig. 8-4 Play Back Display

4. After confirming that the test mode has started, be sure to remove the material used for short-circuiting TP307 and GND of the Mother Board Assembly.

• Test mode functions

The following functions can be controlled in the test mode.

1. Tracking → Open/Close
2. Slider → FWD Scan/REV Scan
3. Tilt → Neutral, servo ON/OFF, tilt +/−
4. Loading → Motor rotation clockwise/counter-clockwise
5. Search → CAV disc frame search
6. TV screen display → ON/OFF

• TV screen display/FL display

The following details are displayed on the TV screen or by FL segments in the test mode.

Test Mode	FL Display	TV Screen Display
Search/frame No.	○	○
Tilt error	○	○
Mechanism loading position	○	○
Mechanism slider position	○	○
Key/remote control signal reception data	—	○
Tilt servo status	—	○
Tracking status	—	○

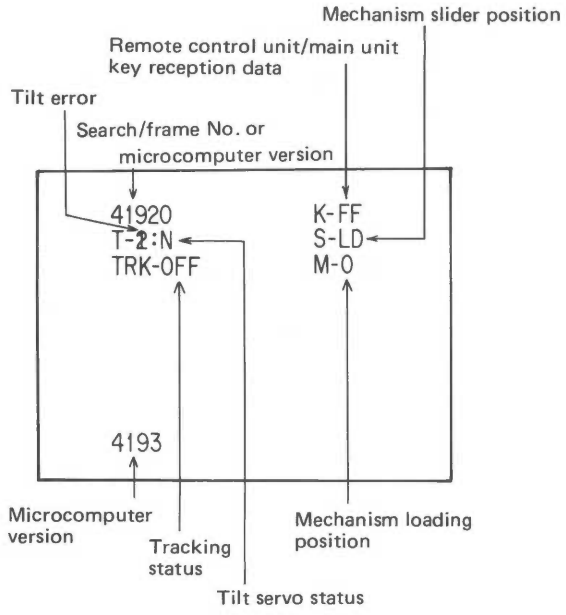


Fig. 8-5 TV Screen display

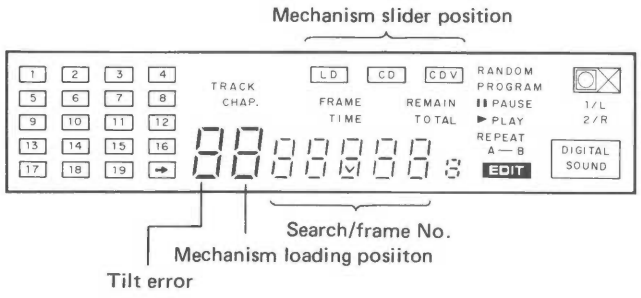
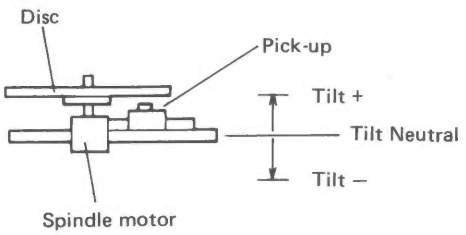


Fig. 8-6 FL display

• Test mode operation methods

1. Open
   — In the stop condition, press the STOP/OPEN (■/▲) key of the main unit.
2. Close
   — In the open condition, press the PLAY (►) key of the main unit.
3. Stop
   — In the play condition, press the STOP/OPEN (■/▲) key of the main unit.
4. Play (Spindle motor startup)
   — In the stop or close condition, press the PLAY (►) key of the main unit.
   - Tracking can be started from the open condition.
   - The tilt is neutral in the initial condition.
   - The type of disc to be played (LD, CD, CDV) is determined by the position of the slider at the time of startup.
5. Tracking Open/Close
   — In the play condition, pressing the PLAY (►) key of the main unit alternates between open and close.
6. Still
   — In the play condition with tracking closed, pressing the PAUSE (II) key of the main unit alternates between play and still.
7. Slider REV Scan
   — Press the REV SCAN (◄◄) key of the main unit.
   Caution: Do not move the slider inside the disc lead-in area while the tracking is open, otherwise the object lens of the pickup may be damaged.
8. Slider FWD Scan
   — Press the FWD SCAN (►►) key of the main unit.
   Caution: Do not move the slider outside the disc lead-out area while the tracking is open, otherwise the object lens of the pickup may be damaged.
9. Tilt Neutral
   — Press the AUTO-PGM EDITING key of the main unit.
10. Tilt servo ON
    — Press the RANDOM PLAY key of the main unit.
11. Tilt – (minus) & servo OFF
    — In a condition other than with the tray open, press the SKIP REV (I◄◄) key of the main unit.

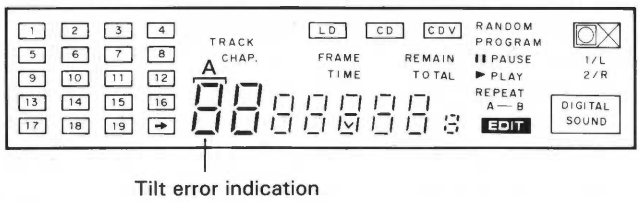


12.Tilt + & servo OFF
— In a condition other than with the tray open, press the SKIP FWD (▶▶|) key of the main unit.
13.Screen display ON/OFF
— Pressing the PGM (program) key of the main unit alternates the screen display between ON and OFF.
14.Search/frame No.
— In the play condition, press the +10 key of the main unit to start search/frame No. entry standby, then enter a search/frame No. with numeric keys 0 to 9 of the main unit, and press the PLAY (▶) key of the main unit.
Note: After the end of search, the unit resumes the previous operation mode.
15.Loading motor rotation (CW)
— With the tray open, press the SKIP REV (|◀◀) key of the main unit.
16.Loading motor rotation (CCW)
— With the tray open, press the SKIP FWD (▶▶|) key of the main unit.

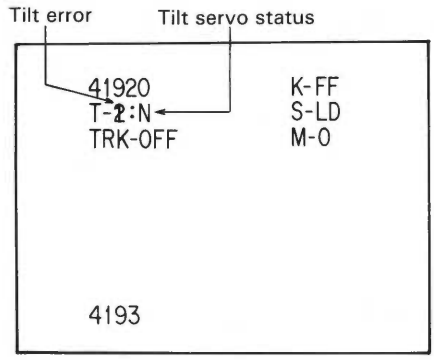
• Description of TV screen display/FL display items

1. Tilt servo status/tilt error

• FL display
The higher digit of the two chapter No. display segments is used. (The servo status is not displayed.)

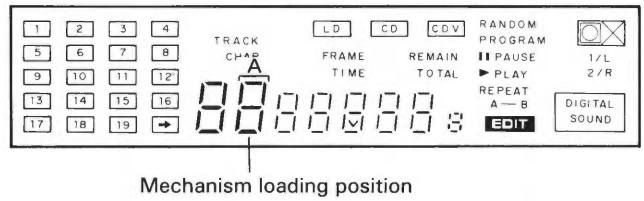


• TV screen display
T - 0 : 000
A B
A: Tilt error indication
"0" to "F". "7" means tilt is neutral.
B: Tilt servo status
N --- Tilt neutral
ON --- Tilt servo ON
OFF --- Tilt servo OFF

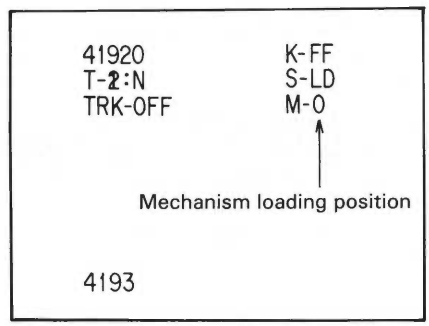


2. Mechanism loading position

• FL display
The lower digit of the two chapter No. display segments is used.



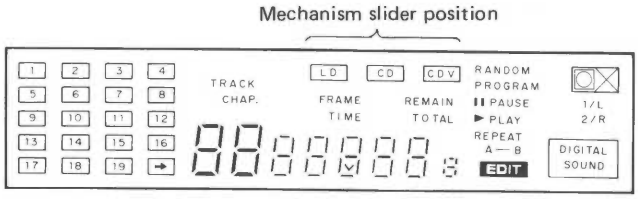
• TV screen display
M - 0
A
A: 0 --- Open
1 --- During loading
2 --- Standby
3 --- During clamping
4 --- Tilt −
5 --- Tilt neutral
6 --- Tilt +
7 --- Tilt limit



3. Mechanism slider position

• FL display

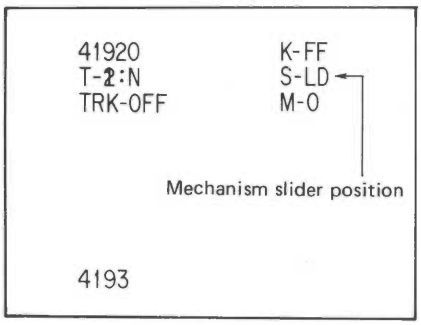
The CD/CDV/LD segment indicators are used. ("IN" is shown in the TV screen display by switching off all of the CD/CDV/LD segments in the FL display.)



• TV screen display

S - 000
A

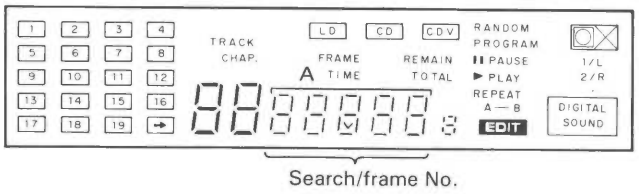
A: IN (OFF) --- TOC area of CD
CD --- Active area of CD
CDV --- Video area of CDV
LD --- Active area of LD



4. Search/frame No.

• FL display

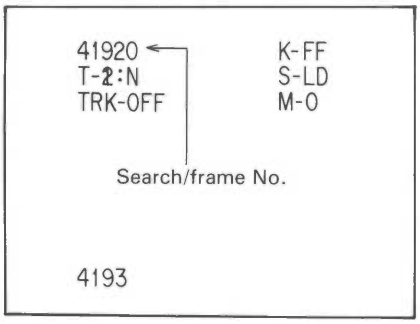
All of the five digits of the frame No. display segments are used. (It will be flashing while search is input.)



• TV screen display

00000
A

A: F0000 --- Lead-in when the top digit is "F"
E0000 --- Lead-out when the top digit is "E"



5. Remote control unit/main unit key reception data

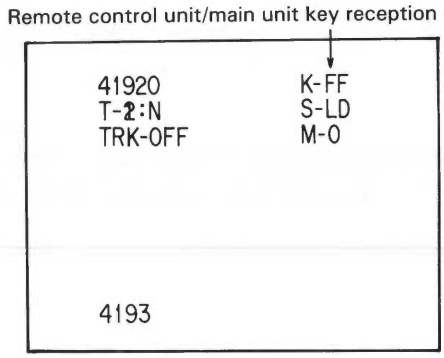
• TV screen display (It is not displayed by FL display)

K-00
A

A	Function	A	Function
00	0	20	CLEAR
01	1	21	SEARCH
02	2	22	CHP/FRM
03	3	23	(CHAPT)
04	4	24	(FRAME)
05	5	25	REPT-A
06	6	26	REPT-B
07	7	27	AUD. MON
08	8	28	(1/L)
09	9	29	(2/R)
0A		2A	(STEREO)
0B		2B	DGT/ANL
0C		2C	CX
0D		2D	TV/LDP
0E		2E	SPEED +
0F		2F	SPEED –
10	+10	30	DISPLAY
11	STOP	31	
12	PLAY	32	
13	PAUSE	33	
14	F-SCAN	34	
15	R-SCAN	35	
16	F-SKIP	36	
17	R-SKIP	37	
18	F-MULTI	38	
19	R-MULTI	39	
1A	F-STEP	3A	
1B	R-STEP	3B	
1C	PROGRAM	3C	
1D	EDIT	3D	
1E	RANDOM	3E	
1F	INTRO	3F	

Notes:

1. *Codes inside ( ) are those which are not generated by normal remote control unit/main unit key operations but are accepted nevertheless.*
2. *The data becomes "FF" when the remote control unit/main unit key data is not present.*

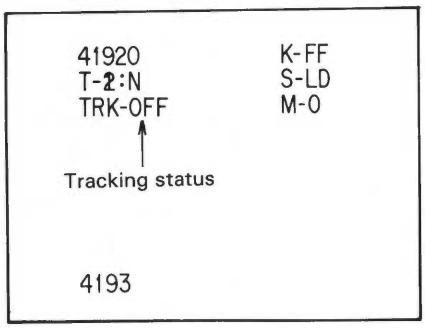


6. Tracking status

- TV screen display (It is not displayed by FL display)

TRK - 000
A

A: ON --- Tracking close
OFF --- Tracking open

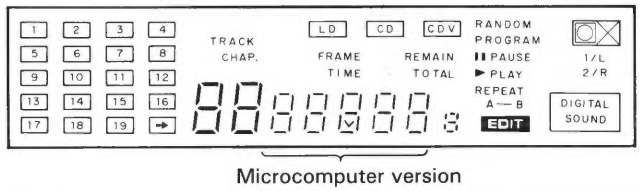


7. Microcomputer version

- FL display

4192 0
A B

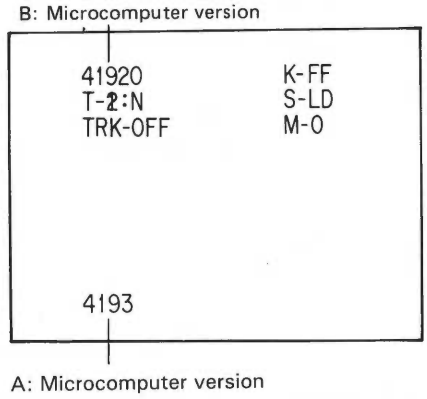
The frame No. display segments of the FL display is used in the stop condition.
A: PD4192 (Mechanism control IC)
B: 0 (Microcomputer version)



- TV screen display

4193
A

A: PD4193 (Mode control IC)
B: PD4192 (Mechanism control IC)



• How to quit the test mode

1. Set the POWER switch to OFF.

9. ADJUSTMENTS

9.1 ADJUSTING JIG AND TOOLS REQUIRED FOR ADJUSTMENT

- Small flat-bladed ⊖ screwdriver (with a shaft of about 7 cm)
- Small Philips ⊕ screwdriver (with a shaft of more than 15 cm)
- Low-pass filter (100 kohms + 1 μF (BP))
- Dual-trace oscilloscope (with delay)
- AF oscillator
- RF oscillator
- Frequency counter
- LD test disc (GGV-1002)
- 8-inch LDD disc (generally available) or CDV disc (generally available)
- Shorting clip
- Digital voltmeter
- TV monitor
- Resistor (100kΩ)
- Resistor (330kΩ)
- Capacitor (0.01μF)

9.2 PREPARATIONS AND PRECAUTIONS FOR ADJUSTMENT

1. Player setting

• How to stand the Mother board assembly

Adjustment should be performed with the bonnet and tray removed and the player set horizontally. (Refer to section 7. Disassembly (Page 55).)

At this time, to check the back of the mother board assembly, remove the mother board assembly (refer to section 7. Disassembly (Page 56).) and stand the mother board assembly as shown in Fig. 9-1. In this case, be careful not to damage the flexible P.C. board. (Fig. 9-2)

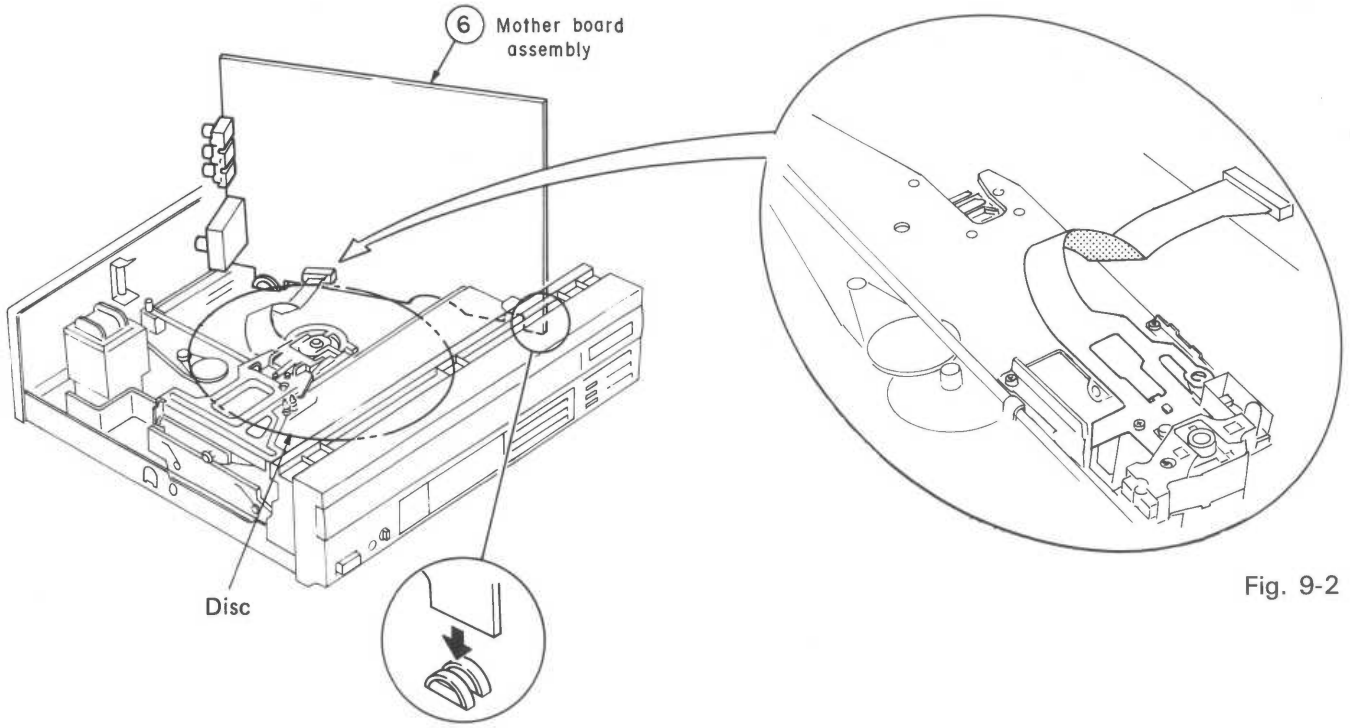


Fig. 9-1

Fig. 9-2

• **How to install the disc**

The disc should be placed from behind on the turntable of spindle motor (check that the disc is accurately set at the center of the turntable at this time), and when PLAY key is pressed, the clamper comes down to clamp the disc before playing starts.

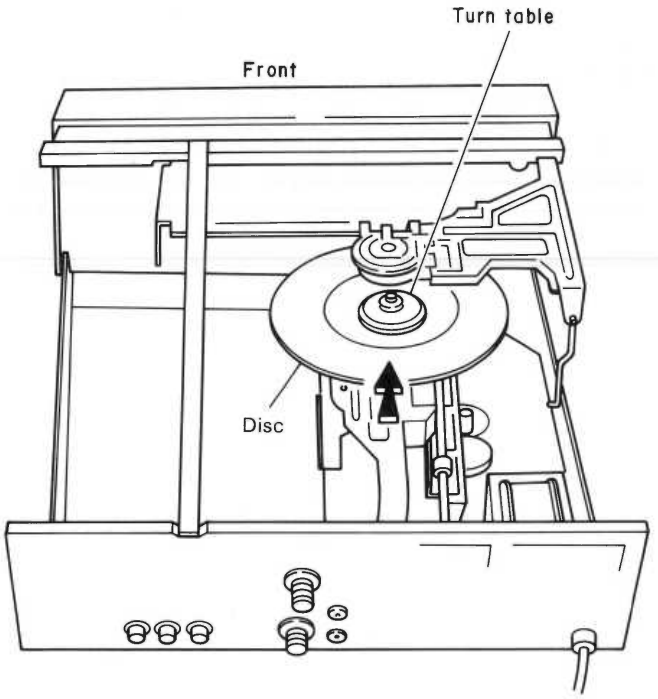


Fig. 9-3

• **How to install the tray**

While the tray is open and POWER OFF, set the teeth without a gear to match the teeth of the tray as shown in Fig. 9-4. Push the tray slightly and make sure that the tray goes into the unit and the power is switched ON. Then press the tray and the tray will be loaded automatically. And install two tray stopper screws.

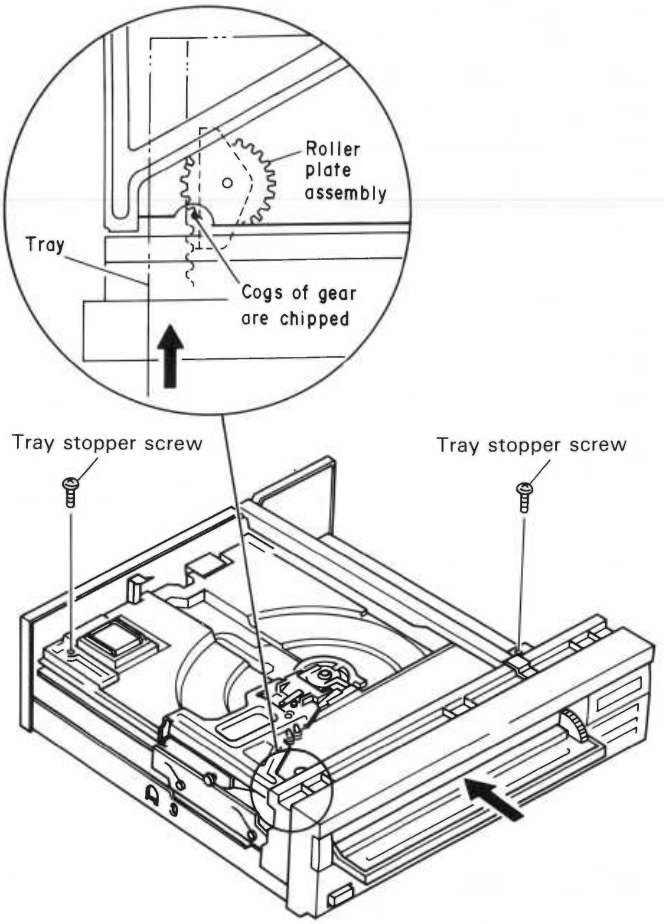


Fig. 9-4

- **For mechanism adjustments from item 1. "Tilt gain adjustment" to item 12. "RF gain adjustment" and item 22. "PD0011A clock Adjustment", the player should be set to the test mode. (Refer to section 8. Test Mode (Page 62).)**
- **Adjustments from item 13. "14.31818 MHz" to item 21. "VCXO frequency adjustment" should be performed with the test mode released.**
- **The oscilloscope should be used with a 10:1 probe.**

2. Adjustment procedure accompanying the replacement of major parts

1) When the pick-up assembly is replaced

- All the adjustments from item 1. "Tilt Servo loop gain adjustment" to item 12. "RF gain adjustment" should be performed.

2) When the spindle motor is replaced

- Adjustment item 8. "Spindle motor centering check and adjustment" should be performed, then the crosstalk at the outermost and innermost edges of the LD test disc should be checked. If crosstalk is present at this time, all the adjustments from item 3. "Slider shaft levelness adjustment" to item 7. "Tilt error balance adjustment" should be performed.

3) When the tilt sensor is replaced

- Adjustments of item 1. "Tilt servo loop gain adjustment", item 3 "Slider shaft levelness adjustment", item 6. "Tilt sensor adjustment", and item 7. "Tilt balance adjustment" should be performed.

3. Major Adjustments required in Special Cases

1) When the video processor IC (IC402) is replaced or when dropout is noticeable on the TV screen

- Adjustment item 14. "Dropout detector adjustment" and adjustment item 16. "Output video level adjustment" should be performed.

2) When the TBC IC (IC901) is replaced, or when the 14.31818 MHz oscillator crystal (X901) is replaced

- Adjustment item 20. "VCO frequency adjustment" and item 21. "VCXO frequency adjustment" should be performed.

3) When correct color does not appear (especially magenta)

- Adjustment item 18. "Color phase error mixing level adjustment" and item 19. "Color phase error signal level adjustment" should be performed

4) When the Philips decoder IC is replaced

- Adjustment item 22. "PD0011A clock adjustment" should be performed.

5) When PM0001 is replaced

- Adjustment item 17. "1H delay video level adjustment" should be performed

9.3 MECHANISM ADJUSTMENTS

1. TILT GAIN ADJUSTMENT

- Purpose: To adjust the gain of tilt servo according to the sensitivity rank (level) of the tilt sensor.
- Symptoms when incorrectly adjusted: Increased hunting of the tilt servo or crosstalk.

Measurement equipment & jigs	Adjusting point
• Screwdriver (flat bladed)	• VR607 in the mother board assembly

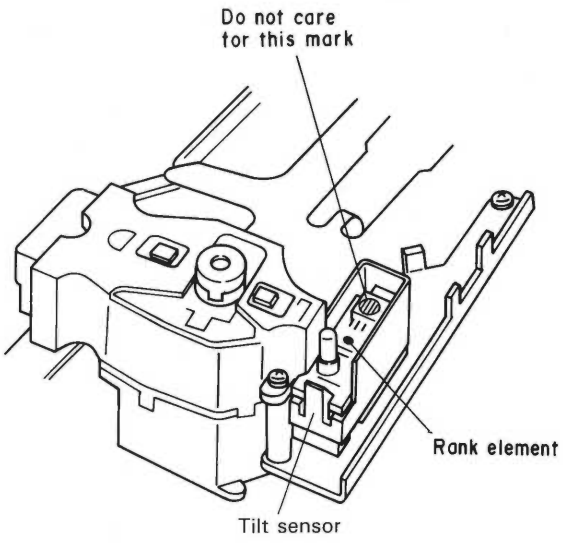
Adjusting procedure

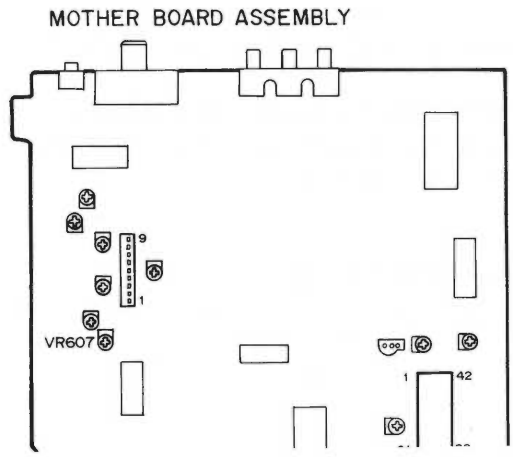
1. According to the color of the rank indication, turn VR607 on the mother board assembly as follows, using the flat bladed ⊖ screwdriver.

Rank	Color	VR angle
A	Red	Rotate fully clockwise
B	None	Set to the mechanical center
C	Blue	Rotate fully counterclockwise

VR 607

Adjustment diagram





2. GRATING COARSE ADJUSTMENT AND TRACKING ERROR BALANCE ADJUSTMENT

- Purpose: To make search operation, etc. function before performing pick-up inclination adjustment.
- Symptom when incorrectly adjusted: Disc play impossible. Track jumping.

Measurement equipment & jigs	Measurement equipment connecting points	Player condition	Adjusting points
• Screwdriver (flat bladed) • Oscilloscope • Test disc: GGV1002 • TV monitor	• Oscilloscope: CH1: Between TRKG Error (CN601-8) and GND in the mother board assembly.	* Test mode: • Play mode • Tracking servo loop open • Set tilt servo to OFF	• Grating adjustment screw in the pick-up assembly • VR605 on the mother board assembly

Adjusting procedure

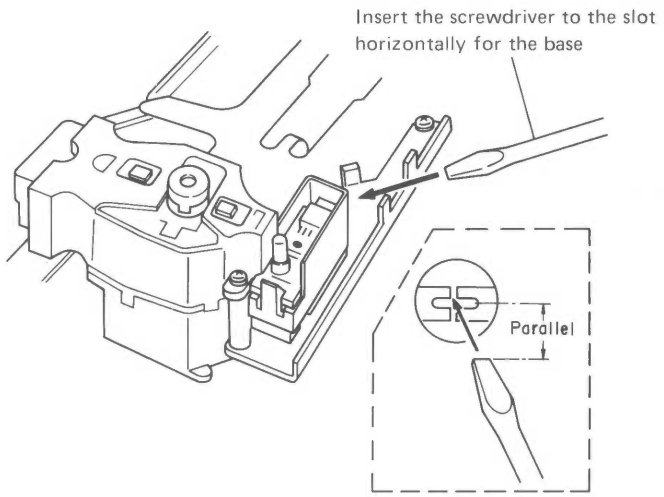
[Grating coarse (temporary) adjustment]

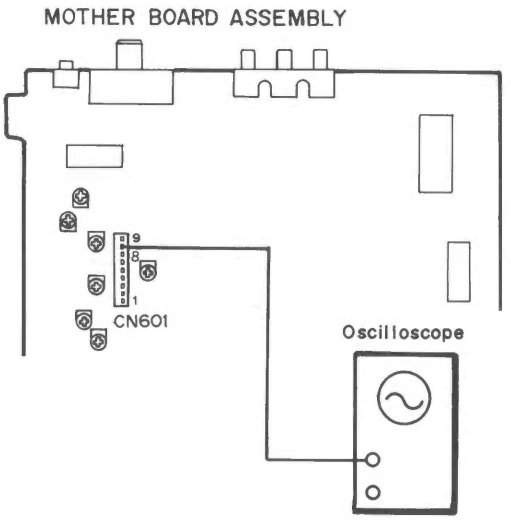
1. Load the LD disc and press the PLAY key.
2. Move the pick-up to around frame #15000 using the Scan keys.
3. Open the TRKG servo loop. (Refer to page 62.)
4. Connect CN601-8 of the mother board assembly to the oscilloscope to observe the waveform.
5. Insert a flat bladed ⊖ screwdriver (small) into the grating adjustment hole horizontally, and first set to the point where the amplitude of the TRKG error waveform is maximum, then find the point where the waveform becomes minimum and the smoothest envelope is obtained (on-track position). (Photo 1)
6. In this condition, rotate the flat bladed screwdriver counterclockwise and stop rotating at the point where the amplitude of the TRKG error waveform becomes maximum for the first time. (Photo 2)

[TRKG (Tracking) balance adjustment]

1. Adjust VR605 in the mother board assembly so that amplitudes "a" and "b" shown in Photo 2 become equal.
   Close the TRKG servo loop and check that the picture on the TV screen appears normal.

Adjustment diagram





Waveforms

* Oscilloscope range: DC 20 mV/div., 5 mS/div.

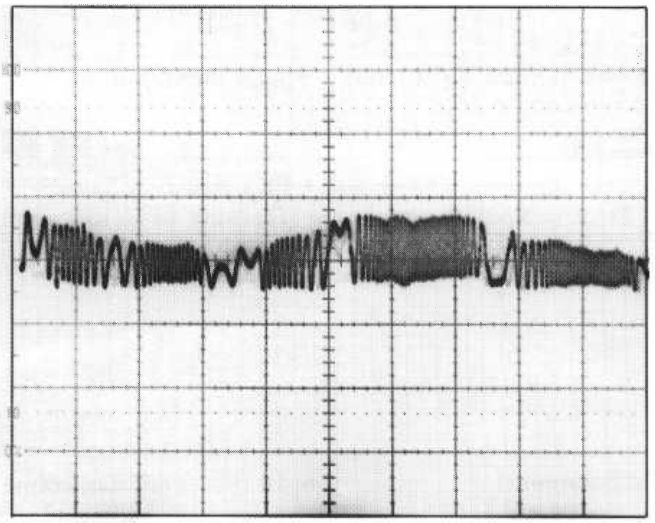


Photo 1 On-track position

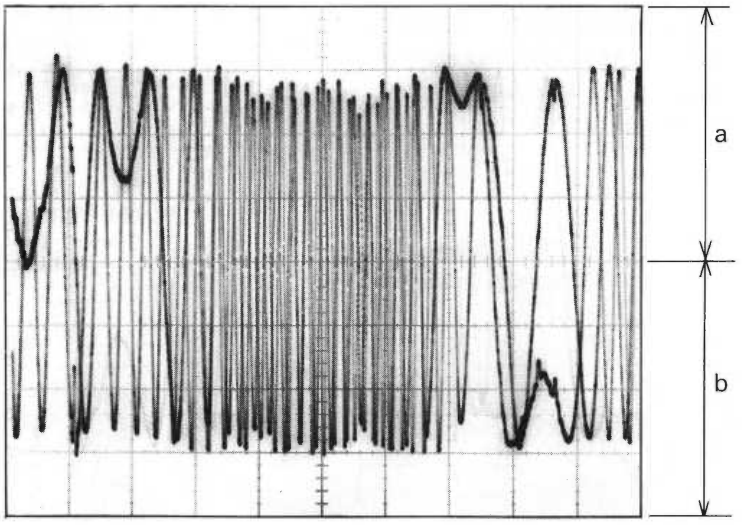


Photo 2 Maximum amplitude

3. SLIDER SHAFT LEVELNESS ADJUSTMENT

- Purpose: To make the disc and the slider shaft parallel so that the pickup inclination adjustment and tilt sensor adjustment can be done correctly.
- Symptoms when incorrectly adjusted: Operating range of the object lens is unsatisfactory with warped discs, and the focus is unlocked at the middle or outer area of the disc.

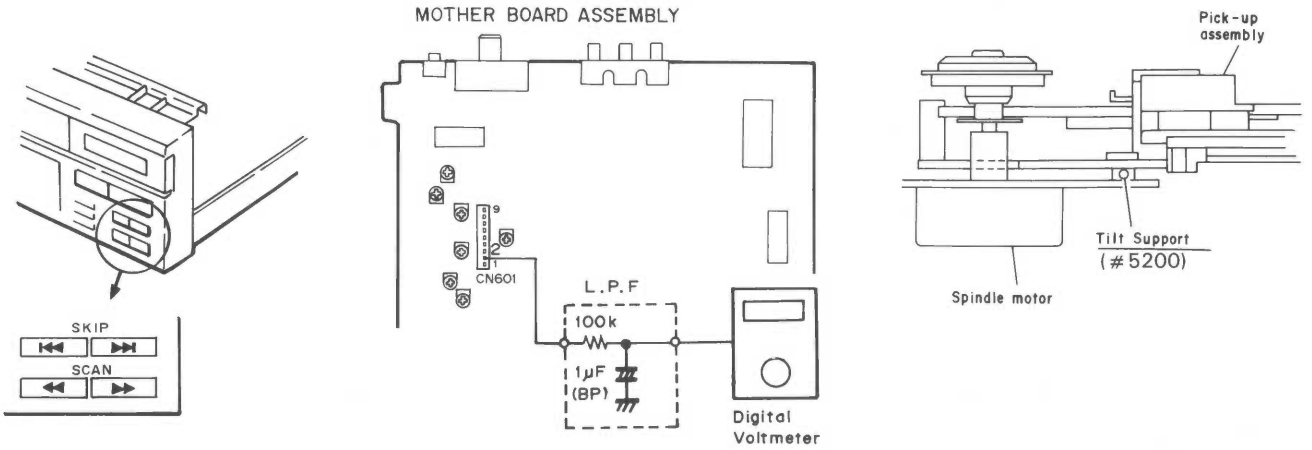
Measurement equipment & jigs	Measurement equipment connecting points	Player condition	Adjusting points
• Digital voltmeter • Low-pass filter • Test disc: GGV1002	• Digital DC voltmeter: Between the FORT (CN601-2) and GND in the mother board assembly	* Test mode: • Still mode • Tracking servo loop open • Set tilt servo to OFF	• Player: SKIP keys (during test mode)

Adjusting procedure

1. Load the LD test disc and feed the slider to around frame #5200 (tilt support) using the SCAN (▶▶) key, and open the TRKG servo loop.
2. Connect Pin 2 of CN601 in the mother board assembly to digital DC voltmeter.
3. Read the digital DC voltmeter (1 mV unit), and note the reading.
4. Feed the slider to around frame #25000 of the LD test disc using the SCAN (▶▶) key.
5. Adjust with the SKIP keys (|◀◀, ▶▶|) so that the meter reading is within ±2 mV of the value noted above.

Pin 2
5200 open TRK
Note OK
Go To 25K
use skip key
so Reading within 2 MV

Adjustment diagram



4. PICK-UP INCLINATION ADJUSTMENT

- Purpose: To adjust the inclination of the pick-up so that laser beam strikes the disc vertically.
- Symptom when incorrectly adjusted: Crosstalk.

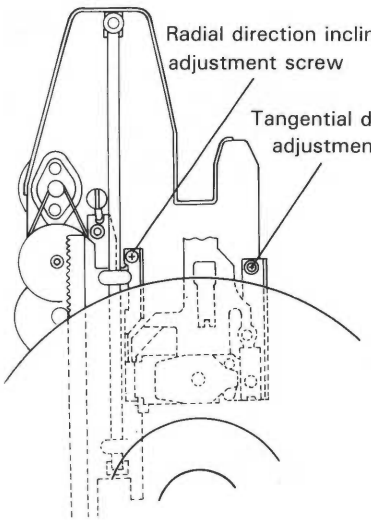
Measurement equipment & jigs	Measurement equipment connecting points	Player condition	Adjusting points
• TV monitor • Test disc: GGV1002	• TV monitor Connect to the video output terminal of the player.	* Test mode: • Still mode • Tracking servo loop close • Set tilt servo to OFF	• For pick-up assembly: Radial direction inclination adjustment screw, and tangential direction inclination adjustment screw.

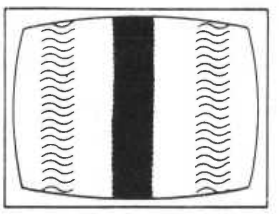
Adjusting procedure

1. Set the player to the STILL mode with the tracking servo loop closed, and search frame #115 of the LD test disc.
2. Adjust the pick-up assembly radial direction inclination adjustment screw and the tangential direction inclination adjustment screw so that crosstalk on the right and left sides of the TV screen becomes minimum.
3. Search frame #130.
4. Adjust the radial direction inclination adjustment screw and the tangential direction inclination adjustment screw so that crosstalk at the right and left sides of the TV screen becomes minimum.
5. Repeat the above procedure so that the crosstalk at frames #115 and #130 becomes minimum.

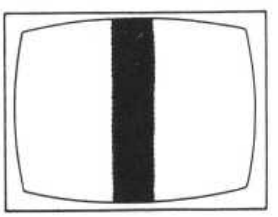
Note: At this time, turn the radial direction inclination adjustment screw and the tangential direction adjustment screw clockwise about a quarter turn beyond the best point, and then turn them counterclockwise by a quarter turn to complete the adjustment.
When crosstalk is difficult to detect, adjust the contrast and brightness of the TV monitor to make it easier to see. If it is still difficult to detect, obtain the maximum RF waveform by adjusting the tangential direction adjustment screw and the radial direction adjustment screw.

Adjustment diagram





Crosstalk on the screen



Crosstalk becomes minimum.

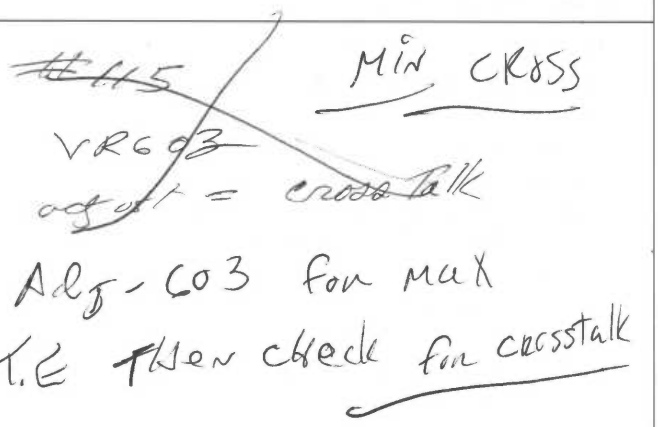
5. FOCUS ERROR BALANCE ADJUSTMENT

- Purpose: To compensate the object lens position electrically so that the crosstalk becomes minimum.
- Symptom when incorrectly adjusted: Crosstalk.

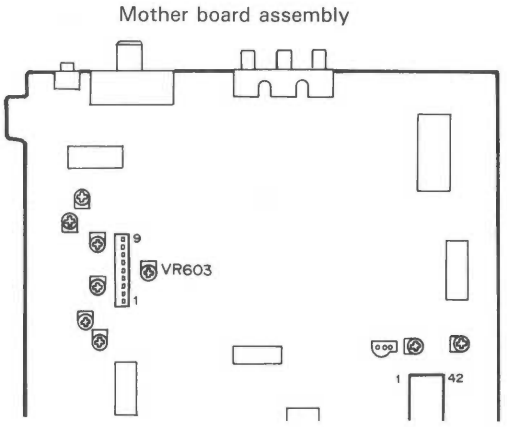
Measurement equipment & jigs	Measurement equipment connecting points	Player condition	Adjusting points
• TV monitor • Test disc: GGV1002	• TV monitor Connect to the video output terminal of the player.	* Test mode: • Still mode • Tracking servo loop close • Set tilt servo to OFF	• VR603 in the mother board assembly

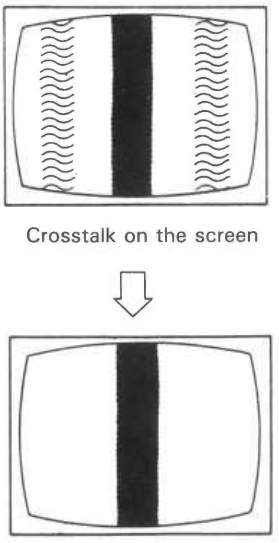
Adjusting procedure

1. Set the player in the test mode and set to the STILL mode with the tracking servo loop closed, and search frame #115 of the LD test disc.
2. Adjust VR603 so that the crosstalk on the right and left sides of the TV screen becomes minimum and equal.



Adjustment diagram





6. TILT SENSOR ADJUSTMENT

- Purpose: To adjust the angle of the tilt sensor optimally (parallel to the disc) after adjustment of the levelness of the slider shaft and the inclination of the pick-up are completed.
- Symptom when incorrectly adjusted: Crosstalk, unsatisfactory operating range of the objective lens, unstable search operation.

Measurement equipment & jigs	Measurement equipment connecting points	Player condition	Adjusting points
• TV monitor • Small Philips ⊕ screwdriver • Test disc: GGV1002	• TV monitor Connect to the video output terminal of the player. * When the TV monitor is not used, connect to the FL tube of the player.	* Test mode: • Still mode • Tracking servo loop close • Set tilt servo to OFF	• Tilt sensor inclination adjustment screw in the mechanism assembly

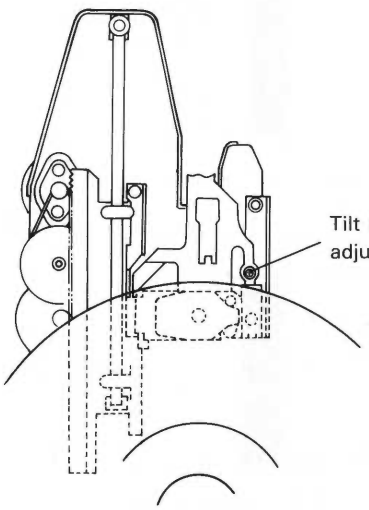
Adjusting procedure

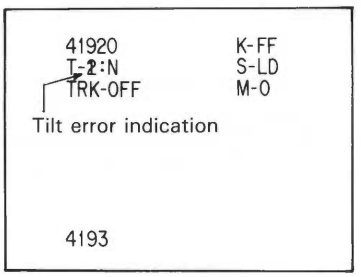
1. Set the player to the STILL mode, and search frame #16200 of the LD test disc.
2. Set tilt balance adjustment VR601 to its mechanical center position.
3. Adjust the tilt sensor inclination adjustment screw so that the tilt error indication code on the TV monitor or on the FL display on the main unit becomes 6 — 8.

Note: At this time, turn the tilt sensor inclination adjustment screw clockwise about a quarter turn beyond the best point, and then turn it counterclockwise by a quarter turn to complete the adjustment.

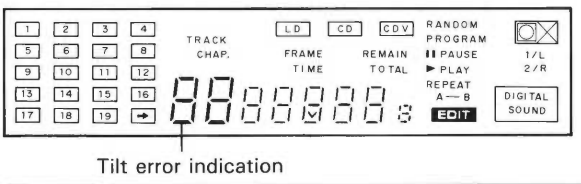
Still To 16200
Set VR601 To center
adjust Tilt sensor
for (7) TRK closed

Adjustment diagram





Note: This on-screen display is used to show the position of the tilt error indication and may be different from the actual display.



7. TILT BALANCE ADJUSTMENT

- Purpose: To compensate the sensitivity difference between the two photo diodes on the tilt sensor board assembly with pick-up inclination adjustment frame.
- Symptom when incorrectly adjusted: Crosstalk, unsatisfactory operating range of the objective lens, unstable search operation.

Measurement equipment & jigs	Measurement equipment connecting points	Player condition	Adjusting points
• TV monitor • Small flat bladed ⊖ screwdriver • Test disc: GGV1002	• TV monitor Connect to the video output terminal of the player. * When the TV monitor is not used, connect to the FL tube of the player.	* Test mode: • Still mode • Tracking servo loop close • Set tilt servo to OFF	• VR601 in the mother board assembly.

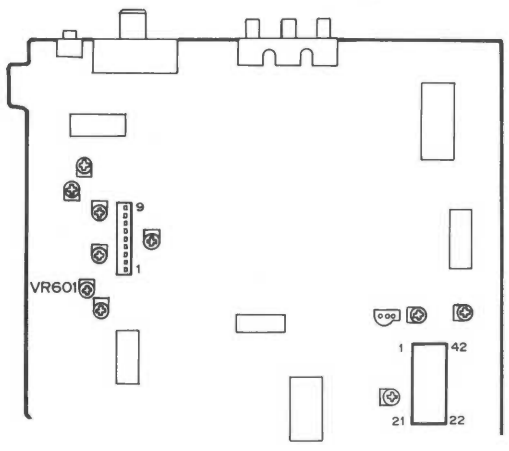
Adjusting procedure

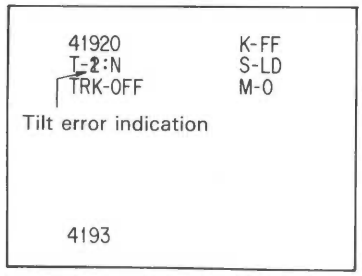
1. Set the player to the STILL mode, and search frame #115 of the LD test disc.
2. Adjust VR601 so that the tilt error indication code on the TV monitor or on the FL display on the player becomes 7.

#115
use VR601
To Fine Tune for (7)
STILL Mode
TRK closed

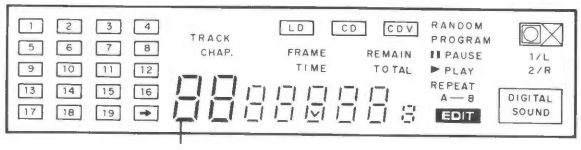
Adjustment diagram

Mother board assembly





Note: This on-screen display is used to show the position of the tilt error indication and may be different from the actual display.



Tilt error indication

8. SPINDLE MOTOR CENTERING CHECK AND ADJUSTMENT

- Purpose: To adjust the mechanism assembly position so that the center of the spindle motor is on the laser beam track when the pick-up assembly is moved toward the inside or outside of the disc.
- Symptom when incorrectly adjusted: Track jumping, longer search time.

Measurement equipment & jigs	Measurement equipment connecting points	Player condition	Adjusting points
• Flat bladed ⊖ screwdriver • Oscilloscope • Test disc: GGV1002	• Oscilloscope: Connect CH1 between the TRKG error (CN601-8) and GND in the mother board assembly. Connect CH2 to the TRKG sum (CN601-7) in the mother board assembly.	* Service mode: • Play mode • Tracking servo loop open • Set tilt servo to ON	• Spindle motor centering adjustment lever in the mechanism assembly

Adjusting procedure

[Centering check]

1. Set the player to the play mode with the TRKG servo loop open, and search frame #25000 (outer edge) of the LD test disc.
2. Observe the signal at CN601-8 (TRKG error) in the mother board assembly and check that the amplitude is minimum and the envelope is smooth. If not, adjust the grating screw using a flat bladed ⊖ screwdriver. (Fig. 1/ Photo 3)
3. Set the oscilloscope to the X-Y mode, and connect CN601-8 (TRKG error) in the mother board assembly to CH1 (X input) and CN601-7 (TRKG sum) to CH2 (Y input) respectively, to observe the Lissajous waveform. (Fig. 2)
4. Fine adjust the grating so that the width of the Lissajous waveform in the direction of the X axis becomes minimum. (Fig. 3)
5. Move the pick-up assembly toward the inside of the disc to around frame #3000.
6. Check that the width of the Lissajous waveform in the direction of the X axis is minimum.
7. At this time, if the Lissajous waveform shows the expanded oval shape around frame #3000, loosen the shaft fixing screw (see Fig. 2) slightly, then perform the centering adjustment in the following manner:

[Centering adjustment]

1. Insert the flat bladed screwdriver into the shaft adjustment lever (see Fig. 2).
2. Turn the screwdriver slowly so that the width of the Lissajous waveform in the direction of the X axis becomes minimum, and then turn it until the Lissajous waveform with the same shape as that observed in item 4 in "Centering check". (Fig. 4)
3. Move the pick-up assembly to the position around frame #25000 (towards the outside of the disc), and adjust the grating screw so that the width of the Lissajous waveform in the direction of the X axis becomes minimum.
4. Move the pick-up assembly towards the inside of the disc again to the position around frame #3000, and check that the width of the Lissajous waveform in the direction of the X axis is minimum.
5. If the width of the Lissajous waveform in the direction of the X axis does not become minimum, repeat the above procedures again so that the minimum width of the Lissajous waveform in the direction of the X axis is obtained either at the inside or outside of the disc.
6. After the centering adjustment is complete, secure the shaft fixing screw (see Fig. 2) while checking that the shape of the waveform does not change.

Adjustment diagram

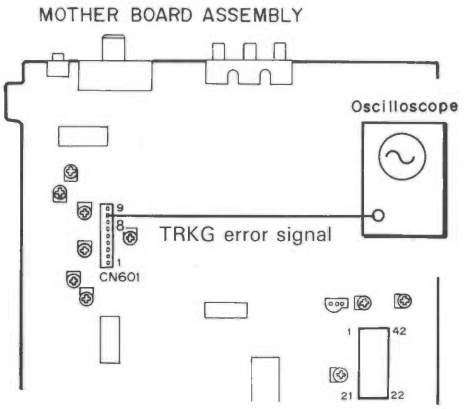


Fig. 1

• Oscilloscope: DC 20 mV/div., 5 mS/div.

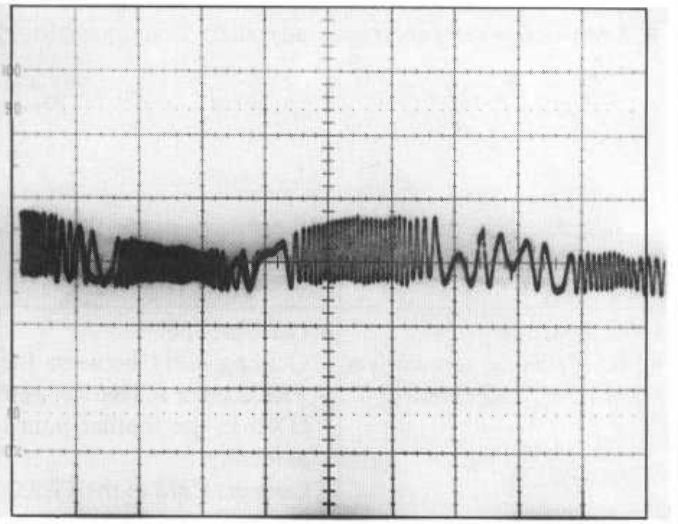
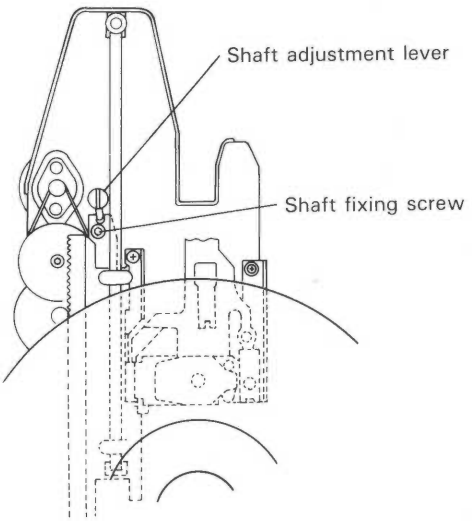
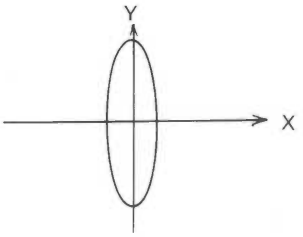


Photo 3: On-track position (Null point)





Lissajous waveform
On-track position; Minimum width in the direction of the X axis and maximum width in the direction of the Y-axis.

Fig. 3

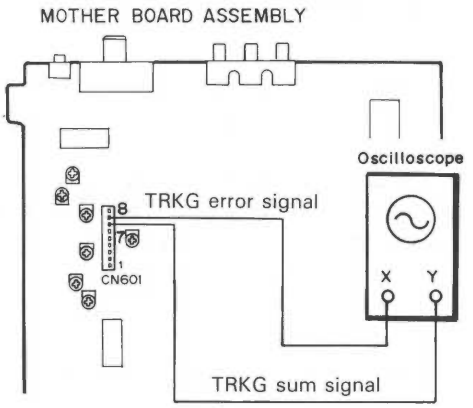
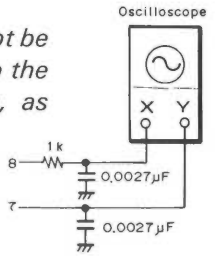
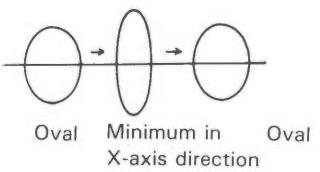


Fig. 2

Reference:
When the Lissajous waveform cannot be seen clearly, add a low-pass filter to the measurement circuit and adjust it, as shown in the figure below.





Lissajous waveform

Fig. 4

9. GRATING FINE ADJUSTMENT AND TRKG BALANCE ADJUSTMENT

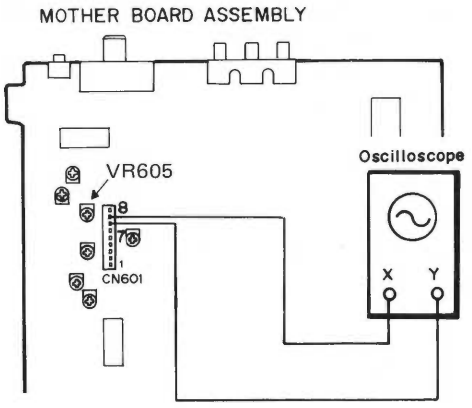
- Purpose: To fine adjust the grating so that the two laser beams for TRKG (tracking) servo are emitted on the optimum track positions of the disc.
- Symptom when incorrectly adjusted: Track jumping.

Measurement equipment & jigs	Measurement equipment connecting points	Player condition	Adjusting points
• Oscilloscope • Flat bladed ⊖ screwdriver • Test disc: GGV1002	• Oscilloscope: Connect CH1 between the TRKG error (CN601-8) and GND in the mother board assembly. Connect CH2 to the TRKG sum (CN601-7) in the mother board assembly.	* Test mode: • Play mode • Tracking servo loop open • Set tilt servo to ON	• Grating screw in the mechanism assembly • VR605 in the mother board assembly

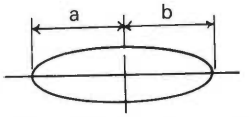
Adjusting procedure

1. Set the player to the play mode with the TRKG servo loop open, and search frame #3000 (inner side) of the LD test disc.
2. Set the oscilloscope to the X-Y mode, and connect CN601-8 (TRKG error) in the mother board assembly to CH1 (X input) and CN601-7 (TRKG sum) to CH2 (Y input) respectively, to observe the Lissajous waveform.
3. Insert the flat-bladed screwdriver into the grating adjustment hole (see page 71), and adjust the grating so that the width of the Lissajous waveform in the direction of the Y axis becomes minimum.
4. At this time, check that dimensions "a" and "b" of the Lissajous waveform become equal (a = b). If not, adjust VR605 (TRKG balance) in the mother board assembly.
5. Close the TRKG servo loop and check that the picture on the TV screen is normal.

Adjustment diagram

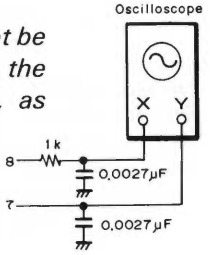


- Oscilloscope range:
  CH1 (X): 20 – 50 mV/div.
  CH2 (Y): 5mV/div
  At this time, the probe for the Y-axis should be set to × 1 mode.



Frame #15,000
Lissajous waveform
Minimum width in direction of the Y-axis, a = b Fig. 1

Reference:
When the Lissajous waveform cannot be seen clearly, add a low-pass filter to the measurement circuit and adjust it, as shown in the figure below.



10. FOCUS SERVO LOOP GAIN ADJUSTMENT

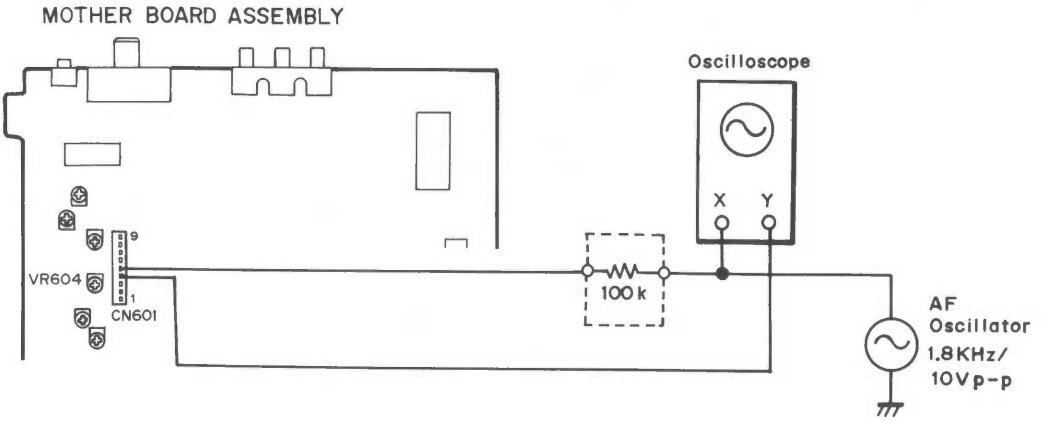
- Purpose: To set the gain for the focus servo loop to the optimum value.
- Symptom when incorrectly adjusted: Degraded playing ability.

Measurement equipment & jigs	Measurement equipment connecting points	Player condition	Adjusting points
• Oscilloscope • AF oscillator (1.8 kHz/ 10 Vp-p) • Resistor (100 kohms) • Test disc: GGV1002	• Oscilloscope: Connect CH1 between the FOCS in (CN601-5) and GND in the mother board assembly. Connect CH2 to the FOCS error (CN601-4) in the mother board assembly.	* Test mode: • Still mode • Tracking servo loop close • Set tilt servo to ON	• VR604 in the mother board assembly

Adjusting procedure

1. Set the output of the AF oscillator to 1.8 kHz/10 Vp-p.
2. Set the player to the still mode, and search frame #15,000 of the LD test disc.
3. Connect CN601-4 and CN601-5 in the mother board assembly as shown in the figure below.
4. Set the oscilloscope to the X-Y mode, and observe the Lissajous waveform.
5. Adjust VR604 so that the Lissajous waveform become symmetrical about the X and Y axes. (Photo 4, 5)

Adjustment diagram



Waveforms

* Oscilloscope range:
  CH1 (X): 200 mV/div.
  CH2 (Y): 5 mV/div.

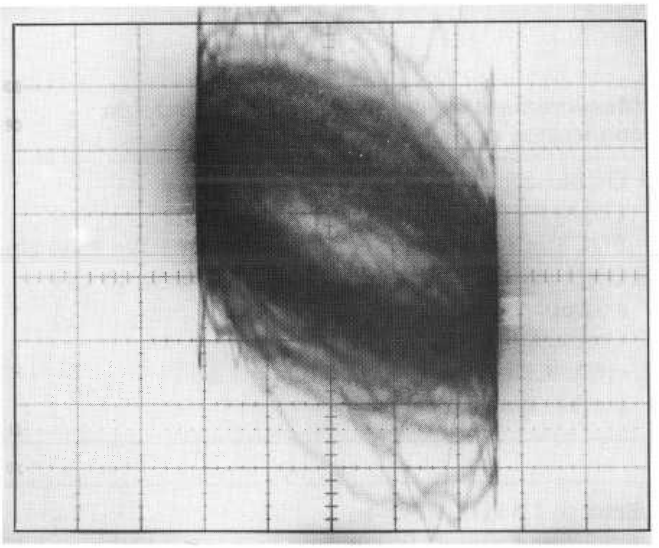


Photo 4

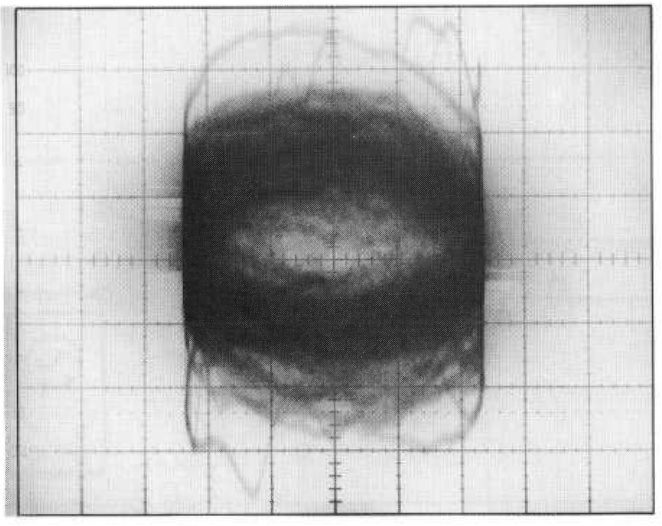


Photo 5

11. TRACKING SERVO LOOP GAIN ADJUSTMENT

- Purpose: To set the gain for the tracking servo loop to the optimum value.
- Symptom when incorrectly adjusted: Degraded playing ability.

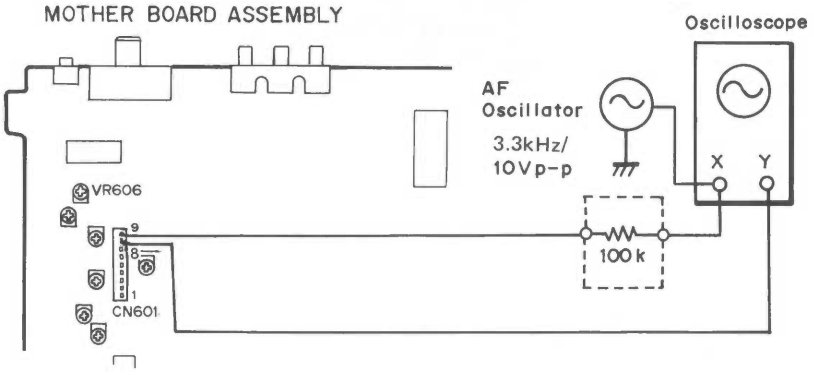
Measurement equipment & jigs	Measurement equipment connecting points	Player condition	Adjusting points
• Oscilloscope • Resistor (100 kohms) • AF oscillator (3.3 kHz/ 10 Vp-p) • Test disc: GGV1002	• Oscilloscope: Connect CH1 between the TRKG in (CN601-9) and GND in the mother board assembly. Connect CH2 to the TRKG error (CN601-8) in the mother board assembly.	* Test mode: • Still mode • Tracking servo loop close • Set tilt servo to ON	• VR606 in the mother board assembly

Adjusting procedure

1. Set the player to the still mode, and search frame #15,000 of the LD test disc.
3. Connect the resistor, AF oscillator and the oscilloscope as shown in the figure below.
   At this time, set the output of the AF oscillator to 3.3 kHz/10 Vp-p.
4. Set the oscilloscope to the X-Y mode, and observe the Lissajous waveform.
5. Adjust VR606 so that the Lissajous waveform become symmetrical about the X and Y axes.
   (Photo 6, 7)

Note: When the required results is not obtained, replace the 100-kohm resistor with a 33-kohm one, or increase the output level of the oscillator.

Adjustment diagram



Waveforms

* Oscilloscope range:
  CH1 (X): 200 mV/div.
  CH2 (Y): 5 mV/div.

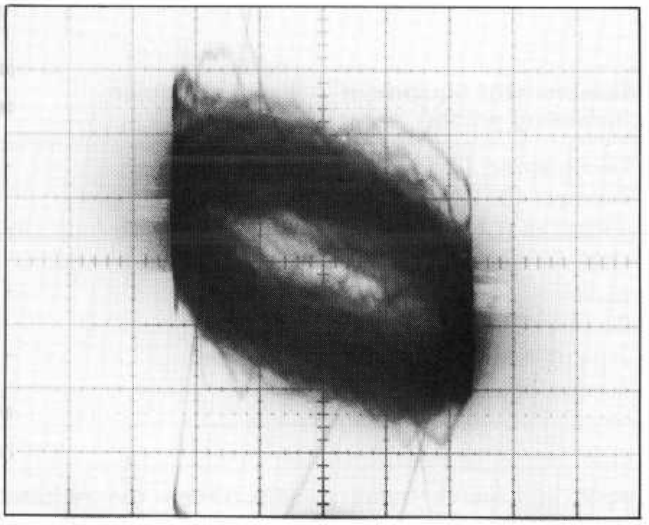


Photo 6

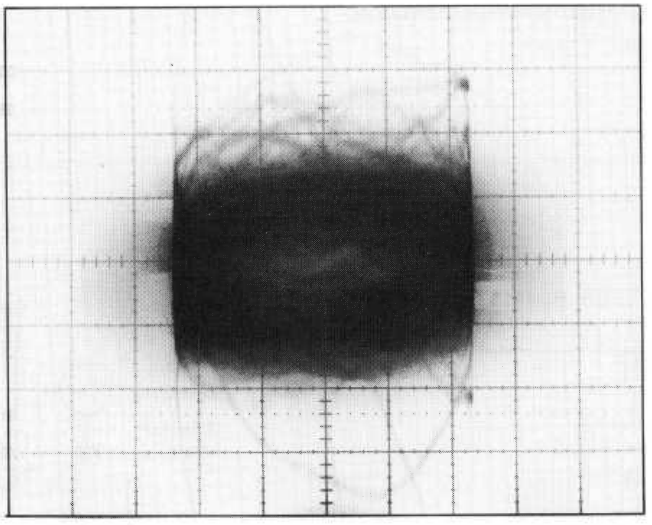


Photo 7

12. RF GAIN ADJUSTMENT

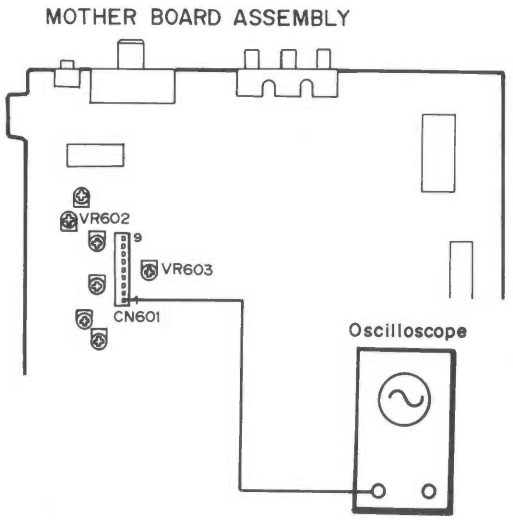
- Purpose: To set the amplitude of the RF signal to the optimum value.
- Symptom when incorrectly adjusted: Dropout occurs frequently. Unstable scan, search operations.

Measurement equipment & jigs	Measurement equipment connecting points	Player condition	Adjusting points
• Oscilloscope • Test disc: GGV1002	• Oscilloscope: Connect CH1 between the RF signal (CN601-1) and GND in the mother board assembly.	* Test mode: • Still mode • Tracking servo loop close • Set tilt servo to ON	• VR602 in the mother board assembly

Adjusting procedure

1. Set the player to the still mode, and search frame #15,000 of the LD test disc.
2. Connect the oscilloscope to CN601-1 in the mother board assembly to observe the RF signal.
3. Adjust VR602 so that the amplitude of the RF signal becomes 300 mV ±50 mV. (Photo 8)

Adjustment diagram



Waveforms

- Oscilloscope range: AC 5 mV/div., 2 mS/div.

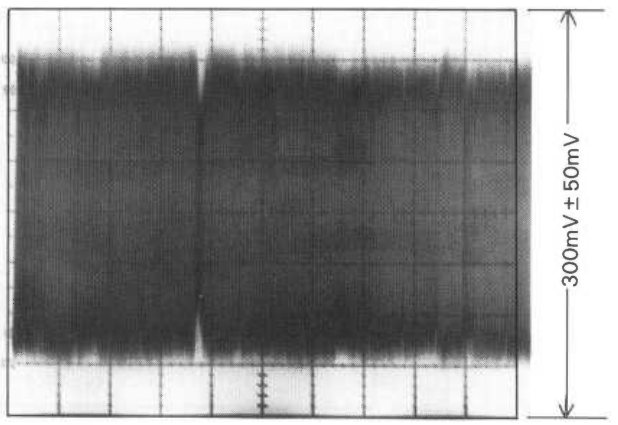


Photo 8

• ELECTRICAL ADJUSTMENTS

13. 14.31818 MHz ADJUSTMENT

- Purpose: To adjust the reference clock frequency to its correct value. This adjustment should be done whenever peripheral parts around IC901 are replaced.
- Symptoms when incorrectly adjusted: Incorrect hue (tint), unstable color on TV, VCXO adjustment impossible when playing an LDD disc.

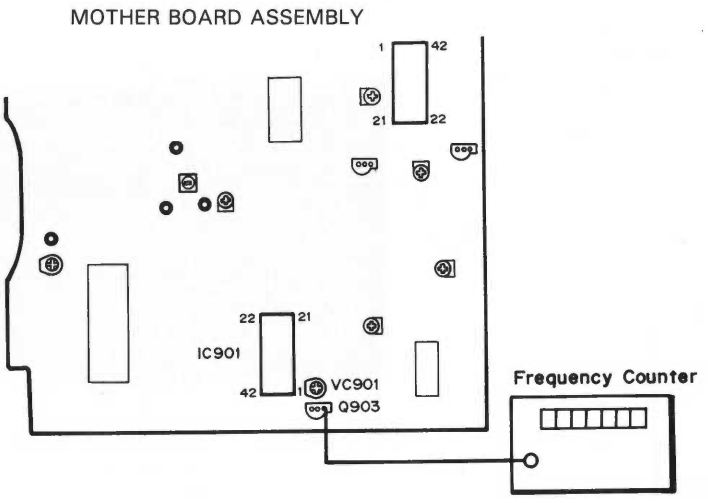
Measurement equipment & jigs	Measurement equipment connecting points	Player condition	Adjusting points
• Frequency counter	• Connect the frequency counter to the emitter of Q903 on the mother board assembly.	* This adjustment should be performed in the normal mode. • In the STOP mode (with a blue background on the monitor screen).	• VC901 in the mother board assembly

Adjusting procedure

1. In the stop mode (when a blue background is displayed on the monitor screen), adjust VC901 in the mother board assembly so that the frequency (14.31818 MHz) at the emitter of Q903 in the mother board assembly becomes 14.31818 MHz.

Note: If adjustment cannot be performed sufficiently by the above method, adjust VC901 so that a frequency of around 15.734265 kHz is present at the base of Q903.

Adjustment diagram



14. DROPOUT DETECTOR ADJUSTMENT

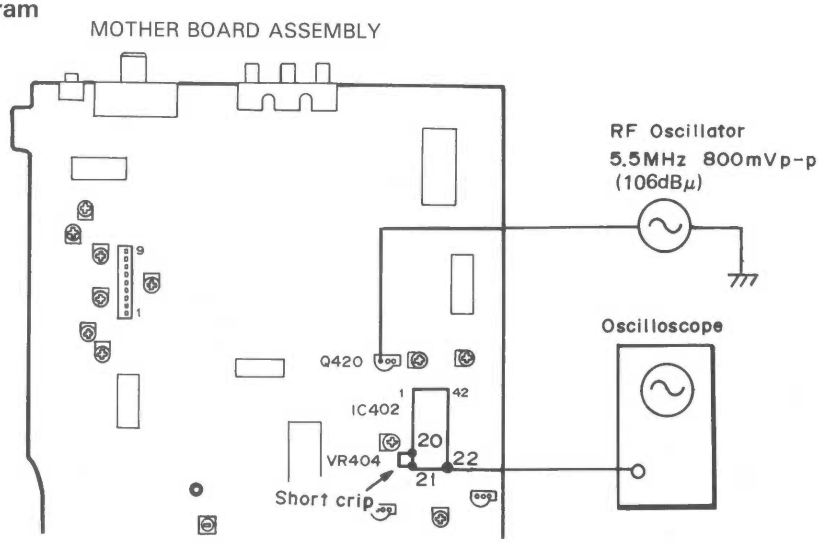
- Purpose: To adjust the comparison frequency of the dropout detector (frequency comparator).
- Symptom when incorrectly adjusted: Over-compensation for dropout (over-emphasized edges in the picture), or under-compensation for dropout (black spots in the picture). Unstable scan, search operation.

Measurement equipment & jigs	Measurement equipment connecting points	Player condition	Adjusting points
• Oscilloscope • RF oscillator (5.5 MHz/800 mVp-p) • Shorting clip	• Oscilloscope: Connect CH1 between IC402 pin 22 and GND in the mother board assembly.	* Normal mode: • Stop mode (blue background screen)	• VR404 in the mother board assembly

Adjusting procedure

1. Connect the RF oscillator to the base of Q420 in the mother board assembly, and apply a 5.5 MHz, 800 mVp-p signal.
2. Short-circuit pins 20 and 21 of IC402 in the mother board assembly, and connect the oscilloscope to pin 22 to observe the waveform.
3. While observing the DC level on the oscilloscope screen, adjust VR404 in the mother board assembly so that the DC level comes to the middle point between the low and high level (pulse waveform with duty 50% above jitter).

Adjustment diagram



Waveforms

- Oscilloscope range: DC 1 V/div., 2 mS/div.

Photo 9

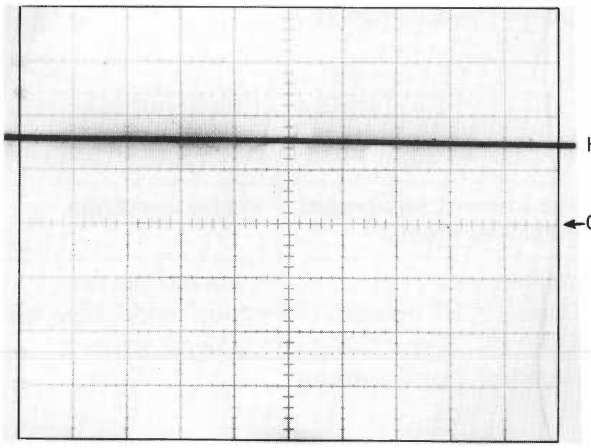


Photo 10

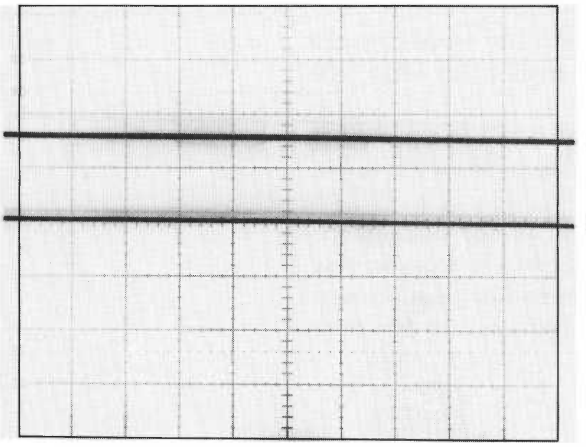
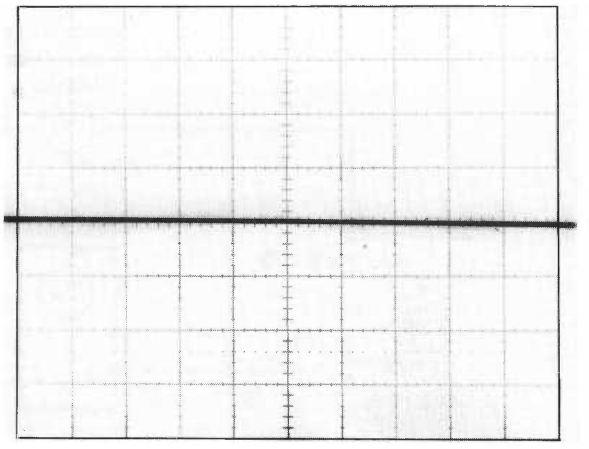


PHOto 11



15. VCO CENTER FREQUENCY ADJUSTMENT

- Purpose: To set the delay time of the time base error correction CCD to the optimum value.
- Symptom when incorrectly adjusted: Color lock unstable, color lock too late after searching, or flicker on the white picture.

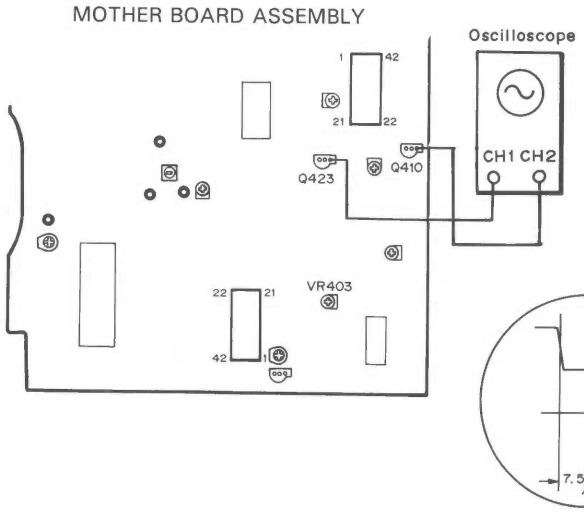
Measurement equipment & jigs	Measurement equipment connecting points	Player condition	Adjusting points
• Dual-trace oscilloscope • Test disc: GGV-1002	• Dual-trace oscilloscope: Connect CH1 between the Q423 emitter and GND in the mother board assembly. Connect CH2 to Q410 emitter.	* Normal mode: • Still mode	• VR403 in the mother board assembly

Adjusting procedure

1. Connect Q423 emitter and Q410 emitter to CH1 and CH2 of the dual-trace oscilloscope.
   CH1: Video signal after time base error is corrected
   CH2: Video signal before time base error is corrected
2. Load the LD test disc and search frame #5100. Adjust VR403 so that the center of the jitter of the video signal at CH1 is delayed by 71 μsec (1H + 7.5 μsec) from the video signal at CH2.

Note: Be careful no to confuse CH1 and CH2.

Adjustment diagram



Waveforms

- Oscilloscope range: AC
  CH1: 20 mV/div., 10 μS/div.
  CH2: 20 mV/div.

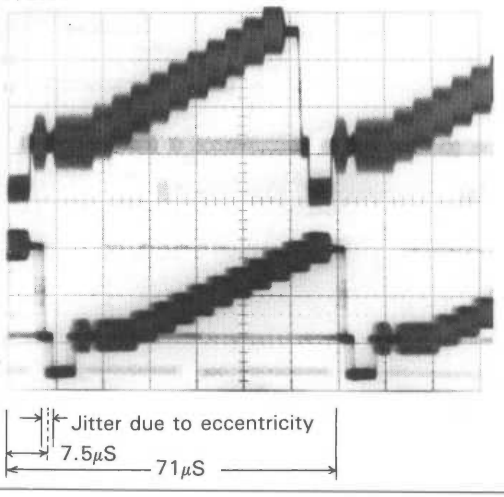


Photo 12

16. OUTPUT VIDEO LEVEL ADJUSTMENT

- Purpose: To set the video signal level to 1 Vp-p (when terminated with 75 ohms).
- Symptom when incorrectly adjusted: Data readout incomplete, and play starts from the middle, or the screen is too bright or too dark.

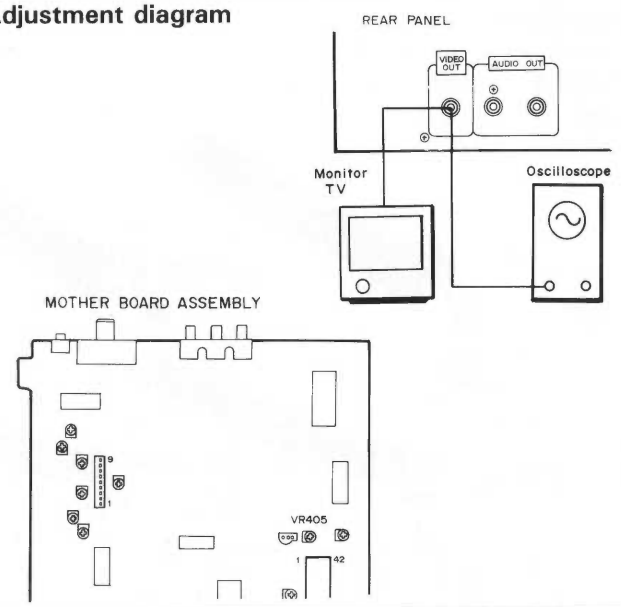
Measurement equipment & jigs	Measurement equipment connecting points	Player condition	Adjusting points
• Oscilloscope • Test disc: GGV1002	• Oscilloscope: Connect to the video output terminal of the player.	* Normal mode: • Still mode	• VR405 in the mother board assembly

Adjusting procedure

Note: The video output terminal is considered to be terminated with 75 ohms when it is connected to a TV monitor. (When VHF OUT is used for connection to TV, terminate the video output terminal with a 75-ohm resistor.)

1. Connect the oscilloscope to the video output terminal to observe the video signal.
2. Search frame #19900.
3. Adjust VR405 so that the voltage between the sync tip level and the white level becomes 1 V ± 5 %.

Adjustment diagram



Waveforms

- Oscilloscope range: AC 20 mV/div., 10 μS/div.

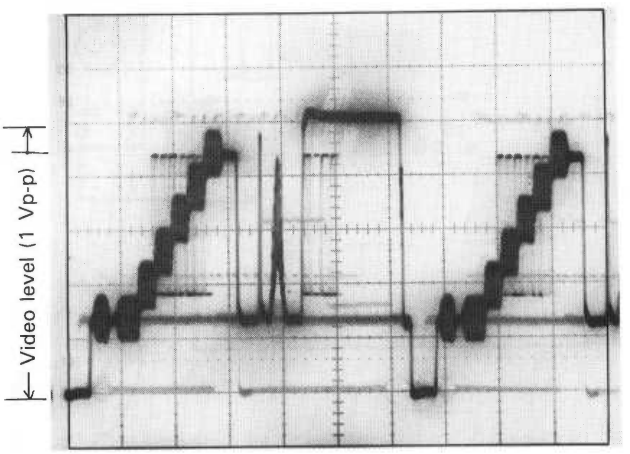


Photo 13

17. 1H DELAY VIDEO LEVEL ADJUSTMENT

- Purpose: To adjust the main video signal so that it is equal to the 1H delay video signal.
- Symptom when incorrectly adjusted: 1H level is too high..... Significant white dropoutand horizontal lines on the screen (horizontal shift).
  1H level is too low..... Significant black dropout.

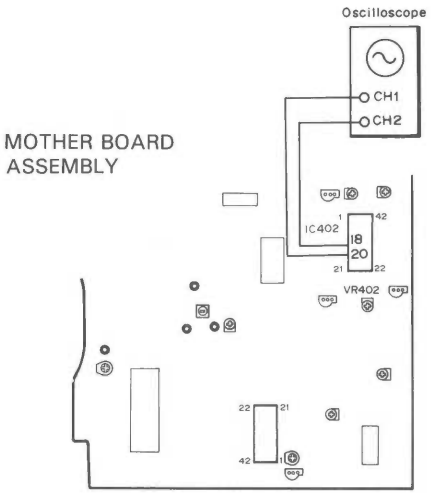
Measurement equipment & jigs	Measurement equipment connecting points	Player condition	Adjusting points
• Dual-trace oscilloscope • Test disc: CGV1002	• Connect the dual-trace oscilloscope as follows: CH1: Between IC402 pin 18 and GND in mother board assembly CH2: To IC402 pin 20	* Normal mode. • Still mode	• VR402 in the mother board assembly

Adjusting procedure

1. Connect IC402 pin 18 and pin 20 on the mother board to CH1 and CH2 of the dual-trace oscilloscope.
2. Search to frame #3800 of the test disc.
3. Adjust VR402 so that the 1H delay video level (CH2) is the same level as the main video level (CH1). (Photo 14)

Note: The video level indicates the difference in level between the sync tip level and the white peak level.

Adjustment diagram



Waveforms

- Oscilloscope range: AC CH1: 20mV/div., 10 μS/div
  CH2: 20mV/div., 10μS/div

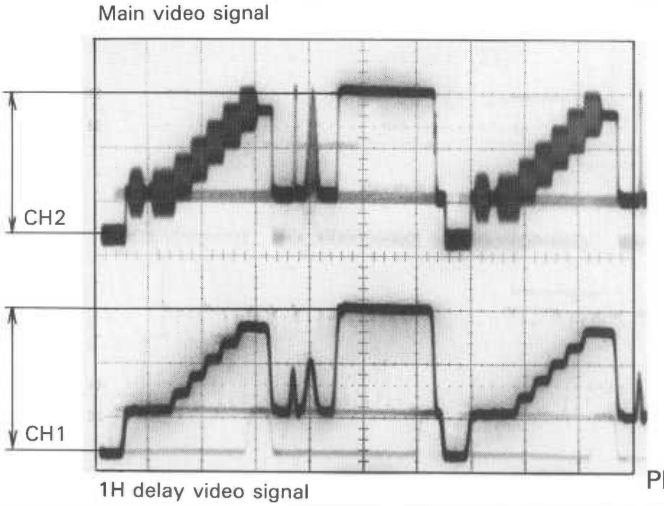


Photo 14

18. COLOR PHASE ERROR MIXING LEVEL ADJUSTMENT

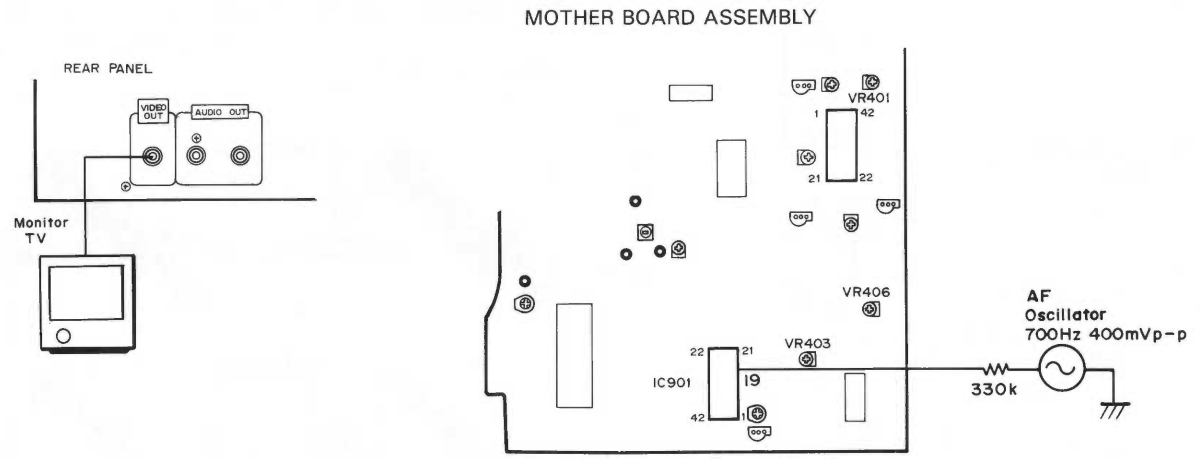
- Purpose: To adjust the amplitude variation characteristics of the color phase compensation section so they are optimum.
- Symptoms when incorrectly adjusted: Degraded video frequency response, dark horizontal line noise on the red screen.

Measurement equipment & jigs	Measurement equipment connecting points	Player condition	Adjusting points
• Oscilloscope • Test disc: CGV1002 • AF oscillator (700 Hz/ 400 mVp-p) • Resistor (330 kohms)	• Oscilloscope: Video output terminals of the player • AF oscillator: IC901 pin 19 in the mother board assembly	* Normal mode • Still mode	• VR401, VR406 in the mother board assembly

Adjusting procedure

1. Connect the oscilloscope and AF oscillator as shown in the figure below.
2. Search to frame #8000 of the test disc (magenta screen).
3. Rotate VR406 on the mother board assembly fully clockwise.
4. Trigger the video signal with the vertical sync signal and observe it with the oscilloscope, and adjust VR401 in the mother board assembly so that the chroma variation envelope becomes flat.

Adjustment diagram



Waveforms

- Oscilloscope
  DC CH1: 20 mVp-p/div, 2 mS/div.

Photo 15

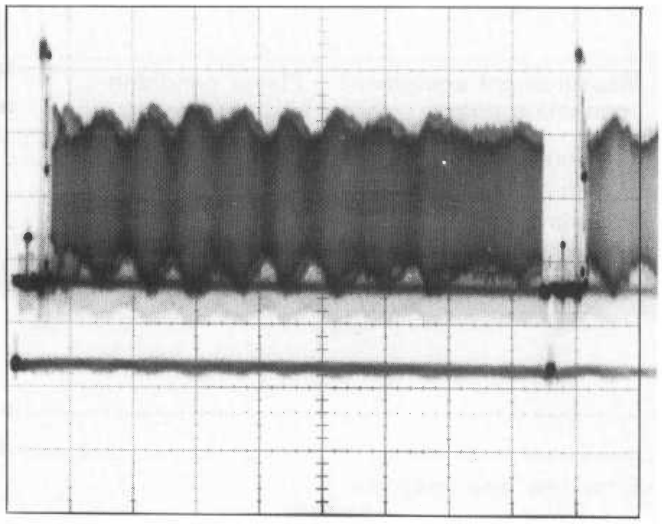
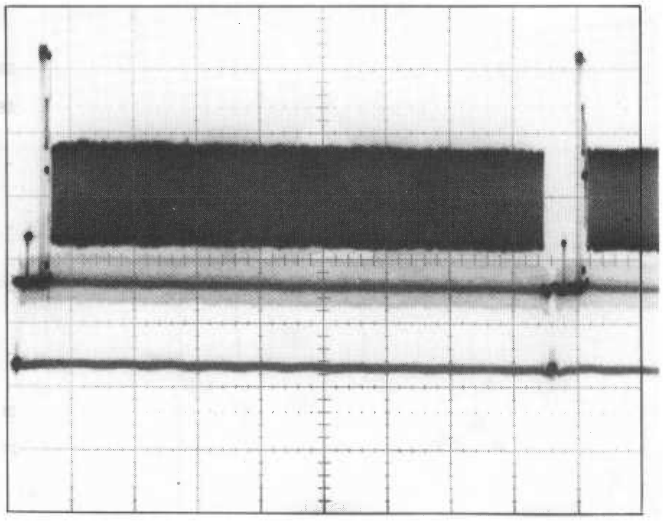


Photo 16



19. COLOR PHASE ERROR SIGNAL LEVEL ADJUSTMENT

- Purpose: To set the error signal of the color phase compensation section to the optimum value.
- Symptom when incorrectly adjusted: Color shade (irregular color) significant (especially with CDV discs).

Measurement equipment & jigs	Measurement equipment connecting points	Player condition	Adjusting points
• TV monitor • Test disc: CGV1002 • AF oscillator (700Hz/400mVp-p) • Resistor (330kohms)	• TV monitor Video output terminal of the player	* Normal mode • Still mode	• VR406 in the mother board assembly

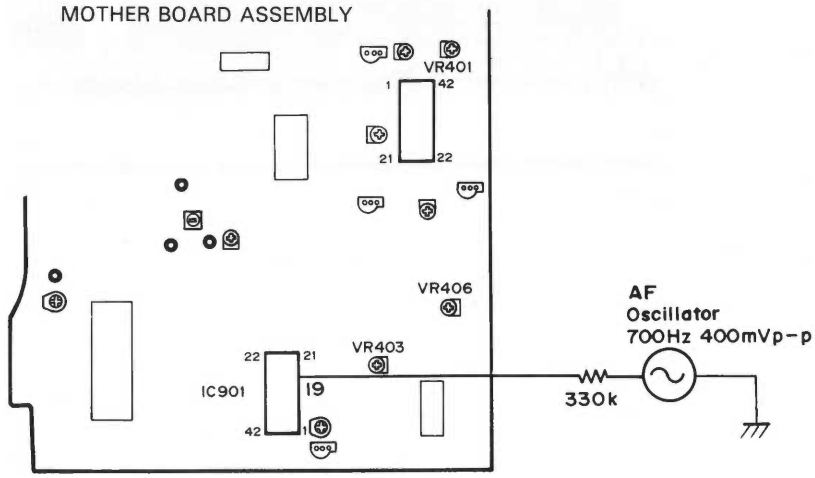
Adjusting procedure

1. Search to frame #8000 of the test disc (magenta screen).
2. Adjust VR406 so that the color shading of the magenta screen is minimized.

Notes:

1. *This adjustment should be performed after VR401 has been correctly adjusted.*
2. *If adjustment is performed without the AF oscillator, more color shading will appear on the CDV disc screen.*

Adjustment diagram



20. VCO FREQUENCY ADJUSTMENT

- Purpose: To adjust the VCO frequency of the PLL circuit used by the EFM decoder.
- Symptoms when incorrectly adjusted: CD play impossible, no digital audio signal output.

Measurement equipment & jigs	Measurement equipment connecting points	Player condition	Adjusting points
• Capacitor (0.01μF) • Oscilloscope • 8-inch LDD (with digital audio) or video part of CDV disc	• Oscilloscope: CH1: Between TP801 and GND in the mother board assembly.	* Normal mode • Play mode	• VL801 in the mother board assembly

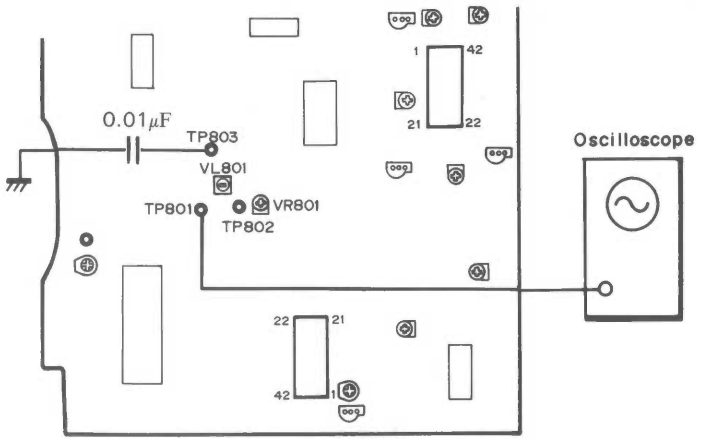
Adjusting procedure

1. Press the OPEN/CLOSE key on the front panel twice to open the disc tray.
2. Load an LDD disc and play it.
3. Ground TP803 in the mother board assembly using the capacitor (0.01μF), and connect the oscilloscope to TP801 to observe the waveform. At this time, adjust the Up/Down position knob so that the waveform comes to the center of the screen.
4. Release the shorting clip and adjust VL801 so that the center of the waveform on the oscilloscope becomes 0 mV ±200 mV from the center of the waveform observed in item 3.

Note: In step1, the disc tray must be opend.

Adjustment diagram

MOTHER BOARD ASSEMBLY



Waveforms

- Oscilloscope
  DC CH1: 50 mV/div, 2 mS/div

Photo 17

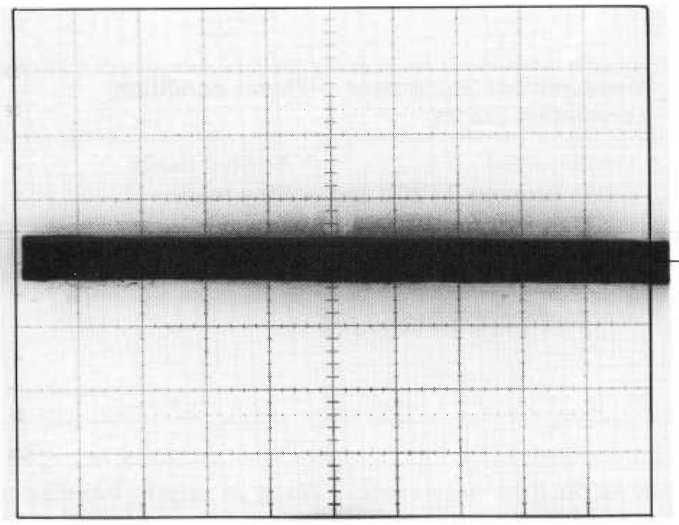
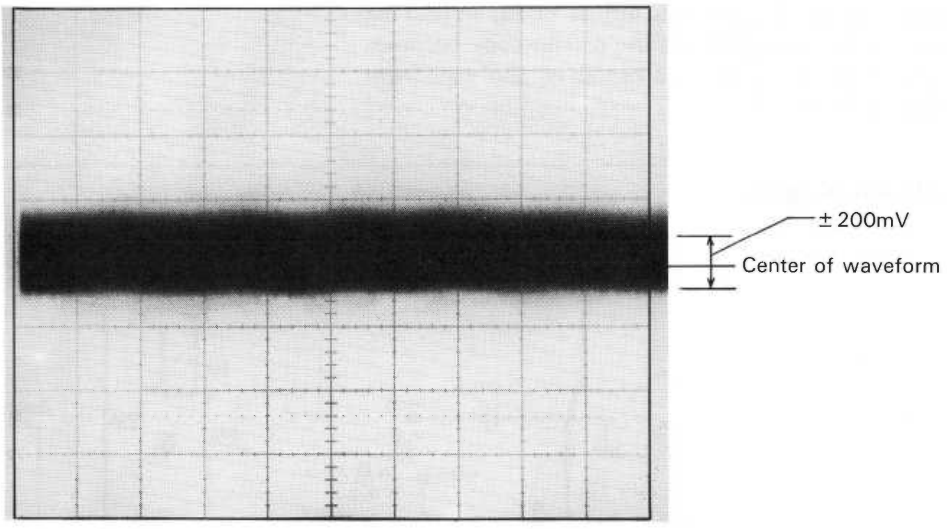


Photo 18



21. VCXO FREQUENCY ADJUSTMENT

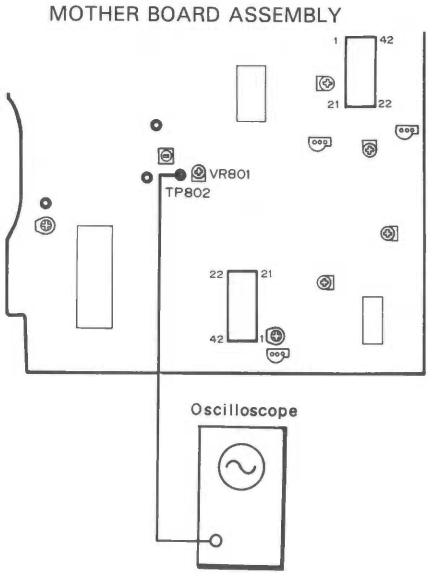
- Purpose: To adjust the frequency of the crystal oscillator used by the EFM decoder.
- Symptom when incorrectly adjusted: Audio signal interrupted occasionally with an LDD disc.

Measurement equipment & jigs	Measurement equipment connecting points	Player condition	Adjusting points
• Oscilloscope • 8-inch LDD disc (with digital audio) or video part os CDV disc	• Oscilloscope CH1: Between TP802 and GND in the mother board assembly.	* Normal mode • Play mode	• VR801 in the mother board assembly

Adjusting procedure

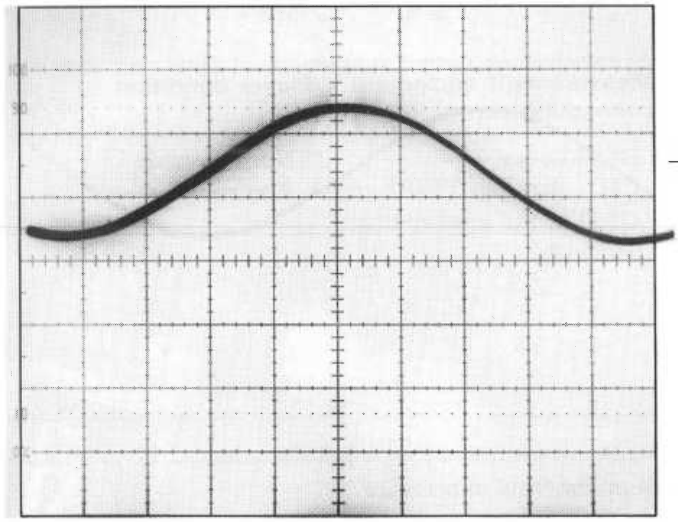
1. Press the OPEN/CLOSE key on the front panel twice to open the disc tray.
2. Load an LDD disc and play it.
3. Connect the oscilloscope to TP802 in the mother board assembly.
4. Adjust VR801 in the mother board assembly so that the center of the waveform on the oscilloscope (Photo 19) becomes 0 V ±0.5 V.

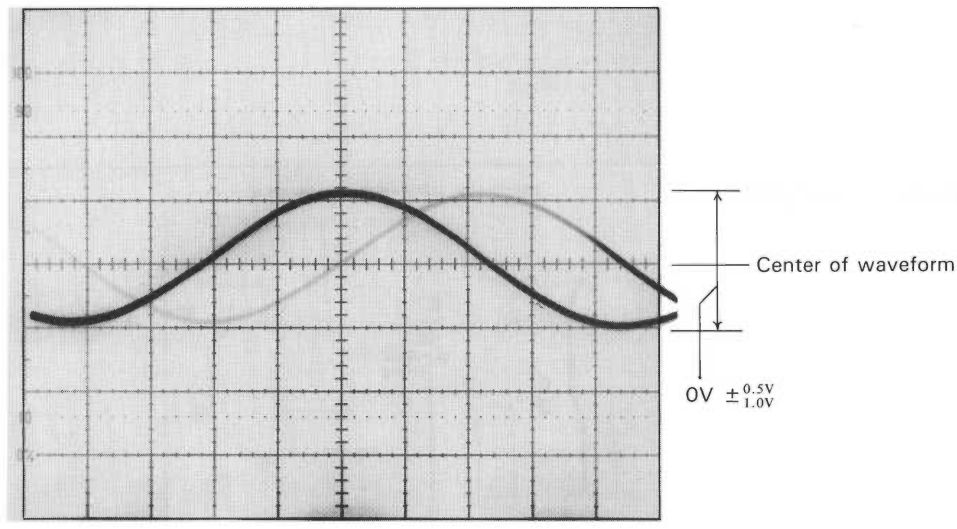
Adjustment diagram



Waveforms

- Oscilloscope range
  DC CH1: 50 mV/div, 5 mS/div





22. PD0011A CLOCK ADJUSTMENT

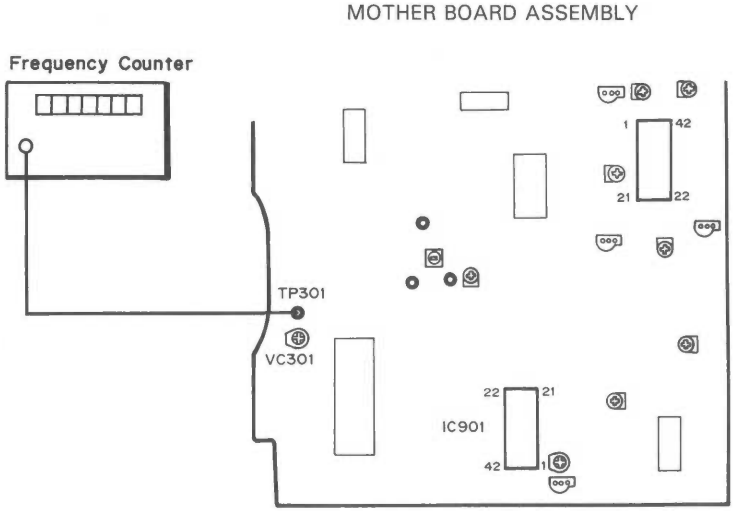
- Purpose: To adjust the clock frequency of the Philips decoder.
- Symptoms when incorrectly adjusted: Philips code readout impossible, no frame time indication, search operation impossible.

Measurement equipment & jigs	Adjusting point
• Frequency counter	• VC301 in the mother board assembly

Adjusting procedure

1. In the test mode stop condition, connect the frequency counter to TP301.
2. In this condition, adjust VC301 in the mother board assembly so that the frequency at this time becomes 3.0 MHz ±0.1 MHz.

Adjustment diagram



10. CIRCUIT DESCRIPTION

10.1 OUTLINE OVERALL CIRCUIT DESCRIPTION

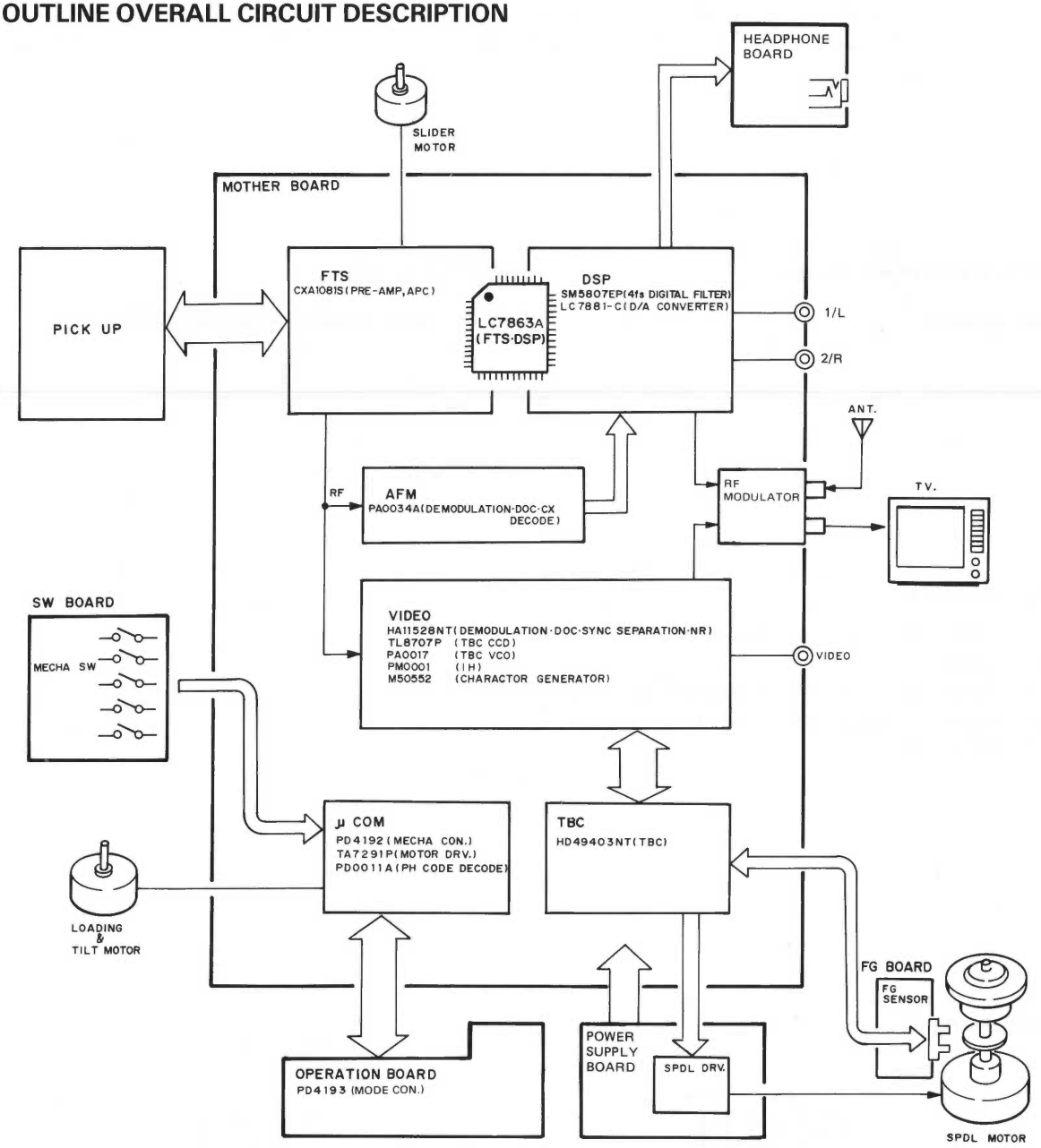
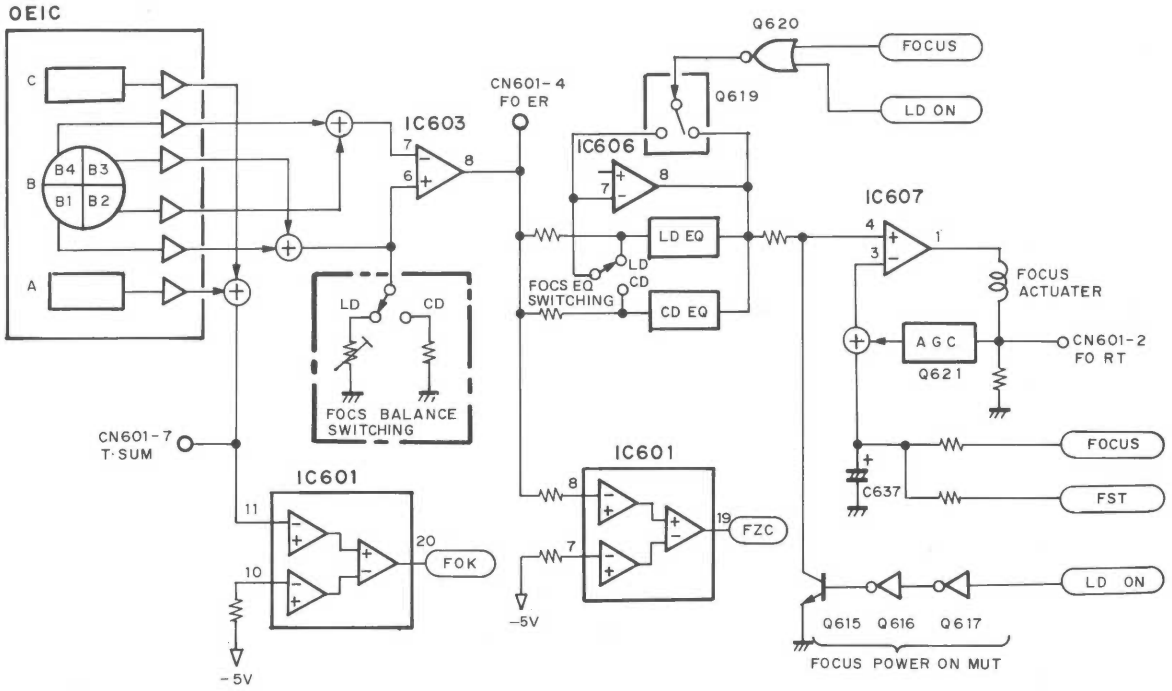


Fig. 10-1

- There are three main P.C. boards; the mother board assembly (VWX1002), the operation board assembly, and the power supply board assembly (VWR1007).
- The power supply board assembly (VWR1007) supplies the ±5 V, ±14 V regulated power supplies and drives the FL display. It also incorporates a switching driver to drive the spindle motor, the power transformer and the primary power switch.
- The operation board assembly incorporates the mode control IC, FL display tube, and the infrared signal receiver (remote sensor).
- The mother board assembly (VWX1002) consists of six major sections; the pick-up, the FTS section controlling the slider motor, the digital signal processor section, the video circuit section, the time base corrector section, the AFM section for analog sound, the mechanism control section and the microcomputer section which controls the servo circuits.
- Other than the above, there are the headphone board assembly, FG board assembly and switch board assembly.

10.2 OUTLINE OF FTS SECTION

1. Focus Block of FTS Section



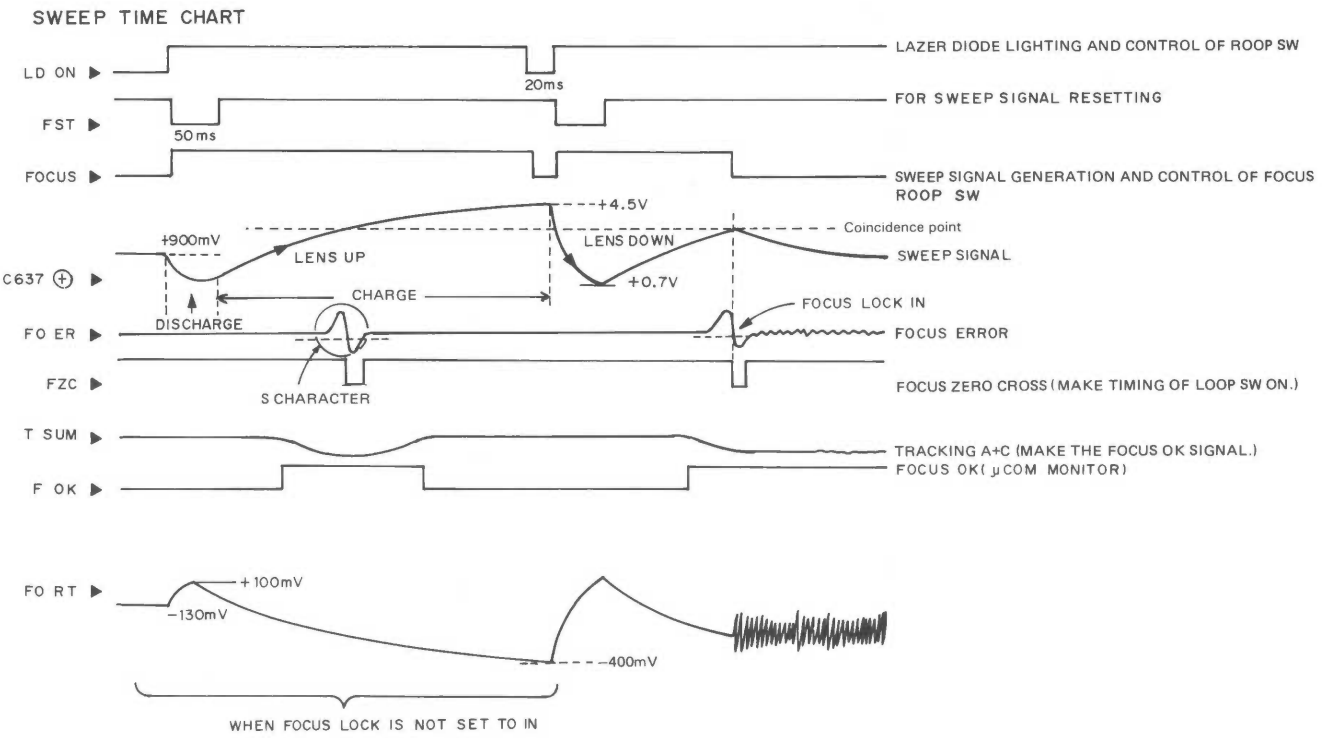


Fig. 10-2

The B1 — B4 signals output from the pick-up OEIC are processed in IC603 to produce the FOER (focus error) signal = (B1 + B3) − (B2 + B4). This is phase-compensated by IC606 and applied to the power op-amp IC607, and the resultant signal is used to drive the focus servo actuator. Q615 — Q617 form a muting circuit which mutes the offset voltage generated by OEIC-IC606 or the pop noise generated when the power is turned ON and OFF.

To start the focus servo, the pick-up actuator should be swept to the zero-cross point of the S-shaped signal. At first, together with LD ON, the FST signal (pin 14) of IC801 (LC7863A) goes low to discharge C637, then the FOCUS signal (pin 13) of IC801 (LC7863A) goes high to charge C637. With this charging curve, the actuator is lifted up to the matching point. At this matching point the S-shaped signal is generated, and at the zero-cross point of the S-shaped signal, the FZC pin (pin 19) IC601 (CX1081S) is inverted from high to low, Then, the FOCUS pin goes low and the focus loop switch of Q619 is opened from the shunt status to close the focus loop. At this time, the FOK pin (pin 20) of IC601 goes high due to the DC voltage obtained from TSUM, while the focus lock status is monitored by the microcomputer. If there is no FOK and FZC signal during focus sweep, it is judged that there is no disc. When the FOK and FZC signals are present, the focus sweep is repeated three times even when the focus cannot be locked.

2. Tracking Slider Block of FTS Section

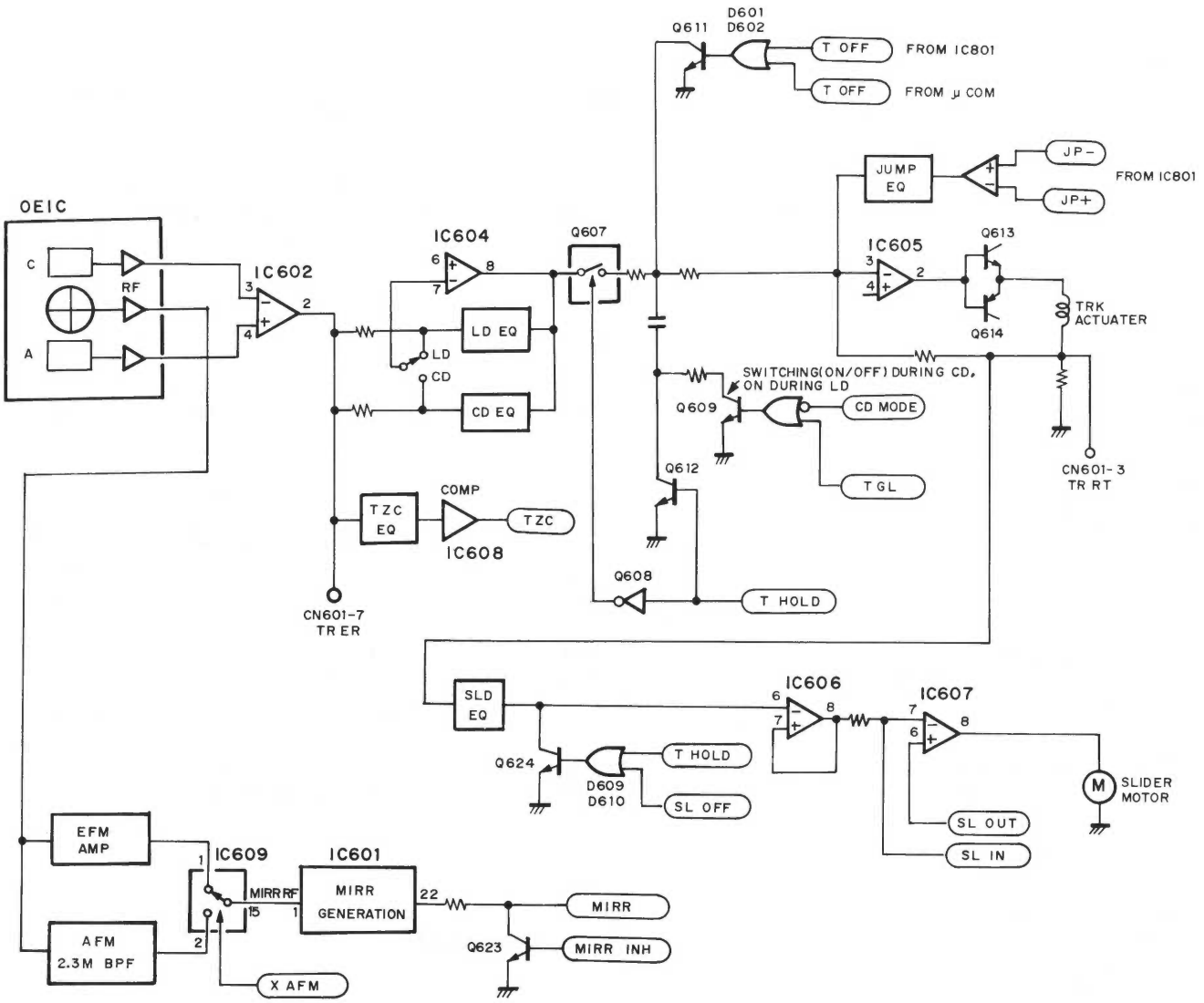


Fig. 10-3-1

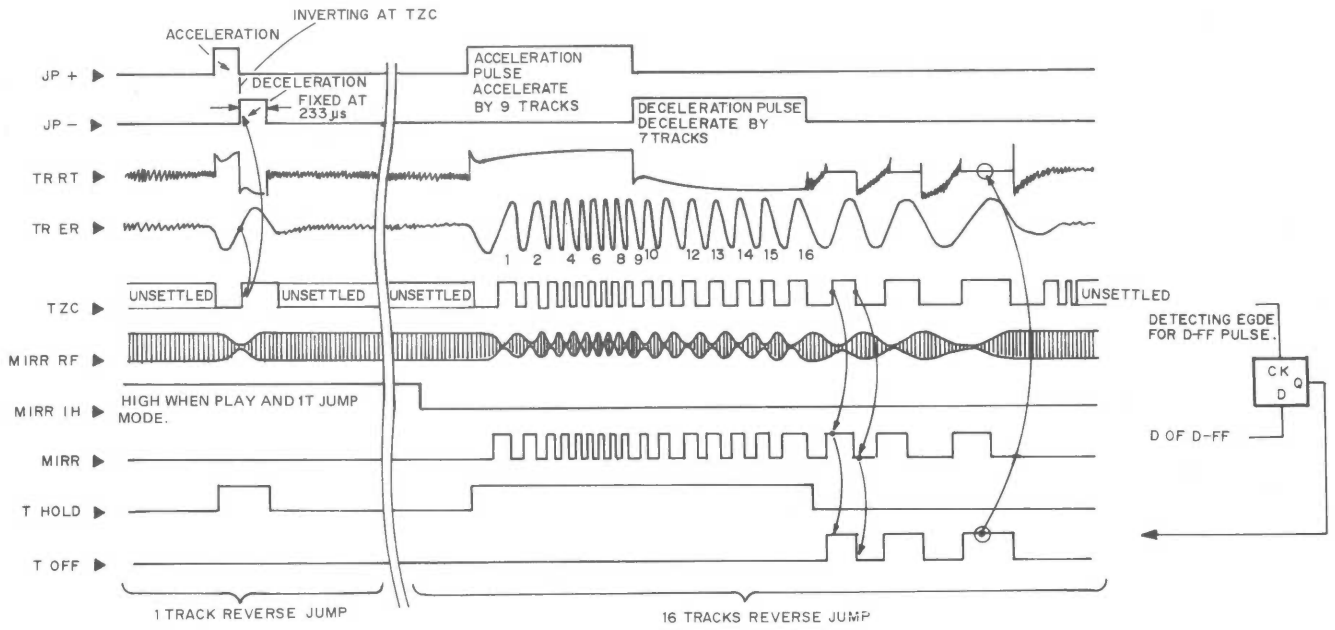


Fig. 10-3-2

The A and C signals output from the pick-up OEIC are processed by IC604 to obtain the TRER (tracking error) signal = C - A. This is phase-compensated by IC604 (2/2) and the power is amplified by IC605, Q613 and Q614. The resultant signal is used to drive the tracking actuator to perform tracking servo.

On the other hand, with the RF signal output from the pick-up OEIC, the EFM signal (for CD and LDD discs) or 2.3 MHz carrier signal (for analog LD disc) is amplified and input to pin 1 of IC601 (CX1081S) to obtain the MIRR signal from pin 22. The MIRR signal goes high when the RF signal is low, and goes low when the RF signal is high, which is used to judge whether the pick-up is on-track or off-track. The MIRR signal is generated in the same way as in our (Pioneer) CD players.

When 1-track jump is required, the accelerating pulse JP + is output from pin 22 of IC801 (LC7863A) by a command from the microcomputer. The decelerating pulse JP– is also generated at the edge of the TZC signal, to be used to release the acceleration in a fixed 233 μS interval. At this time, MIRR INH goes high and the brake mode which continues for 17 mS after 1-track jump due to IC801 is ignored.

IC801 (LC7863A) has 4, 16 and 32-track jump modes as well as 1-track jump. As a typical example, the operation of 16-track jump is described.

When 16-track jump is commanded by the microcomputer, the accelerating pulse is generated for 9-track periods. This track count is performed by counting TZC pulses. Then, the decelerating pulse is generated for 7-track periods, and the brake mode is engaged for 17 mS. In this brake mode, the MIRR signal is latched to turn the tracking loop OFF by the edge of TZC, to detect the direction of slipping of the actuator. It is used to eliminate the section which could cause further slipping of the error signal so that the object track can be reached more easily. TZC EQ prior to IC608 is used to compensate lead of the high-frequency phase of the tracking error signal generated in the phase compensation circuit of IC604.

The slider loop is the same as that in previous models CLD-1010, etc.

For the visual scan operation for LD discs, previous models CLD-1030 and CLD-3030 used a stopper system in which the slider was fed forcibly and the tracking opened when the drive voltage of the actuator reached a fixed DC value. But in the CLD-1070, a multi-jump system is used (4 - 32-track jump, described above). Therefore, at first, the track jump is performed to convert the actuator drive signal into DC so that it can easily be followed up by the slider loop.

3. RF Block of FTS Section

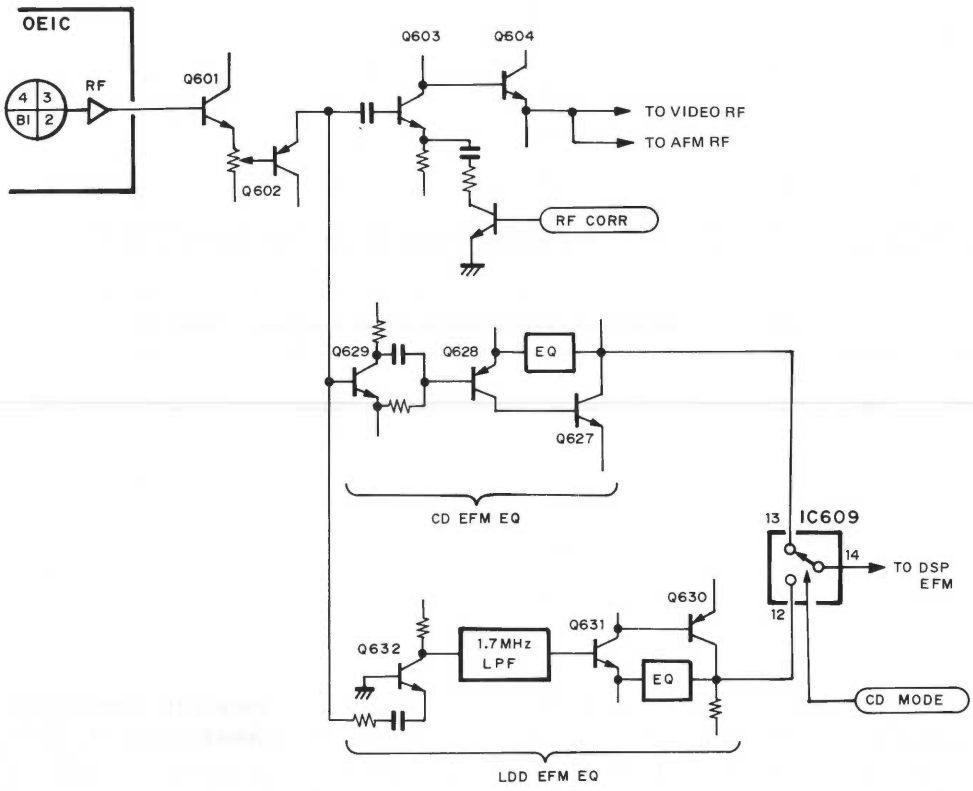


Fig. 10-4

The RF signal output from the pick-up OEIC is current-amplified by the emitter follower Q601. After passing through the semi-fixed resistor VR602 for RF level adjustment, the signal is applied to the emitter follower Q602 in which the signal is divided into three.

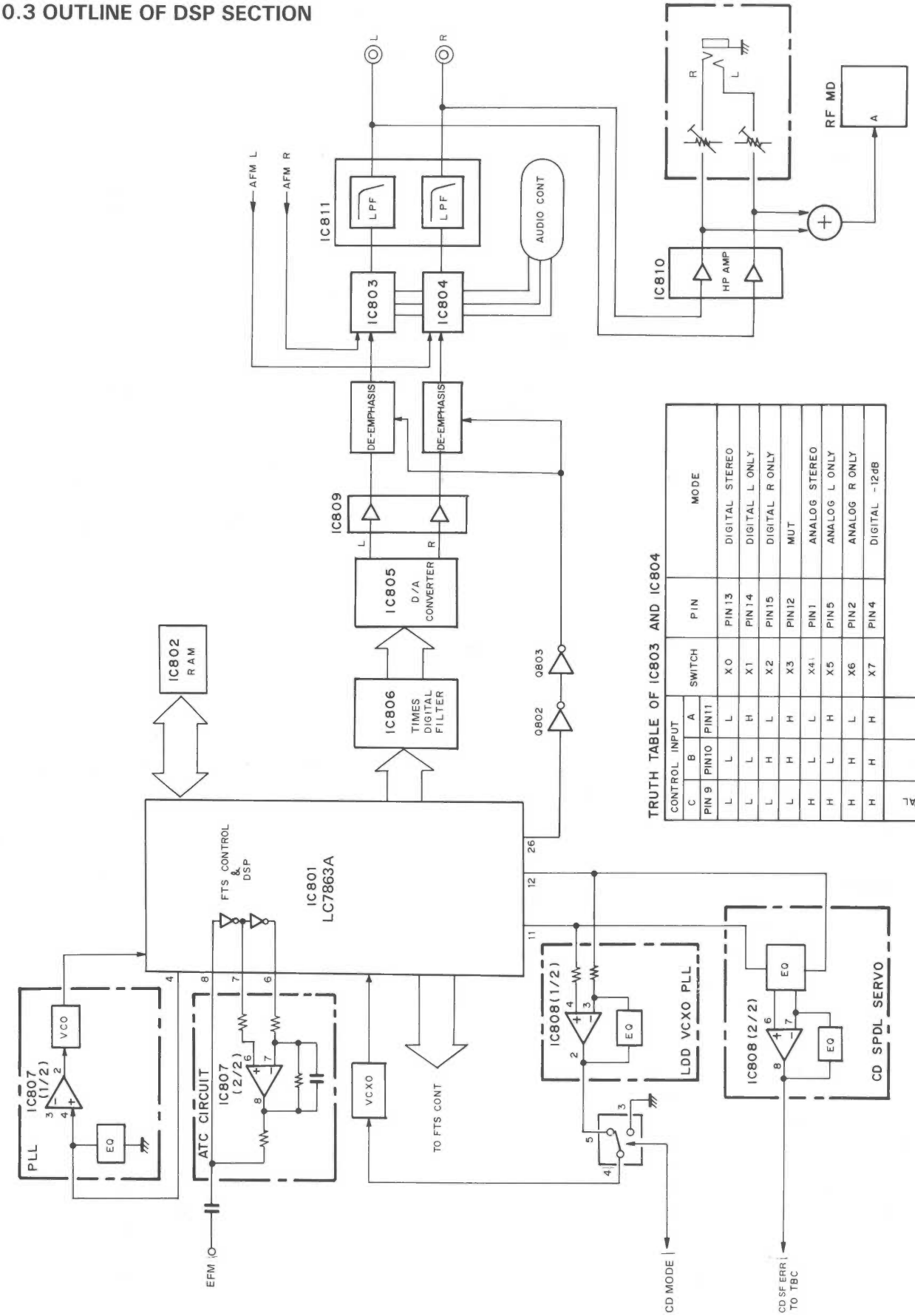
Part is voltage-amplified by Q603 and RF corrected for the inner tracks of CAV discs, or entire CLV, CDV discs. This is used to compensate the upper sideband of the FM signal which is lost in the optical circuits.

Another part is voltage-amplified by Q632, and the EFM signal (digital audio signal) is extracted from LDD discs using the 1.7 MHz LPF. Then the signal is applied to the direct-coupled voltage amplifier circuit consisting of Q630 and Q631, then input to the equalizer having reverse characteristics to the cutting system. A low-boost circuit is also incorporated to compensate for loss caused by the low-frequency cut-off in the pick-up OEIC.

The last part is used for EFM signal in CD playback. The high-frequency components lost in the optical circuits are boosted by Q629 while the group delay which was degraded due to the boosting of high-frequencies is compensated by phase shifter Q629.

The direct-coupled amplifier circuit consisting of Q627 and Q628 is used to compensate for the low-frequency time constant of the pick-up OEIC as well as the boosted high-frequencies. The EFM signal obtained from an LDD or CD as above is selected by a switch in IC609 and is supplied to the DSP section.

10.3 OUTLINE OF DSP SECTION



TRUTH TABLE OF IC803 AND IC804

CONTROL INPUT			SWITCH	PIN	MODE
C	B	A			
PIN 9	PIN10	PIN11			
L	L	L	X0	PIN13	DIGITAL STEREO
L	L	H	X1	PIN14	DIGITAL L ONLY
L	H	L	X2	PIN15	DIGITAL R ONLY
L	H	H	X3	PIN12	MUT
H	L	L	X4	PIN1	ANALOG STEREO
H	L	H	X5	PIN5	ANALOG L ONLY
H	H	L	X6	PIN2	ANALOG R ONLY
H	H	H	X7	PIN4	DIGITAL -12dB
DIGITAL			SO2		
			SO1		

Fig. 10-5

The EFM signal transmitted from the FTS section is input to pin 8 of IC801 (LC7863A) and amplified by the limitter amp with a 2-stage inverter. So that the average DC voltage between pin 6 and pin 7 of IC801 becomes 2.5 V,offset is applied to pin 8 of IC801 by IC807 (2/2). This compensates for the asymmetry caused by the optical circuits when playing a CD. When playing an LDD, since asymmetry is not generated but it is not necessary to be turned OFF, the input signal is processed as it is. IC807 (1/2) and IC801 pins 2 and 3 form a PLL circuit used to pick-up the clock frequency. IC808 (1/2) and VCXO consisting of IC801 pins 79, 80 are the PLL loop used for playing LDD discs. When playing LDD discs, first the disc-rotation speed is locked to the 14.31818 MHz reference oscillator of the TBC. The EFM signal obtained in this way is used to lock the VCO consisting of IC802 pins 2, 3 and the VCXO consisting of IC801 pins 79, 80. IC808 (2/2) is an equalizer for the spindle servo when playing CD discs. When playing CD discs, the VCXO input is grounded by IC609 which forms a fixed oscillator. The CD spindle error signal obtained from IC808 (2/2) is fed to the TBC block and applied to pin 31 of IC901 (HD49403NT), and the spindle motor is driven by the switching driver. The selector switch in IC901 is selected by serial commands from the microcomputer. The EFM signal is demodulated by IC801 (LC7863A) and the signal is passed through the 4-times oversampling digital filter IC806 (SM5807EP) and converted into an analog signal by D/A converter IC805 (LC7881). Next, it passes through the buffer amplifier and deemphasize circuit and is input to the switch-over switches in IC803 and IC804. In this IC, analog/digital signal switching, L/R channel selection and muting by 12 dB are performed. Then the resultant signal is passed through the active low-pass filter IC811 and output to the pin-jacks. The truth tables of IC803 and IC804 are shown in Fig. 10-5.

10.4 OUTLINE OF VIDEO SECTION

The RF signal transmitted from the FTS block is passed through a BPF in which the audio FM signal is picked up and another BPF in which the video FM signal is picked up, and these signals are applied to the AFM processing circuit and VIDEO processing circuit. Most of the AFM processing circuit is contained in IC351 (PA0034A).

1. FM Decoder Block of VIDEO Section

The video FM signal is passed through buffer Q420 and input to pin 5 of IC402 to be demodulated. After demodulation, the signal is output from pin 9. This demodulator uses a delay-type multi-vibrator. The demodulated video signal is input to a discrete LPF in which the carrier components are suppressed. After passing through de-emphasis circuit Q422 and buffer Q423, the signal is input to the delay filter. This delay filter is used to suppress the carrier components as well as to compensate the time lag with respect to the video signal included in the DOC signal. After passing through buffer Q424, the video signal is input to IC402 pin 18, which is the video terminal for the main line of the dropout video signal select switch. When there is no dropout, this signal is output from pin 22 and is applied to the time axis correction CCD IC403 via the buffer Q417.

2. Dropout Corrector of VIDEO Section

The detection of dropout is performed by the frequency detection circuit in IC402. This circuit uses the charging/discharging at pins 11, 13, and if the pulsewidth of the FM rectified waveform becomes wider than the specified value during a low-level period, it is regarded as dropout. For the signal input to the detection circuit (pin 9) in IC402, the video FM signal transmitted from buffer Q420 is used. The video signal which is 1H-delayed by IC405 is input to IC402 pin 20, the 1H-delay video pin for dropout video signal select switch. When dropout occurs, a signal is output from pin 22.

3. Sync Separator Circuit of VIDEO Section

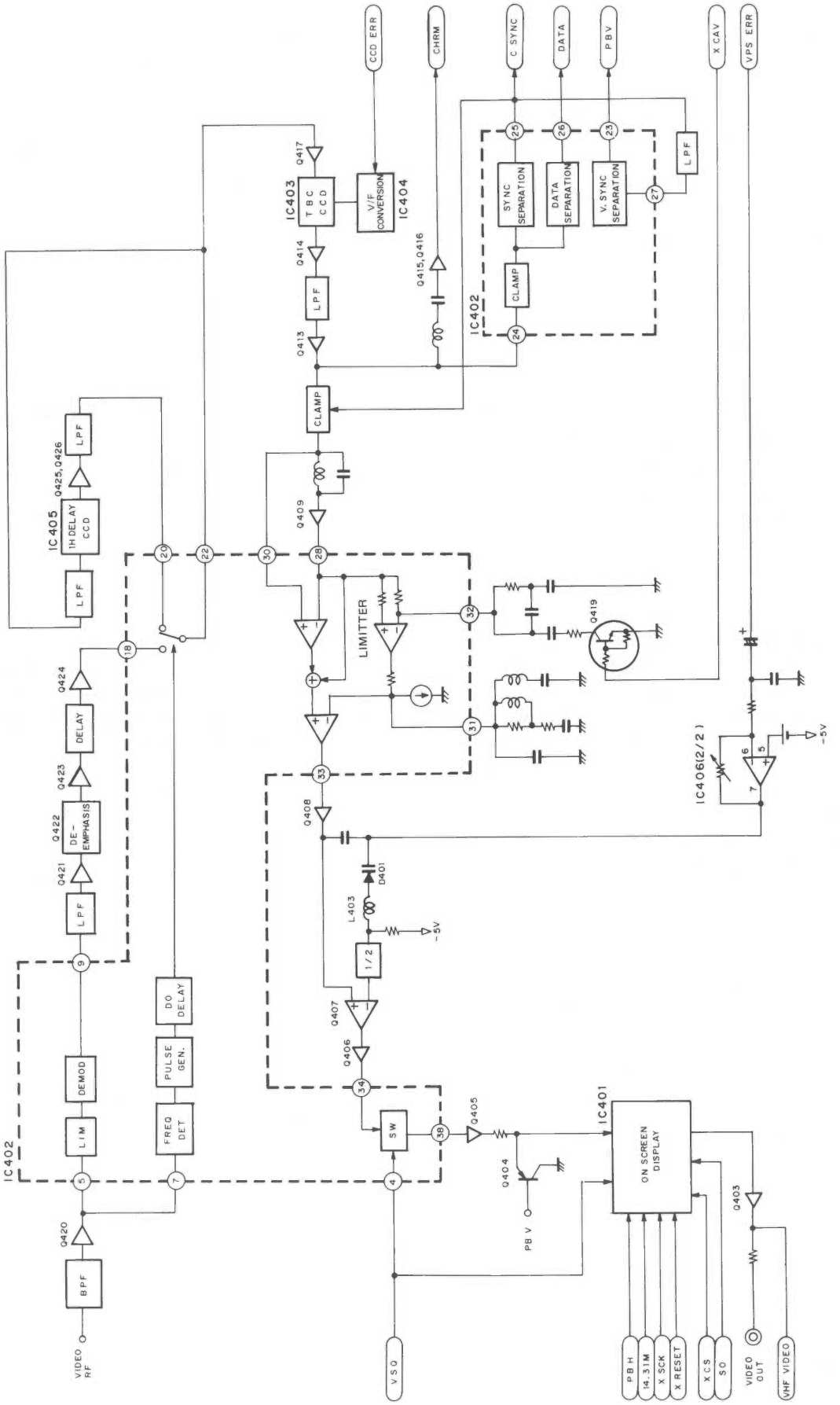
The same circuits as in previous models are used for the circuits from IC403 to the buffer Q413 via LPF. The output signal from Q413 is input to IC402 pin 24. After the signal is clamped in IC402, it is input to the sync separator circuit and the data separator circuit. The sync signal is output from pin 25 while the data is output from pin 26. The vertical sync separator circuit picks up only the vertical sync signal components from the sync separator output, by CR integration. The resultant signal is waveform-shaped and output to pin 23.

4. Sync Tip Clamping Circuit of VIDEO Section

The sync tip clamping circuit consisting of Q410 — Q412 is used to eliminate the DC deviation components generated in IC403. The resultant signal is input to the video NR circuit.

5. Video NR Circuit of VIDEO Section

The video NR circuit is used to reduce audio beats and crosstalk with CLV discs. Before being input to this circuit, the video signal is trapped by an LCR to attenuate the color signal and only the luminance signal is applied to the NR circuit. After noise is reduced, the color signal which is generated by subtracting the above luminance signal from the original video signal is added to further eliminate noise. The amount of attenuation is determined by the circuit which is externally connected to pin 31 of IC402. In the external circuit connected to IC402 pin 32, the frequency range of the noise which is to be reduced is determined. When playing CLV discs, Q419 is turned ON to reduce low-frequency noise and, at the same time, to eliminate crosstalk.



Video Section

6. VPS Circuit of VIDEO Section

The VPS circuit is used to compensate for uneven color hue in the picture due to residual jitter, and consists of Q406 — Q408 and the phase modulation circuit made up from L403 and D401. The residual jitter (VPS ERROR) is amplified by IC406 to drive varicap D401. The operation principle of this circuit is the same as that of the conventional IC (PA9003).

7. Video Squelch, MCA Code Suppress Circuits of VIDEO Section

After the color hue is compensated by the VPS circuit, the video signal is passed through the video squelch circuit in IC402 and output from pin 38. Then, after the MCA codes in the V-blanking period are suppressed by Q404, the signal is input to IC401.

8. Blue-back (blue background), Character Insertion Circuit of VIDEO Section

In IC401 (M50552), the selection between the playback video signal and the blue background signal, and the insertion of characters is performed, then output to the pin jacks via buffer Q403.

10.5 OUTLINE OF TBC SECTION

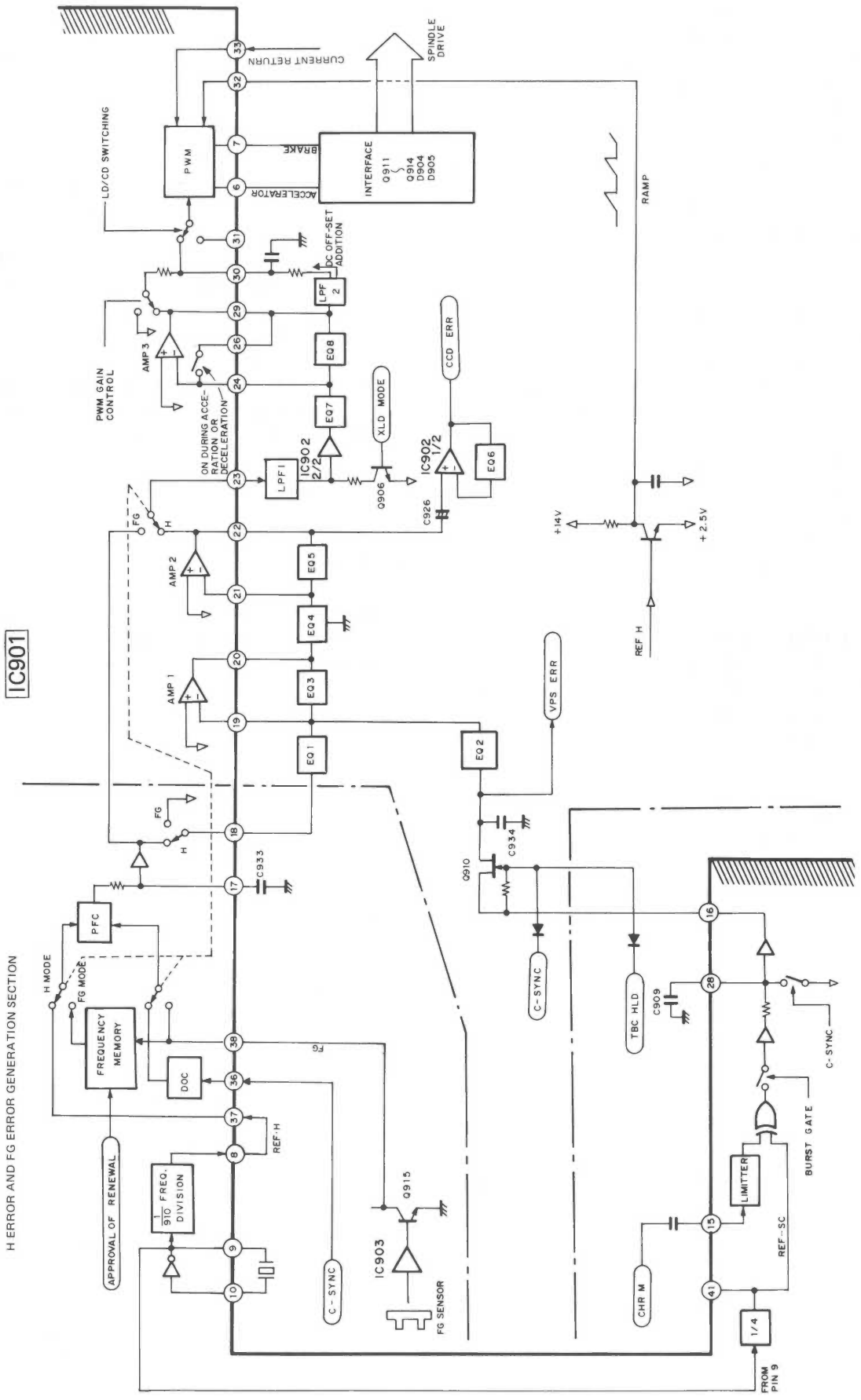
As opposed to the system using trapezoid waves, the TBC circuit in this unit used the PFC (same as TC5081) to generate the H-error signal. Since the PFC has lower phase detection accuracy when compared to that of trapezoid system, a loop is configured mainly for burst errors. Therefore, the loop is made by adding the burst error and H-error. With this, the phase lock points will be generated at the point where the DC outputs of both phase comparators are well balanced.

The relationship between the spindle servo and the CCD (Charge Coupled Device) is the same as that in models LD-S1, CLD-3030, CLD-3070, etc. The error signal is passed through C926 before being input to the CCD, in which the previous DC component is regarded as the spindle servo error. Therefore, when the CCD loop is forcibly opened, the gain setting of the spindle servo is displaced and the spindle servo is unlocked.

The runaway detection system of this unit is completely different from that in previous models. In this unit, it relies on the FG (Frequency Generator) signal obtained by the FG sensor mounted on the spindle motor. First, when the spindle motor starts rotating, its speed is accelerated to about 1600 rpm, and to 1800 rpm by the FG servo, then enters the H-loop. In the case of CAV discs, if the spindle motor is unlocked, the speed is maintained at 1800 rpm by the FG servo and enters the H-loop. In the case of CLV discs, the FG frequency when the spindle motor is locked is stored in memory. And if the spindle motor is unlocked, the number of revolution stored in memory is picked up and the H-servo is engaged.

The gain control also depends on the FG, unlike the previous method. In the case of CLV discs, the FG frequency is read out, and the spindle error is PWM (Pulse width Modulation) by the chopper to control the gain, so that the correct spindle gain is obtained according to the number of revolution. Also for 8-inch discs, the gain is controlled by switching the chopper using commands from the microcomputer. However, the gain for CDV discs is not controlled from inside IC901, but a chopper is switched by the externally-connected transistor switch Q906. The switch located between pin 29 and pin 30 of IC901 is the chopper select switch. The chopper is located in the last stage of the spindle loop. For this, since the DC error voltage, that is, the voltage used to rotate the spindle motor, is also chopped, the dynamic range is narrowed at the outer edge of CLV discs. Therefore, the DC error voltage is bypassed by LPF2 to prevent offset from occurring.

Here, the signal path of the TBC (Time Base Corrector) is described. The reference frequency 14.31818 MHz generated by the crystal oscillator connected between pins 9 and 10 of IC901 is divided to 910, and the REF-H signal is output from pin 8 and input to pin 37. The C-SYNC signal input to pin 36 is protected from dropout and output as PB-H. Both signals are input to a PFC (Phase Frequency Comparator) and output from pin 17. This signal is smoothed by capacitor C993, passes through the buffer amp, and is output from pin 18 as the H-error signal. The chroma components of the video signal are removed by a BPF, and the resultant signal is input to pin 15 for waveform shaping by the limitter. This signal is phase-compared (by the EXOR circuit) with the REF-SC (Reference Sub-carrier) signal which is generated by dividing the 14.31818 MHz clock into four, then passed through the burst gate. Then, the signal is smoothed by the capacitor C909 connected to pin 20 of IC901, and is passed through the buffer amp then output from pin 16 as the burst error signal. The H-error signal is passed through EQ1, while the burst error signal is passed through EQ2, and both signals are mixed by AMP1. The mixed signal is applied to EQ3 — EQ5, and EQ6 of IC902 (1/2) to be used to drive the CCD. The operating point of the op-amp incorporated in IC901 is 2.5 V, but IC902 (1/2) operates at 0 V. The CCD loop consists of EQ1 — EQ6 as described above. Since IC902 is coupled with a capacitor, the CCD operates at around 0 V and there is no DC offset. As the DC error components in the CCD loop will remain in the output of AMP2, the DC components are used to control the rotation speed of the spindle motor. Either the FG loop or H loop is selected by the switch between pins 22, 23 of IC901, and input to LPF1, which is used to reduce the ripple in the FG error signal.



Block Diagram of TBC Section

The signal is passed through a buffer in IC902 (2/2) and is applied to EQ7, EQ8, then the gain is controlled by the chopper switch and input to the PWM circuit. The RAMP signal which is generated from the REF-H signal is input to pin 32 of IC902 so that the spindle error signal is PWM (Pulse width Modulation), then it is used to drive the spindle motor via the switching driver Q203 — Q206 (on the power supply board assembly). This PWM circuit is the same as that used in the CLD-3070, but in this unit, it is incorporated in the IC (IC901).
The residual jitter components which cannot be reduced by the TBC circuit are suppressed by the VPS circuit (in the video block), as in previous models. In previous models, shifting by 140 nS is performed for each jump by the TBC, but this is not done in this model. This is because, since the loop depends on the burst error, the phase will shift by 140 nS each time a track jump is performed. To make the taking in operation smooth, the burst error is held by Q910 and C934 before and after track jumps. The ripple component of the burst error signal generated in IC901 may cause uneven color. Therefore, Q910 performs by a sample-and-hold operation to suppress ripple components. All these operations of IC901 are controlled by serial data from a microcomputer. The operation of IC901 is inhibited by D904 and D905 when the power is turned ON until initialization is completed by the microcomputer. This is to prevent mis-operation, because if both pins 6 and 7 of the PWM circuit go high, all the transistors in the spindle driver (in the power supply board assembly) will be turned on.

10.6. LOADING MOTOR CONTROL

The loading motor drive is controlled by the signals output from pins 24 — 26 of the mechanism control IC (IC301) via the motor driver IC (IC304). The voltages applied to the loading motor are switched by the control signals, as follows:

Slow	CW	CCW	CN6-2	CN6-1	Motor operation
L	L	L	—	—	—
L	L	H	0V	5V	Low-speed counterclock-wise rotation
L	H	L	5V	0V	Low-speed clockwise rotation
L	H	H	0V	0V	Short brake mode
H	L	L	Open	Open	Motor both-ends open mode
H	L	H	0V	11V	High-speed counterclock-wise rotation
H	H	L	11V	0V	High-speed clockwise rotation
H	H	H	—	—	—

The operations of the loading motor may be divided into two types; the loading/clamp operation and tilt servo operation. Each of these operations is described below:

• Loading/clamp operation
When performing the opening/closing of the tray, disc clamp and stop operations, the motor is rotated while detecting the position of the cam gear by the loading/tilt position detection switch connected to pins 61 — 63 of IC301.
In this mode, the motor is driven in the high-speed mode.
Even after the operation is finished, this switch always monitors the cam gear in the standby position and tilt neutral position, and if the position of the cam gear is displaced, it is compensated in the low-speed mode.
** For the table showing the correspondence of the detection switch positions and modes, refer to the pin description of PD4192. (See page 127)*

• Tilt servo operation
When an LD disc or CDV disc (video part) is played back, the loading motor is used for tilt servo.
For operations in this mode, the motor is driven in the low-speed mode.
In the tilt servo mode, the loading motor is operated by the PWM drive which has 2-step duty. (50% duty in high-speed mode, 8% duty in low-speed mode)
The tilt servo controls the loading motor so that the voltage of the signal input to pin 5 (TILT) of IC301 becomes 2.5 V.
The operating ranges of the tilt servo in the normal play modes are as follows:

CAV disc	12-inch:	Frame 0 — 40999
	8-inch:	Frame 0 — 16999
CLV disc	12-inch:	0 min. — 44 min. 59 sec.
	8-inch:	0 min. — 13 min. 59 sec.
CDV disc	Video part:	0 min. 0 sec. — 0 min. 59 sec. (Recording time > 3 min.)

If there is an abnormality on the disc or in the tilt sensor circuit and the inclination of the pick-up is more than ±2°, and the input voltage of the TILT pin does not come within the setting range, the mechanism switch condition is detected to stop the loading motor.

10.7 SLIDER MOTOR CONTROL

The slider motor drive is controlled by the signals output from pins 19, 21 and 22 of the mechanism control IC (IC301) via IC607.
The voltages applied to the slider motor are switched by the control signal as follows:

COFF	SLOUT	SLIN	CN5-1	Motor operation
L	L	L	Servo	Slider servo ON mode
L	L	H	—	—
L	H	L	—	—
L	H	H	—	—
H	L	L	0V	Stop mode
H	L	H	−5V	Counterclockwise rotation
H	H	L	+5V	Clockwise rotation
H	H	H	—	—

When the pick-up position is moved forcibly to judge the presence of a disc or to start the motor, the motor is driven while detecting the pick-up position using the park switch connected to pins 7, 8 of IC301.

10.8 OPERATIONS WHEN THE POWER IS TURNED ON

After the power is turned ON, when the mechanism control microcomputer (PD4192) is reset (pin 45 goes from high to low), initialization is performed in the following order:

1. The terminals of the internal RAM are initialized.
2. The NOP command is transferred to LC7863.
3. PD0011A is initialized.
4. The tray position is detected.
5. HD49403 is initialized.
6. Communications with PD4193 are confirmed.

— If communications are not performed correctly, the following initializing operations are not performed.

7. The pickup position is initialized.
8. Disc rotation is stopped.
9. The loading mode is initialized.

After all the above initializing operations are completed, normal operation is possible.

10.9 OUTLINE OF MODE MICROCOMPUTER IC252: PD4193

This microcomputer performs the following processing:

(1) Key data/remote control signal processing
Accepts the key switch and remote control signals to perform the processing corresponding to the keys.

(2) FL display
Displays information in the FL tube (VAW1010).

(3) On-screen display
Controls the character generator IC (IC401: M50552-132SP) to superimpose characters on the screen, as well as the blue-background.

(4) Mechanism control microcomputer control
Indicates the operation to the mechanism control microcomputer (IC301: PD4192), and at the same time, reads out time data, etc.

(5) System reset control
If communications with the mechanism control microcomputer become abnormal, resets the system to the initial status.

10.10 SERIAL INTERFACE

- There are two microcomputers in the CLD-1070, a 4-bit microcomputer (IC301: PD4192) that controls the mechanism and a 4-bit microcomputer (IC252: PD-4193) that controls the operation and display.
  The two microcomputers are connected via a serial interface.
  This communication line is also used to control peripheral ICs (IC401: M50552-132SP, IC801: LC7863K). To prevent interference between them, the ON/OFF switching of the communication line is controlled by an electronic switch (IC303: NJU4053BD).

10.11 COMMUNICATIONS BETWEEN MICROCOMPUTERS

(1) PD4192 inverts the SHAKE pin (pin 33) to low for several microseconds to send the communication start request to PD4193.

(2) When PD4193 receives the communication start request, the ACK pin (pin 17) is inverted to low to inform PD4192 that communications are possible.

(3) PD4192 inverts the SQEN pin (pin 13) to low to connect the communication line between the microcomputers via the switch (IC303).

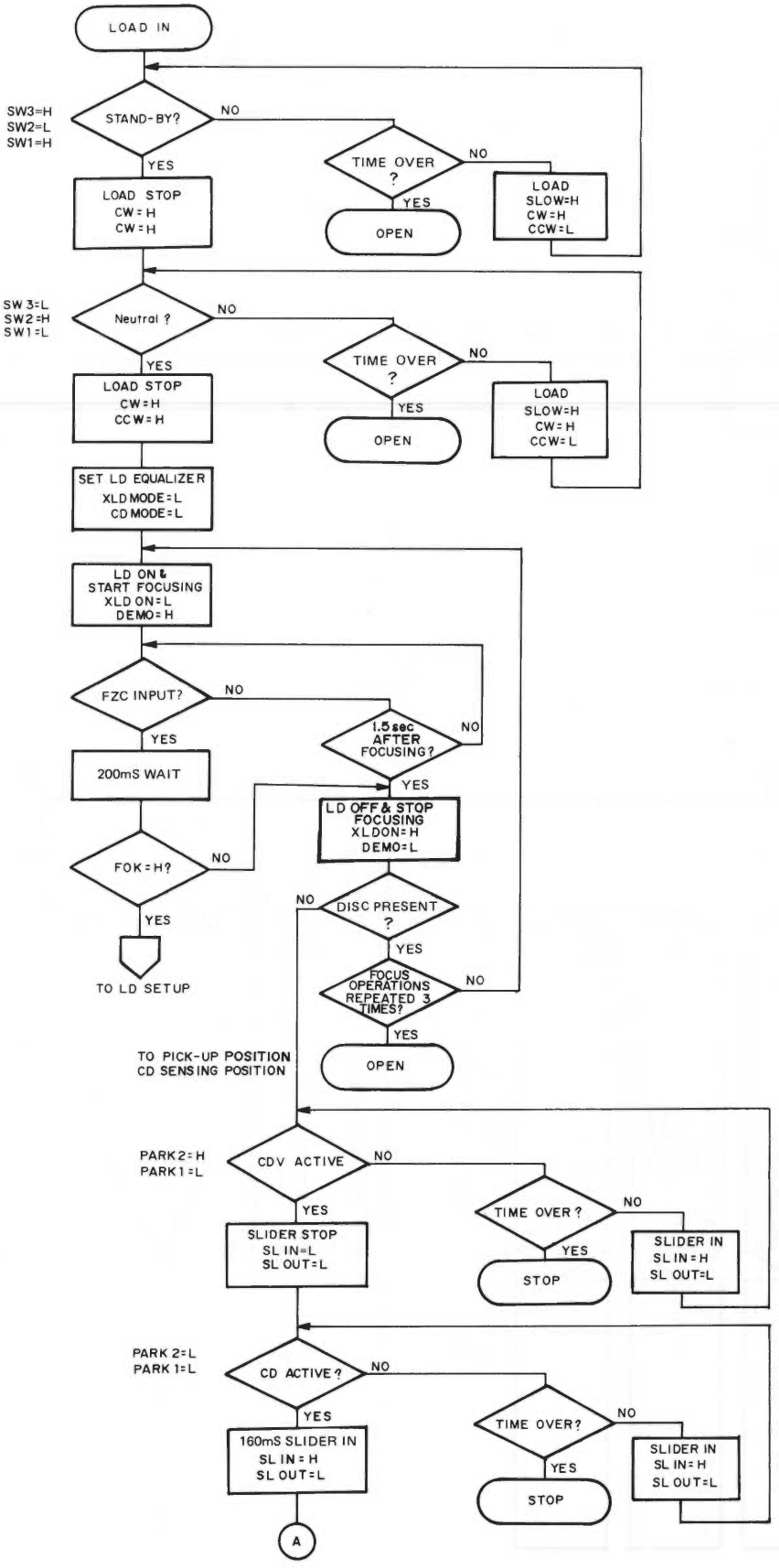
(4) PD4192 transmits the transfer clock (1 MHz) for 8 bits, which synchronizes the transmission and reception of data.

(5) When PD4193 receives the 8-bit data, the ACK pin (pin 17) goes high to signal that the communication has finished.

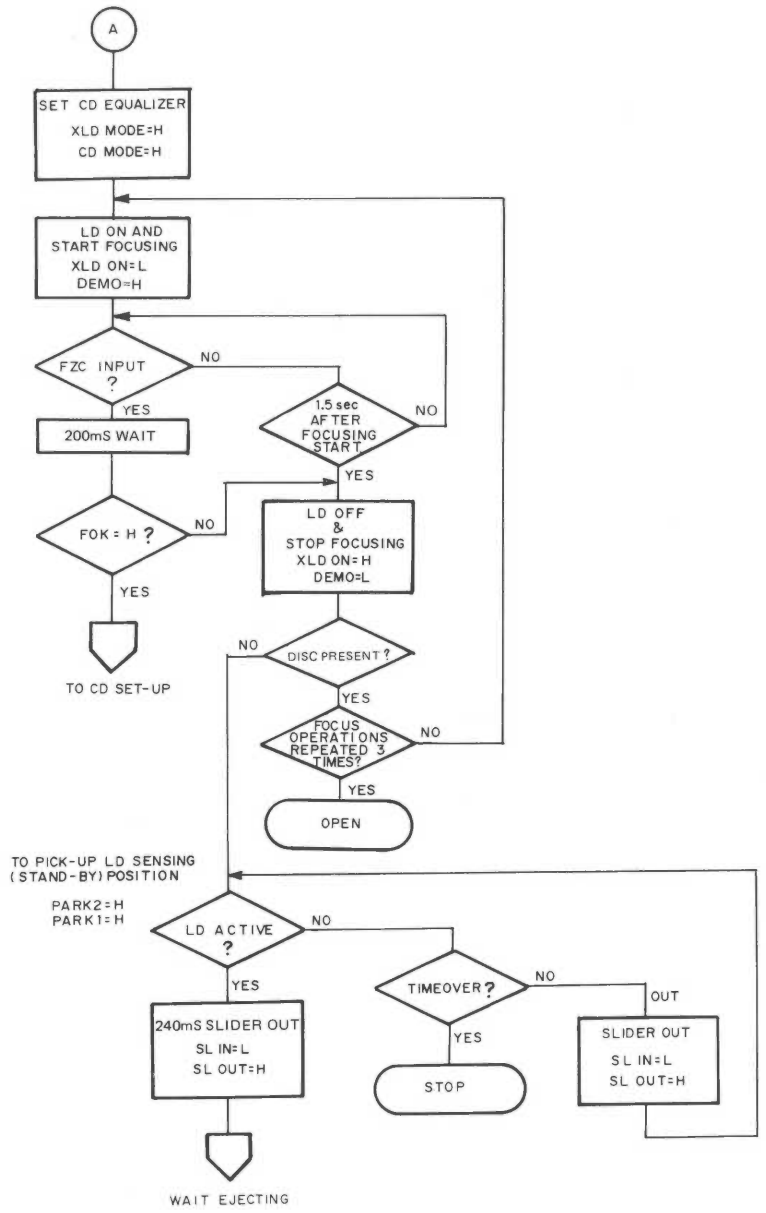
(6) PD4192 inverts the SQEN pin (pin 13) to high to separate the communication line, which completes the communication sequence.

- In communications, 8 bytes of data are transferred as a unit in a 10 — 30 msec period.
- Handshaking is performed using a single-line system. Both PD4192 and PD4193 use common input/output ports; they are normally set to the input mode (high-impedance) and are only set to the output mode when a low level signal is output. Before outputting the low level signal, both microcomputers check that the SHAKE pins are at high level, to prevent interference between the two outputs.
- A check code is added to the communication data to prevent transfer errors. When a transfer error is detected 16 times continuously, PD4193 outputs a reset signal to PD4192 to restore the initial status. If communications are not performed for more than 300 msec., it is reset in the same way.

• Flowchart from tray open status to tray in operation



- From open status till tray-in operation is completed
- If the loading operation is not finished within 10 seconds, it is regarded as abnormal and the tray is opened again
- Clamping
- Pick-up position during LD focus operation: around R65
  R: The distance from center of the spindle motor.
- During focus sweep operation, when FOK goes high or drop signal is input to FZC, it is regarded that a disc is present.
- With a disc present, if the focus lock is not obtained after sweeping the focus three times, it is regarded as abnormal and opens the tray.
- Slider operation limit timer: about 10 seconds
- If the slider operation is not finished within a fixed time, the player enters the stop mode and no key inputs other than OPEN key are accepted.

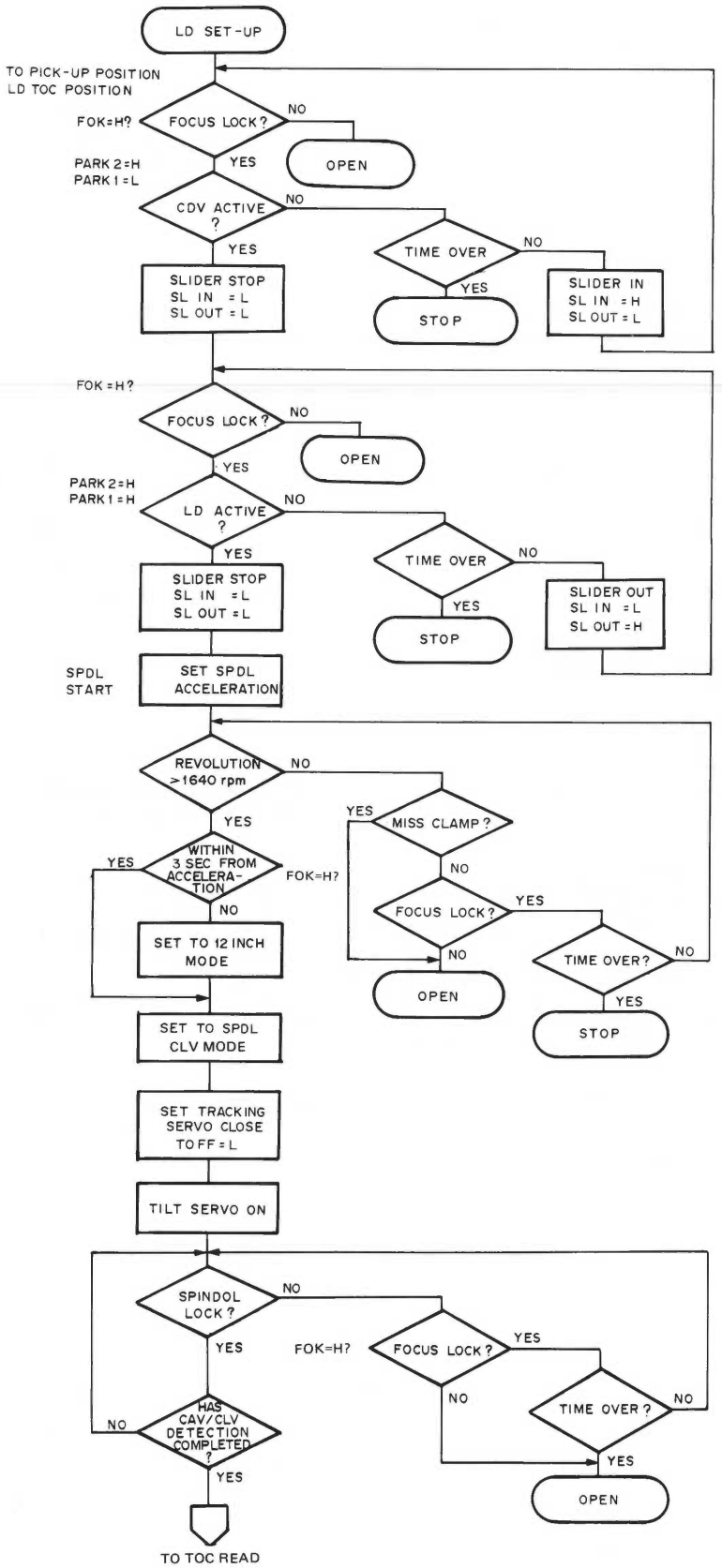


- Pick-up position during CD focus operation: around R30
- CD focus operation is performed in the same way as that for LDs.
  R: The distance from center of the spindle motor.

- LD sense position: around R65
  R: The distance from center of the spindle motor.

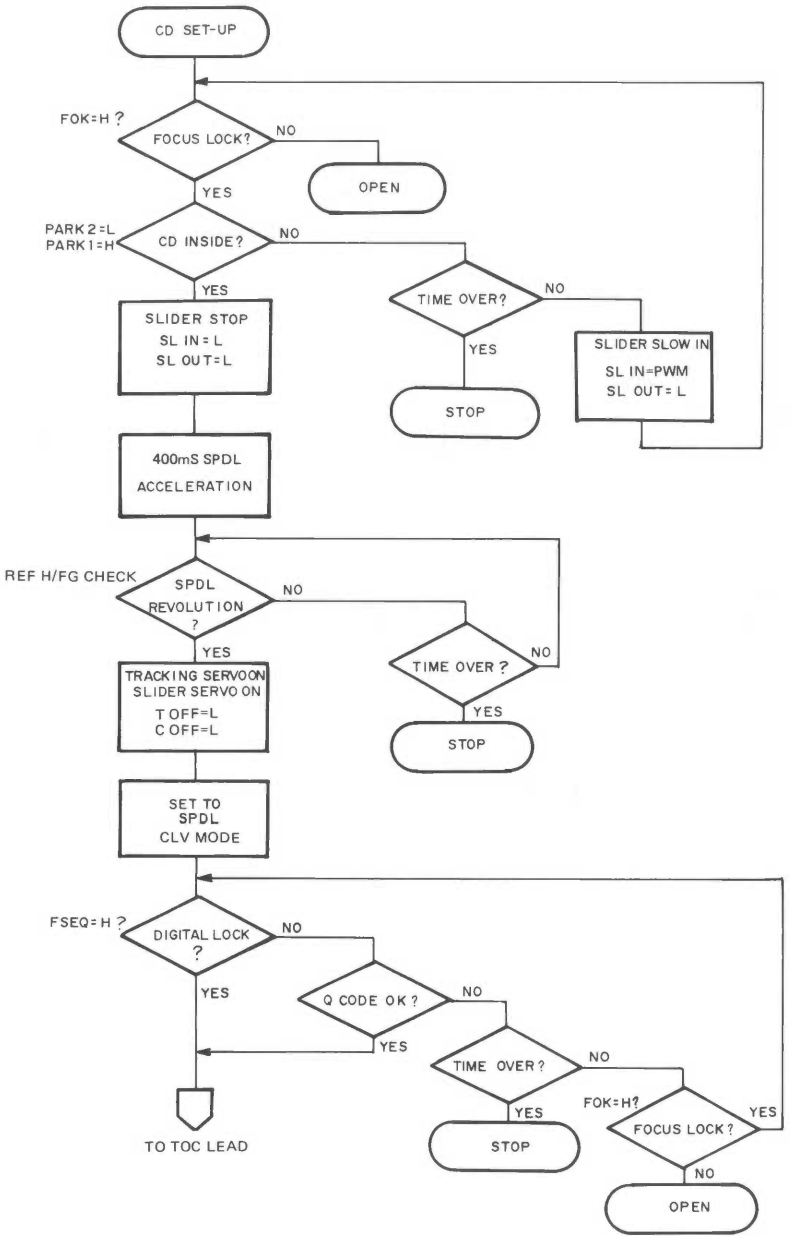
- Timer: about 10 seconds.
  Timer → The TIME OVER time mentioned on the left.

• Flowchart of LD Setup



- When the focus is unlocked while the pick-up is moving to the spindle motor start position, it is judged that LD and CD discs have been loadded simultaneously and the tray is opened.
- Timer : about 10 seconds
  Timer → The TIME OVER time mentioned on the left.
- Timer : about 10 seconds
- Until the disc rotation speed exceeds 1640 rpm, the tracking servo is set to the open mode and SPDL MOTOR is forced acceleration.
- When the pick-up moves across more than 600 tracks in one revolution of the disc, it is judged as mis-clamping and the tray is opened.
- If the focus is unlocked during setup operation, it is judged that there is a scratch on the disc or that the unrecorded surface of the single-side disc is being played, and the tray is opened.
- When the disc rotation speed does not exceed 1640 rpm within 15 seconds after the spindle motor starts accelerating, the player enters the stop mode.
- When the CAV/CLV judgment is not complete within 3 seconds after tracking close, the tray is opened.

• Flowchart of CD Setup

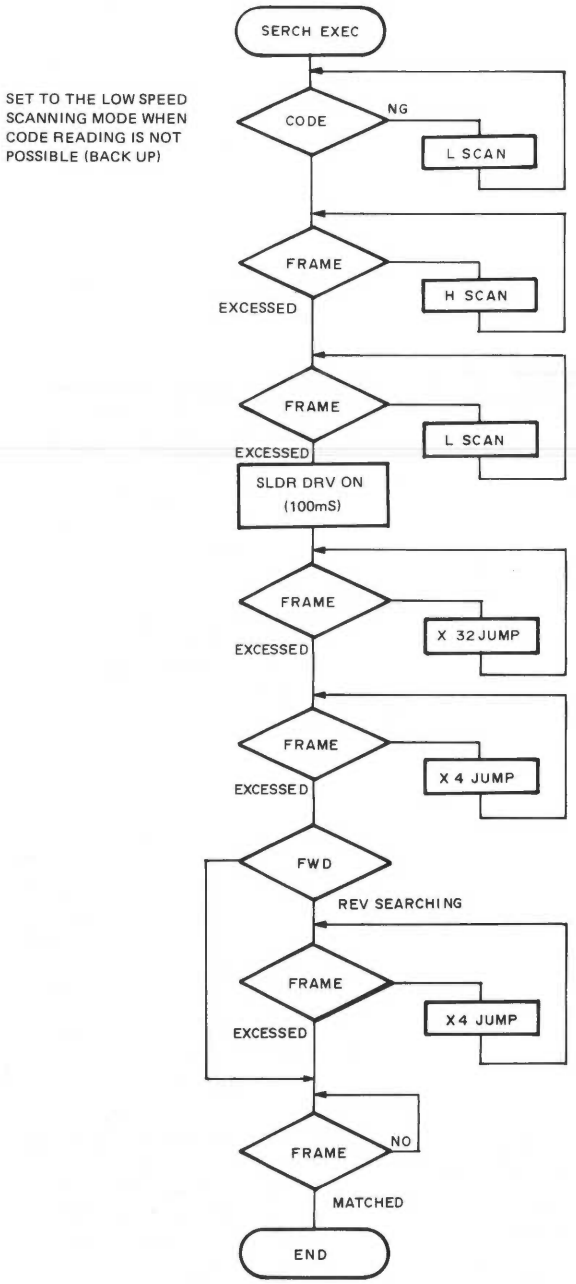


- When the pick-up is fed to the inside of the disc (CD), the disc speed is lowered by driving the slider motor in PWM drive.
- When a CD is loaded, the spindle motor is accelerated for 40 mS forcibly.

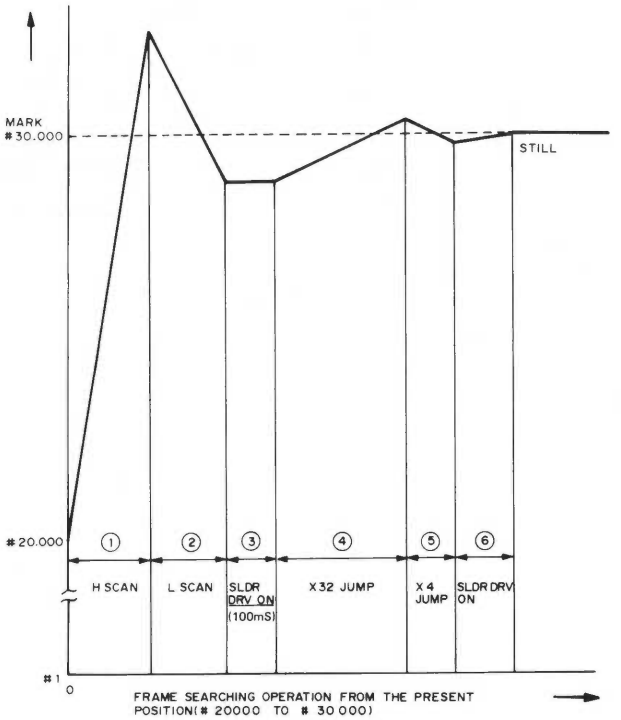
- When the FG input signal is not inverted 6 times within 2 seconds, the player enters the stop mode.

- When the digital lock or Q-code OK signal is not detected within 2 seconds after the tracking/ slider servo is closed, the player enters the stop mode.
- If the focus is unlocked during disc rotation, it is judged that the unrecorded surface of the disc has been placed on the tray, and the tray is opened.

• Flowchart of Frame Search Operation



- Slider motor drive duty : 1/8
- Slider motor drive duty : 100%
- Slider motor drive duty : 1/8
- Waiting for 100 mS (tracking/ slider servo ON)
- 32-track jump
- 4-track jump
- 4-track jump (Reverse search only)

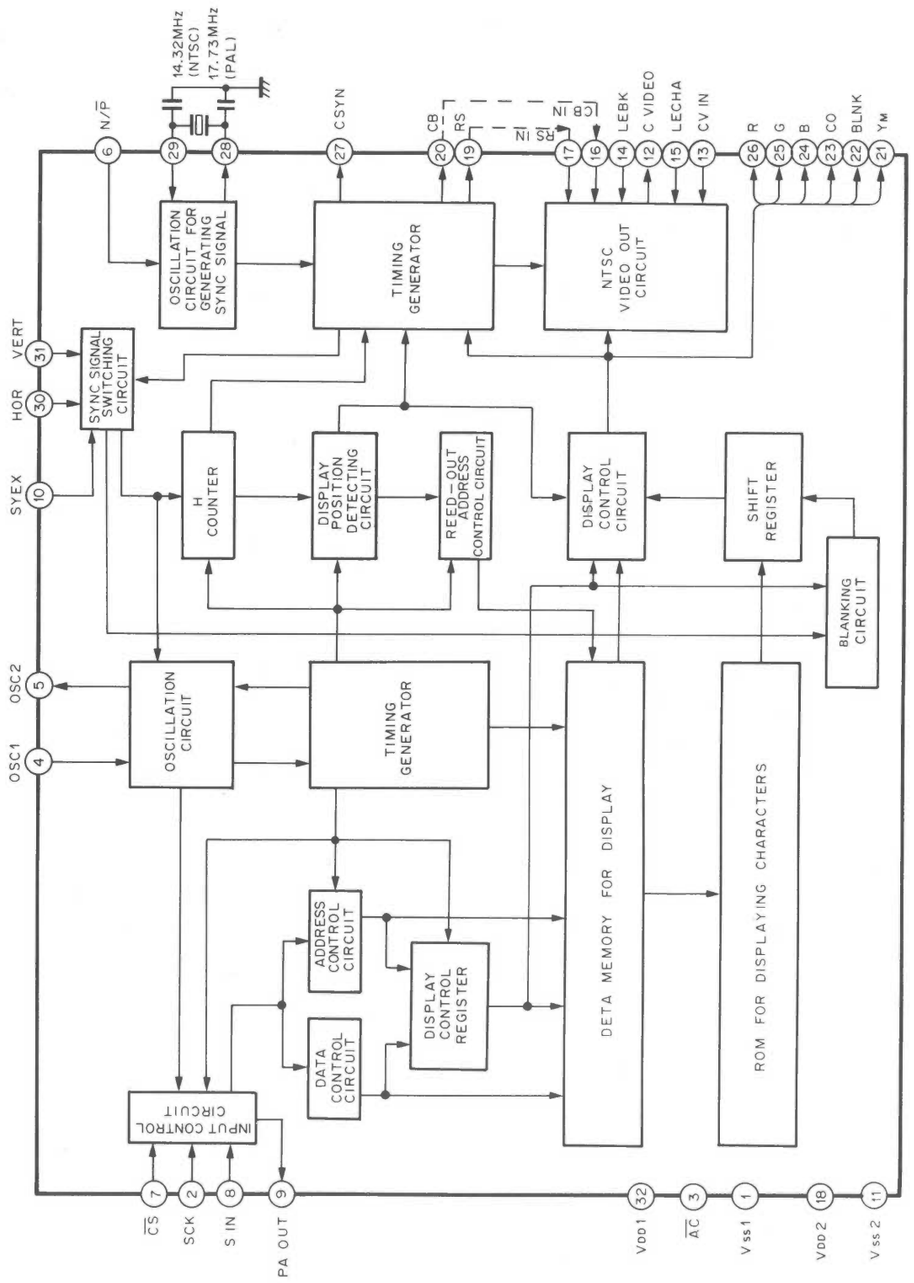


FRAME SEARCH OPERATION

11. IC INFORMATION

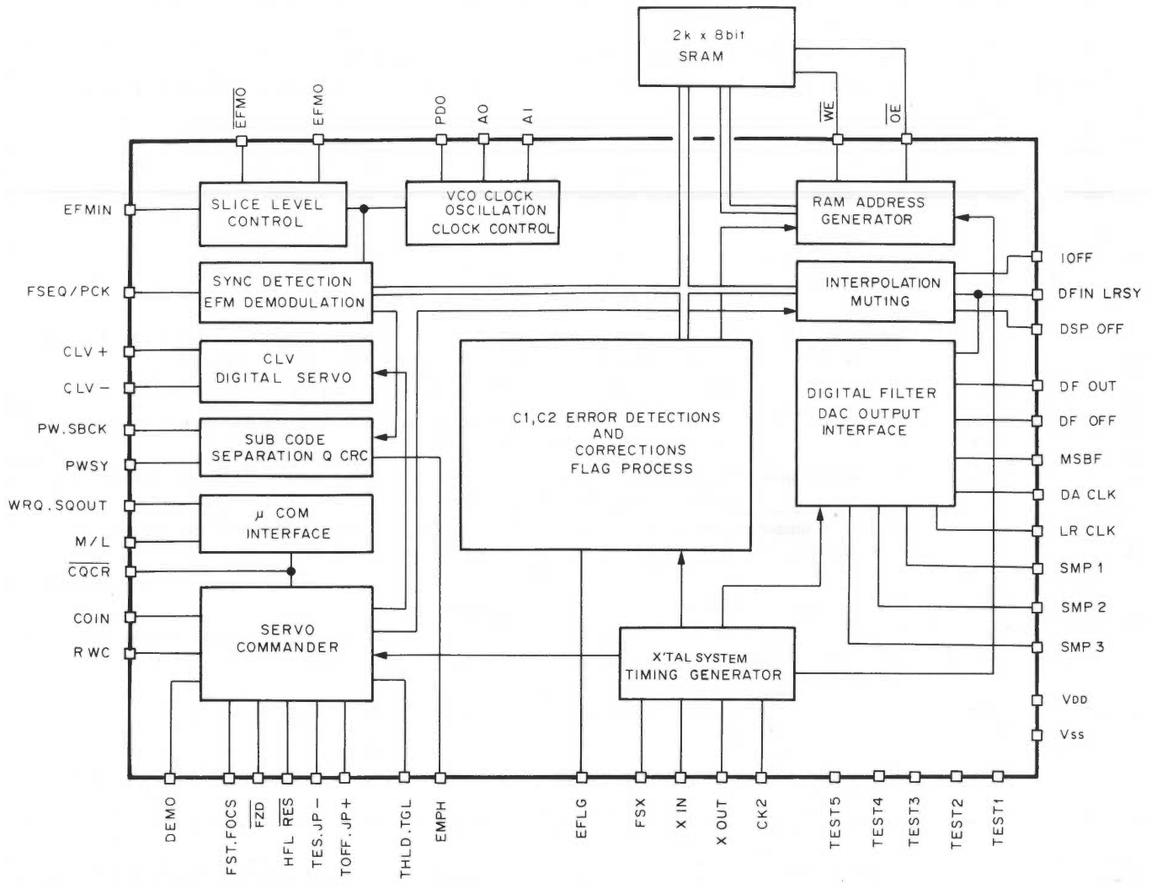
11.1 IC PIN DESCRIIPTIONS

IC401
M50552-132SP (OSD)



Pin No.	Symbol	Name	Discription
1	Vss 1	GND pin	GND pin for digital circuits
2	SCK	Serial clock input	The serial data of SIN (pin 8) is read out at the rising edge of the SCK signal when CS pin (pin 7) is at low level.
3	$\overline{AC}$	Auto clear input	Resets the IC internal circuit at low level.
4	OSC 1	Pin for connection of external oscillator circuit	Pin for connection of external oscillator circuit. The standard oscillating frequency is approx. 7 MHz, which determines the display position and character width on the TV screen in the horizontal direction.
5	OSC 2		
6	N/$\overline{P}$	NTSC/$\overline{PAL}$ select input	NTSC/PAL sync signal generator select pin; "H" = NTSC, "L" = PAL.
7	$\overline{CS}$	Chip select input	Chip select pin. "L" = serial data transmission.
8	SIN	Serial data input	Inputs the data and address of the display control register and display data memory serially.
9	PAOUT	Parity output	Odd parity output pin. Detects the 1-bit error in 1 word of SIN (pin 8).
10	SYEX	Sync signal select input	External/internal sync signal select pin. "H" = external sync, "L" = internal sync.
11	Vss2	GND pin	GND pin of analog circuits
12	C VIDEO	Composite video output	Composite video signal output pin. Outputs the 2 Vp-p composite video signal. When superimposition is activated, the character output signal, etc. is superimposed on the composite signal input to CVIN (pin 13).
13	CVIN	Composite video input	Composite video signal input pin. When superimposition is activated, the character output signal, etc. is superimposed on this composite video signal.
14	LEBK	Blanking level	Input pin of the signal which determines the blanking level of the video signal.
15	LECHA	Character level input	Input pin of the signal which determines the character output level of the video signal. The color of characters is white.
16	CBIN	Color burst signal input.	The CB output (pin 20) is converted to the color burst signal level of the video signal in the externally-connected circuit and is input to this pin.
17	RSIN	Character background color carrier signal input	The RS output (pin 19) is converted to the video signal carrier color signal in the externally-connected circuit, and is input to this pin.
18	VDD2	Power supply pin	Power supply pin for analog circuits
19	RS	Character background carrier color signal output	Carrier color signal output for the character background. Outputs a signal corresponding to the phase angle of the color burst signal CB.
20	CB	Color burst signal output	Outputs a 3.58 MHz color burst signal for NTSC and 4.43 MHz for PAL.
21	YM	Luminance signal output	Luminance signal output pin. Polarity selection is possible when the font ROM is determined.
22	BLNK	Character background output	Character background signal output. Polarity selection is possible when the font ROM is determined.
23	CO	Character output	Character signal output. Polarity selection is possible when the font ROM is determined.
24	B	Blue output	Blue output pin. Polarity selection is possible when the font ROM is determined.
25	G	Green output	Green output pin. Polarity selection is possible when the font ROM is determined.
26	R	Red output	Red output pin. Polarity selection is possible when the font ROM is determined.
27	CSYN	Composite sync signal output	Output pin for NTSC/PAL composite sync signal. Negative polarity.
28	OSCOUT	Oscillator circuit for sync signal generator	Pin for connection of an external sync signal oscillator. An oscillating frequency of 14.32 MHz (for NTSC) or 7.73 MHz (for PAL) is used.
29	OSCIN		
30	HOR	Horizontal sync signal	Horizontal sync signal input. Polarity selection is possible when the font ROM is determined.
31	VERT	Vertical sync signal	Vertical sync signal input. Polarity selection is possible when the font ROM is determined.
32	VDD1	Power supply pin	Power supply pin for digital circuits

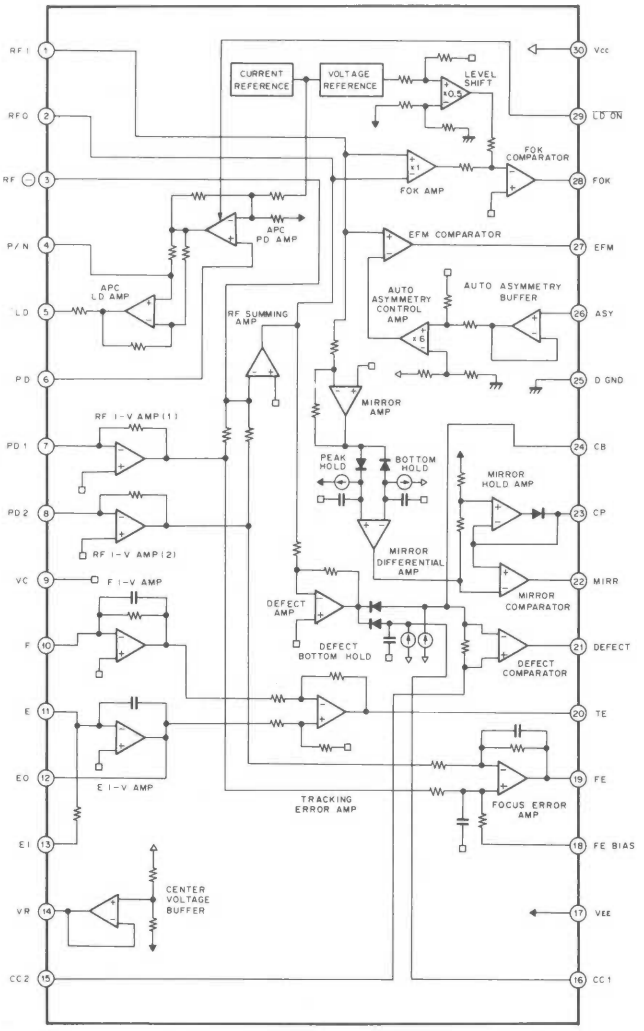
IC801
LC7863K



Pin No.	Name	I/O	Discription
1	TEST1	I	LSI test pin. Normally not connected.
2	AO	O	The VCO (8.6436 MHz) is formed by connecting an LC resonance circuit between AI and AO.
3	AI	I	
4	PDO	O	PDO is the phase output of the EFM signal.
5	VSS	—	GND
6	EFMO	O	After passing through the amplitude limiter, EFM signals with reversed phase are output from EFMO, $\overline{EFMO}$ to control the slice level.
7	$\overline{EFMO}$		
8	EFMIN	I	Inputs the HF signal of 1 — 2 Vp-p to EFMIN.
9	TEST2		LSI test pin. Normally not connected.
10	VDD	—	+5 V
11	CLV+	O	Disc motor control output
12	CLV−		
13	FOCS		Turns focus servo OFF when FOCS is high.
14	FST		Raises the lens gradually when FST is high.
15	$\overline{FZD}$	I	FOCS is reset when $\overline{FZD}$ is generated.
16	HFL		Generates kick pulses, JP+ and JP- according to the track jump command. Jumps by the specified number of tracks (1, 4, 16, 64).
17	TES		
18	FSEQ/PCK	O	4.3218 MHz/PCK pin. With DEMO (pin 24) at high level, it goes high when the SYNC signal detected from the EFM signal matches the SYNC signal of the counter.
19	TOFF		
20	TGL		
21	THLD		
22	JP+		
23	JP−		
24	DEMO	I	Sound generator used for adjustment of the set (player).
25	TEST3		LSI test pin. Normally not connected.
26	EMPH	O	De-emphasis is required when this pin is at high level.
27	DFOFF	I	Digital filter ON/OFF switch. "H" = no filter.
28	DSPOFF		LSI test pin. Normally low.
29	SMP2	O	
30	LRCLK		
31	VDD	—	+5 V
32	SMP3	O	Output signal to D/A converter, and the signal for L/R selection and sampling & holding operations.
33	SMP1		
34	DFOUT		
35	DACLK		
36	DFIN	I/O	Signal output used by CD ROM.
37	LRSY	O	CD ROM sync signal.
38	MSBF	I	
39	CK2	O	2.1609 MHz
40	AD10		RAM address output.

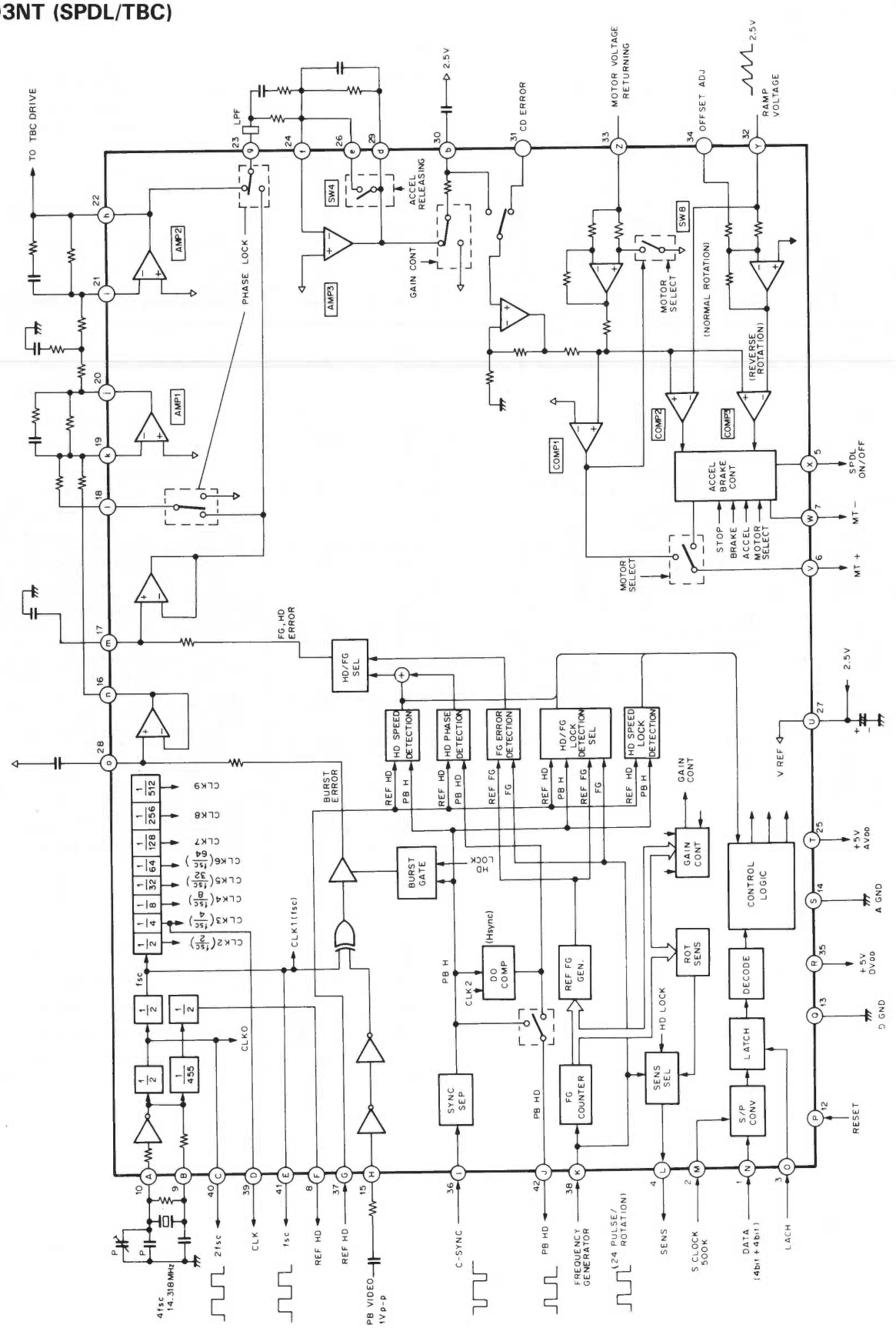
Pin No.	Name	I/O	Discription
41	$\overline{OE}$	O	Output status when $\overline{WE}$ is low. Input status when $\overline{WE}$ is high, $\overline{OE}$ is used for input/output control.
42	$\overline{WE}$		
43	AD9		RAM address output
44	AD8		
45	AD7		
46	AD6		
47	AD5		
48	AD4		
49	AD3		
50	AD2		
51	AD1		
52	AD0		
53	DB7	I/O	Connect to RAM data pins.
54	DB6		
55	DB5		
56	Vss	—	GND
57	DB4	I/O	Connect to RAM data pins
58	DB3		
59	DB2		
60	DB1		
61	DB0		
62	TEST4	I	LSI test pin. Normally not connected.
63	TEST5		
64	IOFF		Provided for CD-ROM. Interpolation and pre-holding are not performed at high level.
65	EFLG	O	C1, C2, single, dual correction monitor pin.
66	PW		PWSY is the main/sub combined SYNC signal. When it is inverted from high to low, this change is detected externally and the clock is transmitted to SBCK for eight times to read out the P, Q, R, S, T, U, V, and W subcode data.
67	PWSY		
68	SBCK	I	
69	FSX	O	7.35 KHz sync signal output.
70	WRQ		When the subcode Q data passes the CRC check, WRQ goes high. This is detected externally and $\overline{CQCK}$ is transmitted to read out the data from SQOUT. When the data is required in LSB-first order, M/L is inverted to low. After RWC is inverted to high by the microcomputer, the command is applied by transmitting it synchronously to the $\overline{CQCK}$ command data.
71	RWC	I	
72	SQOUT	I	
73	VDD	—	+5V
74	COIN	I	
75	$\overline{CQCK}$		
76	$\overline{RES}$		
77	M/L		
78	Vss	—	GND
79	Xin	I	8.6436 MHz crystal oscillator connection pin.
80	Xout	O	

IC601
CXA1081S (FTS)



Pin No.	Name	I/O	Discription
1	RFI	I	Output of RF summing amp is capacitance-coupled and input to this pin.
2	RFO	O	RF summing amp output pin.
3	RF−	I	RF summing amp feedback input pin.
4	P/N	I	Laser diode P-sub/N-sub select pin.
5	LD	O	APC LD amp output pin.
6	PD	I	APC LD amp input pin.
7	PD1	I	RF I-V amp (1) invert input pin.
8	PD2	I	RF I-V amp (2) invert input pin.
9	VC	—	GND when two +/− power supplies are used. Connect to VR (pin 14) when a single power supply is used.
10	F	I	F I-V amp invert input pin.
11	E	I	E I-V amp invert input pin.
12	EO	O	E I-V amp output pin.
13	EI	I	E I-V amp feedback input pin.
14	VR	O	(Vcc + VEE)/2 DC voltage output pin.
15	CC2	I	Defect bottom-hold output is capacitance-coupled and input to this pin.
16	CC1	O	Defect bottom-hold output pin.
17	V_{EE}	—	Negative power supply pin when two +/− power supplies are used. GND when a single power supply is used.
18	FE BIAS	I	Focus error amp non-inverted bias pin.
19	FE	O	Focus error amp output pin.
20	TE	O	Tracking error amp output pin.
21	DEFECT	O	DEFECT comparator output pin.
22	MIRR	O	MIRR comparator output pin.
23	CP	I	MIRR hold capacitor connection pin.
24	CB	I	DEFECT bottom hold capacitor connection pin.
25	D GND	—	GND
26	ASY	I	Auto asymmetry control input pin.
27	EFM	O	EFM comparator output pin.
28	FOK	O	Focus OK comparator output pin.
29	$\overline{\text{LD ON}}$	I	Laser diode ON/OFF select pin.
30	Vcc	—	Positive power supply pin.

IC901
HD4903NT (SPDL/TBC)



Pin No.	Name	I/O	Discription
1	SDAT	I	Serial data input from CPU.
2	SCLK		Serial data clock input from CPU. Strobed at the negative edge.
3	LACH		Serial data latch pulse input from CPU.
4	SENS	O	IC internal state sense output. High-impedance when not selected.
5	MTON		Spindle motor ON signal output.
6	MTPL		Spindle motor accelerating signal output (brush motor). Torque generation direction signal output (3-phase motor)
7	MTMI		Spindle motor decelerating signal output (brush motor). Torque generation signal output (3-phase)
8	RHDO		Reference HD signal output.
9	OSCO		4 fsc reference signal output.
10	OSCI	I	4 fsc reference signal input.
11	TEST		Test pin (0 V)
12	RSET		System reset signal input. "L" = reset.
13	DGND	—	GND for digital circuits (0 V)
14	AGND		GND for analog circuits (0 V)
15	PBVI	I	Burst signal input (AC-coupled).
16	APIO	O	Op-amp 1 output (burst signal time-axis error output).
17	PFDO		LPF capacitor pin for HD/FG signal time-axis error smoothing.
18	AP2O		Op-amp 2 output (HD signal time-axis error output).
19	AP3I	I	Op-amp 3 invert input
20	AP3O	O	Op-amp 3 output
21	AP4I	I	Op-amp 4 invert-signal input.

Pin No.	Name	I/O	Discription
22	AP4O	O	Op-amp 4 output (for CCD circuit phase compensation).
23	SW3O		Analog switch 3 output (HD/FG control select).
24	AP5I	I	Op-amp 5 invert input
25	AVDD	—	Power supply for analog circuits (5 V).
26	SW4I		Analog switch 4 (to discharge capacitor).
27	VREF		Reference power supply (Op-amp reference voltage: 2.5 V).
28	BUER	O	LPF capacitor pin for burst signal time-axis error smoothing.
29	AP5O		Op-amp 5 output (for phase compensation of spindle motor circuits).
30	LPFC	—	LPF capacitor pin for gain control.
31	CDER	I	CD mode spindle motor control signal input.
32	VRMP		Lamp signal input for PWM.
33	VMOT		Spindle motor pin voltage feedback input
34	OFAD		Op-amp offset adjustment input.
35	DVDD	—	Power supply for digital circuits (5 V)
36	SYNC	I	Composite sync signal input (digital signal).
37	RHDI		Reference HD signal input. Normally connected to RHDO (pin 8).
38	FG		FG input (digital signal)
39	CLK	O	Clock signal output for FTS. (447 kHz)
40	2FSC		2 fsc clock signal output.
41	FSC		fsc clock signal output.
42	PBHD		Playback HD signal output (after dropout compensation).

IC252
PD4193 (Mode Control IC)

Pin No.	Name	I/O	Discription
1	d	O	FL segment output OFF/ON
2	c	O	FL segment output OFF/ON
3	b	O	FL segment output OFF/ON
4	a	O	FL segment output OFF/ON
5	NORMAL	I	OEM select. (Connect to GND)
6	XSCK	I/O	Serial clock
7	SO	O	Serial data output
8	SI	I	Serial data input
9	SEL IR	I	Remote control input (interrupt)
10	SHAKE	I	IC301 (PD4192) communication request (interrupt)
11		I	Not used (connected to GND)
12		I	Not used (connected to GND)
13		I	Not used (connected to GND)
14		I	Not used (connected to GND)
15		I	Not used (connected to GND)
16		I	Not used (connected to GND)
17	ACK	I/O	IC301 (PD4192) communication enable NG (I) / OK (O)
18	XCS	O	M50552 chip select OFF/ON
19		I	Not used (connected to GND)
20	XRESET	O	Reset output OFF/ON
21	KIN0	I	Key data input OFF/ON
22	KIN1	I	Key data input OFF/ON
23	KIN2	I	Key data input OFF/ON
24	KIN3	I	Key data input OFF/ON
25	KS0	O	Key scan output ON
26	KS1	O	Key scan output ON
27	KS2	O	Key scan output ON
28	KS3	O	Key scan output ON
29		O	Not used (open)
30	X1	I	Oscillator (4.19 MHz)
31	X2	O	Oscillator (4.19 MHz)
32	GND	I	Ground

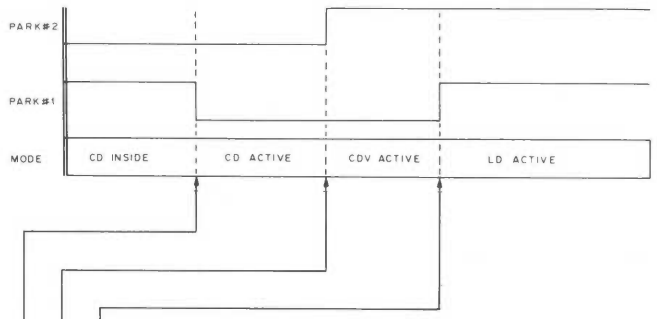
Pin No.	Name	I/O	Discription
33		I	Not used (connected to GND)
34		O	Not used (open)
35	KS 4	O	Key scan output ON
36	KS 5	O	Key scan output ON
37	KS 6	O	Key scan output ON
38		O	Not used (open)
39	RST	I	Reset input. OFF/ON
40	G 1	O	FL timing output OFF/ON
41	G 2	O	FL timing output OFF/ON
42	G 3	O	FL timing output OFF/ON
43	G 4	O	FL timing output OFF/ON
44	G 5	O	FL timing output OFF/ON
45	G 6	O	FL timing output OFF/ON
46	G 7	O	FL timing output OFF/ON
47	G 8	O	FL timing output OFF/ON
48	G 9	O	FL timing output OFF/ON
49	G 10	O	FL timing output OFF/ON
50	G 11	O	FL timing output OFF/ON
51		O	Not used (open)
52		O	Not used (open)
53		O	Not used (open)
54	ℓ	O	FL segment output OFF/ON
55	k	O	FL segment output OFF/ON
56	VLOAD	I	Power supply for FL drive (−30V)
57	VPRE	I	Power supply for FL driver (GND)
58	j	O	FL segment output OFF/ON
59	i	O	FL segment output OFF/ON
60	h	O	FL segment output OFF/ON
61	g	O	FL segment output OFF/ON
62	f	O	FL segment output OFF/ON
63	e	O	FL segment output OFF/ON
64	V_{DD}	I	Power supply (5 V)

IC301
PD4192 (Mechanism control IC)

Pin No.	Name	I/O	Discription
1	FSEQ	I	CD (EFM signal) frame lock signal input pin. (Connected to pin 19 of IC801: LC7863.) Valid signal is input only when the DEMO pin (pin 12) is high. "H" = OK, "L" = NG
2	WRQ		Q-code communication request signal input pin. When this pin is at high level, the subcode signal is input from IC801 (LC7863). The disc playing condition is also checked by detecting the presence of this signal. "H" = subcode communication possible, "L" = inhibited.
3	V-sync		LD/CDV play vertical sync signal input pin. Basically, the IC operates synchronized with this signal. (Falling edge input) In the CAV special play mode, jump timing is generated using this signal as reference. "L" = during vertical sync.
4	THLD		Tracking error hold signal input pin. (Connected to pin 21 of IC801: LC7863) Since this signal goes high while IC801 (LC7863) outputs a jump pulse, it is used to check the jump operation. "H" = during jumping, "L" = in normal play.
5	TILT		Tilt sensor output signal input pin (analog signal). The tilt sensor output is amplified by 40 – 50 dB and input to this pin (0 – 5 V). This analog signal is converted into a digital signal to be used as the tilt servo control input. The loading motor is controlled so that the signal input to the TILT pin is 2.5 V.
6	FOK		Focus servo lock signal input pin. (Connected to pin 20 of IC601: CXA1081S). This signal is generated by comparing the A + C signal from the pickup and is used to detect the focus servo lock. "H" = OK, "L" = Unacceptable.
7	PARK2		Pickup position detection switch input pin #2. This is the mechanism position detection switch input, used to detect the pickup position. (*1)
8	PARK1		Pickup position detection switch input pin #1. This is the mechanism position detection switch input, used to detect the pickup position. (*1)
9	TZC		Tracking error zero-cross signal input pin. This is generated by comparison with the tracking error signal. The carry motor is controlled by counting this signal in the track count search operation.
10	Ref-H/FG		Reference horizontal sync signal/spindle motor FG signal select input pin. Selection of the input signal is performed using the XCAV signal (pin 11). The FG signal is input when XCAV is high, and Ref-H signal is input when it is low.
11	XCAV	O	Noise cancel select signal output pin for video signal playback circuit. It also controls the selection of the signal input to Ref-H/FG (pin 10). "L" = CAV play mode, "H" = other modes.
12	DEMO		Focus sweep operation request signal output pin (connected to pin 24 of IC801: LC7863). When this signal is inverted from low to high, the pickup starts the sweeping operation.
13	SQEN		Serial bus select control signal output pin. This pin determines the pins to which the SQOUT (pin 15) and CQCK (pin 17) are connected. "L" = mode control IC (IC252: PD4193), "H" = signal processing IC (IC801: LC7863).
14	RWC		IC801 (LC7863) communication control signal output pin. (Connected to pin 71 of IC801: LC7863). This signal is set to high level while the SQEN (pin 13) signal is set to high level, then the data is output to the serial bus to perform jump operation (*2).
15	SQ OUT	I	Serial bus data input pin. Connected to IC252 (PD4193) and pin SQOUT (pin 72) of IC801 (LC7863), via a connection select circuit using an analog switch.
16	COIN	O	Serial bus data output pin. (Connected to pin 74 of IC801: LC7863.)
17	CQCK		Serial bus clock output pin. Connected to IC252 (PD4193) and pin CQCK (pin 75) of IC801 (LC7863), via the connection select circuit using the analog switch.
18	FZC	I	Focus error zero-cross signal input pin. The end of the focus sweep operation is detected at the falling edge of this signal.
19	COFF	O	Carry servo operation control signal output pin. The carry servo operation is turned ON and OFF by this signal. "L" = ON, "H" = OFF.
20	TOFF		Tracking servo operation control signal output pin. The tracking servo operation is turned ON and OFF by this signal, "L" = ON, "H" = OFF.
21	COUT		Carry motor forced feeding control signal output pin. After setting the COFF signal (pin 19) to high, setting either of CIN (inner direction) or COUT (outer direction) to high forcibly operates the carry motor.
22	CIN		
23	XLDON		Laser diode ON/OFF control signal output pin. "L" = laser diode ON, "H" = laser diode OFF.
24	SLOW		Loading/tilt motor operation speed select signal output pin. Operates at high speed when selecting the loading mode, and operates at a lower speed when selecting the tilt mode. "L" = low speed, "H" = high speed.

Pin No.	Name	I/O	Discription
25	CW	O	Loading/tilt motor rotation control signal output pin. The rotating direction of the motor and the brake mode are selected by these two control lines. (*3)
26	CCW		
27	SQ2		Audio L/R select signal output pin. The audio output signal is selected by these two control lines and the digital signal (pin 29). (*4)
28	SQ1		
29	DIGITAL		Digital/analog audio select signal output pin. The audio signal output to the line out terminals and the headphone jack are selected by this signal. "L" = analog audio, "H" = digital audio.
30	MUTE		Audio mute control signal output pin. "L" = Mute OFF, "H" = Mute ON.
31	—	—	Not connected.
32	VDD		Power supply connect pin (+5 V)
33	SHAKE	I/O	Data communication handshake signal pin with mode control IC (IC252: PD4193). This pin is a bi-directional data line, and the input/output mode is changed by the microcomputer to control data transmission timing. (*5)
34	VSQ	O	Video output blue-background select signal output pin. "L" = playback video, "H" = blue background.
35	MEMORY		Digital memory/through select control signal output pin. "L" = through, "H" = digital memory.
36	XFREEZ		Digital memory write control signal output pin. "L" = write disable, "H" = write enable.
37	E. TGL		Write position control signal output pin in digital effect mode.
38	EFECT		Digital effect mode ON/OFF control signal output pin. "L" = normal, "H" = effect mode.
39	AI		Digital effect mode select signal output pin.
40	AO		
41	XAFM		Mirror generation RF select signal output pin. This signal is used to convert the mirror signal generation RF signal into an AFM signal depending on the disc being played back. With a CD/CDV disc, it goes high (EFM). With an LD disc, when the TOC data is detected, it goes high, otherwise it is at low level (AFM).
42	MIRR-INH		Mirror signal inhibit control signal output pin. Inhibits the mirror signal output to disable the brake mode so that the pickup jumps by 1 track correctly in the 1-track jump mode. "L" = mirror output enable, "H" = mirror output inhibit.
43	CD MODE		Servo equalizer select signal output pin. Selected depending on the disc being played. (*6)
44	XLDMODE		
45	XRESET	I	Reset signal input pin. "L" = reset, "H" = normal operation.
46	OSCO	O	4.19 MHz clock oscillation output pin.
47	OSCI	I	4.19 MHz clock oscillation input pin.
48	XSTB	O	IC302 (PD0011A) communication control signal output pin.
49	TX		IC302 (PD0011A) communication control signal output pin. "L" = input, "H" = output.
50	XATN		IC302 (PD0011A) communication control signal output pin.
51	XACK	I	IC302 (PD0011A) communication control signal input pin.
52	DATA3	I/O	IC302 (PD0011A) communication data bus control signal input/output pin.
53	DATA2		
54	DATA1		
55	DATA0		
56	SDATA	O	SPDL/TBC servo IC (IC901: HD49403) control signal output pin.
57	SCLK		
58	LATCH		
59	J. TGL		TBC servo jump compensation signal output pin. In the CAV disc special play mode, it goes low when a track jump is performed, and then goes back to high after a fixed time has elapsed after Vsync.
60	SENS	I	IC901 (HD49403) SPDL servo status check signal input pin.
61	SW1		Loading/tilt position detection switch input pin. (*7)
62	SW2		
63	SW3		
64	GND	—	GND (ground)

*1 By combining these two switches, the following positions can be checked.



LD-inside position: Indicating the start of the active program area of an LD disc (R55 – R56.4)

CDV-inside position: Indicating the start of the video part of a CDV disc. (R37 – R38.4)

CD-inside position: Indicating the start of the active program of a CD disc. (R25 – R26.4)

R: The distance from center of the spindle motor.

*2

Code	Command	Code	Command
00H	Command clear	—	—
11H	1-track out #1	19H	1-track in #1
12H	1-track out #2	1AH	1-track in #2
13H	4-track out	1BH	4-track in
14H	16-track out	1CH	16-track in
15H	32-track out	1DH	32-track in

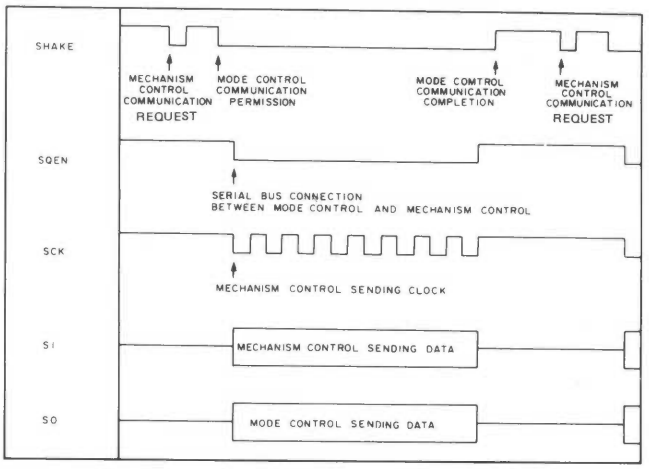
*3

CW	CCW	Loading/Tilt Motor Operation
L	L	Motor both-ends release (open mode)
L	H	Loading-out direction rotation
H	L	Loading-in direction rotation
H	H	Motor both-ends short-circuit (short-circuit mode)

*4

DIGITAL	SQ2	SQ1	L-ch Line Out	R-ch Lin Out
L	L	L	Analog L-channel	Analog R-channel
L	L	H	Analog L-channel	Analog L-channel
L	H	L	Analog R-channel	Analog R-channel
L	H	H	Mute	Mute
H	L	L	Digital L-channel	Digital R-channel
H	L	H	Digital L-channel	Digital L-channel
H	H	L	Digital R-channel	Digital R-channel
H	H	H	Digital -12 dB - L	Digital -12 dB - R

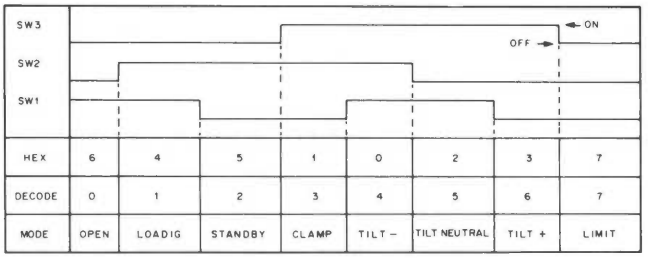
*5



*6

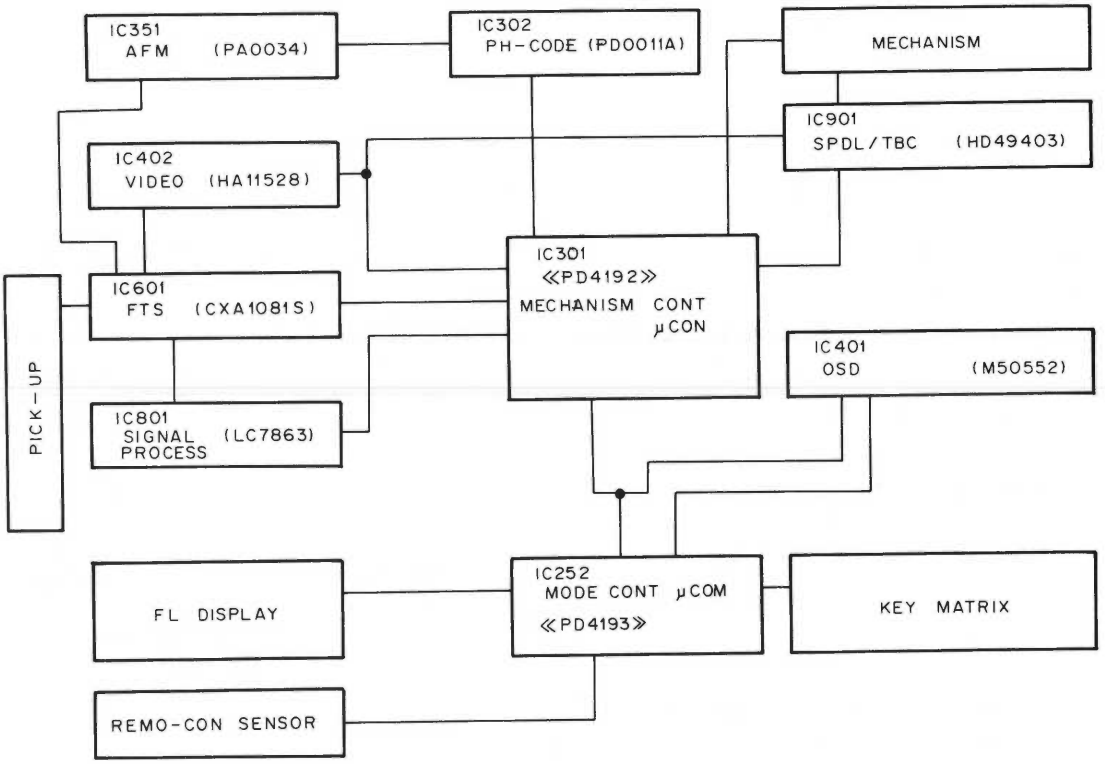
CDMODE	XLDMODE	Disc Mode
L	L	LD
L	H	CDV Video part
H	L	Not defined
H	H	CD/CDV Audio part

*7

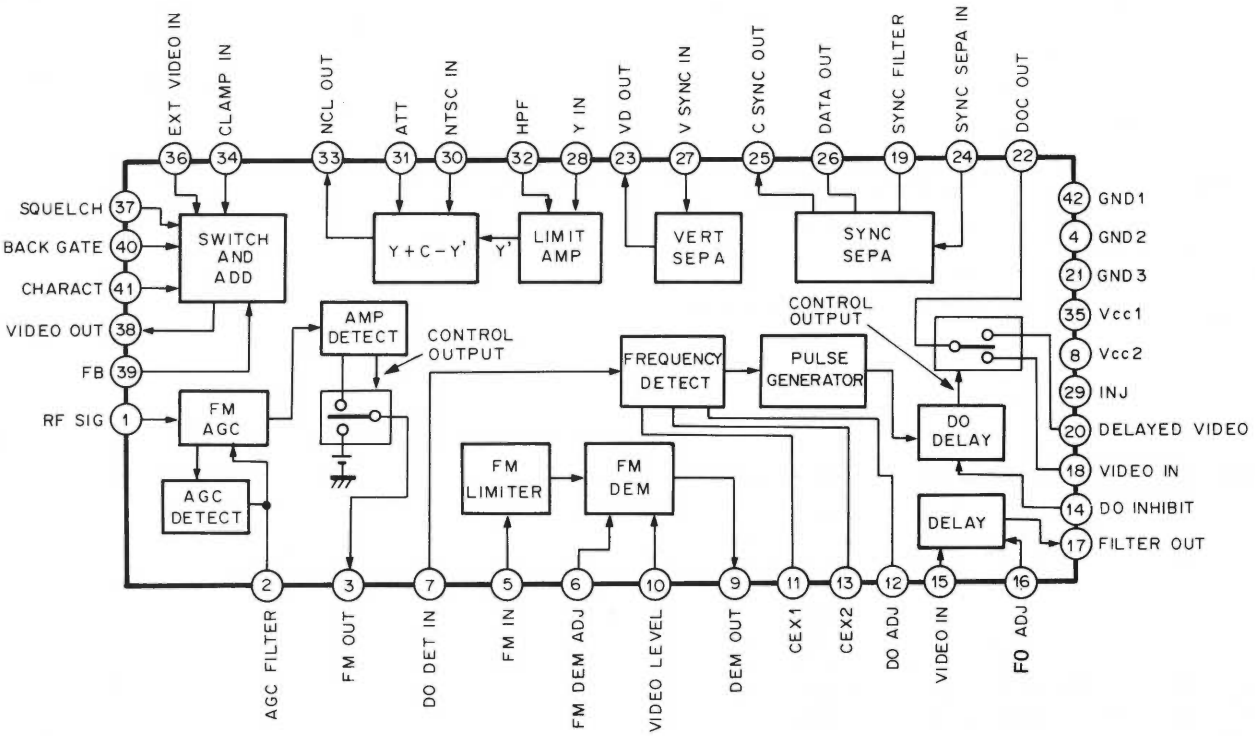


- **System Configuration Diagram**

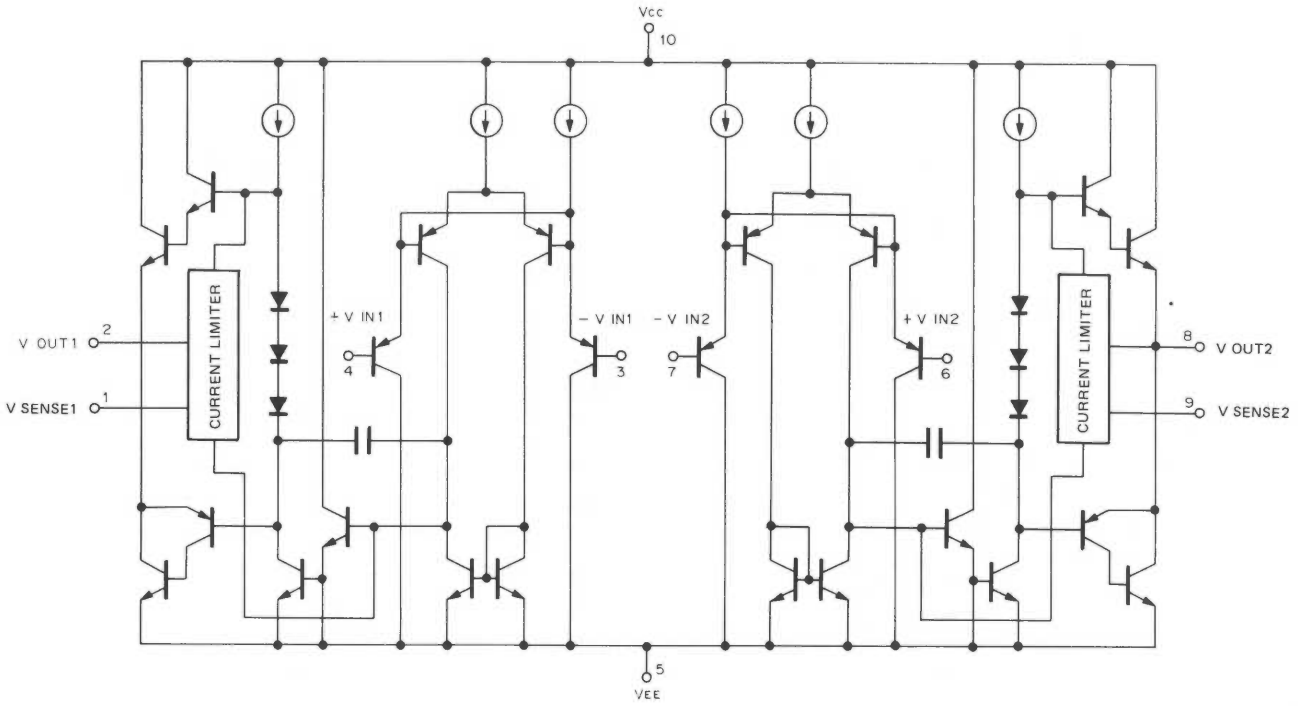
The player system supported by this microcomputer is shown in the block diagram below.



11.2 BLOCK DIAGRAM
IC402
HA11528NT (Video)



IC607
LA6510 (AMP)



12. MECHANISM DESCRIPTION

1. LOADING AND TILT OPERATION

<Loading Operation>

First, the loading up operation when the disc tray in the player is lowered is described.

(Refer to Fig. 12-1)

When loading motor ① rotates counterclockwise, Gear pulley ② is turned counterclockwise by the belt. As teeth (a) of Gear pulley ② are engaged with teeth (b) of Two stair gear ③, Two stair gears ③ rotates clockwise. And since teeth (c) of Two stair gears ③ are engaged with teeth (d) of cam gear ④, cam gear ④ turns counterclockwise. At this time, protrusion (e) of cam gear ④ is inserted into groove (f) in Slide Cam ⑤ to move it in the forward direction.

(Refer to Fig. 12-2)

After this, two screws ⑦ secured to Roller plate assembly ⑥ and lifted up together with Roller plate assembly ⑥ along groove (g) in Slide Cam ⑤. On the other side of Chassis assembly ⑧, since protrusion (i) of Clamper arm (A) ⑨ is inserted into hole (h) in Roller plate assembly ⑥, it is lifted up along grove (j) on chassis assembly ⑧ synchronized with the movement of Roller plate assembly ⑥.

The grooves on both sides of the tray are engaged between protrusion (k) of Roller plate assembly ⑥ and protrusion (l) of Clamper arm (A) ⑨, and the tray is also lifted up together with Roller plate assembly ⑥. Since Clamper arm (B) ⑩ is connected to Clamper arm (A) ⑨ by two springs ⑪ and section (m), when Clamper arm (A) ⑨ is lifted up, the Clamper is also lifted up. The above operations are performed sequentially, setting the tray to the "up" condition.

(Refer to Fig. 12-1)

Next, when the disc tray is fully in the up position, teeth (n) of cam gear ④ are engaged with teeth (o) of follow gear ⑫, and follow gear ⑫ is turned clockwise. Then, since teeth (p) of follow gear ⑫ are engaged with teeth (q) of Thrust Gear ⑬, Thrust Gear ⑬ turns counterclockwise. With this, as teeth (q) of the Thrust Gear ⑬ are engaged with the teeth inside the tray, the disc tray is fed in the forward direction.

In the loading down operation, loading motor ① turns clockwise, so the above gears are turned in the reverse direction to perform loading down.

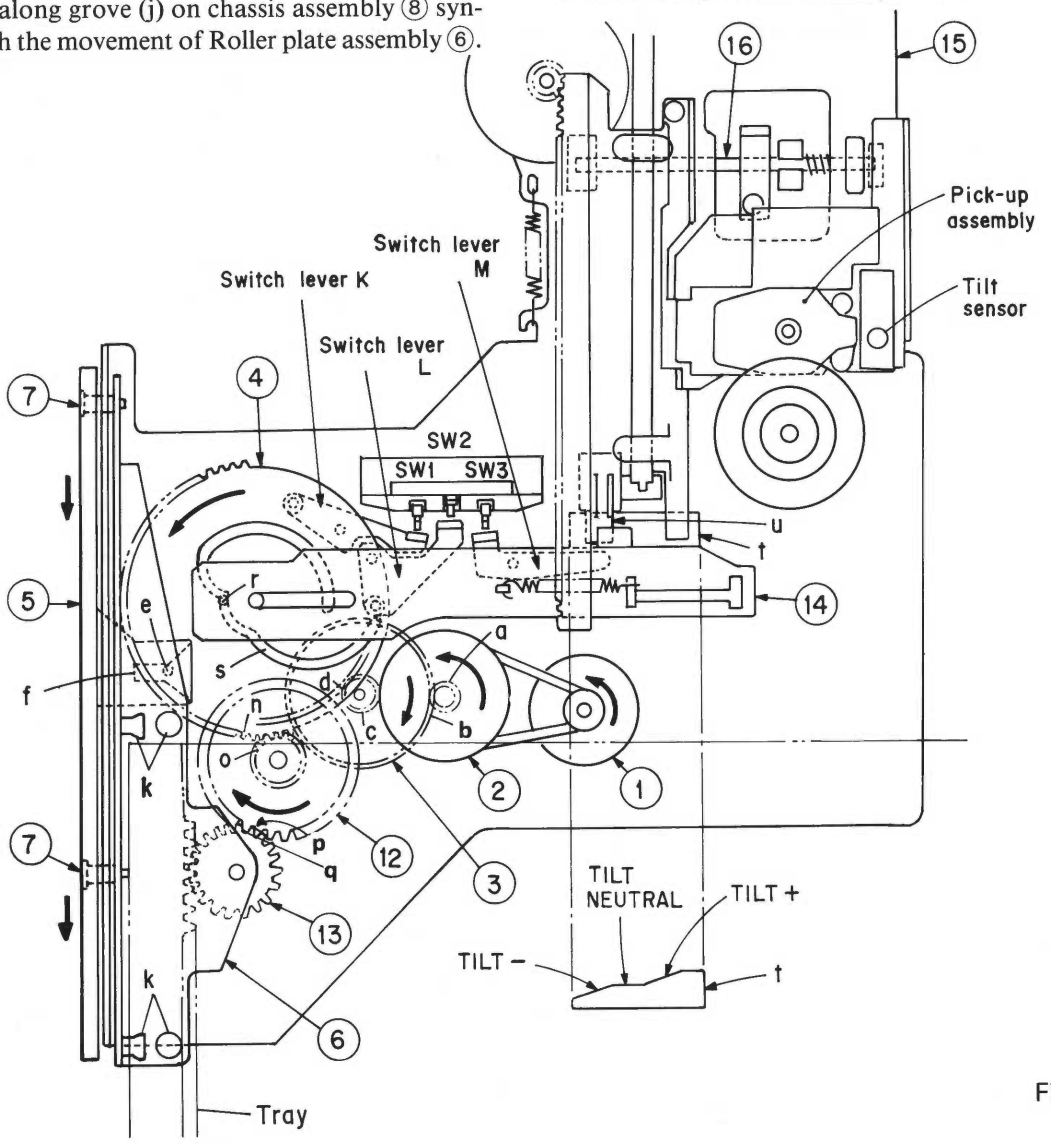


Fig. 12-1

<Tilt Operation>

(Refer to Fig. 12-1)

After the loading down operation is completed, loading motor ① still rotates to perform the tilt operation. The tilt operation is performed by cam gear ④ and Spring slanting cam ⑭. Protrusion (r) of Spring slanting cam ⑭ moves along groove (s) in cam gear ④. The pickup, tilt sensor and the slider assembly are mounted on Sorvo mechanism base assembly ⑮. When slant section (t) of Spring slanting cam ⑭ is moved, protrusion (u) of Sorvo mechanism base assembly ⑮ rocks up and down with Shaft ⑯ as its pivot, like a seesaw. The center of the slant section of Spring slanting cam ⑭ is flat and is used as the neutral position for the tilt operation. The higher position on the slope is for the tilt-up operation and the lower position on the slope is for the tilt-down operation. When a warped disc is loaded, it is detected by the tilt sensor, which turns loading motor ① to move protrusion (u) of Sorvo mechanism base assembly ⑮ along the slanted section (t) of Spring slanting cam ⑭ so that the correct tilt position is obtained. The detection of the tilt position is performed by switch levers K, L and M.

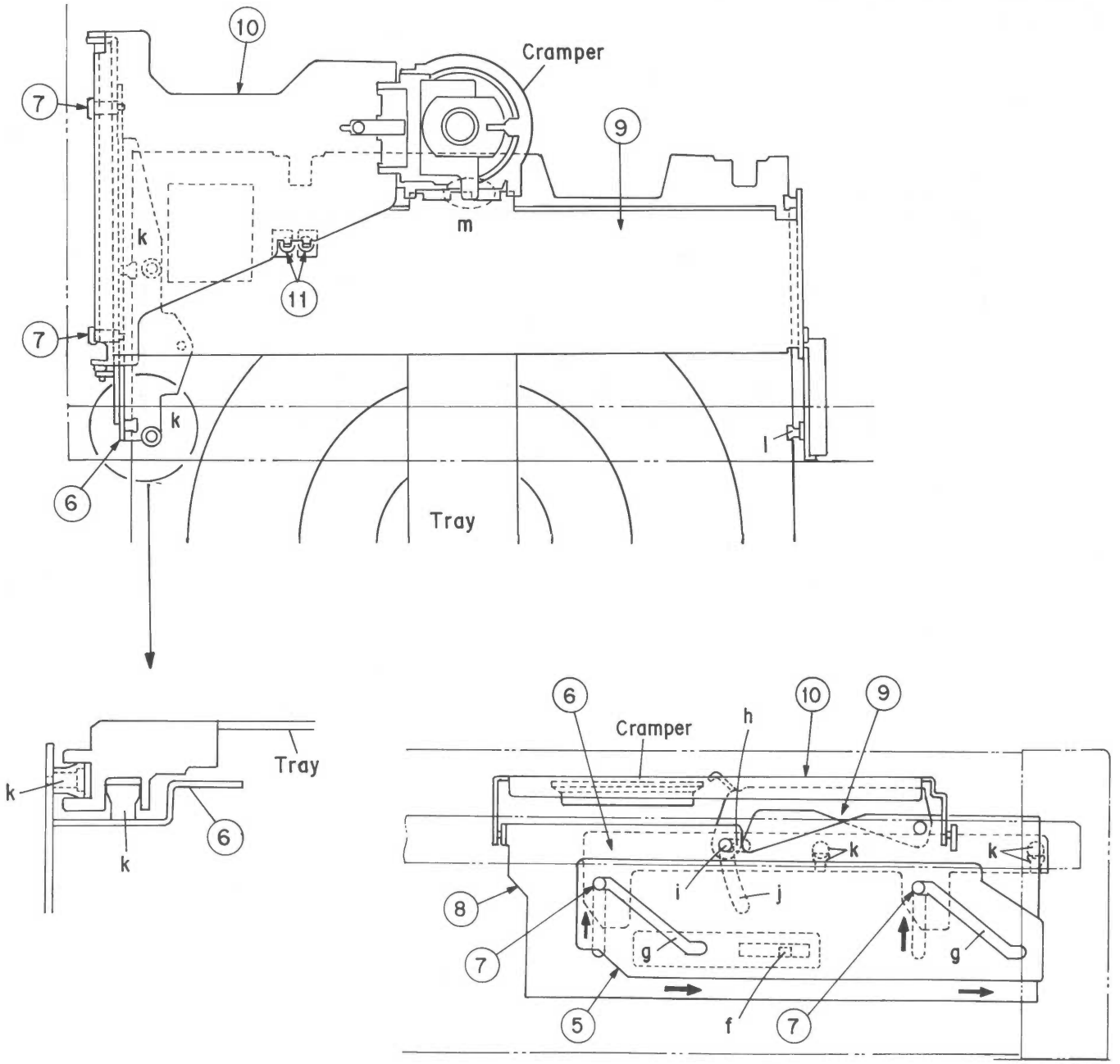


Fig. 12-2

13. PANEL FACILITIES

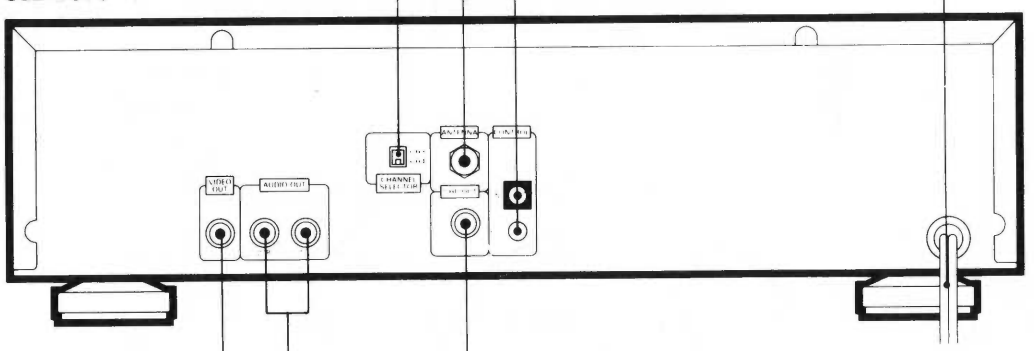
ANTENNA terminal (75Ω F-type jack)
Connect the coaxial cable (75Ω) from the VHF TV antenna to this terminal.

CONTROL IN and OUT jacks (miniature phone jack)
These jacks are for control cords, when the player is used together with other Pioneer products with the Pioneer SR mark.

Power cord
Connect this to a power outlet.

CHANNEL SELECTOR (CH3/CH4)
This switch is for changing the channel of the internal VHF converter.
Set to the channel which is not used for TV broadcasts in your area.

CLD-1070

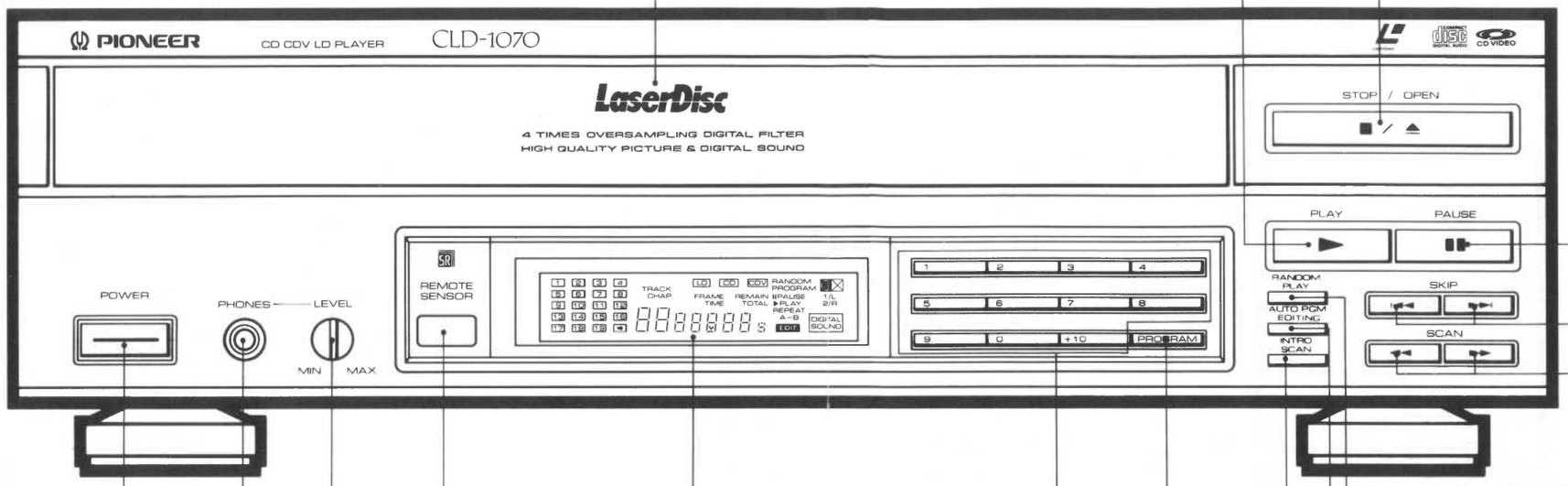


For the VOLTAGE SELECTOR, refer to the front cover.

VHF OUT terminal (75Ω F-type jack)
Connect this terminal to your TV set's VHF antenna terminal.

AUDIO OUT jacks (RCA jacks)
These jacks output Compact Disc audio, Compact Disc with Video audio, LaserVision Disc audio (analog) and the audio for LaserVision with Digital Sound Discs. Selection of either digital or analog sound can be made by operating a key on the remote control unit.
Connect these terminals to the CD or AUX input jacks of your stereo amplifier.
Do not connect them to your amplifier PHONO input.

VIDEO OUT jack (RCA jack)
Connect this jack to a TV monitor or a TV set which is equipped with a video input jack.



Door/Disc table

PLAY button

STOP/OPEN button

PAUSE button

SKIP buttons

SCAN buttons

RANDOM PLAY button

AUTO PGM EDITING button

INTRO SCAN button

PROGRAM button

Digit buttons

Display window

POWER switch

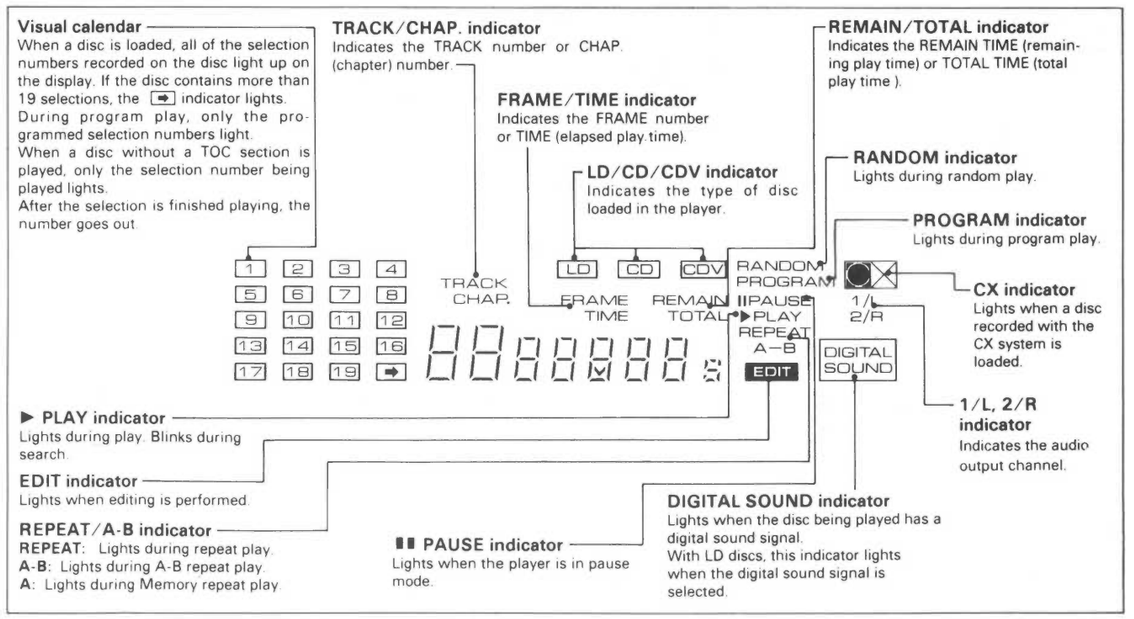
Press to turn power to the unit ON and OFF.
If there is disc in the unit when power is turned ON, playback will begin automatically.

PHONES jack

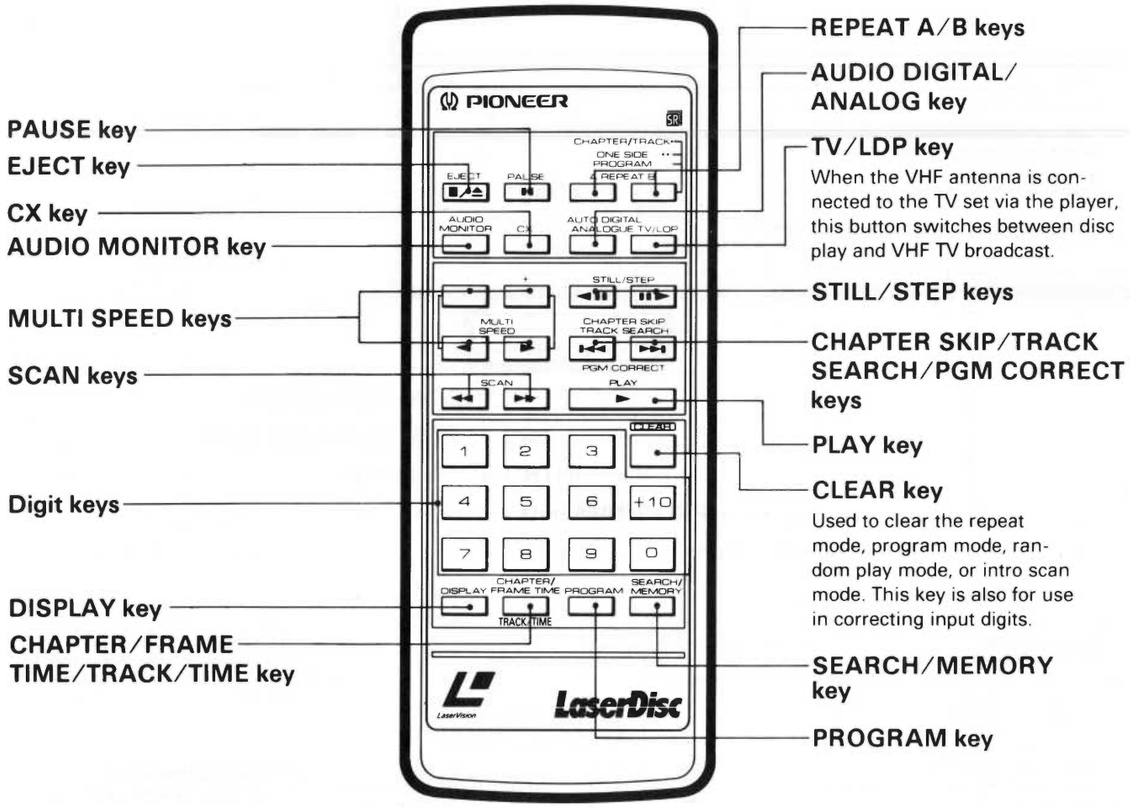
PHONES LEVEL control

Turn this control in the "MAX" direction to increase the output level from the PHONES jack. Turn this control in the "MIN" direction to decrease the output level from the PHONES jack.

REMOTE SENSOR



The buttons with the same names or marks on the front panel of the player unit control the same operations as the corresponding keys on the remote control unit.



14. SPECIFICATIONS

1. General

System ..... LaserVision Disc system and Compact Disc digital audio system
Laser ..... Semiconductor laser wavelength 780 nm
Power requirements
U.S. and Canadian models ..... AC 120V, 50/60 Hz
U.S. Military model ..... AC 110V/120-127V/220V/240V or AC 110V/120V/220V/240V (Switchable), 50/60 Hz
Power consumption
U.S. and Canadian models 37W
U.S. Military model 40W
Weight ..... 7.5 kg (16 lbs 9 oz)
Dimensions ..... 420(W) x 416(D) x 122(H) mm
16-9/16(W) x 16-3/8(D) x 4-13/16(H) in
Operating temperature ..... +5°C — +35°C (41°F — 95°F)
Operating humidity ..... 5% — 90%
(There should be no condensation of moisture.)

2. Disc

LaserVision Discs
*Maximum playing times
12-inch standard play disc ..... 1 hour/both sides
12-inch extended play disc ..... 2 hours/both sides
8-inch standard play disc ..... 28 min/both sides
14 min/one side
8-inch extended play disc ..... 40 min/both sides
20 min/one side
Spindle motor speed
Standard play disc ..... 1,800 rpm
Extended play disc .... 1,800 rpm (inner circumference) to 600 rpm (outer circumference)
(For a 12-inch disc)

Compact Discs
Disc ..... Diameter: 5-inch, 3-inch, Thickness: 1.2 mm
Rotation direction (pickup side) ..... Counterclockwise
Linear speed ..... 1.2 — 1.4m/sec
*Maximum playting time
60 min. or more: 5-inch discs
20 min. or more: 3-inch discs
(For stereo playback)

Compact Discs with Video
Disc ..... Diameter: 5-inch, Thickness: 1.2 mm
Rotation direction (pickup side) ..... Counterclockwise
Linear speed ..... Audio portion: 1.2 — 1.4m/sec
Video portion: 11 — 12m/sec
Maximum playing time ..... Video portion: 5 min. (CLV)
Audio portion: 20 min. (Digital)

* *Actual playback time differs for each disc.*

3. Video characteristics

Format ..... NTSC specifications
Video output
Level ..... 1 Vp-p nominal, sync. negative, terminated
Impedance ..... 75Ω unbalanced
Jack ..... RCA jack
VHF output
Channel ..... Channel 3 or 4 (switchable)
Impedance ..... 75Ω unbalanced
Terminal ..... F-type jack

4. Audio characteristics

Output level
During analog audio output ..... 200 mVrms (1 kHz, 40%)
During digital audio output ..... 200 mVrms (1 kHz, −20 dB)
Jacks ..... Both RCA jacks
Number of channels 2

Digital Audio Characteristics

Frequency response	5 Hz — 20 kHz (+0.5 dB, −1.0 dB) (EIAJ)
SN ratio	100 dB (EIAJ)
Dynamic range	92 dB (EIAJ)
Channel separation	88 (EIAJ)
Total harmonic distortion	0.04% (EIAJ)
Wow and flutter	Limit of measurement (±0.001% W. PEAK) or less (EIAJ)

5. Other Terminals

Control input/output ..... Both miniature jacks

6. Accessories

Remote control unit (CU-CLD017) 1
Size "AAA" (IEC R03) dry cell batteries 2
RF antenna cable 1
Video connecting cord 1
Audio connecting cord 1
Antenna adaptor
(75Ω/300Ω → 75Ω F-type plug) 1
F-type jack — IEC plug adaptor
(U.S. Military model only) 1
Operating instructions 1
Warranty card 1

7. Functions

Remote control unit operations (CU-CLD017)

	Function	Standard Play Disc (CAV)	Extended Play Disc (CLV)	Compact Disc with Video	Compact Disc
Basic Functions	Single-side play	YES	YES	YES	YES
	Pause	YES	YES	YES	YES
	Stop	YES	YES	YES	YES
Search	Fast forward (forward and reverse)	YES	YES	YES	YES
	Chapter/Track skip	YES	YES	YES	YES
	Direct chapter/Track number search	YES	YES	YES	YES
	Frame number search	YES	NO	NO	NO
	Time number search	NO	YES	YES	YES
Program	Chapter/Track program play	YES	YES	YES	YES
	Program correction	YES	YES	YES	YES
Repeat	Repeat between 2 points	YES	YES	YES	YES
	Memory repeat	YES	YES	YES	YES
	Chapter/Track repeat	YES	YES	YES	YES
	One-side repeat	YES	YES	YES	YES
	Program repeat	YES	YES	YES	YES
Trick play	Still/Step	YES	NO	NO	NO
	Multi-speed (Forward/receive 9-level variable)	YES	NO	NO	NO
Time display	Elapsed time display	NO	YES	YES	YES
	Absolute time display	NO	NO	NO	YES
	Remaining track time display	NO	NO	YES	YES
	Remaining total time display	YES (Only discs with TOC	YES (Only discs with TOC)	YES	YES
	Total number of selections, total time display	YES (Only discs with TOC)	YES (Only discs with TOC)	YES	YES
Others	CX system ON/OFF	YES*	YES*	—	—
	AUTO DIGITAL/ANALOG switch	YES**	YES**	—	—
	TV/LVP selection	YES	YES	YES	YES
	Audio channel selection (Stereo, 1/L, 2/R)	YES	YES	—	—

* Valid for analog sound when playing a disc with the CX mark.
** Can only be used with discs with digital sound tracks.

PLAYER FUNCTIONS

- Display, Visual Calendar Display
- Intro Scan, Random Playback and Auto Program Edit
- Digital Sound for LaserVision Discs

NOTE:
The specifications and design of this product are subject to change without notice, due to improvement.