Service Manual

Pioneer

CDX-P656/X1N/UC

ORDER NO.
CRT2317

MULTI-CD COMPACT DISC PLAYER

CDX-P656 X1N/UC

CDX-P25 X1N/EW

COMPACT disc DIGITAL AUDIO

- **See the separate manual CX-892(CRT2356) for the CD mechanism description, disassembly and circuit description.**
- **The CD mechanism employed in this model is one of C7 series.**

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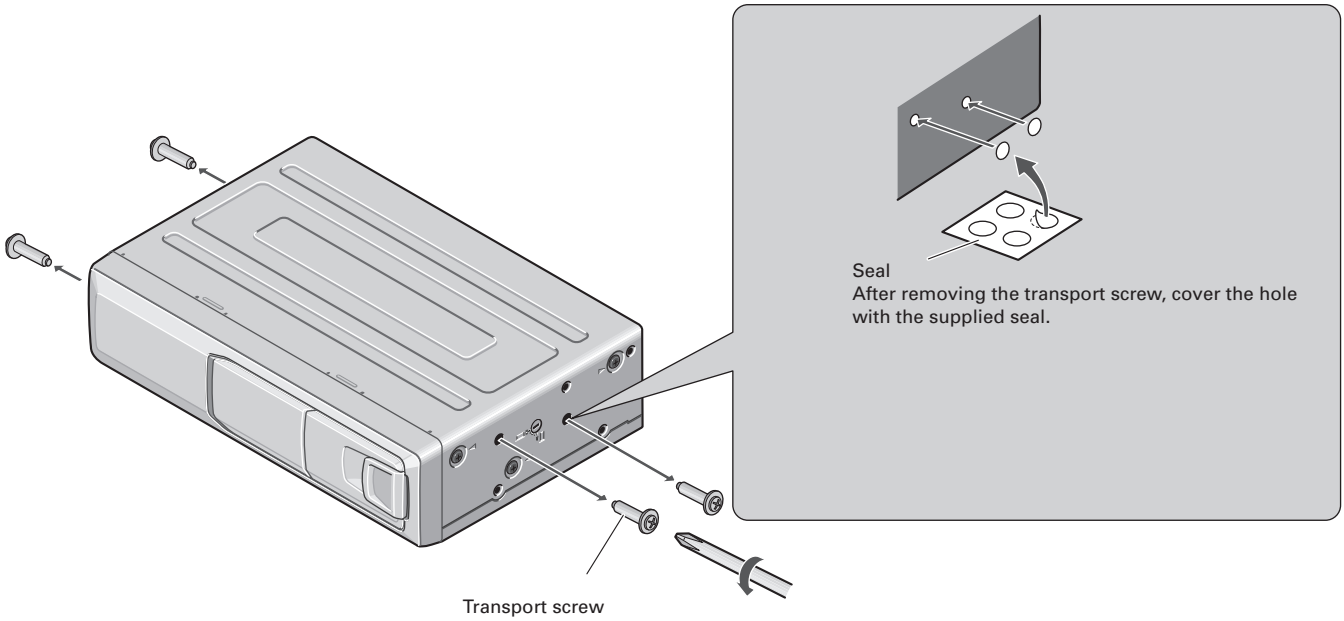
K-ZZY. FEB. 1999 Printed in Japan

● **CD Player Service Precautions**

1. For pickup unit(CXX1285) handling, please refer to"Disassembly"(See page 40). During replacement, handling precautions shall be taken to prevent an electrostatic discharge(protection by a short pin).
2. During disassembly, be sure to turn the power off since an internal IC might be destroyed when a connector is plugged or unplugged.
3. Please checking the grating after changing the pickup unit(see page 29) since these screws protects the mechanism during transport, be sure to affix it when it is transported for repair, etc.

Transportation of multi-CD Player



A transport screw has been attached to the set in order to protect it during transportation. After removing the transport screw, cover the hole with the supplied seal. Be sure to remove the transport screw before mounting the set. The removed transport screw should be retained in the accessory bag for use the next time the set is transported.

1. SAFETY INFORMATION

1.1 CDX-P656/X1N/UC

CAUTION

This service manual is intended for qualified service technicians; it is not meant for the casual do-it-yourselfer.
Qualified technicians have the necessary test equipment and tools, and have been trained to properly and safely repair complex products such as those covered by this manual.
Improperly performed repairs can adversely affect the safety and reliability of the product and may void the warranty.
If you are not qualified to perform the repair of this product properly and safely; you should not risk trying to do so and refer the repair to a qualified service technician.

WARNING

This product contains lead in solder and certain electrical parts contain chemicals which are known to the state of California to cause cancer, birth defects or other reproductive harm.
Health & Safety Code Section 25249.6 - Proposition 65

1.2 CDX-P25/X1N/EW

1. Safety Precautions for those who Service this Unit.

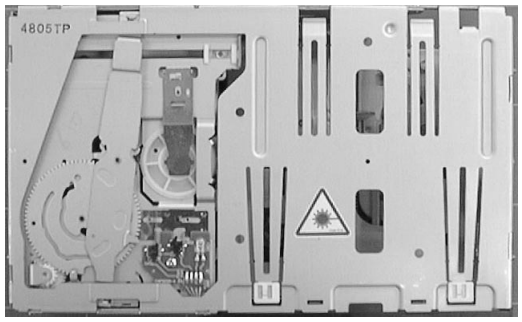
- **Follow the adjustment steps (see pages 29 through 34)in the service manual when servicing this unit. When checking or adjusting the emitting power of the laser diode exercise caution in order to get safe, reliable results.**

Caution:

1. **During repair or tests, minimum distance of 13cm from the focus lens must be kept.**
2. **During repair or tests, do not view laser beam for 10 seconds or longer.**

2. A "CLASS 1 LASER PRODUCT" label is affixed to the rear of the player.

3. The triangular label is attached to the mechanism unit frame.

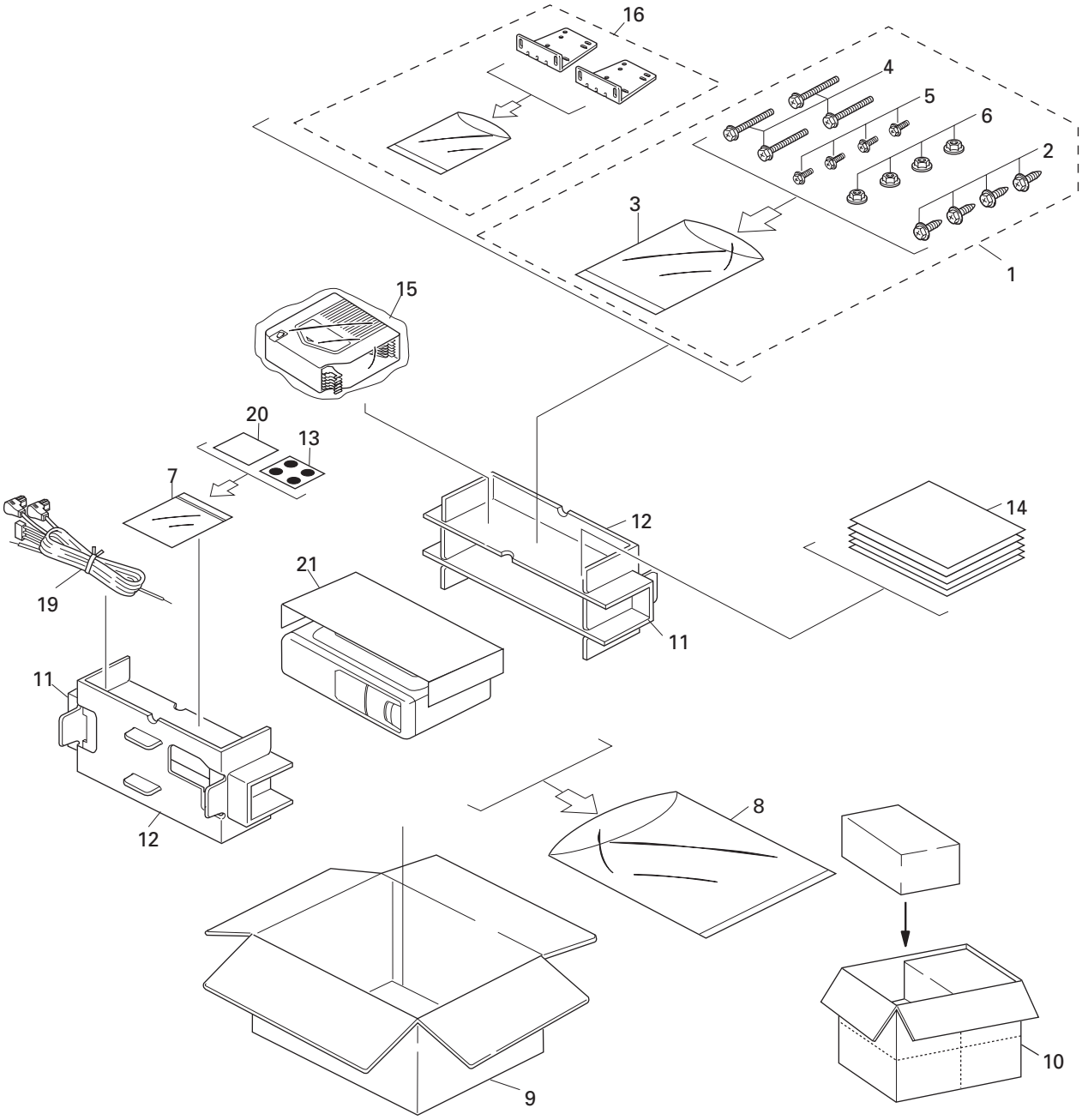


4. Specifications of Laser Diode

Specifications of laser radiation fields to which human access is possible during service.
Wavelength = 800 nanometers

2. EXPLODED VIEWS AND PARTS LIST

2.1 PACKING



NOTE:

● Parts marked by "*"are generally unavailable because they are not in our Master Spare Parts List.

● Screws adjacent to ∇ mark on the product are used for disassembly.

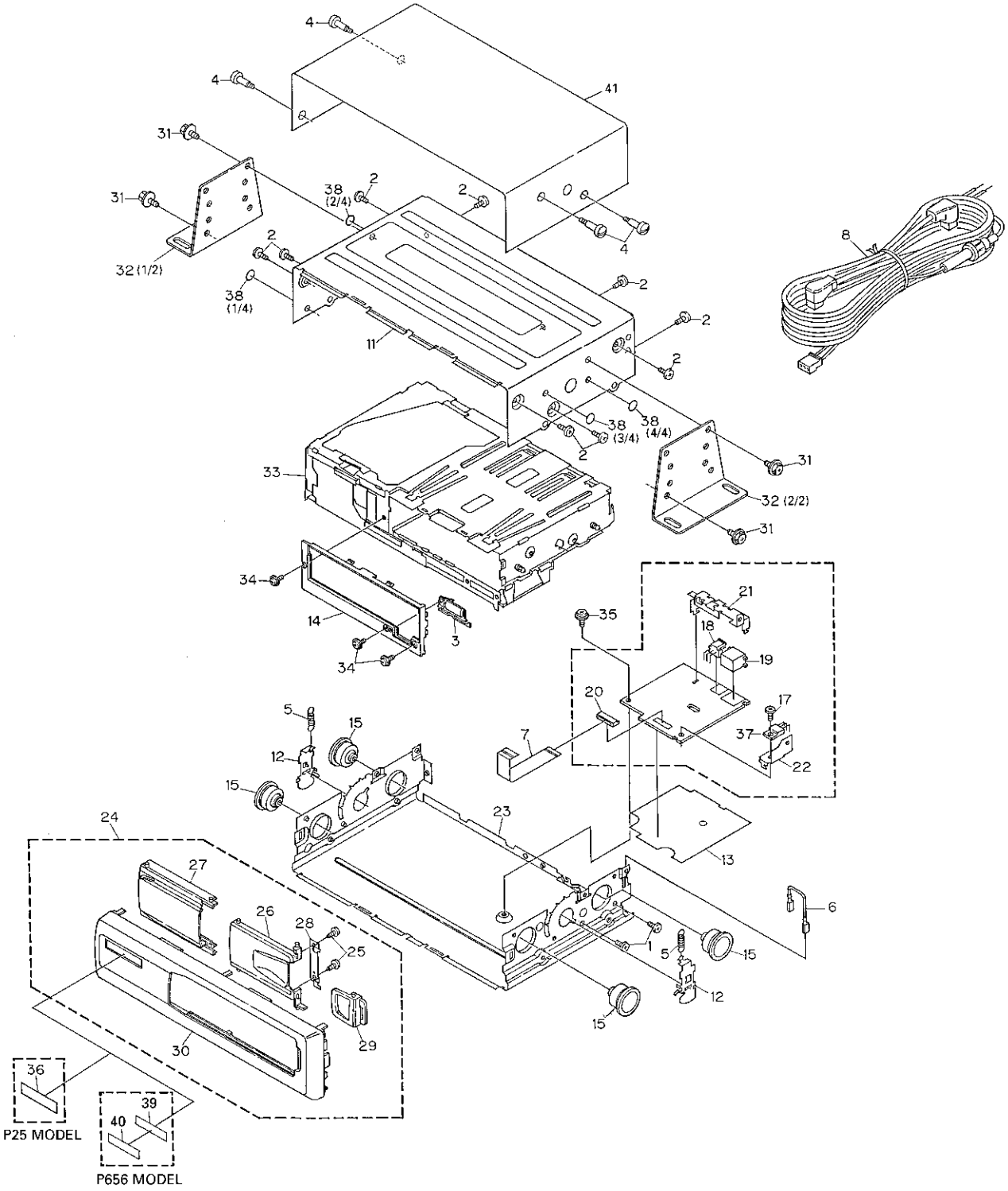
● PACKING SECTION PARTS LIST

Mark	No.	Description	Part No. CDX-P656/X1N/UC	Part No. CDX-P25/X1N/EW
	1	Screw Assy	CEA1962	CEA1962
	2	Screw	CBA1295	CBA1295
*	3	Polyethylene Sheet	CNM5158	CNM5158
	4	Screw	HMB60P500FMC	HMB60P500FMC
	5	Screw	HMF40P080FZK	HMF40P080FZK
	6	Nut	NF60FMC	NF60FMC
*	7	Polyethylene Bag	CEG1099	CEG1099
	8	Polyethylene Bag	CEG1185	CEG1042
	9	Carton	CHG3713	CHG3715
	10	Contain Box	CHL3713	CHL3715
	11	Protector	CHP2133	CHP2133
	12	Protector	CHP2134	CHP2134
	13	Seal	CNM5599	CNM5599
	14-1	Owner's Manual	CRD2887	CRD2893
	14-2	Owner's Manual	Not used	CRD2894
*	14-3	Warranty Card	CRY1070	CRY1087
*	14-4	Caution Card	CRP1201	CRP1203
*	14-5	Caution Card	CRP1205	CRP1205
	15	Magazine Assy	CXB4027	CXB4027
	16	Angle Assy	CXB3591	CXB3591
	17	•••••		
	18	•••••		
	19	Cord	CDE5831	CDE5830
*	20	Caution Card	CRP1090	CRP1090
*	21	Caution Card	CRP1195	CRP1195

● Owner's Manual

Model	Part No.	Language
CDX-P656/X1N/UC	CRD2887	English, French
CDX-P25/X1N/EW	CRD2893	English, Italian, French
	CRD2894	German, Dutch, Spanish

2.2 EXTERIOR



(1) EXTERIOR SECTION PARTS LIST

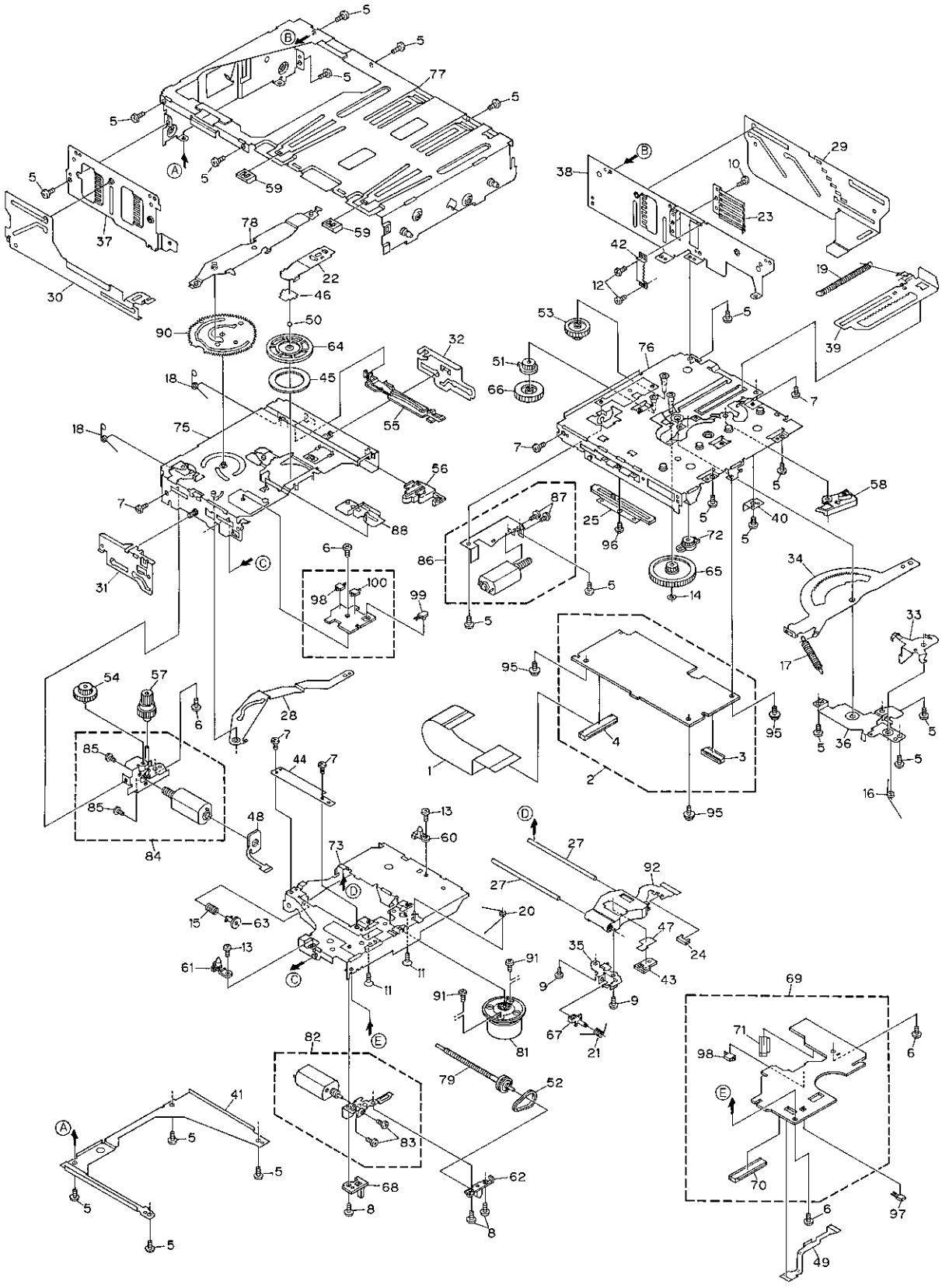
Mark	No.	Description	Part No.
	1	Screw	BMZ26P040FMC
	2	Screw	BMZ30P040FZK
	3	Button	CAC4632
	4	Screw	CBA1460
	5	Spring	CBH1859
	6	Connector	CDE5525
	7	Connector	CDE5783
	8	Cord	See Contrast table(2)
	9	•••••	
	10	•••••	
	11	Upper Case	CNB2431
	12	Arm	CNC8058
	13	Insulator	CNM6074
	14	Panel	CNS5216
	15	Damper	CNV5591
	16	Power Unit	CWX2299
	17	Screw	BMZ26P060FMC
	18	Plug(CN901)	CKS-460
	19	Connector(CN921)	CKS3407
	20	Connector(CN911)	CKS4072
	21	Holder	CNC8055
	22	Holder	CNC8056
	23	Lower Case Unit	CXB3395
	24	Grille Unit	See Contrast table(2)
	25	Screw	BPZ20P080FMC
	26	Door	See Contrast table(2)
	27	Door	See Contrast table(2)
	28	Holder	CNC8139
	29	Lever	See Contrast table(2)
	30	Grille	See Contrast table(2)
	31	Screw	HMF40P080FZK
	32	Angle Assy	CXB3591
	33	CD Mechanism Module	See Contrast table(2)
	34	Screw	IMS20P035FZK
	35	Screw	IMS26P040FMC
	36	Sheet	See Contrast table(2)
	37	Transistor(Q910)	2SD2396
	38	Seal	CNM5599
*	39	Double Faced Tape	See Contrast table(2)
*	40	Batch	See Contrast table(2)
*	41	Caution Card	CRP1195

(2) CONTRAST TABLE

CDX-P656/X1N/UC and CDX-P25/X1N/EW are constructed the same except for the following:

Mark	No.	Symbol and Description	Part No. CDX-P656/X1N/UC	Part No. CDX-P25/X1N/EW
	8	Cord	CDE5831	CDE5830
	24	Grille Unit	CXB4374	CXB4383
	26	Door	CAT2045	CAT2013
	27	Door	CAT2046	CAT2014
	29	Lever	CNS5392	CNS5391
	30	Grille	CNS5290	CNS5292
	33	CD Mechanism Module	CXK4805	CXK4800
	36	Sheet	Not used	CAH1682
*	39	Double Faced Tape	CNM6211	Not used
*	40	Batch	CAH1680	Not used

2.3 CD MECHANISM MODULE



(1)CD MECHANISM MODULE SECTION PARTS LIST

Mark No.	Description	Part No.
1	Connector	CDE6069
2	CD Core Unit(C7)	See Contrast table(2)
3	Connector(CN701)	CKS1953
4	Connector(CN101)	CKS2272
5	Screw	BMZ20P025FMC
6	Screw	CBA1037
7	Screw	CBA1041
8	Screw	CBA1176
9	Screw	CBA1362
10	Screw	CBA1387
11	Screw	CBA1470
12	Screw	CBA1476
13	Screw	CBA1486
14	Washer	CBF1038
15	Spring	CBH2172
16	Spring	CBH2173
17	Spring	CBH2174
18	Spring	CBH2175
19	Spring	CBH2285
20	Spring	CBH2177
21	Spring	CBH2178
22	Spring	CBL1390
23	Spring	CBL1392
24	Short Pin	CBL1239
25	Volume(VR801)	CCW1023
26	•••••	
27	Shaft	CLA3304
28	Arm	CNC7901
29	Lever	CNC7902
30	Lever	CNC7904
31	Lever	CNC7905
32	Lever	CNC7906
33	Arm	CNC7908
34	Arm	CNC7909
35	Holder	CNC7911
36	Holder	CNC7912
37	Frame	CNC7917
38	Frame	CNC7918
39	Lever	CNC7919
40	Stopper	CNC7920
41	Frame	CNC7921
42	Bracket	CNC8354
43	Plate	CNC8375
44	Cover	CNC8434
45	Sheet	CNM6009
46	Spacer	CNM6146
47	Sheet	CNM6296
48	PCB	CNP5227
49	PCB	CNP5228
50	Ball	CNR1189
51	Gear	CNR1531
52	Belt	CNT1086
53	Gear	CNV5472
54	Gear	CNV5473
55	Rail	CNV5474
56	Lever	CNV5475
57	Gear	CNV5477
58	Arm	CNV5478
59	Holder	CNV5480
60	Guide	CNV5481
61	Guide	CNV5482
62	Holder	CNV5483
63	Holder	CNV5484
64	Clamper	CNV5485
65	Gear	CNV5486
66	Gear	CNV5562
67	Holder	CNV5563
68	Lighting Conductor	CNV5785
69	Mechanism PCB	CWX2303
70	Connector(CN801)	CKS1965
71	Connector(CN802)	CKS3486
72	Damper Unit	CXA7714
73	Chassis Unit	CXB2850
74	•••••	
75	Chassis Unit	CXB2851
76	Magazine Holder Unit	CXB2853
77	Frame Unit	CXB4426
78	Arm Unit	CXB2855
79	Screw Unit	CXB2857
80	•••••	
81	Motor Unit(M851)(SPINDLE)	CXB3003
82	Motor Unit(M854)(CARRIAGE)	CXB3004
83	Screw	JFZ20P025FMC
84	Motor Unit(M853)(TRAY)	CXB4421
85	Screw	JFZ20P025FMC
86	Motor Unit(M852)(ELV)	CXB3006
87	Screw	JFZ20P025FMC
88	Lever Unit	CXB3938
89	•••••	
90	Gear Unit	CXB4338

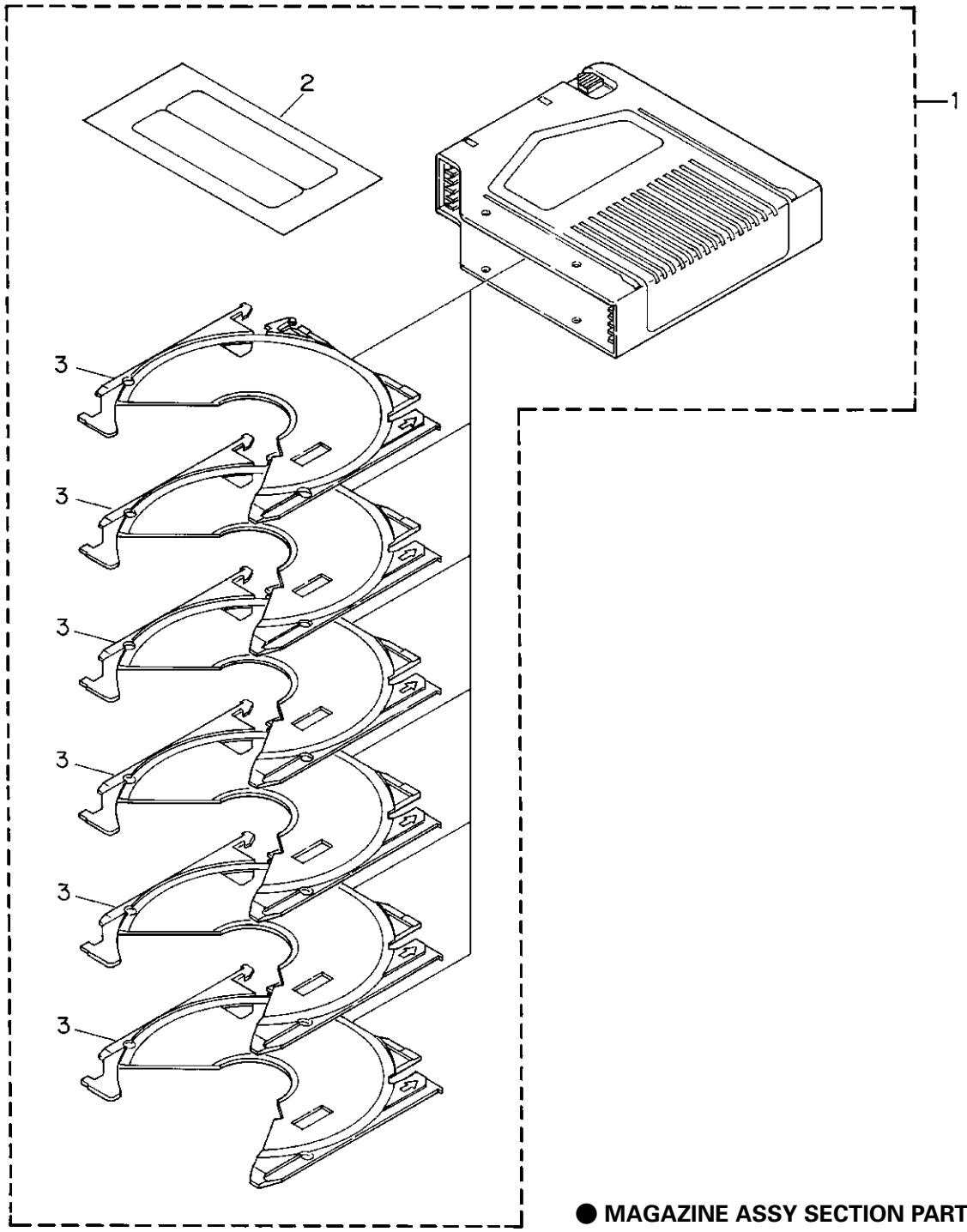
Mark	No.	Description	Part No.
	91	Screw	JGZ17P025FZK
	92	Pickup Unit(Service)	CXX1285
	93	•••••	
	94	•••••	
	95	Screw	IMS26P040FMC
	96	Screw	JFZ20P025FNI
	97	Photo-transistor(Q851)	PT4800
	98	Spring Switch(S851,S853)	CSN1051
	99	LED(D851)	CN504-2
	100	Spring Switch(S852)	CSN1052

(2) CONTRAST TABLE

CDX-P656/X1N/UC and CDX-P25/X1N/EW are constructed the same except for the following:

Mark No.	Symbol and Description	Part No.	
		CDX-P656/X1N/UC	CDX-P25/X1N/EW
2	CD Core Unit(C7)	CWX2261	CWX2260

2.4 MAGAZINE ASSY



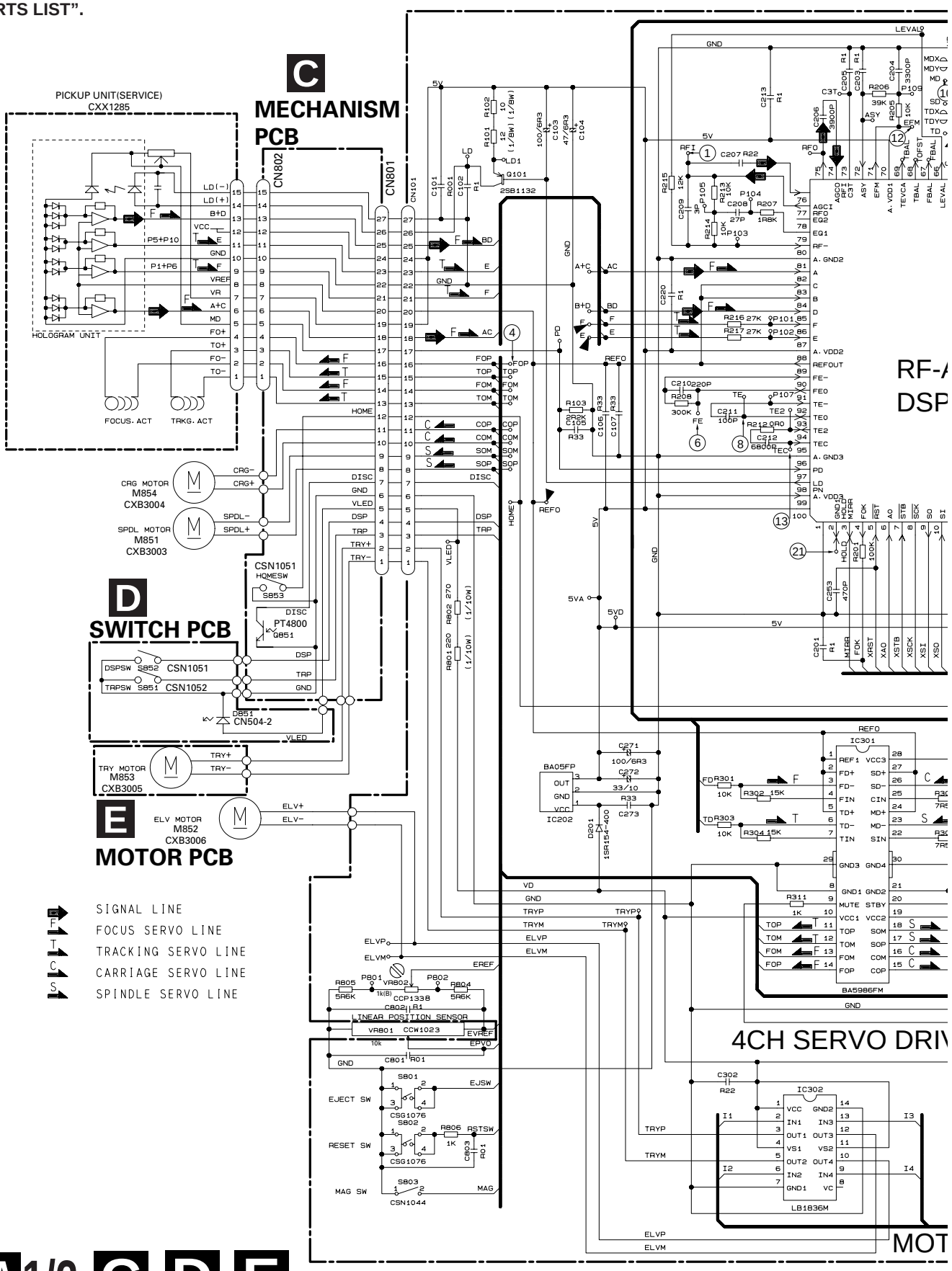
● **MAGAZINE ASSY SECTION PARTS LIST**

Mark	No.	Description	Part No.
	1	Magazine Assy	CXB4027
	2	Label	CRW1395
	3	Tray	CNV5341

3. SCHEMATIC DIAGRAM

3.1 OVERALL CONNECTION DIAGRAM

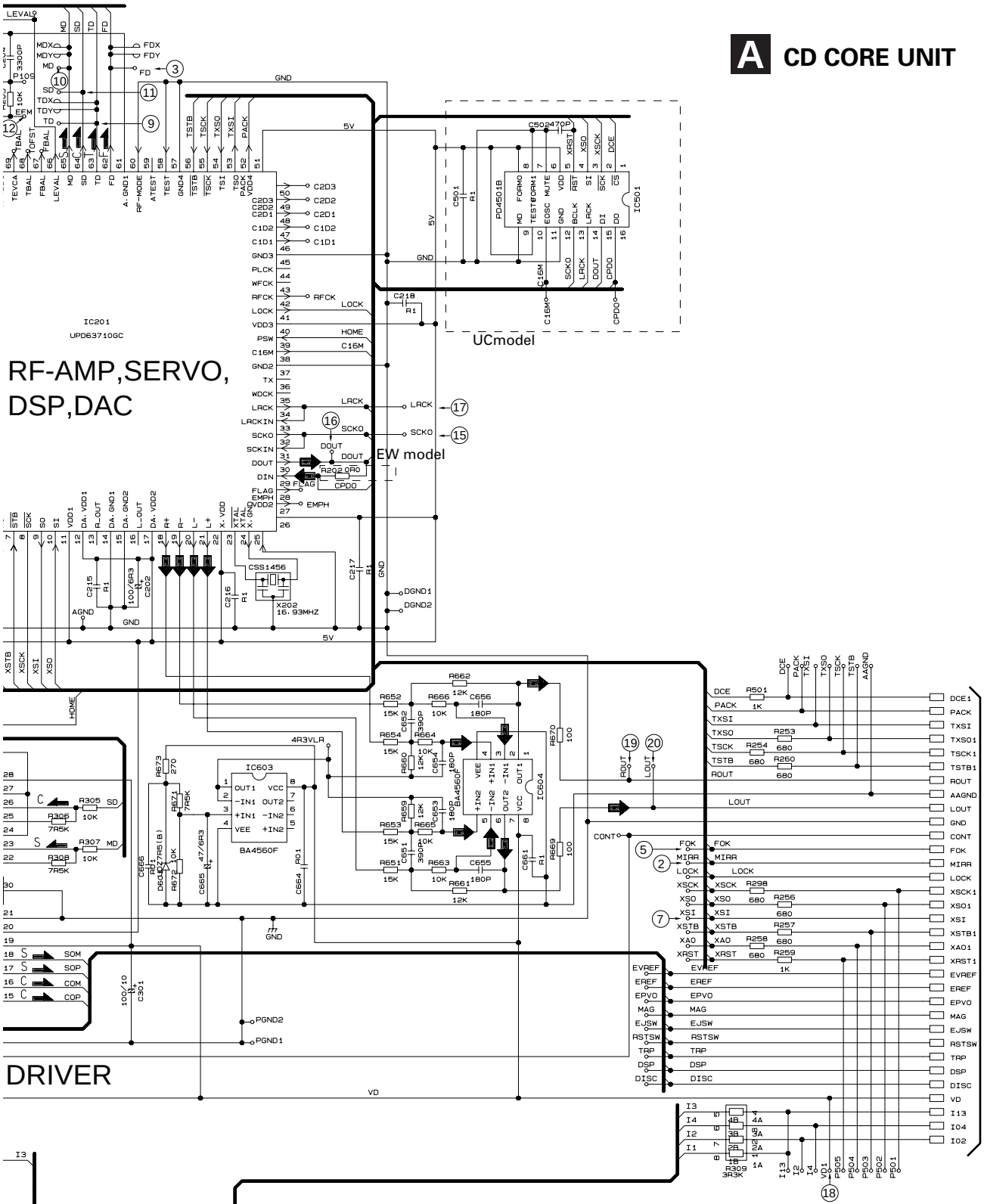
Note: When ordering service parts, be sure to refer to "EXPLODED VIEWS AND PARTS LIST" or "ELECTRICAL PARTS LIST".

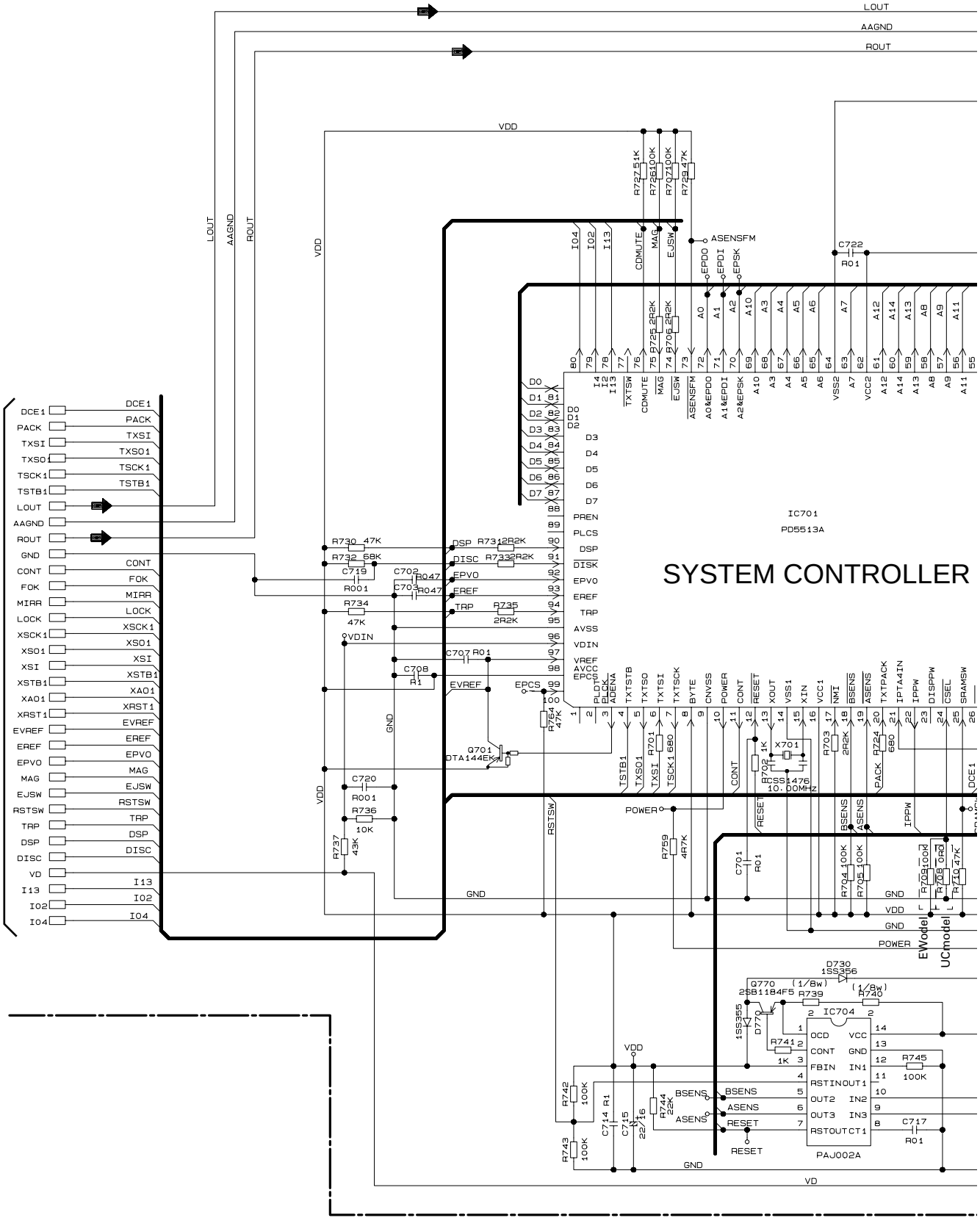


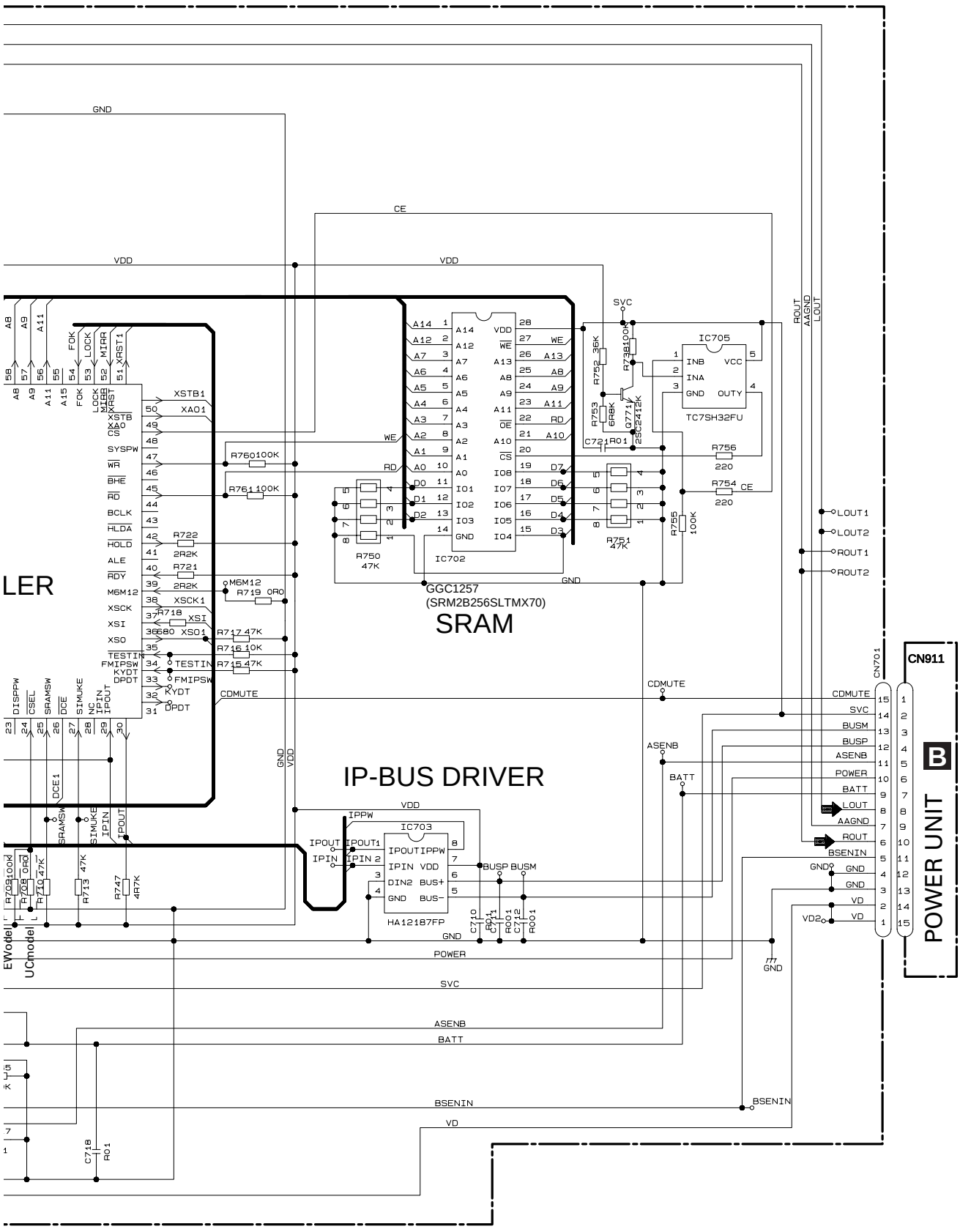
NOTE:
- Symbol indicates a resistor. No differentiation is made between chip resistors and discrete resistors.
- Symbol indicates a capacitor. No differentiation is made between chip capacitors and discrete capacitors.

Decimal points for resistor and capacitor fixed values are expressed as:
2.2→2R2
0.022→R022

A CD CORE UNIT



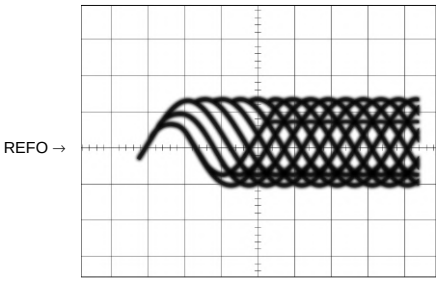

SYSTEM CONTROLLER
IC701
PD5513A
A1/2
A2/2
LOUT
AAGND
ROUT
VDD
GND
POWER
VD
EWodel
UCmodel
PAJ002A


LER
SRAM
GGC1257
(SRM2B256SLTMX70)
IP-BUS DRIVER
HA12187FP
TC7SH32FU
IC705
IC702
IC703
CN911
POWER UNIT
B
CN701
GND
VDD
CE
SVC
ROUT
AAGND
LOUT
XSTB1
XAO1
SYSPW
WE
RD
BHE
BCLK
HLDA
HOLD
ALE
RDY
M6M12
XSCK
XSI
XSO
TESTIN
FMIPSW
KYDT
DPDT
CDMUTE
DISPPW
CSEL
SRAMSW
DCE
SIMUKE
NC
IPIN
IPOUT
DCE1
IPPW
BUSP
BUSM
ASENB
BATT
POWER
SVC
BSENIN
VD
VD2
LOUT1
LOUT2
ROUT1
ROUT2
EWodel
UCmodel

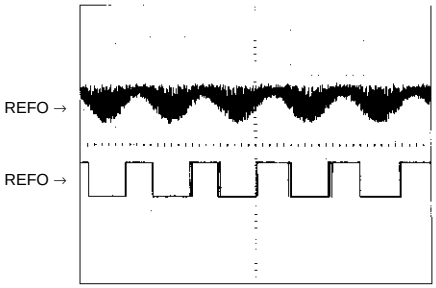
Note:1. The encircled numbers denote measuring pointes in the circuit diagram.
2. Reference voltage
REFO:2.5V

● Waveforms

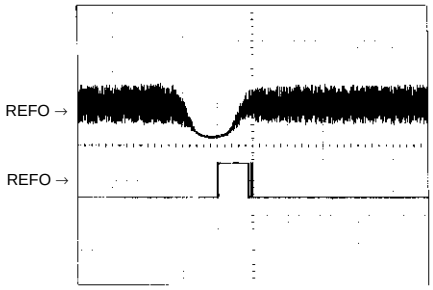
① RFI 0.5V/div. 0.5µs/div.
Normal mode: play



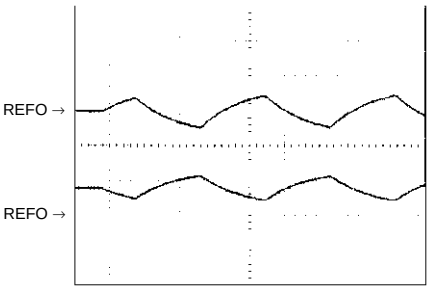
① CH1: RFI 1V/div. 0.5ms/div.
② CH2: MIRR 5V/div.
Test mode: Tracking open



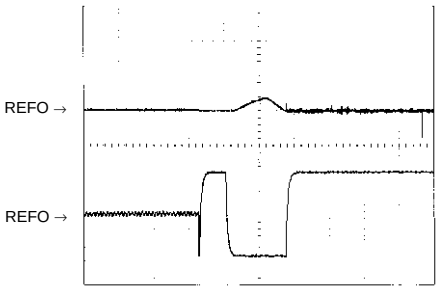
① CH1: RFI 1V/div. 0.5ms/div.
② CH2: MIRR 5V/div.
Normal mode: The defect part passes 800µm



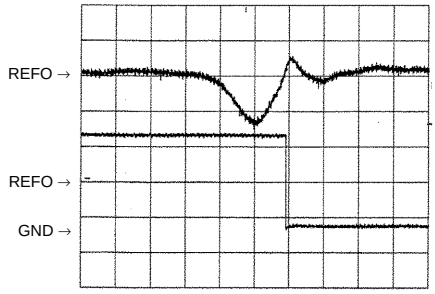
③ CH1: FD 0.5V/div. 0.2s/div.
④ CH2: FOR 2V/div.
Test mode: No disc, Focus close



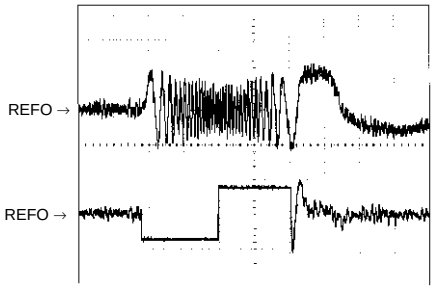
③ CH1: FD 0.5V/div. 0.2s/div.
⑤ CH2: FOK 2V/div.
Normal mode: Focus close



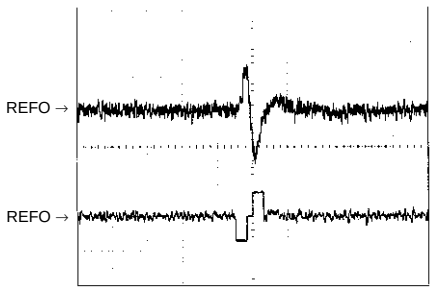
⑥ CH1: FE 0.5V/div. 1ms/div.
⑦ CH2: XSI 2V/div.
Normal mode: Focus close



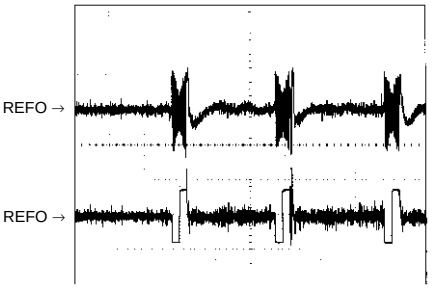
⑧ CH1: TE 0.5V/div. 0.5ms/div.
⑨ CH2: TD 0.5V/div.
Test mode: 32 tracks jump (REV)



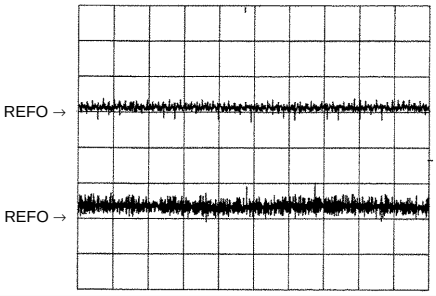
⑧ CH1: TE 0.5V/div. 0.5ms/div.
⑨ CH2: TD 0.5V/div.
Test mode: Single jump (REV)



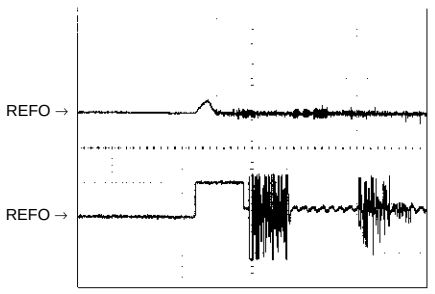
⑧ CH1: TE 0.5V/div. 5ms/div.
⑨ CH2: TD 0.5V/div.
Test mode: 100 tracks jump (REV)



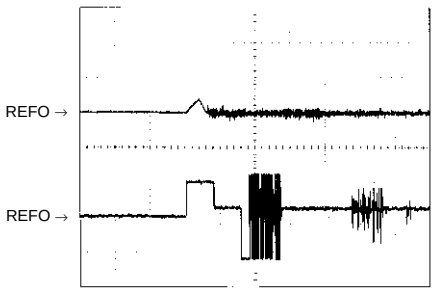
⑥ CH1: FE 0.1V/div. 20ms/div.
③ CH2: FD 0.2V/div.
Normal mode: Play



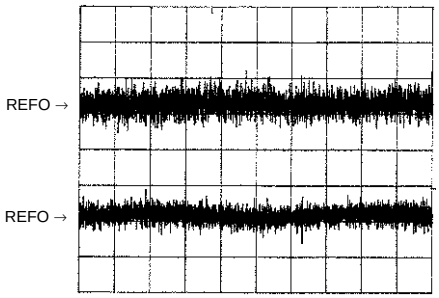
③ CH1: FD 0.5V/div. 0.5s/div.
⑩ CH2: MD 1V/div.
Normal mode: Focus close (12cm)



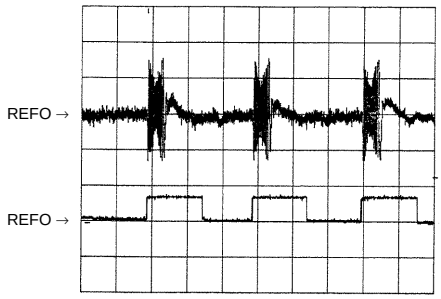
③ CH1: FD 0.5V/div. 0.5s/div.
⑩ CH2: MD 1V/div.
Normal mode: Focus close (8cm)



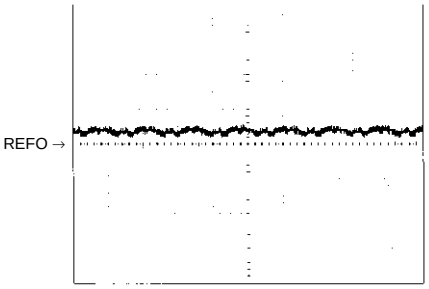
⑧ CH1: TE 0.2V/div. 20ms/div.
⑨ CH2: TD 0.2V/div.
Normal mode: play



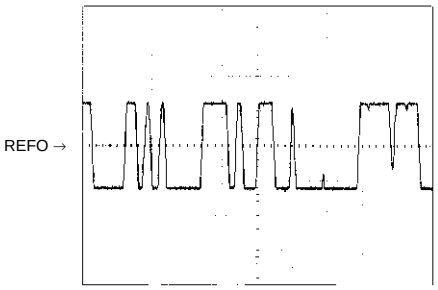
⑧ CH1: TE 0.5V/div. 5ms/div.
⑪ CH2: SD 0.5V/div.
TEST mode:100Tracks jump(FWD)



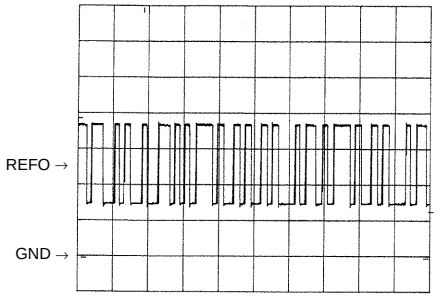
⑩ MD 0.5V/div. 0.1s/div.
Normal mode: Play (12cm)



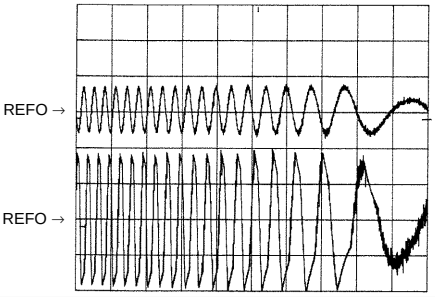
⑩ MD 1V/div. 10ms/div.
Long Search (12cm)



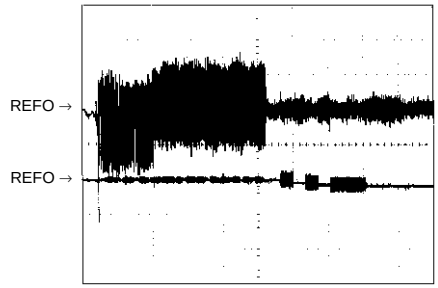
⑫ EFM 1V/div. 5µs/div.
Normal mode: Play



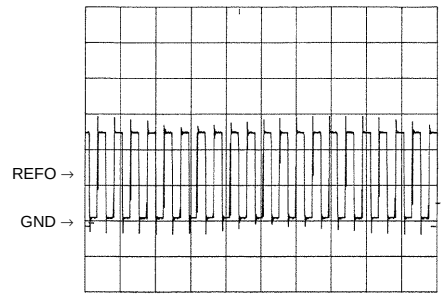
⑧ CH1: TE 1V/div. 2ms/div.
⑬ CH2: TEC 1V/div.
Test mode: Focus close
Tracking open



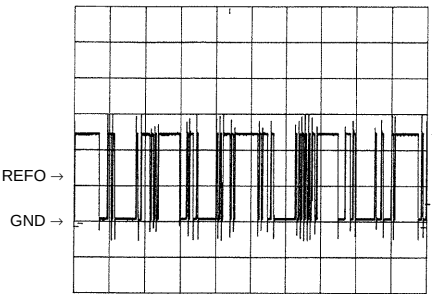
⑧ CH1: TE 0.5V/div. 0.2s/div.
⑥ CH2: FE 0.5V/div.
Normal mode: AGC after focus close



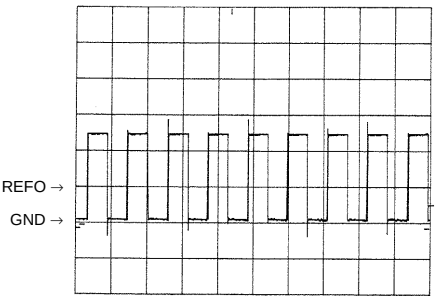
⑮ SCKO 2V/div. 1µs/div.
Normal mode: Play



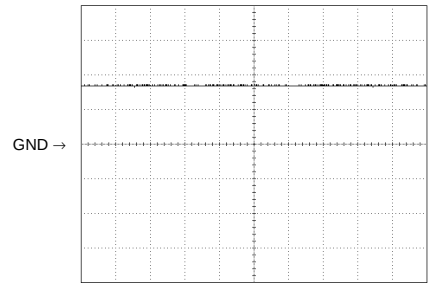
⑯ DOUT 2V/div. 10µs/div.
Normal mode: Play



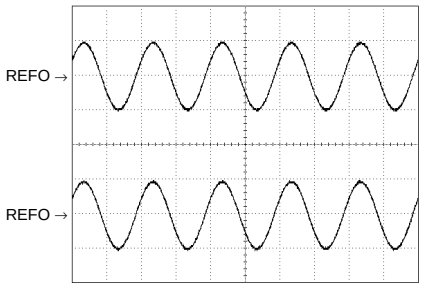
⑰ LRCK 2V/div. 20µs/div.
Normal mode: Play



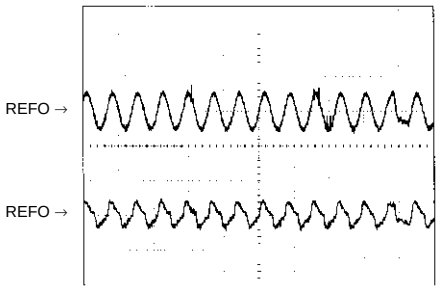
⑱ VD 5V/div. 50ms/div.
Normal mode: No disc



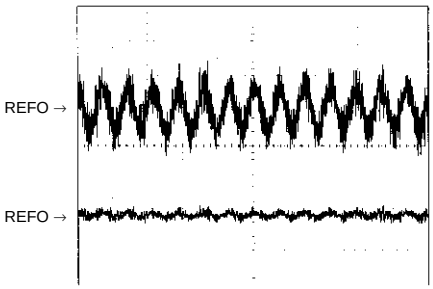
⑲ CH1: R OUT 2V/div.
⑳ CH2: L OUT 2V/div. 500µs/div.
Normal mode: Play (1kHz 0dB)



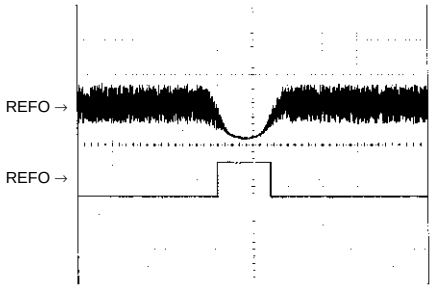
⑥ CH1: FE 0.2V/div.
③ CH2: FD 0.5V/div. 1ms/div.
Normal mode: During AGC



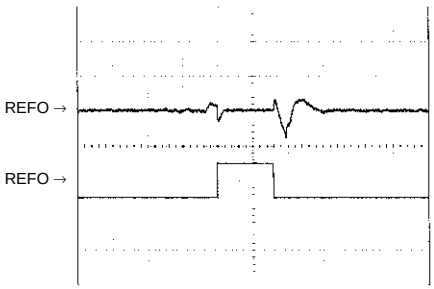
⑧ CH1: TE 0.2V/div.
⑨ CH2: TD 0.5V/div. 1ms/div.
Normal mode: During AGC



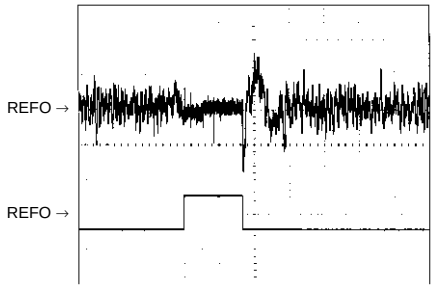
① CH1: RFI 1V/div.
㉑ CH2: HOLD 5V/div. 0.5ms/div.
Normal mode: The defect part passes 800µm(B.D)



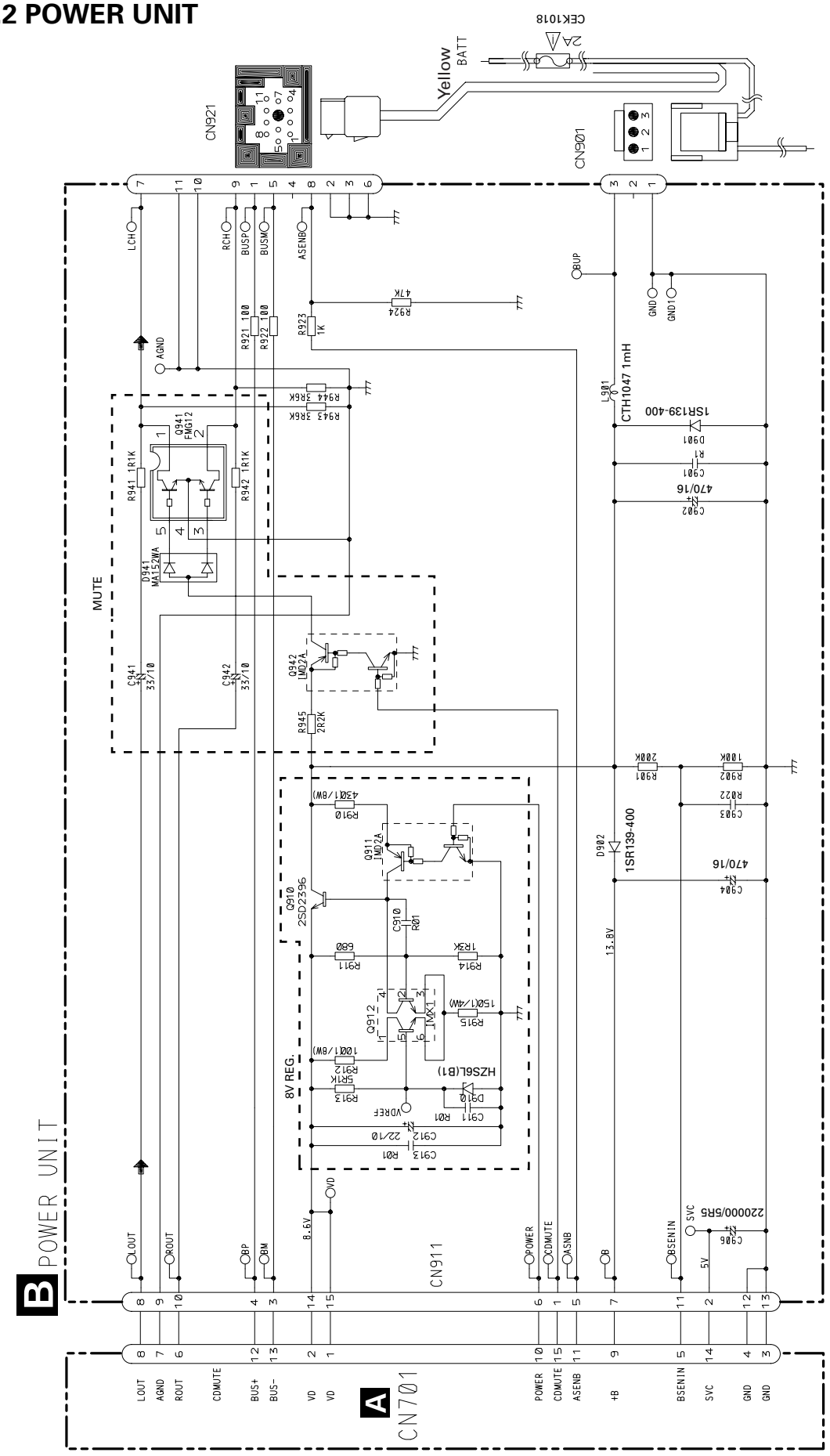
③ CH1: FD 1V/div.
㉑ CH2: HOLD 5V/div. 0.5ms/div.
Normal mode: The defect part passes 800µm(B.D)



⑨ CH1: TD 0.1V/div.
㉑ CH2: HOLD 5V/div. 0.5ms/div.
Normal mode: The defect part passes 800µm(B.D)



3.2 POWER UNIT



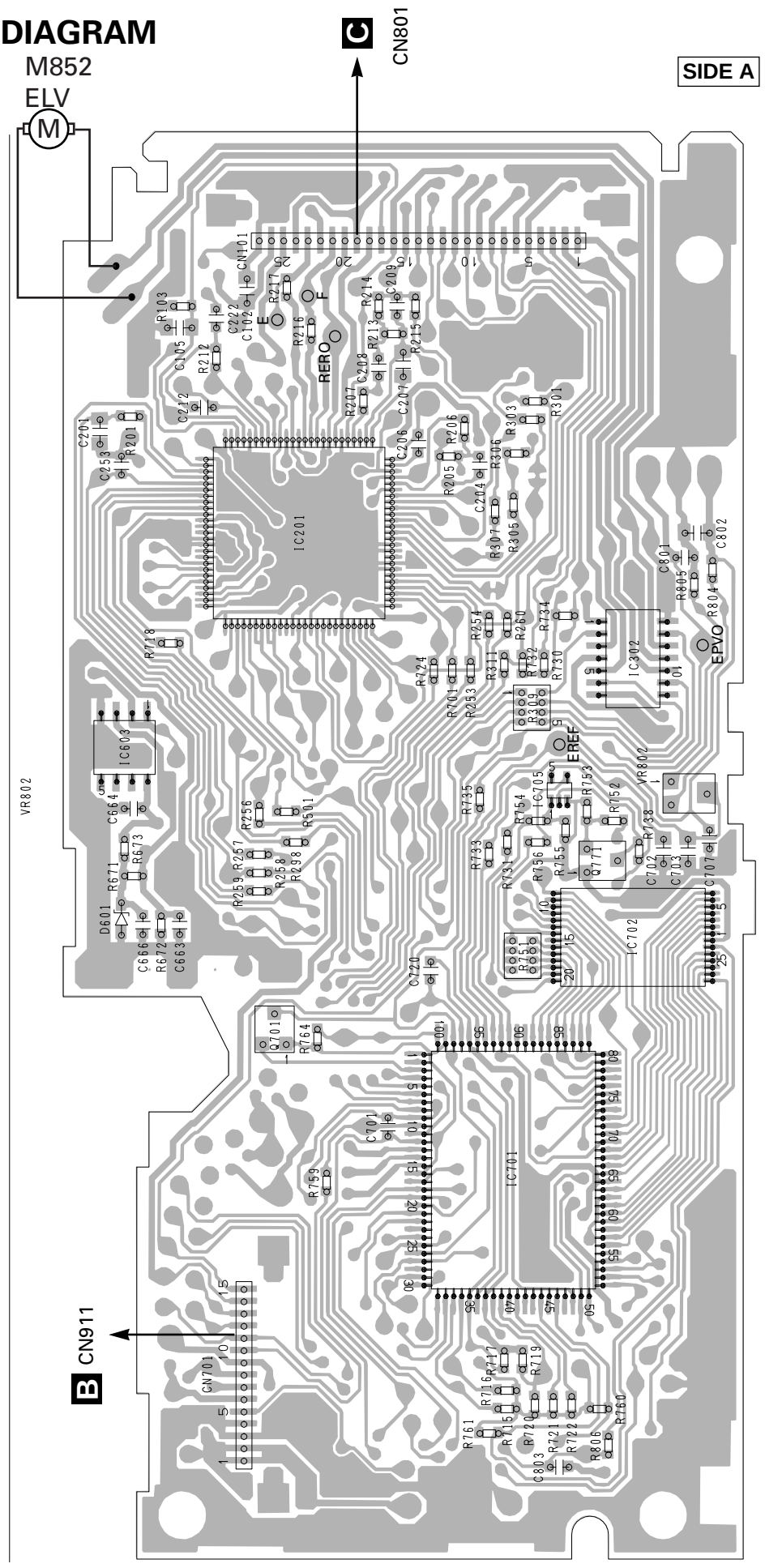
The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.

4. PCB CONNECTION DIAGRAM

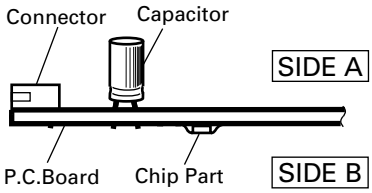
4.1 CD CORE UNIT

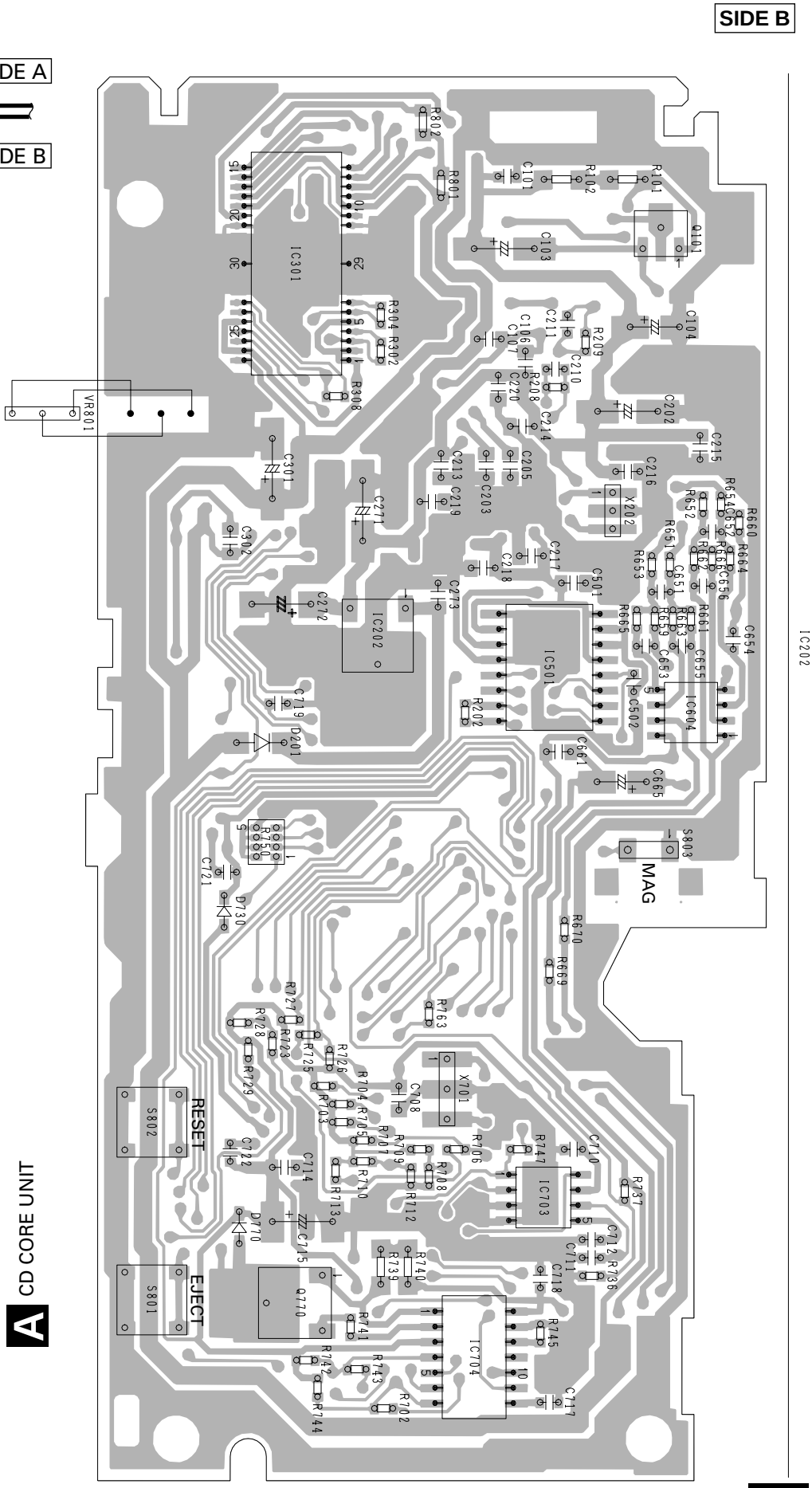
NOTE FOR PCB DIAGRAMS

1. The parts mounted on this PCB include all necessary parts for several destination.
   For further information for respective destinations, be sure to check with the schematic diagram.



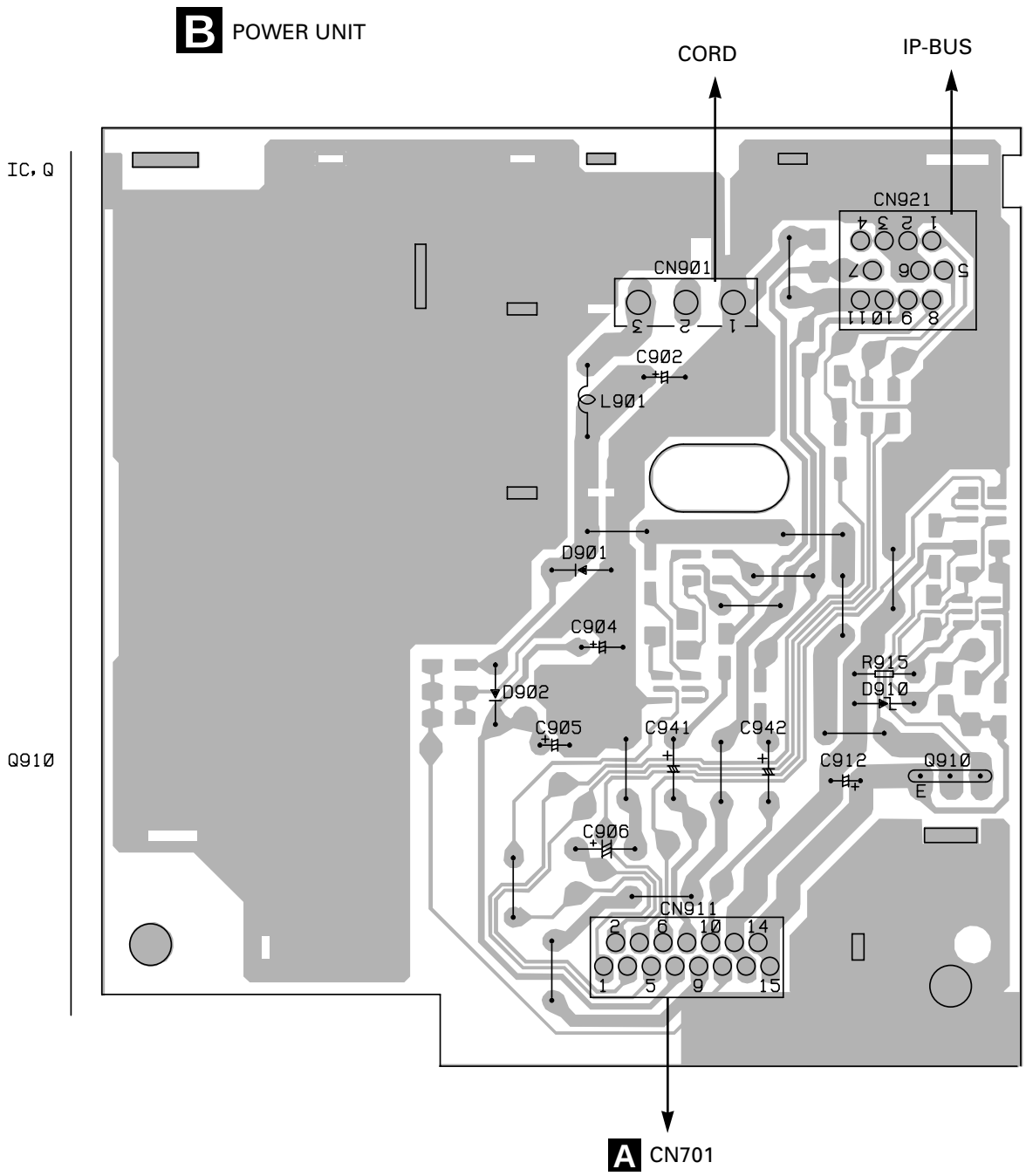
2. Viewpoint of PCB diagrams





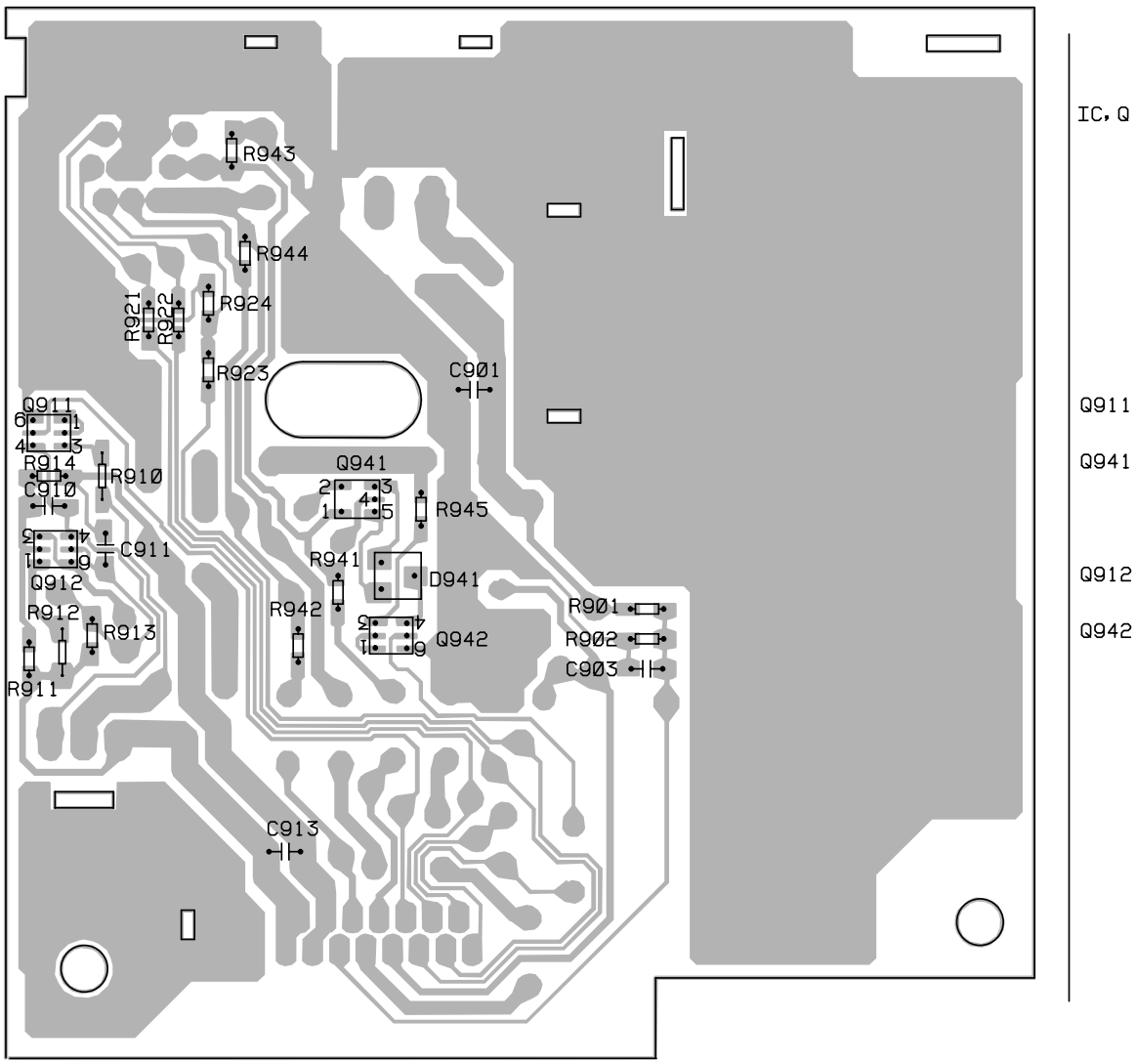
4.2 POWER UNIT

SIDE A



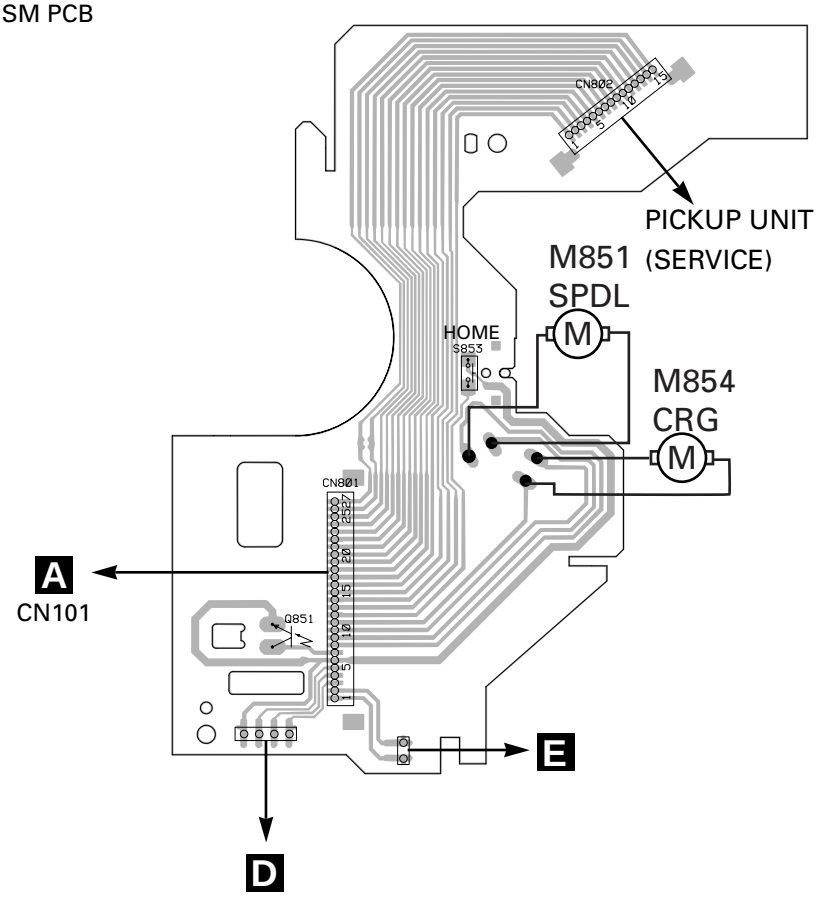
SIDE B

B POWER UNIT



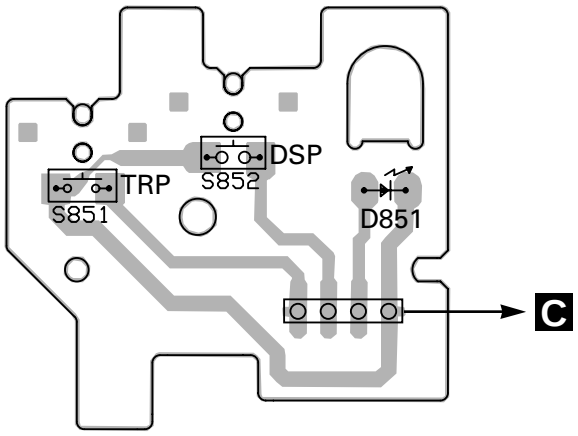
4.3 MECHANISM PCB

C MECHANISM PCB



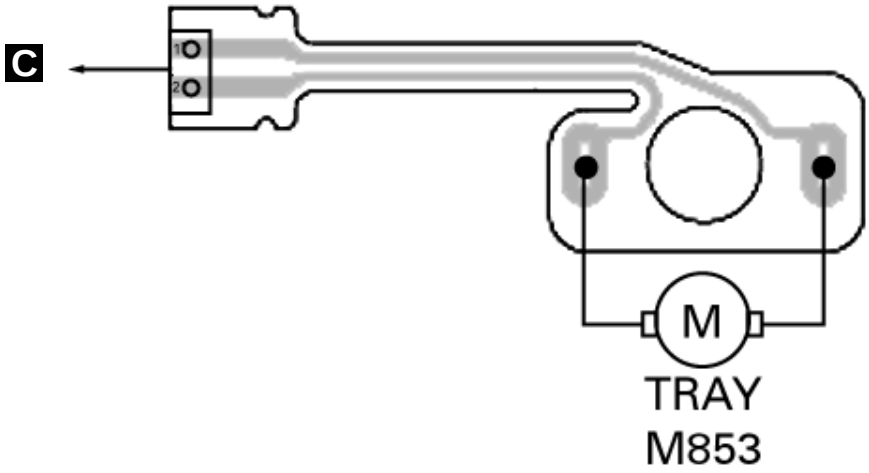
4.4 SWITCH PCB

D SWITCH PCB



4.5 MOTOR PCB

E MOTOR PCB



5. ELECTRICAL PARTS LIST

NOTE:

- Parts whose parts numbers are omitted are subject to being not supplied.
- The part numbers shown below indicate chip components.

Chip Resistor

RS1/○S○○○J,RS1/○○S○○○J

Chip Capacitor (except for CQS.....)

CKS....., CCS....., CSZS.....

A Unit Number : CWX2261(CDX-P656/X1N/UC)
CWX2260(CDX-P25/X1N/EW)
Unit Name : CD Core Unit

MISCELLANEOUS

=====Circuit Symbol and No.		===Part Name	Part No.
IC	201	IC	UPD63710GC
IC	202	IC	BA05FP
IC	301	IC	BA5986FM
IC	302	IC	LB1836M
IC	501	IC(UC model)	PD4501B
IC	603	IC	BA4560F
IC	604	IC	BA4560F
IC	701	IC	PD5513A
IC	702	IC (SRM2B256SLTMX70)	GGC1257
IC	703	IC	HA12187FP
IC	704	IC	PAJ002A
IC	705	IC	TC7SH32FU
Q	101	Transistor	2SB1132
Q	701	Transistor	DTA144EK
Q	770	Transistor	2SB1184F5
Q	771	Transistor	2SC2412K
D	201	Diode	1SR154-400
D	601	Diode	UDZ7R5(B)
D	730	Diode	1SS356
D	770	Diode	1SS355
X	202	Ceramic Resonator 16.93MHz	CSS1456
X	701	Ceramic Resonator 10.00MHz	CSS1476
S	801	Push Switch(EJECT)	CSG1076
S	802	Push Switch(RESET)	CSG1076
S	803	Spring Switch(MAG)	CSN1044
VR	802	Semi-fixed 1kΩ(B)	CCP1338

RESISTORS

=====Circuit Symbol and No.		===Part Name	Part No.
R	101		RS1/8S120J
R	102		RS1/8S100J
R	103		RS1/16S222J
R	201		RS1/16S104J
R	202	(EW model)	RS1/16S0R0J
R	205		RS1/16S103J
R	206		RS1/16S393J
R	207		RS1/16S182J
R	208		RS1/16S304J
R	212		RS1/16S0R0J
R	213		RS1/16S103J
R	214		RS1/16S103J
R	215		RS1/16S123J
R	216		RS1/16S273J
R	217		RS1/16S273J
R	253		RS1/16S681J
R	254		RS1/16S681J
R	256		RS1/16S681J
R	257		RS1/16S681J
R	258		RS1/16S681J
R	259		RS1/16S102J
R	260		RS1/16S681J
R	298		RS1/16S681J
R	301		RS1/16S103J
R	302		RS1/16S153J
R	303		RS1/16S103J
R	304		RS1/16S153J
R	305		RS1/16S103J
R	306		RS1/16S752J
R	307		RS1/16S103J
R	308		RS1/16S752J
R	309		RA4C332J
R	311		RS1/16S102J
R	501		RS1/16S102J
R	651		RSK1/16S153J
R	652		RSK1/16S153J
R	653		RSK1/16S153J
R	654		RSK1/16S153J
R	659		RSK1/16S123J
R	660		RSK1/16S123J
R	661		RSK1/16S123J
R	662		RSK1/16S123J
R	663		RSK1/16S103J
R	664		RSK1/16S103J
R	665		RSK1/16S103J
R	666		RSK1/16S103J
R	669		RS1/16S101J
R	670		RS1/16S101J
R	671		RS1/16S752J
R	672		RS1/16S103J
R	673		RS1/16S271J
R	701		RS1/16S681J
R	702		RS1/16S102J
R	703		RS1/16S222J
R	704		RS1/16S104J
R	705		RS1/16S104J
R	706		RS1/16S222J
R	707		RS1/16S104J
R	708	(UC model)	RS1/16S0R0J
R	709	(EW model)	RS1/16S104J
R	710		RS1/16S473J
R	713		RS1/16S473J
R	715		RS1/16S473J
R	716		RS1/16S103J
R	717		RS1/16S473J
R	718		RS1/16S681J
R	719		RS1/16S0R0J
R	721		RS1/16S222J
R	722		RS1/16S222J
R	724		RS1/16S681J
R	725		RS1/16S222J
R	726		RS1/16S104J
R	727		RS1/16S513J
R	729		RS1/16S473J
R	730		RS1/16S473J

=====Circuit Symbol and No.		===Part Name	Part No.
R	731		RS1/16S222J
R	732		RS1/16S683J
R	733		RS1/16S222J
R	734		RS1/16S473J
R	735		RS1/16S222J
R	736		RS1/16S103J
R	737		RS1/16S433J
R	738		RS1/16S104J
R	739		RS1/8S2R0J
R	740		RS1/8S2R0J
R	741		RS1/16S102J
R	742		RS1/16S104J
R	743		RS1/16S104J
R	744		RS1/16S223J
R	745		RS1/16S104J
R	747		RS1/16S472J
R	750		RA4C473J
R	751		RA4C473J
R	752		RN1/16SE3602D
R	753		RN1/16SE6801D
R	754		RS1/16S221J
R	755		RS1/16S104J
R	756		RS1/16S221J
R	759		RS1/16S472J
R	760		RS1/16S104J
R	761		RS1/16S104J
R	764		RS1/16S473J
R	801		RS1/10S221J
R	802		RS1/10S271J
R	804		RS1/16S562J
R	805		RS1/16S562J
R	806		RS1/16S102J

CAPACITORS

C	101		CKSRYB102K50
C	102		CKSQYB104K25
C	103		CEV101M6R3
C	104		CEV470M6R3
C	105		CKSQYB334K16
C	106		CKSQYB334K16
C	107		CKSQYB334K16
C	201		CKSQYB104K25
C	202		CEV101M6R3
C	203		CKSQYB104K25
C	204		CKSRYB332K50
C	205		CKSQYB104K25
C	206		CKSRYB392K50
C	207		CKSQYB224K16
C	208		CCSRCH270J50
C	209		CCSRCJ3R0C50
C	210		CCSRCH221J50
C	211		CCSRCH101J50
C	212		CKSRYB682K50
C	213		CKSQYB104K25
C	215		CKSQYB104K25
C	216		CKSQYB104K25
C	217		CKSQYB104K25
C	218		CKSQYB104K25
C	220		CKSQYB104K25
C	253		CKSRYB471K50
C	271		CEV101M6R3
C	272	33µF/10V	CCH1300
C	273		CKSQYB334K16
C	301		CEV101M10

=====Circuit Symbol and No.		===Part Name	Part No.
C	302		CKSQYB224K16
C	501	(UC model)	CKSQYB104K25
C	502	(UC model)	CKSRYB471K50
C	651		CCSRCH391J50
C	652		CCSRCH391J50
C	653		CCSRCH181J50
C	654		CCSRCH181J50
C	655		CCSRCH181J50
C	656		CCSRCH181J50
C	661		CKSQYB104K25
C	664		CKSRYB103K25
C	665		CEV470M6R3
C	666		CKSRYB103K25
C	701		CKSRYB103K25
C	702		CKSQYB473K16
C	703		CKSQYB473K16
C	707		CKSRYB103K25
C	708		CKSQYB104K25
C	710		CKSRYB103K25
C	711		CKSRYB102K50
C	712		CKSRYB102K50
C	714		CKSQYB104K25
C	715		CSZST220M16
C	717		CKSRYB103K25
C	718		CKSRYB103K25
C	719		CKSRYB102K50
C	720		CKSRYB102K50
C	721		CKSRYB103K25
C	722		CKSRYB103K25
C	801		CKSRYB103K25
C	802		CKSQYB104K25
C	803		CKSRYB103K25

B Unit Number : CWX2299
Unit Name : Power Unit

MISCELLANEOUS

Q	910	Transistor	2SD2396
Q	911	Transistor	IMD2A
Q	912	Transistor	IMX1
Q	941	Transistor	FMG12
Q	942	Transistor	IMD2A
D	901	Diode	1SR139-400
D	902	Diode	1SR139-400
D	910	Diode	HZS6L(B1)
D	941	Diode	MA152WA
L	901	Choke Coil 1mH	CTH1047

RESISTORS

R	901	RS1/10S204J
R	902	RS1/10S104J
R	910	RS1/8S431J
R	911	RS1/10S681J
R	912	RS1/8S101J
R	913	RS1/10S512J
R	914	RS1/10S132J
R	915	RD1/4PU151J
R	921	RS1/10S101J
R	922	RS1/10S101J
R	923	RS1/10S102J
R	924	RS1/10S473J
R	941	RS1/10S112J
R	942	RS1/10S112J
R	943	RS1/10S362J
R	944	RS1/10S362J
R	945	RS1/10S222J

=====Circuit Symbol and No.	===	Part Name	Part No.
CAPACITORS			
C	901		CKSQYB104K50
C	902	470µF/16V	CCH1183
C	903		CKSQYB223K25
C	904	470µF/16V	CCH1183
C	906	0.22F/5.5V	CCL1037
C	910		CKSQYB103K50
C	911		CKSQYB103K50
C	912		CEJA220M10
C	913		CKSQYB103K50
C	941		CEJA330M10
C	942		CEJA330M10
C	Unit Number :		
	Unit Name :	Mechanism PCB	
Q	851	Photo-transistor	PT4800
S	853	Spring Switch(HOME)	CSN1051
D	Unit Number :		
	Unit Name :	Switch PCB	
D	851	LED	CN504-2
S	851	Spring Switch(DSP)	CSN1051
S	852	Spring Switch(TAP)	CSN1052
E	Unit Number :		
	Unit Name :	Motor PCB	
M	853	Motor(TRAY)	CXB3005
Miscellaneous Parts List			
		Pickup Unit(P8)(Service)	CXX1285
M	851	Motor(SPINDLE)	CXB3003
M	852	Motor(ELV)	CXB3006
M	854	Motor(CARRIAGE)	CXB3004
VR	801	Volume 10kΩ	CCW1023

6. ADJUSTMENT

6.1 CHECKING THE GRATING

● Checking the Grating After Changing the Pickup Unit

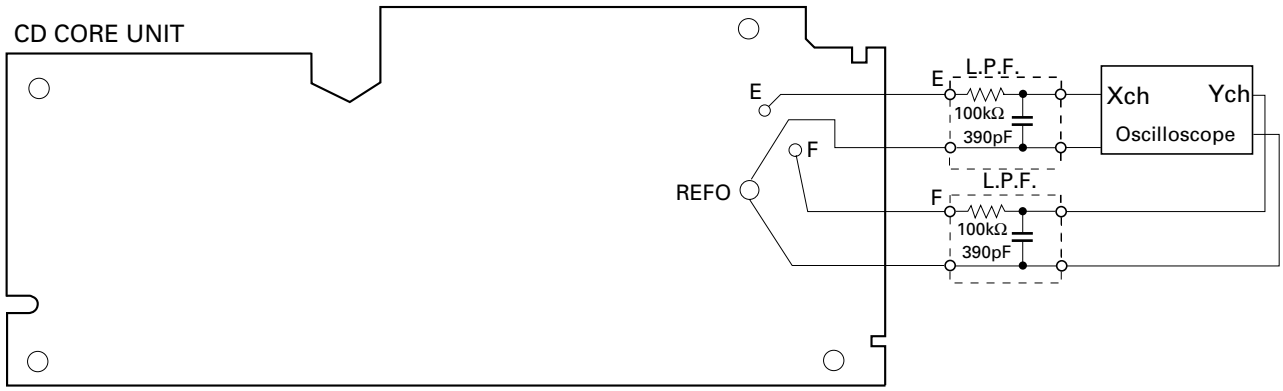
• **Note :**
CD mechanism modules the grating angle of the pickup unit cannot be adjusted after the pickup unit is changed. The pickup unit in the CD mechanism module is adjusted on the production line to match the CD mechanism module and is thus the best adjusted pickup unit for the CD mechanism module. Changing the pickup unit is thus best considered as a last resort. However, if the pickup unit must be changed, the grating should be checked using the procedure below.

• **Purpose :**
To check that the grating is within an acceptable range.

• **Symptoms of Mal-adjustment :**
If the grating is off by a large amount symptoms such as being unable to close tracking, being unable to perform track search operations, or track searching taking a long time, may appear.

• **Method :**

• Measuring Equipment	• Oscilloscope, Two L.P.F.
• Measuring Points	• E, F, REFO
• Disc	• ABEX TCD-784
• Mode	• TEST MODE



• **Checking Procedure**
1. Enter Test mode, then select Multi-CD player and switch the 5V regulator on.
2. Using the **TRK+** and **TRK-** buttons, move the pickup unit to the innermost track.
3. Press key **9** to close focus, the display should read "91". Press key **9** 2 times. Enter Rough Servo mode. Press key **8** to implement the tracking balance adjustment the display should now read "81".
4. As shown in the diagram above, monitor the LPF outputs using the oscilloscope and check that the phase difference is within 75° . Refer to the photographs supplied to determine the phase angle.
5. If the phase difference is determined to be greater than 75° try changing the pickup unit to see if there is any improvement. If, after trying this a number of times, the grating angle does not become less than 75° then the mechanism should be judged to be at fault.

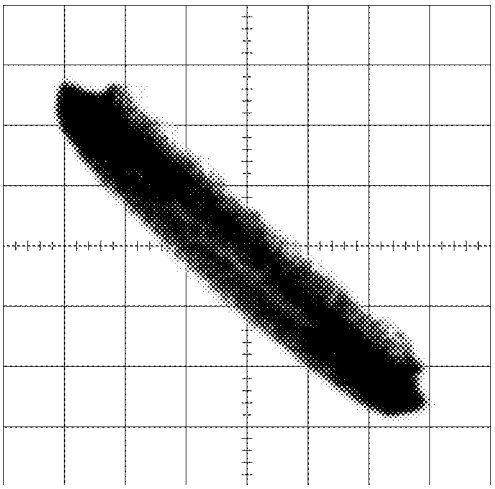
• **Note**
Because of eccentricity in the disc and a slight misalignment of the clamping center the grating waveform may be seen to "wobble" (the phase difference changes as the disc rotates). The angle specified above indicates the average angle.

• **Hint**
Change the disc changes the clamp position and may decrease the "wobble".

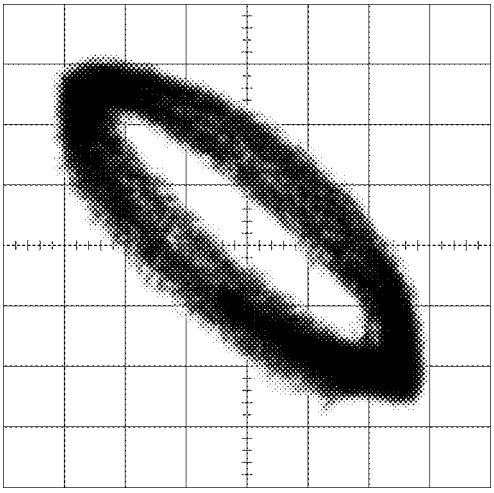
Grating waveform

Ech→ Xch 20mV/div, AC
Fch→ Ych 20mV/div, AC

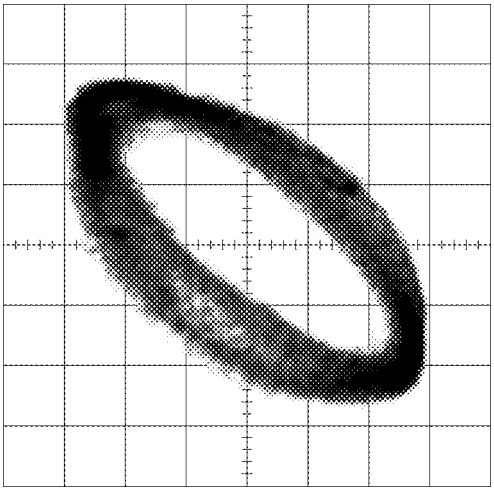
0˚



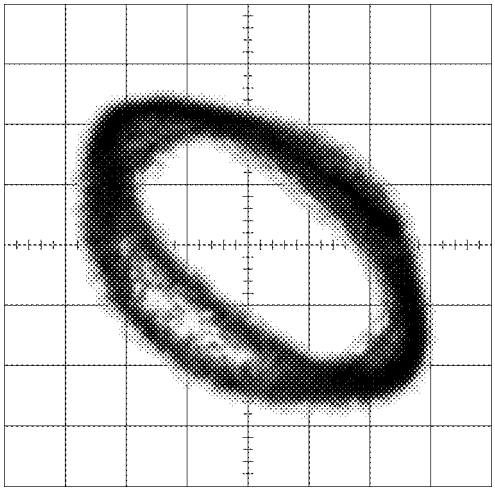
30˚



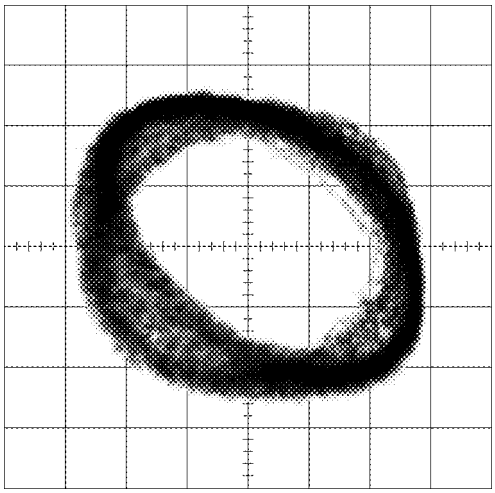
45˚



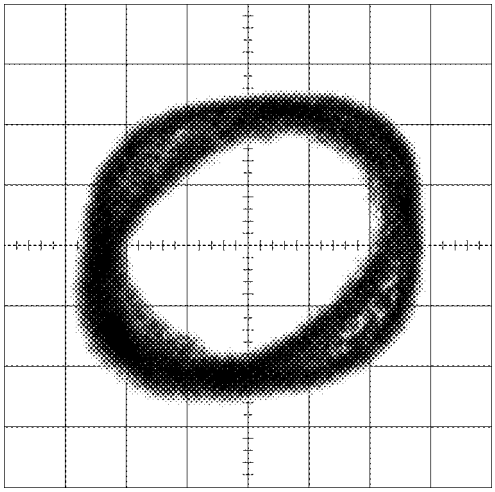
60˚



75˚



90˚



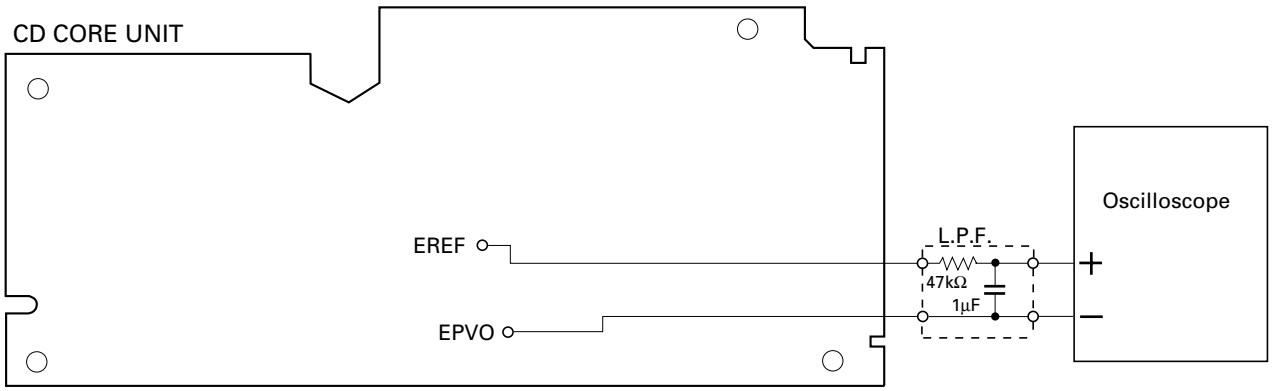
6.2 ADJUSTMENT OF ELEVATION WHEN THE CD CORE UNIT HAS BEEN REMOVED FOR MAINTENANCE

● Adjustment When Error Code 60 is Displayed Because of Malfunctioning Elevation

• **Note :**
This mechanisms is detects the height of the stage using slide-variable resistance.
To absorb dislocation of the stage height caused by differences in the mechanism and the CD core unit, adjustment must be made for each CD-mechanism module using a variable resistor.
Normally, readjustment is not needed, as this has been adjusted at the factory. However, adjustment of elevation is required according to the procedure explained below if an elevation error has occurred or if the CD core unit has been removed.

• **Purpose :**
To adjust and confirm whether or not elevation operates correctly.

• **Adjustment Method :**
• Measuring Equlpment: Oscilloscope, One L.P.F.
• Measuring Points : EREF, EPVO
• Setting : Without a magazine in Test mode
With the mechanism placed upside-down (Place the CD mechanism module so that the CD core unit is above.)



• **Confirmation Procedure**

1. Enter Test mode, then select Multi-CD player.
2. Press key **7** to enter Mechanism Test mode.
3. Press key **12** twice to specify the amount of movement.

Examples of display

TRACK	FUNCTION
	' "

TRACK	FUNCTION
72	00' 00"

The amount of movement changes each time key **12** is pressed.

maximum movement
↑ Key 12
↑ during movement
Key 12 ↑ Key 12
↑ minimum movement

TRACK	FUNCTION
72	00' 02"

TRACK	FUNCTION
72	00' 01"

TRACK	FUNCTION
72	00' 00"

Examples of display

4. Press key **9** to set ELV/TRAY mode to TRAY.

TRACK	FUNCTION
72	01' 02"

5. Press key **FF** to release the clamp and return the tray to the magazine.

Release the clamp

6. Press key **9** to enter Elevation Move mode.

TRACK	FUNCTION
72	00' 02"

7. Use key **FF/REV** to operate elevation and set if to the graduation of the third step (Fig. 1).

8. Make the adjustment.
   Use VR802 to adjust the difference in potential between EREF and EPVO to 0 ±10 mV.

9. When adjustment is completed, press key **BAND** to exit Mechanism Test mode.

TRACK	FUNCTION
72	00' 02"

10. Confirm operation of the mechanism.
    Place the mechanism horizontally (CD core unit below). Take care not to short-circuit the PCB.

TRACK	FUNCTION
	' "

11. Confirm the height of the stage. Use the DISC± key to select Disc No.3.

    Check if the stopper bend of the clamp lever is engaged in the groove of the frame stopper (Fig. 2-4).

TRACK	FUNCTION
04	00' 00"

• **Note :**
The stopper bend will be pressed downward into the groove for final clamping. Confirm the engagement position of the stopper bend.

• If the stopper bend is engaged in the center and pressed downward, adjustment is completed. Go to step 15.

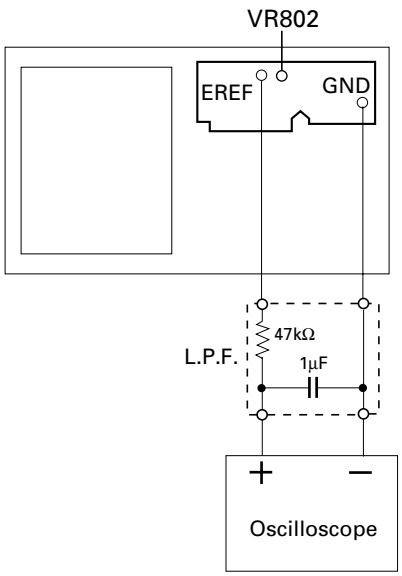
• If the stopper bend is dislocated, check the amount of dislocation by following steps 12 to 14.

12. To see the amount of dislocation, place the mechanism upside-down. If the stopper bend has been dislocated in the direction of the first CD, turn VR802 to the left(Fig. 2).

    To lower the stage toward the sixth step by 0.1 mm, reduce the voltage of EREF (adjusted in step 8) by 20 mV.

    If the stopper bend has been dislocated in the direction of the sixth CD, turn VR802 to the right(Fig. 4).

    To raise the stage toward the first step by 0.1 mm, increase the voltage of EREF (adjusted in step 8) by 20 mV.



13. Place the mechanism horizontal. Go back to step 11 to reconfirm the stage height.

14. When adjustment of the stage height is completed, proceed as follows:

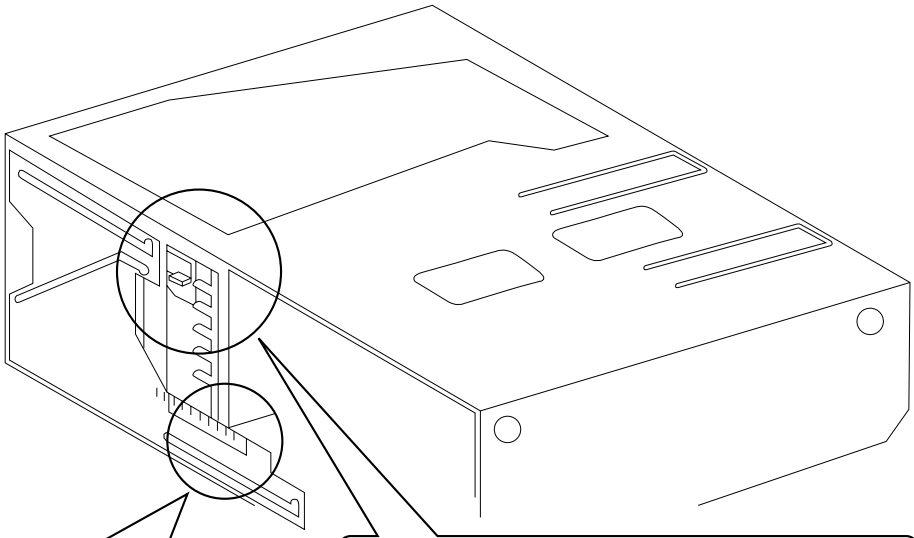
15. Press the **EJECT** switch.

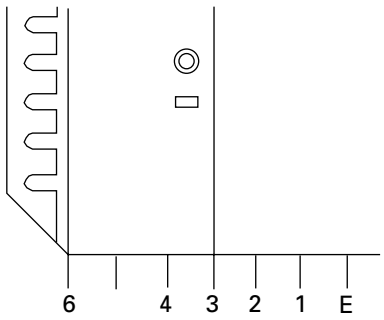
16. Once operation of the mechanism has stopped, turn the power OFF.

17. Wait more than one minute after the power is turned off, then turn the power ON and insert a magazine.

18. Check if the mechanism operates correctly with the first and fourth CDs.

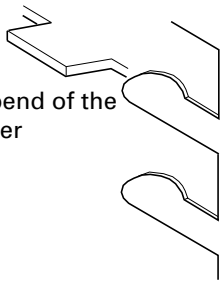
19. If the mechanism operates properly, adjustment is completed. If the mechanism operates improperly, make the adjustment again.





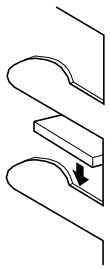
Adjust the insertion gate of magazine to the third scale.

Fig. 1



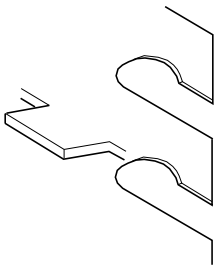
Dislocated toward the first CD.

Fig. 2



Engaged in the center and pressed downward.

Fig. 3



Dislocated toward the sixth CD.

Fig. 4

7. GENERAL INFORMATION

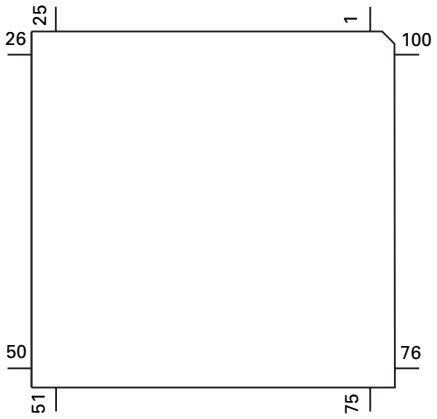
7.1 IC

● **Pin Functions (UPD63710GC)**

Pin No.	Pin Name	I/O	Function and Operation
1	GND		Logic circuit GND
2	HOLD	I/O	Defect detection output
3	MIRR	I/O	MIRR output
4	FOK	O	RFOK signal output
5	$\overline{\text{RST}}$	I	Reset signal input
6	A0	I	Command/parameter identification signal input
7	$\overline{\text{STB}}$	I	Data strobe signal input
8	$\overline{\text{SCK}}$	I	Clock signal input for serial data input/output
9	SO	O	Serial data and status signal output
10	SI	I	Serial data input
11	VDD		Positive power supply terminal to logic circuit
12	DA.VDD		Positive power supply terminal to D/A converter
13	NC		Not used
14, 15	DA.GND		D/A converter GND
16	NC		Not used
17	DA.VDD		Positive power supply terminal to D/A converter
18	R+	O	Right channel audio data output
19	R-	O	Right channel audio data output
20	L-	O	Left channel audio data output
21	L+	O	Left channel audio data output
22	X.VDD		Positive power supply terminal to crystal oscillation circuit
23	$\overline{\text{XTAL}}$	O	Crystal oscillator connect pin
24	XTAL	I	Crystal oscillator connect pin
25	X.GND		Crystal oscillation circuit GND
26	VDD		Positive power supply terminal to logic circuit
27	EMPH	O	Output pin for the pre-emphasis data in the sub-Q code
28	FLAG	O	Flag output pin to indicate that audio data currently being output consists of noncorrectable data
29	DIN	I	Serial data input to internal DAC
30	DOUT	O	Serial audio data output
31	SCKIN	I	Serial clock input to internal DAC
32	SCKO	O	Audio data that is output from DOUT changes at rising edge of this clock
33	LRCKIN	I	LRCK signal input to internal DAC
34	LRCK	O	Signals to distinguish the right and left channels of the audio data output from DOUT
35	WDCK	O	Output double the frequency of LRCK
36	TX	O	Digital audio interface data output
37	GND		Logic circuit GND
38	C16M	O	Oscillator clock buffering output
39	LIMIT	I	Status of the pin is output at Bit 5 of the status output
40	VDD		Positive power supply terminal to logic circuit
41	LOCK	O	EFM synchronous detection signal
42	RFCK	O	Frame synchronous signal of XTAL-system
43	WFCK	O	Frame synchronous signal of PLL-system
44	PLCK	O	Monitor pin of bit clock
45	GND		Logic circuit GND
46	C1D1	O	Output pin for indicating the C1 error correction results
47	C1D2	O	Output pin for indicating the C1 error correction results
48	C2D1	O	Output pin for indicating the C2 error correction results
49	C2D2	O	Output pin for indicating the C2 error correction results
50	C2D3	O	Output pin for indicating the C2 error correction results
51	VDD		Positive power supply terminal to logic circuit

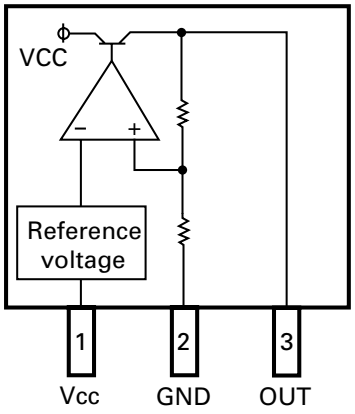
Pin No.	Pin Name	I/O	Function and Operation
52	PACK	O	CD-TEXT PACK synchronous signal
53	TSO	O	CD-TEXT data serial output
54	TSI	I	CD-TEXT control parameter serial input
55	$\overline{\text{TSCK}}$	I	CD-TEXT serial clock input
56	TSTB	I	CD-TEXT parameter strobe signal input
57	GND		Logic circuit GND
58	TEST	I	Test pin
59	ATEST	I/O	Test pin
60	RFMODE	I	Use/not use select for internal RF amplifier
61	A.GND		Analog circuit GND
62	FD	O	Focus drive output
63	TD	O	Tracking drive output
64	SD	O	Sled drive output
65	MD	O	Spindle drive output
66	DACO	O	DAC output for adjustment
67	FBAL	O	DAC output for adjustment
68	TBAL	O	DAC output for adjustment
69	TEVCA	O	DAC output for adjustment
70	A.VDD		Power supply terminal to analog circuit
71	EFM	O	EFM signal output
72	ASY	I	EFM comparator reference voltage input
73	C3T		3T detection capacitor additional pin
74	RFI	I	RF signal input for EFM data regulation
75	AGCO	O	RF signal output of after gain adjustment
76	AGCI	I	RF-AGC amplifier input
77	RFO	O	RF summing amplifier output
78	EQ2		RF amplifier equalizer parts additional pin
79	EQ1		RF amplifier equalizer parts additional pin
80	RF-	I	RF summing amplifier inverted input
81	A.GND		Analog circuit GND
82	A	I	Photo detector A input
83	C	I	Photo detector C input
84	B	I	Photo detector B input
85	D	I	Photo detector D input
86	F	I	Photo detector F input
87	E	I	Photo detector E input
88	A.VDD		Positive power supply terminal to analog circuit
89	REFOUT	O	Reference electric potential output
90	FE-	I	Focus error amplifier inverted input
91	FEO	I/O	Focus error amplifier output
92	TE-	I	Tracking error amplifier inverted input
93	TEO	I/O	Tracking error amplifier output
94	TE2	I/O	Tracking error output of after amplification
95	TEC	I	Tracking comparator input
96	A.GND		Analog circuit GND
97	PD	I	PD detection signal input for LD output monitor
98	LD	O	LD control current output
99	PN	I	APC circuit control polarity set pin
100	A.VDD		Positive power supply terminal to analog circuit

*UPD63710GC

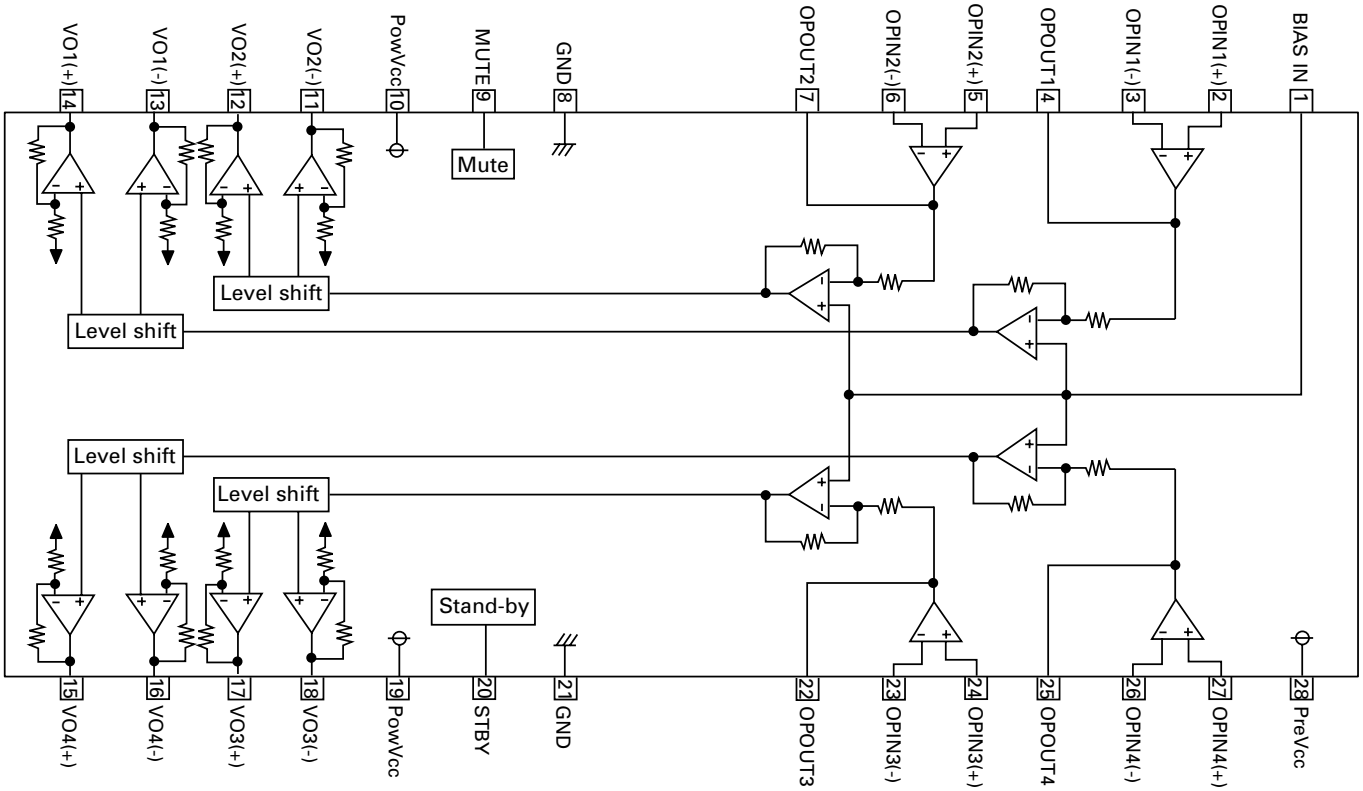


IC's marked by* are MOS type.
Be careful in handling them because they are very liable to be damaged by electrostatic induction.

BA05FP



BA5986FM

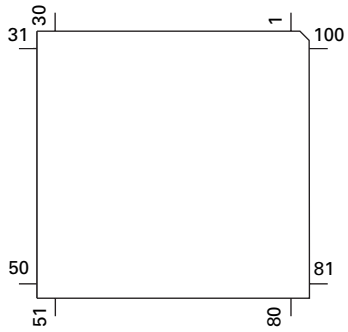


● **Pin Functions (PD5513A)**

Pin No.	Pin Name	I/O	Format	Function and Operation
1,2	NC			Not used
3	$\overline{\text{ADENA}}$	O	C	A/D reference voltage output
4	TXTSTE	O	C	TEXT parameter output
5	TXTSO	O	C	TEXT control parameter serial output
6	TXTSI	I		TEXT data serial input
7	TXTSCK	O	C	TEXT clock output
8	BYTE	I		VCC joint
9	CNVSS	I		VSS joint
10	POWER	O	C	CD +5V control
11	CONT	O	C	Servo driver output control
12	$\overline{\text{RESET}}$	I		Reset input
13	XOUT	O		Crystal oscillating element connection pin
14	VSS			GND
15	XIN	I		Crystal oscillating element connection pin
16	VCC			VDD
17	$\overline{\text{NMI}}$	I		Pull up
18	$\overline{\text{BSENS}}$	I		Back Up sense input
19	$\overline{\text{ASENS}}$	I		ACC power sense input
20	TXTPACK	I		TEXT PACK interrupt input
21	IPTA4IN	I		IPIN joint
22	$\overline{\text{IPPW}}$	O	C	Power supply control output for IP BUS interface IC
23	NC			Not used
24	CSEL	I		Compression select
25	SRAMSW	I		When there is SRAM,"H"
26	CCS	O	C	IP-BUS chip select
27,28	NC			Not used
29	IPIN	I		Data input from IP BUS interface IC
30	IPOUT	O	C	Data output for IP BUS interface IC
31,32	NC			Not used
33	FMIPSW	I		FM/IP BUS select switch
34	$\overline{\text{TESTIN}}$	I		Test program mode input
35	XSO	O	NM	LSI data output
36	XSI	I		LSI data input
37	XSCK	O	NM	LSI clock output
38	M6M12	I		6/12 disc select input
39–43	NC			Not used
44	$\overline{\text{RD}}$	O	C	SRAM enable output
45	NC			Not used
46	$\overline{\text{WR}}$	O	C	SRAM write enable output
47	NC			Not used
48	$\overline{\text{CS}}$	O	C	SRAM chip select
49	XA0	O		Control signal distinguishing data from microcomputer
50	$\overline{\text{XSTB}}$	O	C	CD LSI strobe output
51	$\overline{\text{XRST}}$	O	C	CD LSI reset output
52	MIRR	I		Mirror detector input
53	LOCK	I		Spindle lock detector input
54	FOK	I		FOK signal input
55	NC			Not used
56	A11	I		Address BUS input
57	A9	O	C	SRAM address bus output
58	A8	O	C	SRAM address bus output
59	A13	O	C	SRAM address bus output
60	A14	O	C	SRAM address bus output
61	A12	O	C	SRAM address bus output
62	VCC			VDD
63	A7	O	C	SRAM address bus output
64	VSS			GND

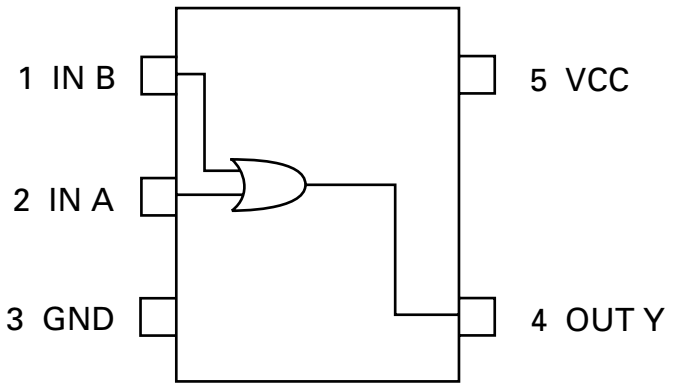
Pin No.	Pin Name	I/O	Format	Function and Operation
65–68	A6-A3	O	C	SRAM address bus output
69	A10	O	C	SRAM address bus output
70	A2 & (EPSK)	O	C	SRAM address bus output and (E2PROM clock output)
71	A1 & (EPDI)	O/I	C	SRAM address bus output and (E2PROM data input)
72	A0 & (EPDO)	O	C	SRAM address bus output and (E2PROM data output)
73	NC			Not used
74	$\overline{\text{EJSW}}$	I		Eject key switch interrupt input
75	$\overline{\text{MAG}}$	I		Magazine lock switch interrupt input
77	NC			Not used
78	I13	O	C	Motor driver control output
79	I2	O	C	Motor driver control output
80	I4	O	C	Motor driver control output
81–88	D0-D7	I/O	C	SRAM data bus
89,90	NC			Not used
91	DSP	I		DISC detect timing input
92	$\overline{\text{DISK}}$	I		Disc detector input
93	ELVPVO	I		Voltage input from ELV position sense
94	ELVREF	I		ELV reference voltage input
95	TRP	I		Tray position input
96	AVSS	I		A/D GND
97	VDIN			Power supply short sensor input
98	VREF	I		A/D converter reference voltage input
99	AVCC			A/D VCC
100	EPCS	I/O	C	E2PROM detect input , Chip select output

*PD5513A



Format	Meaning
C	C MOS
NM	Middle resistivity N channel open drain

TC7SH32FU



7.2 DIAGNOSIS

7.2.1 DISASSEMBLY

● **Removing the Upper Case(not shown)**

1. Remove the night screws.
2. Remove the Upper Case.

● **Removing the CD Mechanism Module**

1 Remove the four dampers(Fig.5).

2 Disconnect the connector(Fig.5).

3 Remove the two springs(Fig.5).

1 Disconnect the connector and then remove the CD Mechanism Module(Fig.6).

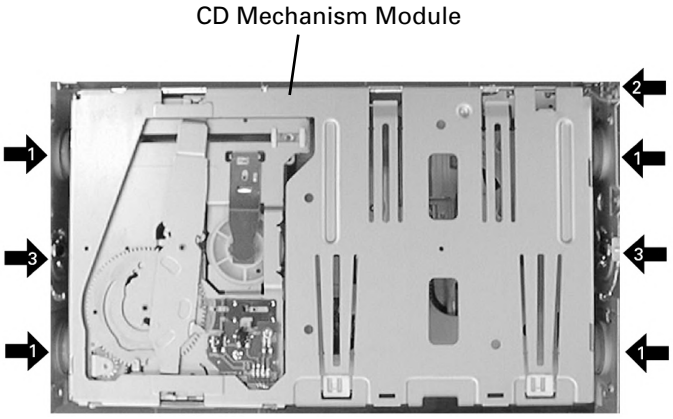


Fig.5

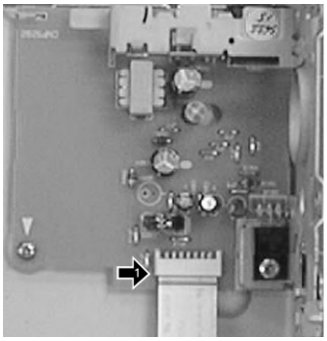


Fig.6

● **Removing the Grille Unit(not shown)**

1. Press the two tabs indicated by arrows and then pull out the Grille Unit.

● **Removing the Power Unit(Fig.7)**

1 Remove the two screws.

2 Remove the screw.

3 Remove the claw and remove the Power Unit.

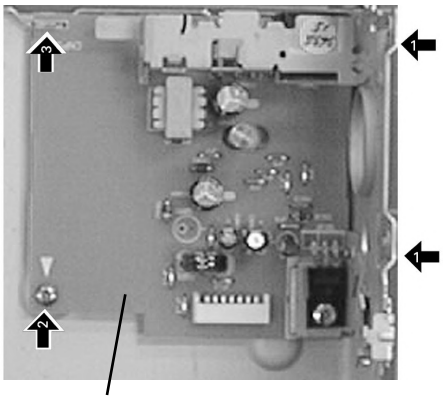


Fig.7

● Removing the Pickup Unit

1. Insert the short pin from the pickup unit in the flexible substrate.
2. Remove the flexible substrate from the connector.
3. Remove the flexible card from the connector.
4. Remove the lead wires to which the spindle motor and carriage motor assy were soldered.
5. Remove the two screws and lift the relay substrate up as shown in the figure on the upper right.

At this time, make sure that the flexible tray motor printed circuit board and flexible relay card are not pulled excessively.

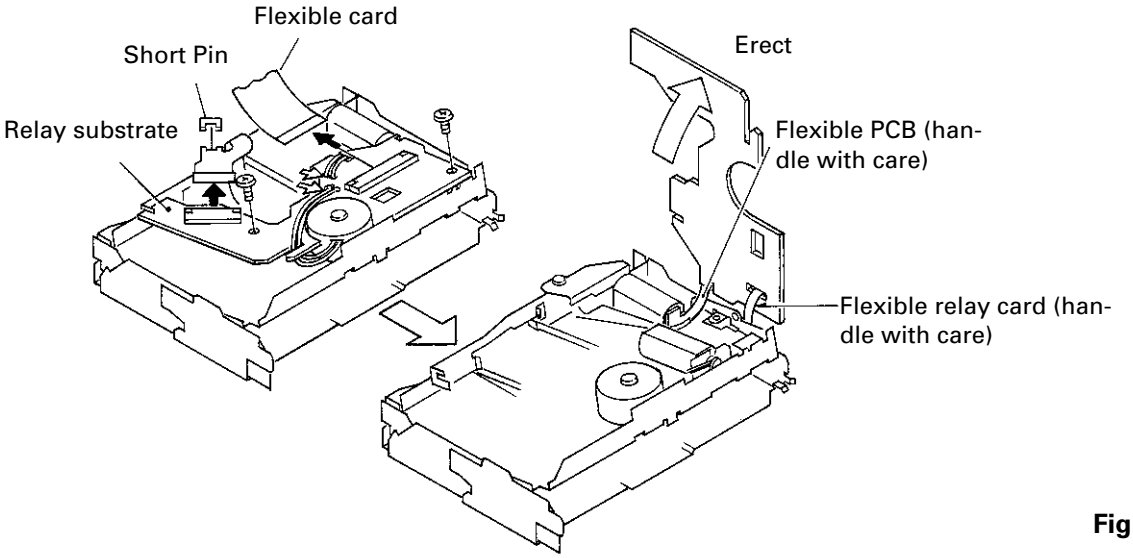


Fig.8

6. Remove screw A and then remove the carriage motor assy, lighting conductor, feed screw holder, feed screw and belt (see Fig. 9).
7. Remove screw B on the main side and the pickup unit together with the guide shaft (see Fig. 9).

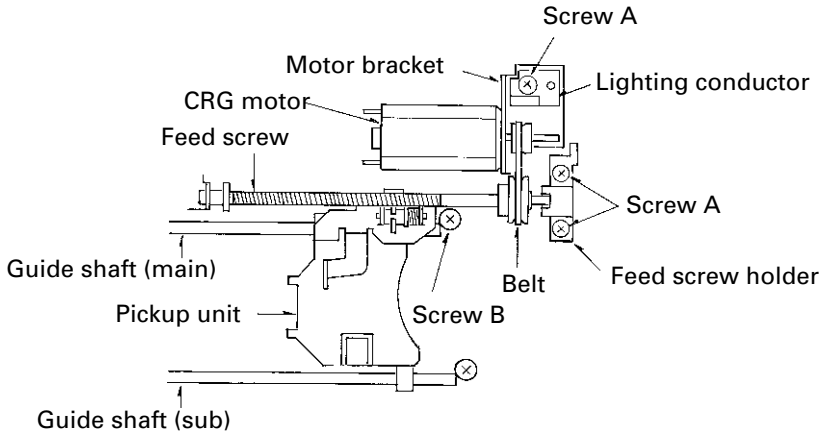


Fig.9

7.2.2 TEST MODE

● CD Test Mode

1) Precautions

- This unit uses a single power supply (+5V) for the regulator. The signal reference potential, therefore, is connected to REFO(approx. 2.5V) instead of GND.
  If REFO and GND are connected to each other by mistake during adjustments, not only will it be impossible to measure the potential correctly, but the servo will malfunction and a severe shock will be applied to the pick-up. To avoid this, take special note of the following.
  Do not connect the negative probe of the measuring equipment to REFO and GND together. It is especially important not to connect the channel 1 negative probe of the oscilloscope to REFO with the channel 2 negative probe connected to GND.
  Since the frame of the measuring instrument is usually at the same potential as the negative probe, change the frame of the measuring instrument to floating status.
  If by accident REFO comes in contact with GND, immediately switch the regulator or power OFF.

- Always make sure the regulator is OFF when connecting and disconnecting the various filters and wiring required for measurements.

- Before proceeding to further adjustments and measurements after switching regulator ON, let the player run for about one minute to allow the circuits to stabilize.

- Since the protective systems in the unit's software are rendered inoperative in test mode, be very careful to avoid mechanical and /or electrical shocks to the system when making adjustment.

- Disc detection during tray extraction and return operations is performed by means of the photo transistor in this unit. Consequently, if the inside of the unit is exposed to a strong light source with the outer casing removed for repairs or adjustment, the following malfunctions may occur:
  *Even with a disc loaded, the unit detects "no disc" and cannot start play.
  *Although a 12-cm disc is loaded, the unit detects "8cm disc" mistakenly.
  When the unit malfunctions this way, either re-position the light source, move the unit or cover the photo transistor.

- During exchanging discs, do not press the keys for the discs to be exchanged.

2) Test Mode

This mode is used for adjusting the CD mechanism module of the device.

- Test mode starting procedure
  Reset while pressing the **4** and **6** keys together.

- Test mode cancellation
  Switch ACC, back-up OFF.

- If the 8 or 9 key is pressed while focus search is in progress, immediately turn the power off (otherwise the actuator may be damaged due to the lens stuck).

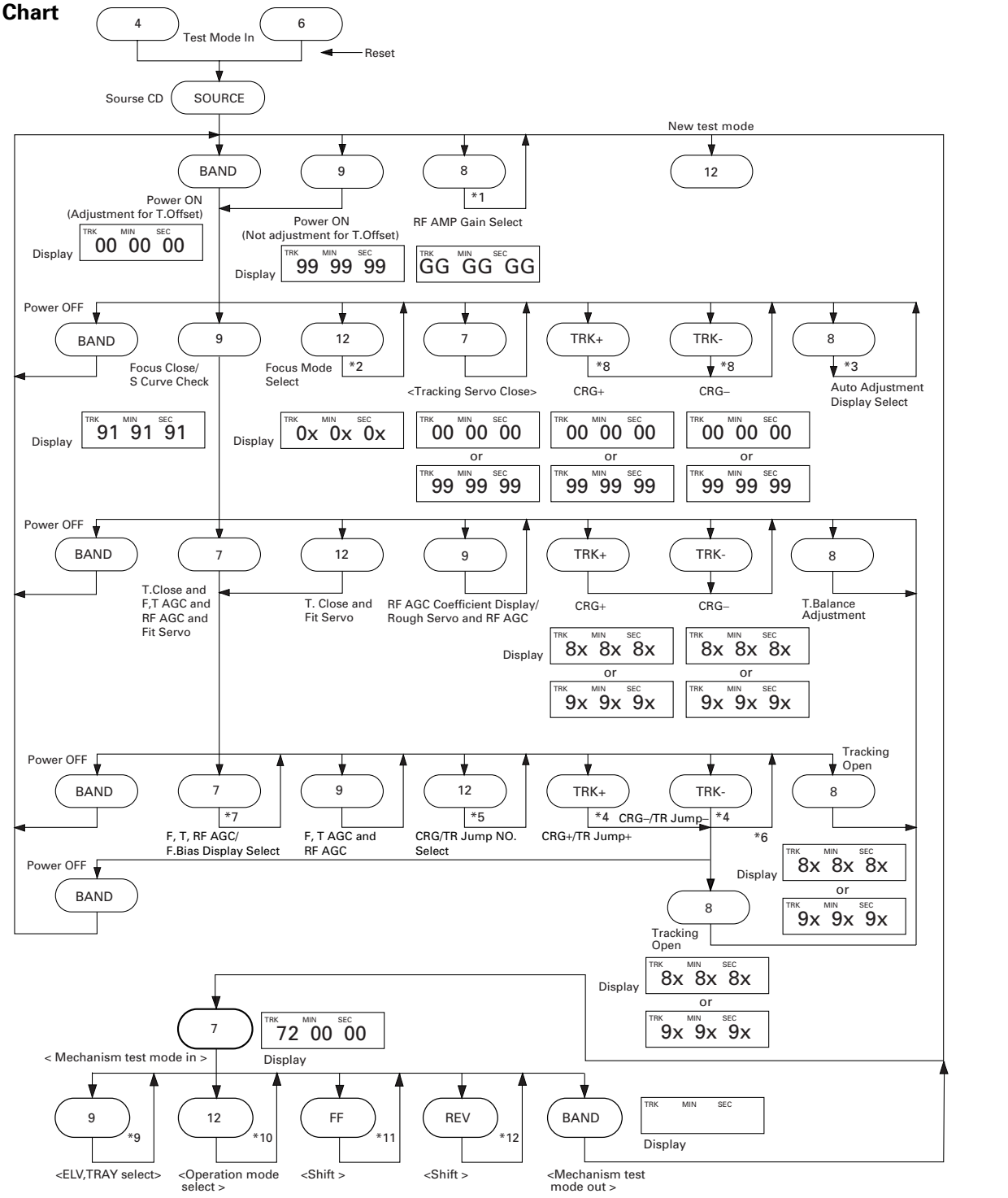
- Jump operation of TRs other than 100TR continues after releasing the key. CRG move and 100TR jump operations are brought into the “Tracking close” status when the key is released.

- Powering Off/On resets the jump mode to “Single TR (91)”, the RF AMP gain setting to 0 dB, and the automatic adjustment value to the initial value.

- During exchanging discs, do not press the keys for the discs to be exchanged.

Key to adjustment text inside (12 keys type)	HEAD UNIT (6 keys type)
BAND	BAND
TRK+/FF	TRK+/FF
TRK-/REV	TRK-/REV
7	1
8	2
9	3
10	4
11	5
12	6
DISC-	DISC-
SOURCE ON/OFF	SOURCE ON/OFF

● Flow Chart



*1 TYP → +6dB → +12dB
Display 06 06 06 12 12 12

*2 Focus Close → S Curve Check
Display 00 00 00 (99 99 99) 01 01 01

*3 F.Offset Display → RF.Offset Display → F.Cansel Display
F.Cancel Value = {Top Rank 8bit of Set Value (7F [H] to 80 [H]) + 128} / 4
= 63 [D] to (32 [D]) to 00 [D]

*4 Single TR/32TR/100TR

*5 Single TR → 32TRK → 100TRK → CRG Move
Display 9x(8x):91(81) 92(82) 93(83) 94(84)

*6 CRG Move, 100TR Jump Only

*7 TRK, MIN, SEC → F.AGC Gain → T.AGC Gain → RF AGC Gain
(F,T.AGC Gain = (Present Value/Initial Value) × 20)

*8 Voltage of CRG Motor = 2 [V]

*9 ELV motor select → TRAY motor select
72 00 0X Display 72 10 0X

*10 8ms pulse drive → 24ms pulse drive → DC drive
72 00 00 Display 72 00 01 72 00 02
48ms pulse drive → 100ms pulse drive → DC drive
72 10 00 Display 72 10 01 72 10 02

*11 ELV select : ELV dowm (Disc 12 → 1)
TRAY select : TRAY out

*12 ELV select : ELV up (Disc 1 → 12)
TRAY select : TRAY in

● Error Messages

If a CD is not operative or stopped during operation due to an error, the error mode is turned on and cause(s) of the error is indicated with a corresponding number. This arrangement is intended at reducing nonsense calls from the users and also for facilitating trouble analysis and repair work in servicing.

(1) Basic Indication Method

1) When SERRORM is selected for the CSMOD (CD mode area for the system), error codes are written to DMIN (minutes display area) and DSEC (seconds display area). The same data is written to DMIN and DSEC. DTNO remains in blank as before.

2) Head unit display examples

Depending on display capability of LCD used, display will vary as shown below. xx contains the error number.

8-digit display	6-digit display	4-digit display
ERROR–xx	ERR–xx OR Err–xx	E–xx

* When the system is manufactured for an OEM basis, the error display will be configured according to the customer specification.

(2) Error Code List

Code	Class	Displayed error code	Description of the code and potential cause(s)
10	Electricity	Carriage Home NG	CRG can't be moved to inner diameter. CRG can't be moved from inner diameter. → Failure on home switch or CRG move mechanism.
11	Electricity	Focus Servo NG	Focusing not available. → Stains on rear side of disc or excessive vibrations on REWRITABLE.
12	Electricity	Spindle Lock NG	Spindle not locked. Sub-code is strange (not readable). → Failure on spindle, stains or damages on disc, or excessive vibrations.
		Subcode NG	A disc not containing CD-R data is found. Turned over disc are found, though rarely. → Failure on home switch or CRG move mechanism.
		RF AMP NG	An appropriate RF AMP gain can't be determined. → CD signal error.
17	Electricity	Setup NG	APC protection doesn't work. Focus can be easily lost. → Damages or stains on disc, or excessive vibrations.
30	Electricity	Search Time Out	Failed to reach target address. → CRG tracking error or damages on disc.
A0	System	Power Supply NG	Power (VD) is ground faulted. → Failure on SW transistor or power supply (failure on connector).
A1	System	Mechanism power failure	Mechanism elevation reference voltage is out of prescription. →EREF adjustment VR and/or power abnormal.
50	Mechanism	An error upon ejection	MAG switch release time has time out. Elevation time out when eject.
60	Mechanism	An error while putting in and out the tray	Tray in / out time has time out. Tray is caught when put in.

Code	Class	Displayed error code	Description of the code and potential cause(s)
70	Mecha-nism	An error upon elevation	Elevation time has time out.
80	Mecha-nism	An error with an em-pty magazine inserted	No disc is available.

Remarks: Unreadable TOC does not constitute an error. An intended operation continues in this case.
A newly designed head unit must conform to the example given above.
Upper digits of an error code are subdivided as shown below:
1x: Setup relevant errors, 3x: Search relevant errors, 3x: Search relevant errors, Ax: Other errors.

● New Test Mode

M-CD plays the same way as before.
If an error such as off focus, spindle unlocking, unreadable sub-code, or sound skipping occurs after setup, its cause and time occurred (in absolute time) are displayed.
During setup, operational status of the control software (internal RAM: CPOINT) is displayed.
These displays and functions are prepared for enhancing aging in the servicing and efficiency of trouble analysis.

(1) Shifting to the New Test Mode

① Turn on the current test mode by starting the reset from the 4 and 6 keys together.
② Select M-CD for the source through the specified procedure including use of the [SOURCE] key. Then, press the 12 key while maintaining the regulator turned off.
③ After the above operations, the new test mode remains on irrespective of whether the M-CD is turned on or off. You can reset the new test mode by turning on the reset start.
* With some products, the new test mode can be reset through the same operations as that employed for shifting to the STBY mode (while maintaining the Acc turned off).

(2) Key Correspondence

Key	Test mode		New test mode	
(Example)	Power Off	Power On	In-play	Error Production
BAND	To power on (offset adjustment performed)	To power off	–	Time/Err.No. switching
UP	–	FWD-Kick	FF/TR+	–
DOWN	–	REV-Kick	REV/TR-	–
7	–	T.Close (AGC performed) /parameter display switching	Scan	–
8	RF AMP gain switching	Parameter display switching /T.BAL adjustment/T.Open	Mode	–
9	To power on (offset adjustment not performed)	F.Close/RF AGC/F.T.AGC	–	–
10	–	F.Open	–	–
11	–	Jump Off	–	–
12	–	F.Mode switching /T.Close (no AGC)/Jump switching	Auto/Manu	T.No./Time switching

Key (Example)	Mechanism Test Mode
BAND	Back to the test mode
UP	Playing the mechanism
DOWN	Playing the mechanism
7	Mechanism test mode in
8	–
9	TRAY/ELV select
10	–
11	–
12	Operation step select

Note: Eject and CD on/off is performed in the same procedure as that for the normal mode.

(3) Cause of Error and Error Code

Code	Class	Contents	Description and cause
40	Electricity	Off focus detected.	FOK goes low. → Damages/stains on disc, vibrations or failure on servo.
41	Electricity	Spindle unlocked.	FOK = Low continued for 50 msec. → Damages/stains on disc, vibrations or failure on servo.
42	Electricity	Sub-code unreadable.	Sub-code was unreadable for 50 msec. → Damages/stains on disc, vibrations or failure on servo.
43	Electricity	Sound skipping detected.	Last address memory function was activated. → Damages/stains on disc, vibrations or failure on servo.

Note: Mechanical errors during aging are not displayed.
The error codes should be indicated in the same way as in the normal mode.

(4) Display of Operational Status (CPOINT) during Setup

Status No.	Contents	Protective action
00	CD+5V ON process in progress.	None
01	Servo LSI initialization (1/3) in progress.	None
02	Servo LSI CRAM initialization in progress.	None
03	Servo LSI initialization (2/3) in progress.	None
04	Offset adjustment (1/3) in progress.	None
05	Offset adjustment (2/3) in progress.	None
06	Offset adjustment (3/3) in progress.	None
07	FZD adjustment in progress.	None
08	Servo LSI initialization (3/3) in progress.	None
10	Carriage move to home position started.	None
11	Carriage move to home position started.	None
12	Carriage is moving toward inner diameter.	Specified 10 seconds has been passed or failure on home switch.
13	Carriage is moving toward outer diameter.	Specified 10 seconds has been passed or failure on home switch.
14	Carriage outer kick in progress.	None
15	Carriage outer diameter feed (1 second) in progress.	None
20	Servo close started.	None
21	Pre-processing for focus search started.	None
22	Spindle rotation and focus search started.	None
23	Waiting for focus close (XSI=Low).	Specified focus search time has been passed.
24	Standing by after focus close is over.	Specified focus search time has been passed.
25	Focus search preprocessing is in progress while setup protection is turned on.	None

Status No.	Contents	Protective action
26	Focus search preprocessing is in progress while focus recovery is turned on.	None
27	Wait time after focus close is set up.	Off focus.
28	Standing by after focus close is over.	Off focus.
29	Setup (1/2) before T balance adjustment is started.	Off focus.
30	Setup (2/2) before T balance adjustment is started.	Off focus.
31	T balance adjustment started.	Off focus.
32	T balance adjustment (1/2).	Off focus.
33	T balance adjustment (2/2).	Off focus.
34	Waiting for spindle rotation to end. Spindle rough servo.	Off focus.
35	Standing by after spindle rough servo is over.	Off focus.
36	RF AGC started.	Off focus.
37	RF AGC started.	Off focus.
38	RF AGC ending process in progress.	Off focus.
39	Tracking close in progress.	Off focus.
40	Standing by after tracking is closed. Carriage closing in progress.	Off focus.
41	Focus/tracking AGC started.	Off focus.
42	Focus AGC started.	Off focus.
43	Focus AGC in progress.	Off focus.
44	Tracking AGC in progress.	Off focus.
45	Standing by after focus/tracking AGC are over.	Off focus.
46	Spindle processes applicable servo.	Off focus.
47	Check for servo close is started.	Off focus.
48	Check of LOCK pin started.	Off focus or spindle not locked.
49	RF AGC started.	Off focus.
50	RF AGC in progress.	Off focus.
51	Standing by after RF AGC is over.	Off focus.

(5) Display Examples

1) During Setup (When status no. = 11)

TRK No.	MIN.	SEC.
11	11'	11"

2) During Operation (TOC read, TRK search, Play, FF and REV)

The same as in the normal mode.

3) When a Protection Error Occurred

Switch to the following displays (A) and (B) using the [BAND] switch:

(A) Error occurrence timing display in absolute time.

An example: Error occurred in 12th tune at 34'56" in absolute time.

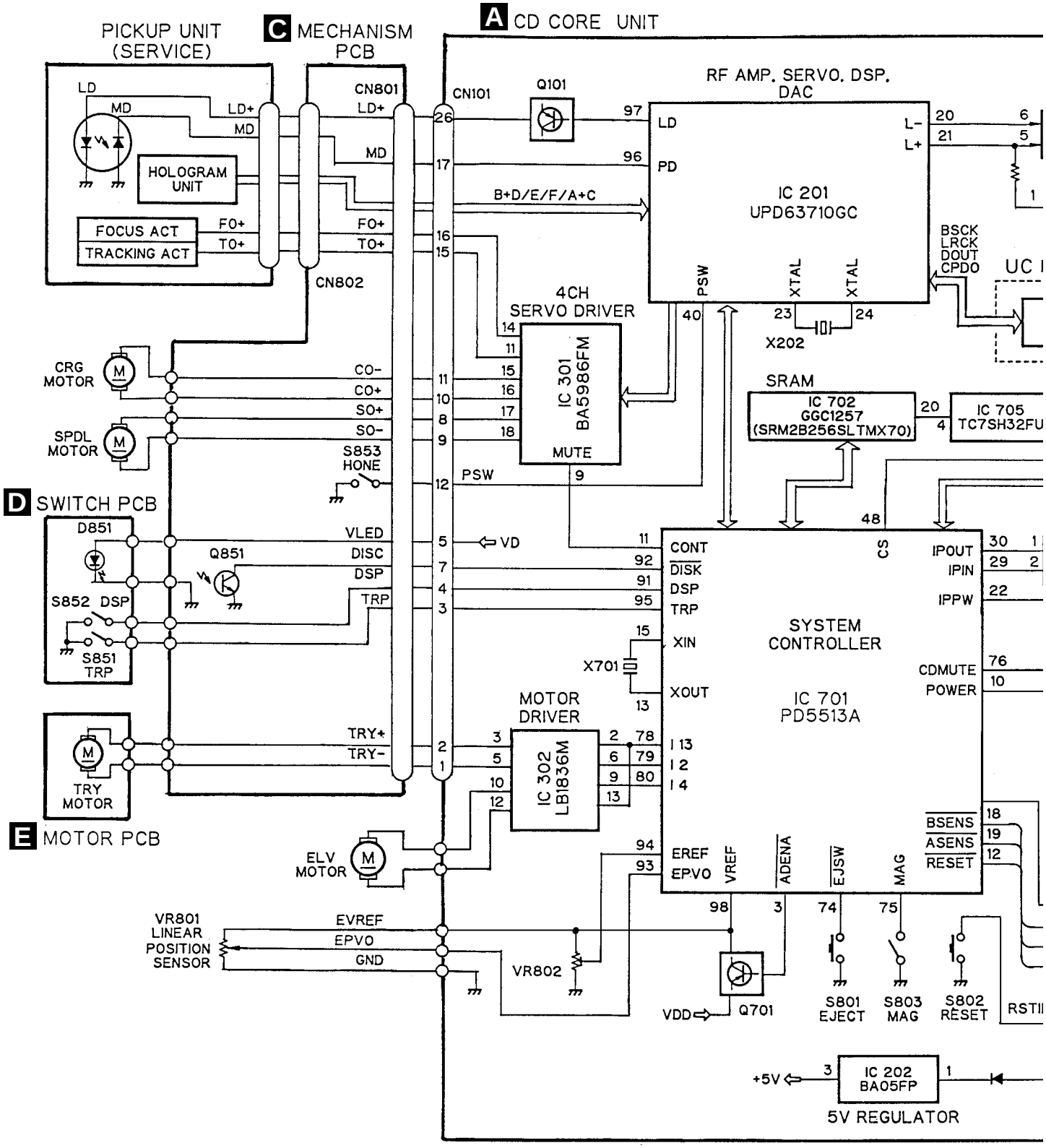
TRK No.	MIN.	SEC.
12	34'	56"

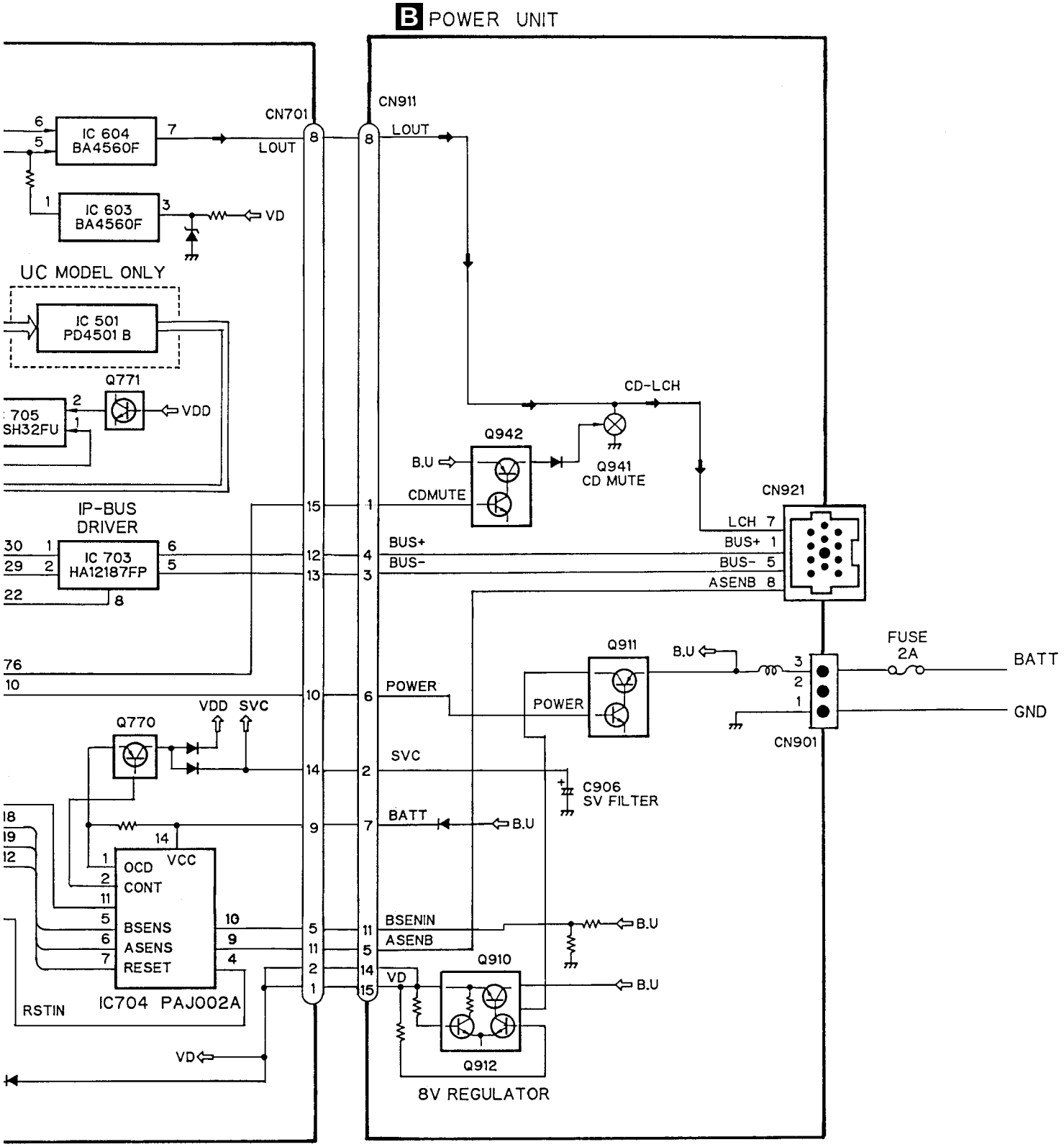
(B) Error No. display

An example: Error #40 (Off focus is detected)

ERROR-40

7.3 BLOCK DIAGRAM




B POWER UNIT
CN701
CN911
IC 604
BA4560F
LOUT
IC 603
BA4560F
VD
UC MODEL ONLY
IC 501
PD4501 B
Q771
VDD
IP-BUS
DRIVER
IC 703
HA12187FP
CD-LCH
Q942
Q941
CD MUTE
B.U
CDMUTE
CN921
LCH 7
BUS+ 1
BUS- 5
ASENB 8
BUS+
BUS-
Q911
POWER
FUSE
2A
BATT
GND
CN901
VDD SVC
Q770
SVC
C906
SV FILTER
BATT
OCD
CONT
BSENS
ASENS
RESET
VCC
IC704 PAJ002A
RSTIN
BSENIN
ASENB
Q910
Q912
8V REGULATOR

8. OPERATIONS AND SPECIFICATIONS

8.1 OPERATION

If the power does not switch on or if the compact disc player does not operate when the button on the multi-CD controller is pressed, or if the multi-CD controller display is incorrect, press this button on the player with the tip of a pencil to restore normal operation. (This button is located inside the door.) **Always press the clear button on the multi-CD controller, too, after pressing this button.**

- If the clear button is pressed when the player contains a magazine or the ignition switch is set to the ON or ACC position, the CD title display and ITS memory are cleared.

8.2 SPECIFICATIONS

General

System ..... Compact disc audio system
Usable discs ..... Compact Disc
Signal format ..... Sampling frequency: 44.1 kHz
Number of quantization bits: 16; linear
Power source ..... 14.4 V DC
(10.8 — 15.1 V allowable)
Max. current consumption ..... 1.0 A
Weight ..... 1.9 kg (4.2 lbs.)
Dimensions ..... 248 (W) × 66 (H) × 169 (D) mm
[9-3/4 (W) × 2-5/8 (H) × 6-5/8 (D) in.]

Audio

Frequency characteristics ..... 5 — 20,000 Hz (± 1 dB)
Signal-to-noise ratio ..... 92 dB (1 kHz) (IHF-A Network)
Distortion ..... 0.005 %
Dynamic range ..... 90 dB (1 kHz)
Output level ..... 1,000 mV (1 kHz, 0 dB)
Number of channels ..... 2 (stereo)

Note:

Specifications and design are subject to possible modification without prior notice due to improvements.

Service Manual

ORDER NO.
CRT2356

CD MECHANISM MODULE

CX-892

- **This service manual describes the operation of the CD mechanism incorporated in models listed in the table below.**
- **When performing repairs use this manual together with the specific manual for model under repair.**

Model	Service Manual	CD Mechanism Module	Mechanism Unit
CDX-P650/X1N/UC,EW,ES	CRT2315	CXK4800	CXB3007
CDX-P656/X1N/UC	CRT2317	CXK4805	CXB3007
CDX-P25/X1N/EW		CXK4800	CXB3007
CDX-FM657/X1N/UC,EW,ES	CRT2316	CXK4815	CXB3007
CDX-FM653/X1N/UC	CRT2321	CXK4811	CXB3007

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2. DISASSEMBLY 18
3. MECHANISM DESCRIPTIONS.....23

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PIONEER ELECTRONIC [EUROPE] N.V. Haven 1087 Keetberglaan 1, 9120 Melsele, Belgium
PIONEER ELECTRONICS ASIACENTRE PTE.LTD. 253 Alexandra Road, #04-01, Singapore 159936

K-ZZU. FEB. 1999 Printed in Japan

1. CIRCUIT DESCRIPTIONS

The LSI (UPD63710GC) used on this unit comprises five main blocks ; the pre-amp section, servo, signal processor, DAC and CD text decoder (not used on this model). It also equips with nine automatic adjustment functions.

1.1 PRE-AMP SECTION

This section processes the pickup output signals to create the signals for the servo, demodulator and control.

The pickup output signals are I-V converted by the pre-amp with the built-in photo-detector in the pickup, then added by the RF amp to obtain RF, FE, TE, TE zero cross and other signals.

This pre-amp section is built in the servo LSI UPD63710GC (IC201). The following describes function of each section.

Since this system has a single power supply (+5V), the reference voltage for this LSI and pickup are set to REFO (2.5V). The REFO is obtained by passing the REFOUT from the LSI through the buffer amplifier. The REFO is output from Pin 89 of this LSI. All measurements are done using this REFO as reference.

Note : During the measurement, do not try to short the REFO and GND.

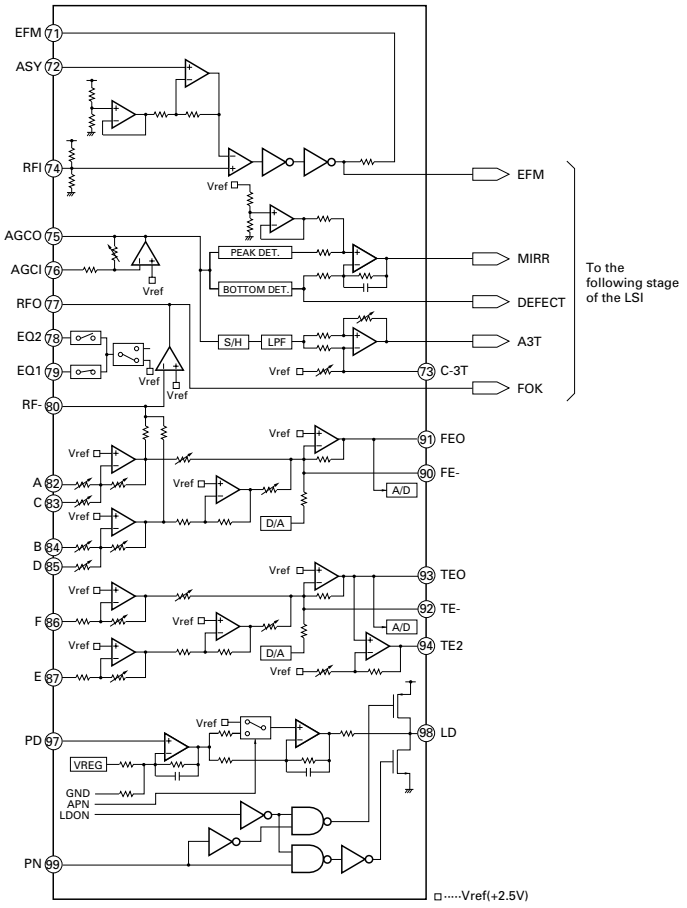


Fig.1 : BLOCK DIAGRAM OF BUILT-IN RF AMPLIFIER

1) APC Circuit (Automatic Power Control)

When the laser diode is driven with constant current, the optical output has large negative temperature characteristics. Thus, the current must be controlled from the monitor diode so that the output may be constant. APC circuit is for it. The LD current is obtained by measuring the voltage between LD1 and V+5. The value of this current is about 35mA.

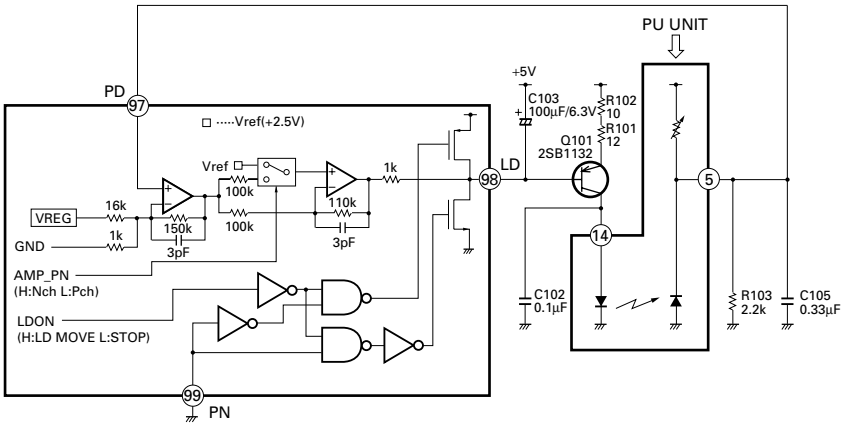


Fig.2 : APC CIRCUIT

2) RF Amplifier and RFAGC Amplifier

The photo-detector outputs (A + C) and (B + D) are added, amplified and equalized on this LSI and then output to the RFI terminal as the RF signal. (The eye pattern can be checked by this signal.)

The RFI voltage low frequency component is :

$$RFI = (A + B + C + D) \times 3.2$$

RFI is used on the FOK generator circuit and RF offset adjusting circuit.

R215 is an offset resistor for maintaining the bottom reference voltage of the RFI signal at 1.5 VDC. The D/A output used for the RF offset adjustment (to be described later) is entered via this resistor.

After the RFI signal from Pin 77 is externally AC coupled, entered to Pin 76 again, then amplified on the RFAGC amplifier to obtain the RFO signal.

The RFAGC adjustment function (to be described later) built-in the LSI is used for switching feedback gain of the RFAGC amplifier so that the RFO output may go to 1.5 ± 0.3Vpp.

The RFO signal is used for the EFM, DFCT, MIRR and RFAGC adjustment circuits.

3) FOK Circuit

This circuit generates the signal that is used for indicating the timing of closing the focus or state of the focus close currently being played. This signal is output from Pin 4 as the FOK signal. It goes high when the focus close and in-play.

The RFOK signal is generated by holding DC level of the RFI at its peak with the succeeding digital section, then comparing it at a specific threshold level. Thus, the RFOK signal goes high even if the pit is absent. It indicates that the focus close can take place on the disc mirror surface, too.

This signal is also supplied to the micro computer via the low pass filter as the FOK signal and used for the protection and the RF amplifier gain switching.

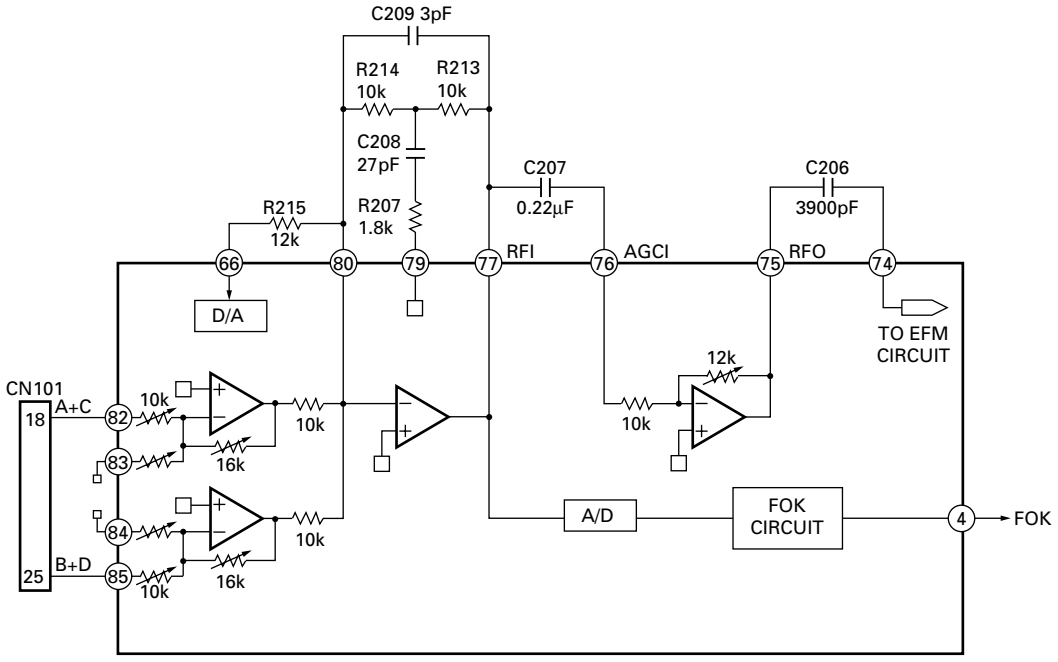


Fig.3 : RFAMP, RFAGC AND FOK CIRCUIT

4) Focus Error Amplifier

The photo-detector outputs (A + C) and (B + D) are passed through a differential amplifier and an error amplifier, and then (A + C – B – D) is output from Pin 91 as the FE signal. The FE voltage low frequency component is :

$$FE = (A + C - B - D) \times \frac{16k}{10k} \times \frac{(80k//300k)}{20k}$$

$$= (A + C - B - D) \times 5$$

Using REFO as the reference, an S-curve of approximately 1.5 Vpp is obtained for the FE output. The final-stage amplifier cutoff frequency is 11.4 kHz.

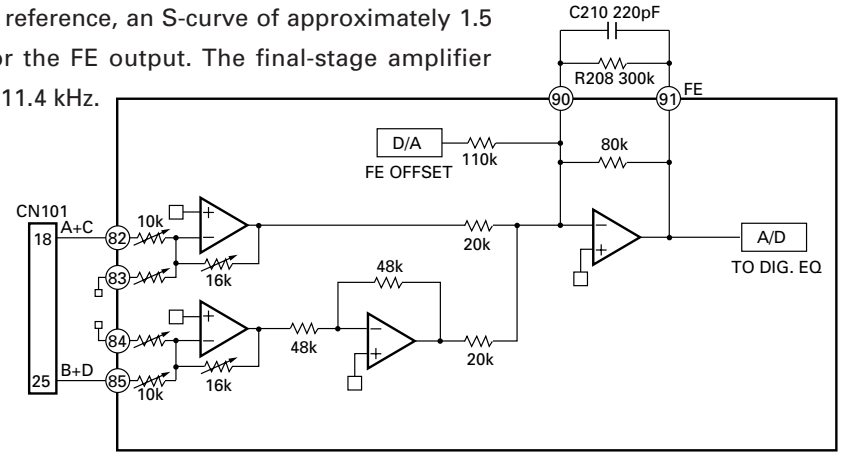


Fig.4 : FOCUS ERROR AMPLIFIER

5) Tracking Error Amplifier

The photo-detector outputs E and F are passed through a differential amplifier and an error amplifier, and then (E – F) is output from Pin 93 as the TE signal. The TE voltage low frequency component is :

$$TE = (E - F) \times \frac{224k}{(56k+27k)} \times \frac{80k}{38k}$$

$$= (E - F) \times 5.7 \text{ (Effective LSI output is 5.0).}$$

Using REFO as the reference, the TE waveform of approximately 1.3 Vpp is obtained for the TE output. The final-stage amplifier cutoff frequency is 20 kHz.

6) Tracking Zero Crossing Amplifier

TEC signal (the tracking zero crossing signal) is obtained by multiplying the TE signal four times. It is used for locating the zero crossing points of the tracking error. The zero cross point detection is done for the following two reasons :

① To count tracks for carriage moves and track jumps.

② To detect the direction in which the lens is moving when the tracking is closed (it is used on the tracking brake circuit to be described later).

The TEC signal frequency range is 300 Hz to 20 kHz.

TEC voltage = TE level × 4

Theoretical TEC level is 5.2V. The signal exceeds D-range of the operational amplifier and thus is clipped. It, however, can be ignored since this signal is used by the servo LSI only at the zero crossing point.

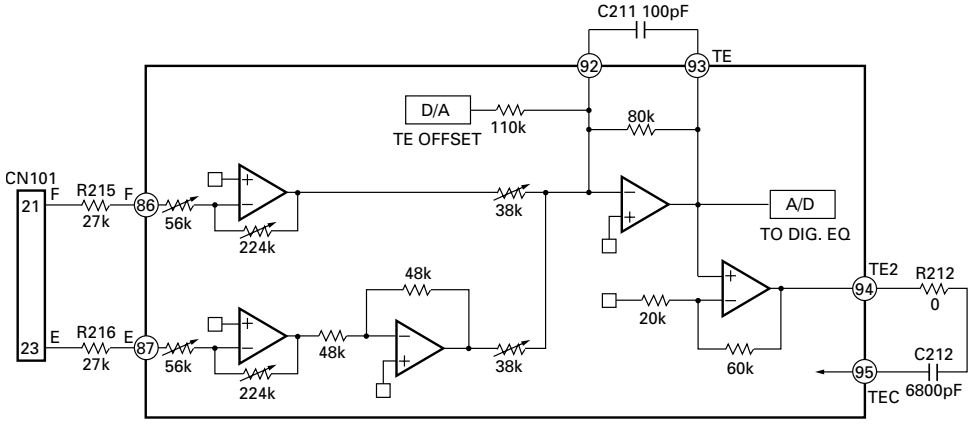


Fig.5 TRACKING ERROR AMPLIFIER AND TRACKING ZERO CROSSING AMPLIFIER

7) DFCT (Defect) Circuit

The DFCT signal is used for detecting defects on the mirrored disc surface. It allows monitoring from the HOLD pin (Pin 2). It goes high when defects are found on the mirrored surface.

The DFCT signal is generated by comparing the RF amplified signal (which is obtained by bottom holding the RFO signal) at a specific threshold level by the succeeding digital section.

Stains or scratches on the disc can constitute the defects on the mirrored disc surface. Thus, as long as the DFCT signal remains high in the LSI, the focus and tracking servo drives are held in the current state so that a better defect prevention may be ensured.

8) 3TOUT Circuit

The 3TOUT signal is generated by entering disturbance to the focus servo loop, comparing phase of fluctuations of the RF signal 3T component against that of the FE signal at that time, then converting the signal to DC level. This signal is used for adjusting bias of the FE signal (to be described later). This signal is not output from the LSI, thus its monitoring is not available.

9) MIRR (Mirror) Circuit

The MIRR signal shows the on track and off track data, and is output from Pin 3.

When the laser beam is

On track : MIRR = "L"

Off track : MIRR = "H"

This signal is used on the brake circuit (to be described later) and also as the trigger to turn on track counting when jumping take place.

The MIRR signal is supplied to the micro computer, too, for the protection purpose.

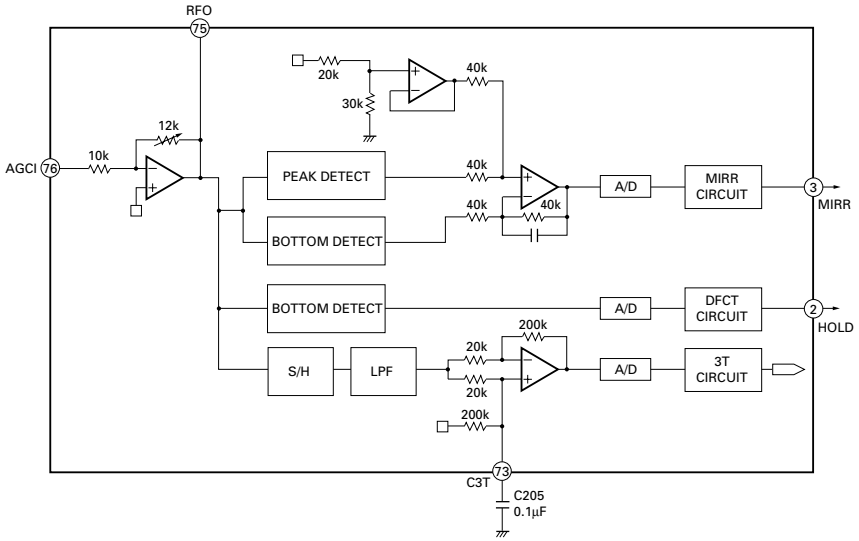


Fig.6 : DFCT, MIRR AND 3T DETECTION CIRCUIT

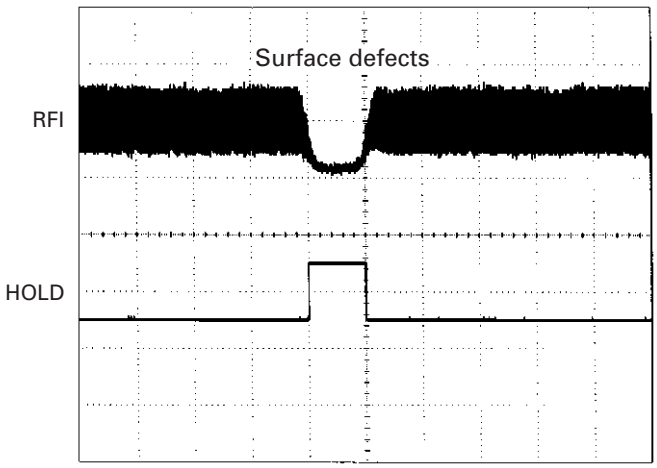


Fig.7 : HOLD OUTPUT WAVEFORM
(When surface defects are present)

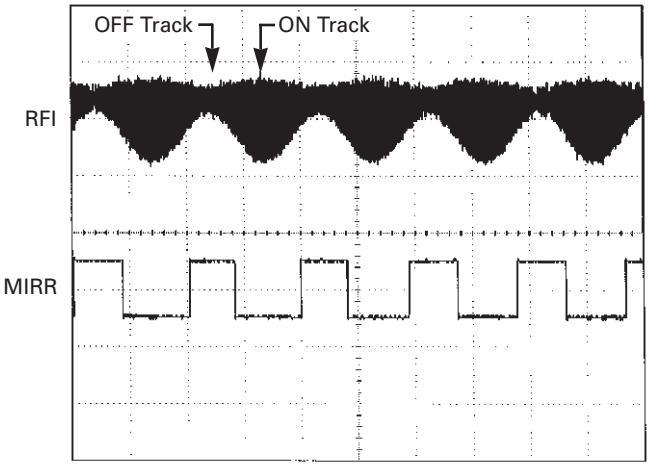


Fig.8 : MIRR OUTPUT WAVEFORM
(When an access is made)

10) EFM Circuit

This circuit is used for converting the RF signal to digital signal consisting of "0" and "1". The RFO signal from Pin 75 is externally AC coupled, entered to Pin 74, then applied to the EFM circuit.

Loss of the RF signal due to scratches or stains on the disc, or vertical asymmetry of the RF due to variations in the discs manufactured can't be eliminated by AC coupling alone. This circuit, therefore, controls the reference voltage ASY on the EFM comparator by use of the fact that "0" and "1" appear fifty fifty in the EFM signal. By this arrangement, the comparate level is constantly maintained at almost center of the RFO signal level. The reference voltage ASY is generated when the EFM comparator output is passed through the low pass filter. The EFM signal is output from Pin 71. It is a 2.5 Vp-p amplitude signal centering on REFO.

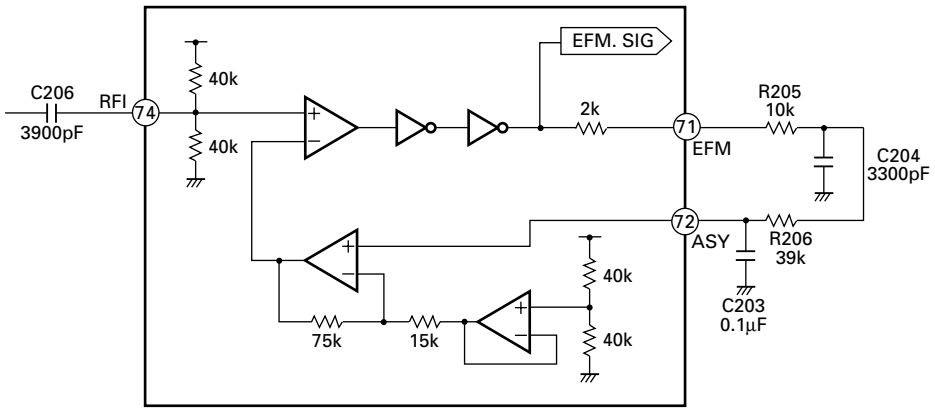


Fig.9 : EFM CIRCUIT

1.2 SERVO SECTION (UPD63710GC : IC201)

The servo section controls the operations such as error signal equalizing, in focus, track jump and carriage move. The DSP is the signal processing section used for data decoding, error correction and interpolation processing, among others.

This circuit implements analog to digital conversion of the FE and TE signals generated on the pre-amplifier, then outputs them through the servo block as the drive signal used on the focus, tracking and carriage system. The EFM signal is decoded on the signal processing section and finally output via the D/A converter as the audio signal. The decoding process also generates the spindle servo error signals which is fed to the spindle servo block to generate the spindle drive signal.

The focus, tracking, carriage and spindle drive signals are then amplified on the driver IC BA5986FM (IC301) and fed to respective actuators and motors.

1) Focus Servo System

The focus servo main equalizer is consisted of the digital equalizer. Fig.10 shows the focus servo block diagram.

When implementing the focus close on the focus servo system, the lens must be brought within the in-focus range. Therefore, the lens is moved up and down according to the triangular focus search voltage to find the focus point. During this time, the spindle motor is kicked and kept rotating as a set speed.

The servo LSI monitors the FE and RFOK signals and automatically carries out the focus close at an appropriate point.

The focus closing is carried out when the following three conditions are met :

① The lens approaches the disc from its current position.

② RFOK = "H"

③ The FZC signal is latched at high after it has once crossed the threshold set on the FZD register (Edge of the FZD).

As the result, the FE (= REFO) is forced to low.

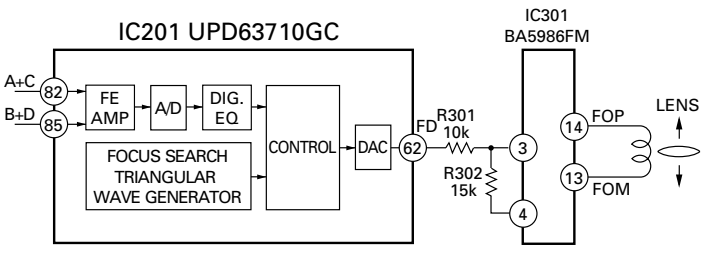


Fig.10 : FOCUS SERVO BLOCK DIAGRAM

When the above conditions are all met and the focus is closed, the XSI pin goes to low from the current high, then 40 ms later, the microcomputer begins to monitor the RFOK signal after it that has been passed through the low pass filter.

When the RFOK signal is recognized as low, the micro computer carries out various actions including protection.

Fig.11 a series of operations carried out relevant to the focus close (the figure shows the case where focus close is not available).

You can check the S-curve, search voltage and actual lens behavior by selecting the Display 01 for the focus mode select in the test mode, and then pressing the focus close button.

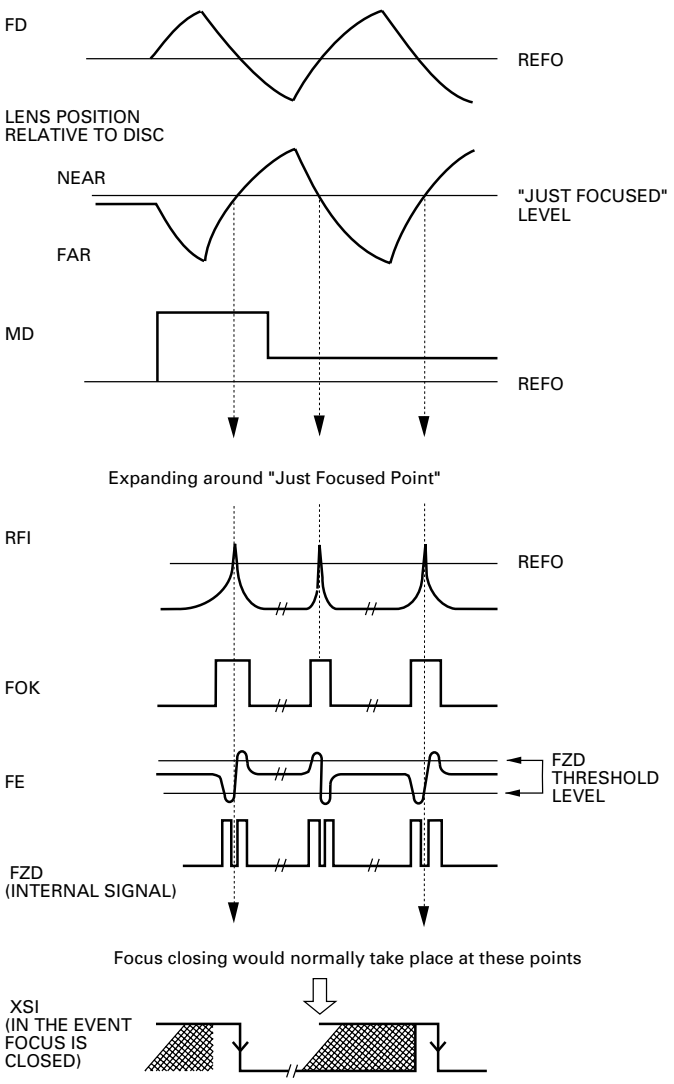


Fig.11 : FOCUS CLOSE SEQUENCE

2) Tracking Servo System

The digital equalizer is employed for the main equalizer on the tracking servo. Fig.12 shows the tracking servo block diagram.

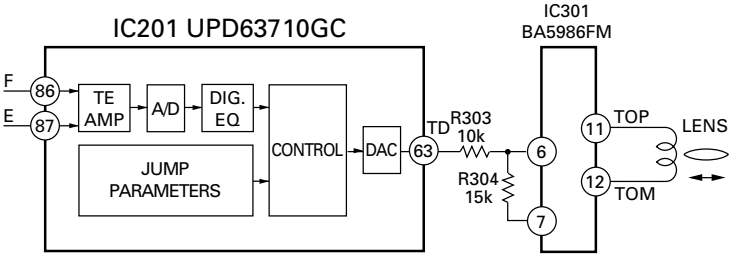


Fig.12 : TRACKING SERVO BLOCK DIAGRAM

a) Track jump

When the LSI receives the track jump command from the microcomputer, the operation is carried out automatically by the auto sequence function of the LSI. This system has five types of track jumps used for the search : 1, 4, 10, 32 and 32 × 3. In the test mode, in addition to three jumps (1, 32 and 32 × 3), move of the carriage can be check by mode selection. For track jumps, the microcomputer sets almost half of tracks (5 tracks for 10 tracks, for instance) and counts the set number of tracks using the TEC signals. When the microcomputer has counted the set number of tracks, it outputs the brake pulse for a fixed period of time (duration can be specified with the command) to stop the lens. In this way, the tracking is closed and normal play is continued.

To improve the servo loop retracting performance just after the track jump, the brake circuit is turned on for 50 ms after the brake pulse has been terminated to increase gain of the tracking servo.

Fast forward and reverse operations are realized by through consecutive signal track jumps. The speed is about 10 times as fast as that in the normal mode.

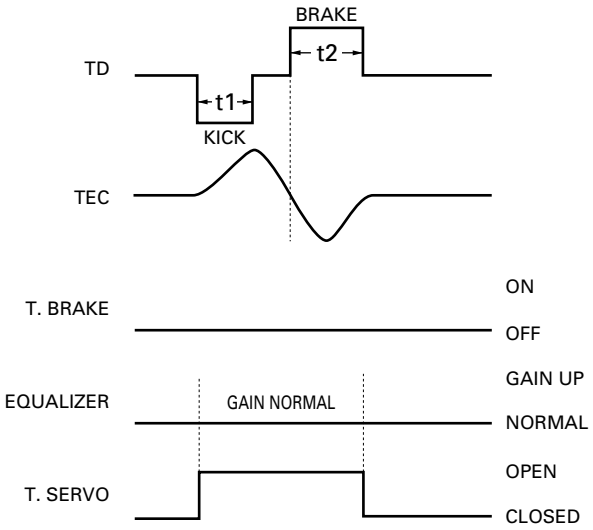


Fig.13 : SINGLE TRACK JUMP

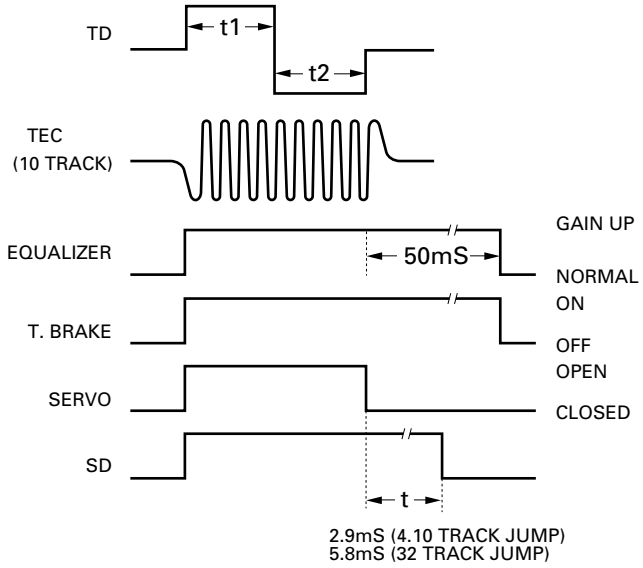
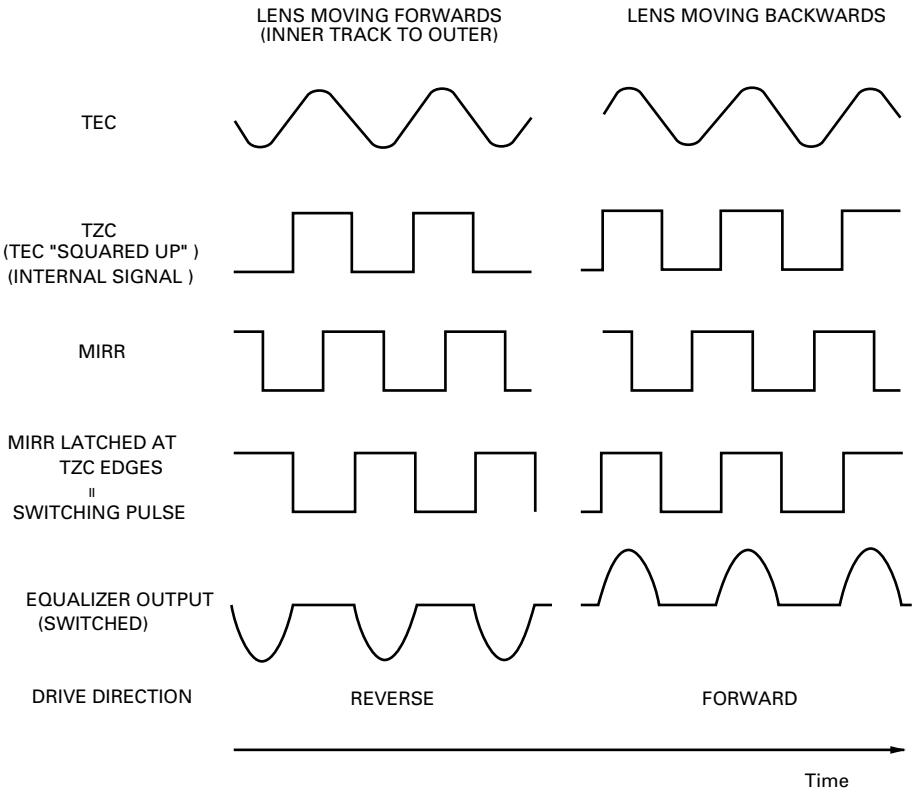


Fig.14 : MULTI-TRACK JUMP

b) Brake Circuit

The servo retracting performance can be deteriorate during the setup or track jump operation. In this connection, the brake circuit is used to ensure steady retract of the tracking servo. The brake circuit detects in which direction the lens is moving, then slows down its move by outputting the drive signal that moves the lens into the opposite direction alone. Track slippage direction is determined by referencing the TEC and MIRR signals and their phase.



Note : Equalizer output assumed to hava same phase as TEC.

Fig.15 : TRACKING BRAKE CIRCUIT

3) Carriage Servo System

The carriage servo supplies the tracking equalizer's low-frequency component (lens position data) output to the carriage equalizer, then, after providing a fixed amount of gain to it, outputs the drive signal from the LSI. This signal is then applied to the carriage motor via the driver IC.

When the lens offset reaches a certain level during play, the entire pickup must be moved into the forward direction. Therefore, the equalizer gain is set to the level that allows to generate a voltage higher than the carriage motor starting voltage. In actual operations, a certain threshold level is set for the equalizer output by the servo LSI so that the drive voltage may be output from the servo LSI only when the equalizer output exceeds the threshold level. This arrangement helps reducing power consumption. Also, due to disc eccentricity or other factors, the equalizer output may cross the threshold level a number of times. In this case, the drive voltage output from the LSI will have pulse-like waveform.

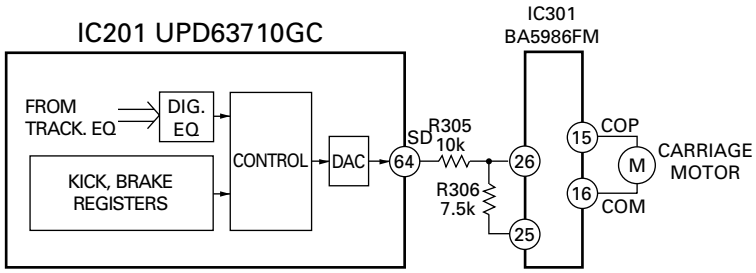


Fig.16 : CARRIAGE SERVO BLOCK DIAGRAM

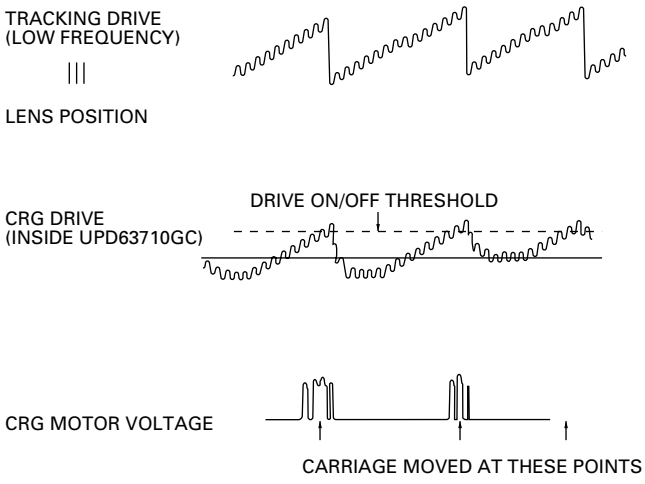


Fig.17 : CARRIAGE SIGNAL WAVEFORM

4) Spindle Servo System

The spindle servo has the following modes.

① Kick :

This mode is used for accelerating the disc rotation during setup.

② Offset :

(a) After the kick is over in the setup, this mode is turned on until changing to rough servo mode.

(b) When focus is lost during play, this mode is turned on until the focus is restored.

Both of the above are used for maintaining the disc rotation rate near to the specified rate.

③ Applicable servo :

The CLV servo mode is turned on for the normal operations.

In the EFM demodulation block, the frame sync signal and internal counter output signal are sampled for every WFCK/16 and a signal is produced for indicating whether or not they are matching.

They are determined to be asynchronous only when this signal fails to match 8 times in succession. In all other cases, above two signals are assumed to be synchronous. In the applicable servo mode, the retracting servo is automatically selected if the two signals are synchronous. If not, the regular servo is automatically selected.

④ Brake :

This mode is turned on when stopping the spindle motor.

The microcomputer outputs the brake voltage through the servo LSI. The LSI monitors the EFM waveform and, if its longest pattern exceeds a certain interval (if the rotation is sufficiently slow), the flag is set the LSI and the microcomputer turns off the brake voltage. When the flag is not up within a specified period time, the microcomputer switches the mode from the brake to the stop mode, and maintains this mode for a fixed period of time. If this stop mode is continued for a fixed period of time, the disc will be ejected.

⑤ Stop :

This mode is used for powering on the system and the eject operation. When this mode is turned on, voltage across the spindle motor is 0V.

⑥ Rough servo :

This mode is used for when the carriage feed (carriage mode for the long search, etc.) is turned on. The linear speed is calculated from the EFM waveform and high or low level is entered to the spindle equalizer. In the test mode, this mode is also used for the grating check.

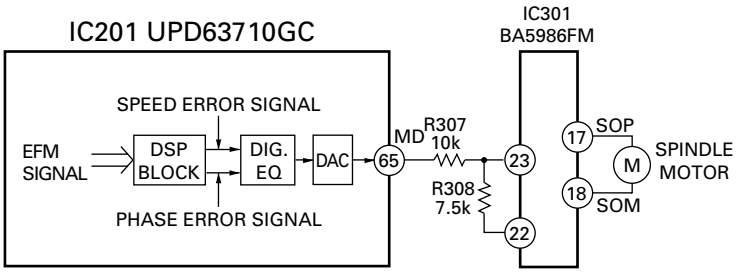


Fig.18 : SPINDLE SERVO MOTOR BLOCK DIAGRAM

1.3 AUTOMATIC ADJUSTMENT FUNCTIONS

Every circuit adjustment on the CD-LSI of this system is automated.

Every circuit adjustment is automatically implemented when the disc is inserted or the CD mode is selected from the source key. The following describes how the adjustments are executed.

1) FZD Cancel Setting

This setting is used for executing the focus close operation without fail.

When power is turned on, the FE offset level is read and a voltage opposite to this offset value is written to the CRAM on the IC to cancel the offset. In this manner, the FZD threshold level can be set to a constant value (+240mV), thereby ensuring to meet one of the requirements for the IC to execute the focus close that "the FZD signal is latched at high".

2) Automatic Adjustment of TE, FE and RF Offset

Using REFO as the reference, this function adjusts the pre-amp TE, FE and RF offsets to the respective target value when power is turned on (targets values of the TE, FE and RF are 0, 0 and –1V, respectively).

The following is the adjustment procedure :

(1) Respective offset (LD off) is read by the microcomputer via the servo LSI.

(2) The microcomputer calculates the voltages to be corrected from the read values, then sets them to the specified field.

3) Automatic Adjustment of Tracking Balance (T. BAL)

This adjustment is used for eliminating differences between the pickup E and F channels outputs by adjusting gain of the amplifier on the LSI. In the actual operation, the TE waveform is adjusted so that it may be vertically symmetric with REFO.

The following is the adjustment procedure :

(1) Make sure the focus close is complete.

(2) Kick the lens in the radial direction to generate the TE waveform.

(3) At this time, the microcomputer reads the TE signal offset value (via the servo LSI) being calculated by the LSI.

(4) The microcomputer determines if the read offset value is positive, negative or zero.
If the offset value = 0, the adjustment is terminated.
If the offset value = A positive or negative value, gain of the E and F channels amplifiers are modified according the predetermined rule.

Then above steps (2) through (4) are repeated until the "Offset value = 0" or "Specified limit count" is reached.

4) Automatic Adjustment of FE Bias

This adjustment is intended at maximizing the RFI level by optimizing the focus point in-play. This adjustment utilizes the phase difference between the RF waveform 3T level and the focus error signal when disturbance is applied.

Since disturbance is applied to the focus loop, this adjustment is designed to take place in the same timing as the auto gain control (to be described later).

The following is the adjustment procedure :

(1) Disturbance is injected to the focus loop by the command from the microcomputer (within the servo LSI).

(2) The LSI detects fluctuation of the RF signal 3T component level.

(3) The LSI determines relationship between fluctuation of the 3T component and the injected disturbance to detect magnitude and direction of the off-focus introduced.

(4) The microcomputer reads the detected results from the LSI.

(5) The microcomputer calculates necessary correction, then hands the calculated value to the bias adjustment term set on the LSI.

This adjustment is repeated several times, as it is so with the auto gain control, to ensure higher accuracy.

5) Focus and Tracking Automatic Gain Control

This function is used for implementing automatic control of the focus and tracking loop gain.

The following is the adjustment procedure :

(1) Inject disturbance to the servo loop.

(2) Extract the error signal (FE and TE) generated at when the disturbance is applied to obtain the signals G1 and G2 via the B.P.F.

(3) The microcomputer reads the G1 and G2 signals via the LSI.

(4) Based on the necessary correction calculated by the microcomputer, the LSI performs the loop gain adjustment.

Above adjustments are repeated several times to ensure higher adjustment accuracy.

6) Automatic RF Level Adjustment (RFAGC)

This adjustment is used for implementing intended signal transmission successfully by adjusting unevenness of the RF signal (RFO) levels, that results from disc and machine relevant factors, to a target value. The adjustment is actually done by varying gain of the amplifier provided between the RFI and RFO.

The following is the adjustment procedure :

(1) Using the command, the microcomputer reads the output from the RF level detection circuit on the servo LSI.

(2) Based on the read value, the microcomputer calculates an amplifier gain that will produce the target RFO level.

(3) The microcomputer sends the corresponding command to the servo LSI so that the above gain value may be set.

This adjustment takes place at the following timing :

- When the focus close alone is completed during the setup process.
- Just before the setup is completed (just before the play takes place).
- After the off-focus has been corrected during the play.

7) Adjustment of Pre-Amp Stage Gain

It is used for adjusting the entire RFAMP (FE, TE and RF amplifiers) to +6dB or +12dB depending on given gain level when reflected light from the disc is significantly below the required level due to stained lens. This phenomena can be noticed when playing back the CD-RW.

The following is the adjustment procedure :

When reflected light from disc is judged to be significantly below the required level during the setup, set the entire RFAMP to +6dB or +12dB. In this case, if the gain is modified, the setup have to be repeated from the first step.

Through the adjustment, if you judged the play becomes available by setting the entire RFAMP to +6dB, +6dB should be selected for the setup next time on.

See the figure below :

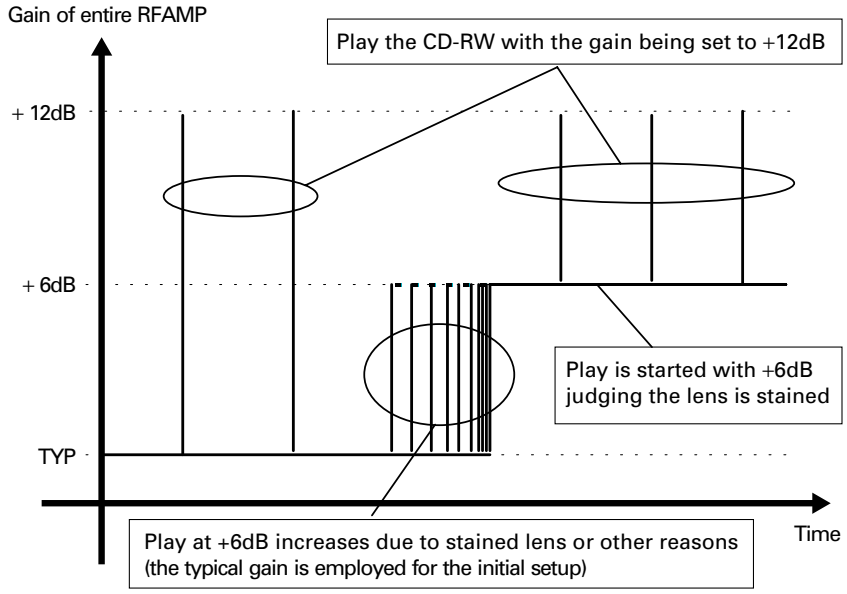


Fig.19 : CONCEPTUAL DIAGRAM OF PRE-AMP GAIN ADJUSTMENT

8) Initial Adjusting Values

All the automatic adjustments are implemented using the previous adjustment values as the initial values unless the microcomputer power (the backup power) is not turned off (though there are some exceptions).
When the backup is turned off, automatic adjustment is executed based on the initial values rather than the previous adjustment values.

9) Displaying Coefficients After Adjustment

You can display and check results of some automatic adjustments (FE and RF offset, FZD cancel and F / T / RFAGC) from the test mode. The following coefficients are displayed in each automatic adjustment :

(1) FE and RF offset and FZD cancel

Reference value = 32 (The coefficient of 32 indicates that no adjustment was required).

The results are displayed in multiples of approximately 40 mV.

An example : When FZD cancel coefficient = 35

35 − 32 = 3

3 × 40 mV = 120 mV

Since the corrected value is approximately +120 mV, the FE offset before adjustment was −120 mV.

(2) F and T gain adjustment

Reference value = Focus/Tracking = 20

A coefficient displayed indicates an amount of adjustment conducted on the reference value.

An example : When AGC coefficient = 40

40/20 = Overall gain has bee doubled (+6dB). (The original loop gain of 1/2 has been doubled to have the targeted overall gain.)

(3) RF level adjustment (RFAGC)

Reference value = 8

Coefficient = 9 to 15 ····· The direction in which the RF level is increased (the gain is increased).

Coefficient = 7 to 0 ····· The direction in which the RF level is decreased (the gain is decreased).

Incrementing or decreasing the coefficient by "1" varies the gain by 0.7 to 1dB.

Maximum gain = Typically +6.5dB. Coefficient at this time is 15.

Minimum gain = Typically −6.0dB. Coefficient at this time is 0.

1.4 POWER SUPPLY UNIT CONFIGURATION

The power supply unit of this system consists of 4 power sources, VD(8.6V), 5VA(5V), 4R3VLR(4.3V) and EVREF(5V).

VD :Main power source. Generated in the expansion board.

5VA :Power source for IC201 and the Pick-up Unit. Generated by the regulator IC (IC101) from VD.

4R3VLR :Audio midpoint voltage. Generated by the regulator IC (IC603) from VD.

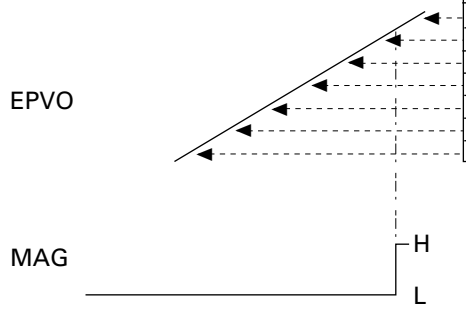
EVREF :Power source for Linear Position Sensor. A/D reference voltage of the microcomputer. Usually taken from the microcomputer's VDD line via on enabling switch.

1.5 MECHANISM OPERATION

1) Elevation Operation

The microcomputer determines the present elevation position from the voltage value (EPVO) obtained from the potential divider VR801.

The voltage of the position of the requested disk is calculated from figure 20 and the ELV Motor is controlled so that the EPVO voltage is matched to the value obtained from the calculation.



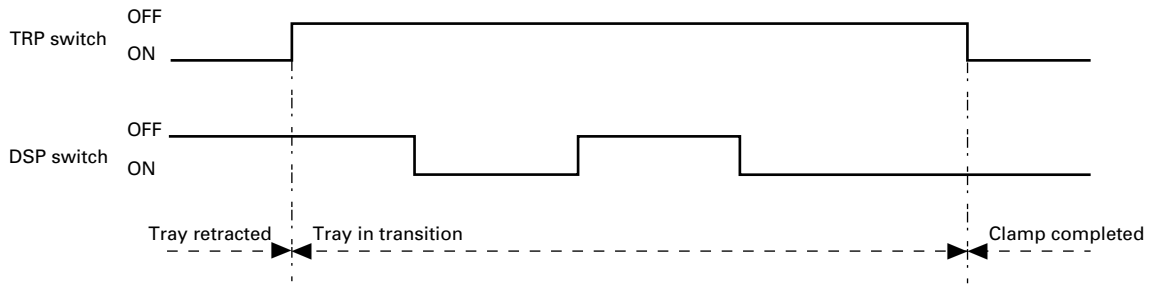
	min	typ	max
EJECT Voltage position	EREF+455LSB		
DISC1 Voltage position	EREF+341LSB	EREF+351LSB	EREF+361LSB
DISC2 Voltage position	EREF+134LSB	EREF+144LSB	EREF+154LSB
DISC3 Voltage position	EREF- 10LSB	EREF+ 0LSB	EREF+ 10LSB
DISC4 Voltage position	EREF- 145LSB	EREF- 135LSB	EREF- 125LSB
DISC5 Voltage position	EREF- 299LSB	EREF- 289LSB	EREF- 279LSB
DISC6 Voltage position	EREF- 443LSB	EREF- 433LSB	EREF- 423LSB

* 1LSB=approx 4.88mV (5/1024V)

Fig. 20

2) Tray Extension and Retraction

The microcomputer detects the DSP signal waveform (voltage) and TRP signal waveform (voltage) obtained at the DSP switch (S852) and the TRP switch (S851) by tray retraction, tray extension and clamp completion and controls the Tray Motor.



3) 0.6mm UP/DOWN Operation

In order to secure clearance with the neighboring disk the Stage Mechanism is driven down by the ELV Motor (M852) when clamping is complete. The microcomputer detects the completion of clamping, and when the Tray Motor is brought to a full stop, the ELV Motor (M852) is forcibly driven for a 240 ms interval in the downward direction.
When the tray is being retracted, the ELV Motor (M852) is controlled to match the value of EPVO calculated during the elevation operation. The tray retraction operation is started when the Tray has been moved to the prescribed position.

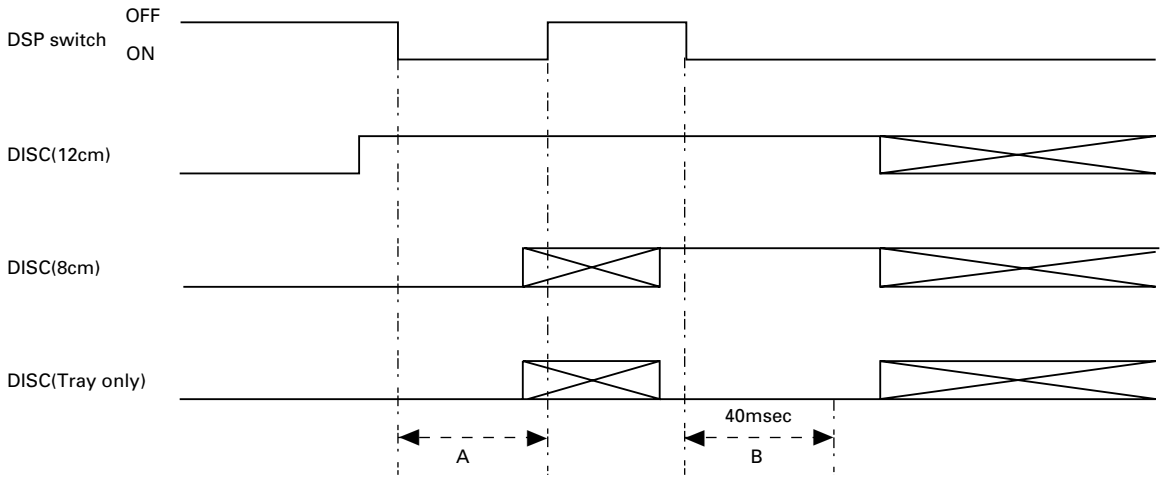
Each motor is driven by the driver IC302 (LB1836M). LB1836M is an IC which usually operated through the combination of H and L of the 4 lines I1, I2, I3 and I4. With this system, I1=I3 and control is realized through a combination of H and L of the 3 lines I1, I2 and I4.

ELV Motor	Tray Motor	I1,I3	I2	I4
Forward	Brake	H	H	L
Reverse	Stand-by	L	L	H
Brake	Forward	H	L	H
Stand-by	Reverse	L	H	L
Brake	Brake	H	H	H
Stand-by	Stand-by	L	L	L

* ELV Motor Forward : ELV-up (Disc No. Down)
Tray Motor Forward : Tray Ejection

4) Disc Detection

The DSP signal waveform (voltage) at the DSP switch (S852) is used for determinating the existence and non-existence of a disk and the disk type (8cm or 12cm). The disk detection operations are carried out while the Tray is being pulled out of the magazine. Disk detection is determined when the light passes through (DISC waveform L:less than 2.5v) or is interrupted (DISC waveform H:2.5V or above) with an array of LEDs and photo transistors above and below the Tray.



The DISC waveform is continuously monitored within the intervals A and B above and if a L is detected even once, that interval is determined as L. If a L is not detected at all then that interval is determined as H in the following.

	A	B
12cm	H	H
8cm	L	H
No Disk	—	L

Cautions on Service

1) Do not hold the upper frame of the magazine insertion port in the CD mechanism module, marked by an arrow in Fig. 21, when servicing. It's because this section is easily deformed.

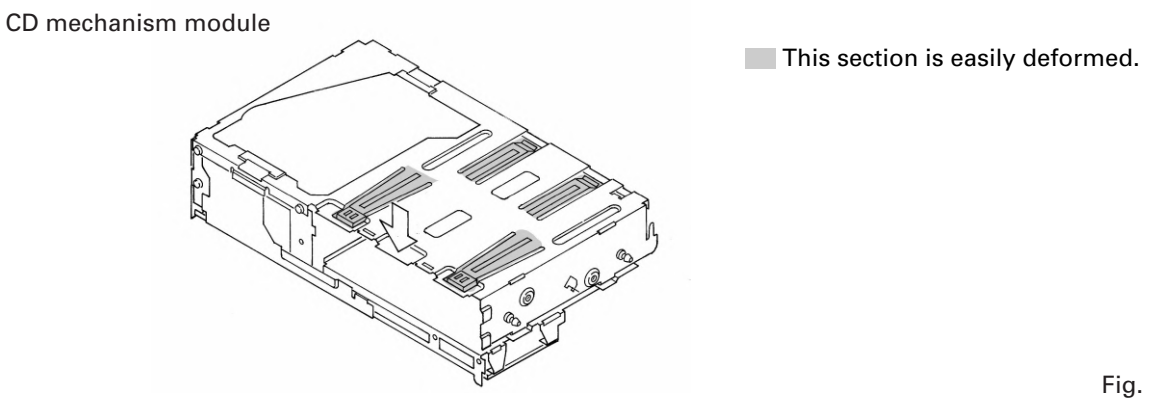


Fig. 21

2) The stage mechanism section projects below the chassis when positioned at the fifth stage or lower. So, do not leave the stage mechanism section at these positions to avoid damage or malfunction.

3) Before removing the flexible card and pickup flexible PCB from the connectors on the relay PCB, be sure to insert a short pin into the pickup unit first.

4) When replacing the tray motor assy, mount the 2-stage gear(Not resable) on the shaft of a new tray motor assy. (As the gear uses snap-on fittings, push it in until it is snapped completely.)

5) When replacing the magazine holder assy, mount the worm wheel(Not resable) on the shaft of a new elevation worm wheel.
(As the gear uses snap-on fittings, push it in until it is snapped completely.)

2. DISASSEMBLY

● Removing the Pickup Unit

1. Insert a short pin into the pickup flexible PCB.
2. Remove the pickup flexible PCB from the connector.
3. Remove the flexible card from the connector.
4. Remove the lead wires of the spindle motor assy and carriage motor assy by removing solder.
5. Loosen the two screws. Lift up the relay PCB as shown in Fig. 22.

Be careful not to excessively pull the tray motor flexible PCB and the relay flexible PCB.

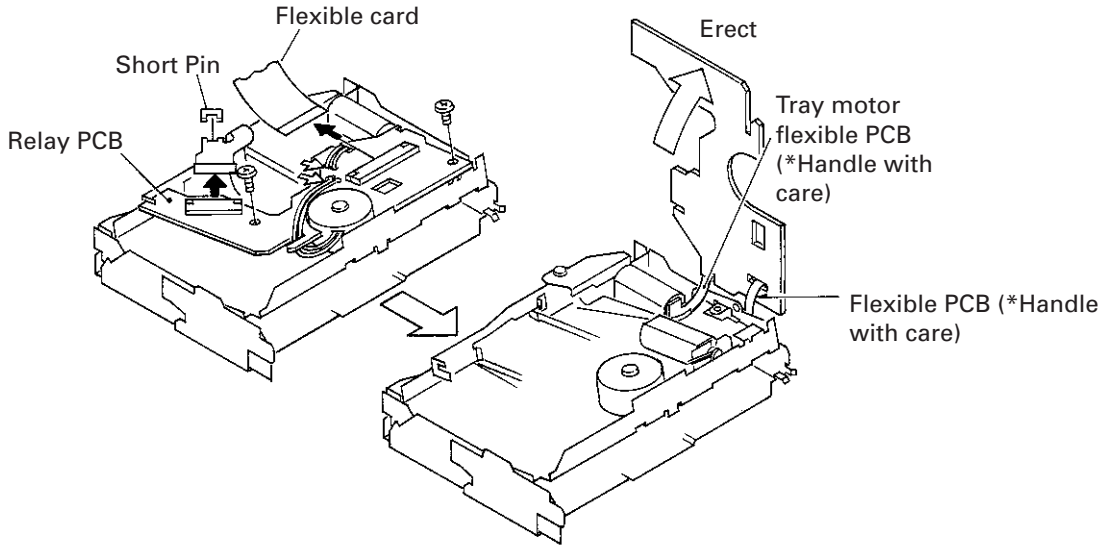


Fig. 22

6. Remove three screws A and then remove the carriage motor assy, remove the lighting conductor , screw holder, feed screw and belt (see Fig. 23).
7. Remove screw B on the main side and the pickup unit together with the guide shaft (see Fig. 23).

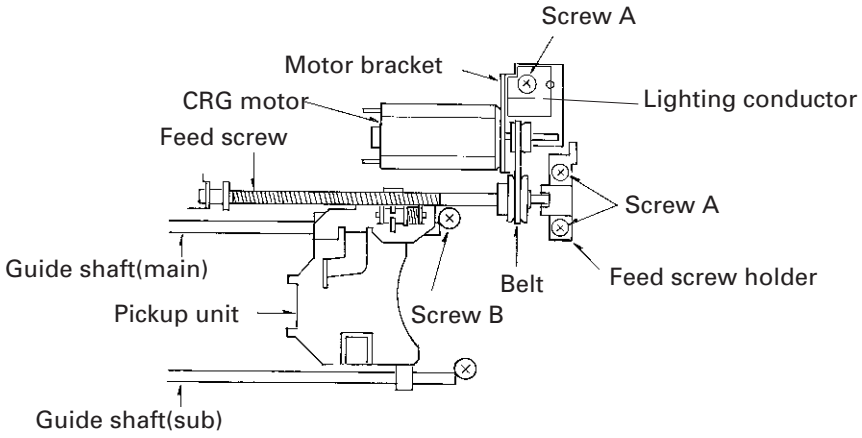


Fig. 23

● Removing the CD Core Unit

1. Insert a short pin into the pickup flexible PCB.
2. Remove the flexible card from the CD core unit connector.
3. Remove the lead wires of the elevation motor assy that were soldered to the CD core unit.
4. Remove screw C and three screws D and then the CD core unit (see Fig. 24).

Mechanism unit - bottom view

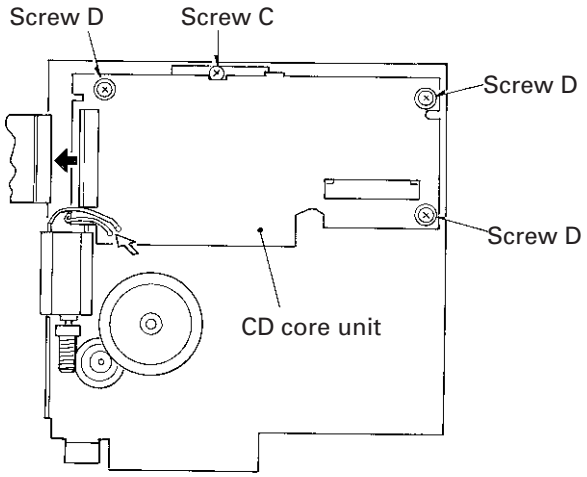


Fig. 24

● Cautions on Mounting the CD Core Unit

When mounting the CD core unit on the CD mechanism module, accurately insert the linear position sensor (Slide control: VR801) mounted on the CD core unit into the U-shaped groove of the elevation front lever (see Fig. 35).

If the linear position sensor is not inserted into the U-shaped groove, elevation operation will malfunction.

● Removing the Carriage Motor Assy

After removing the pickup unit (see "Removing the Pickup Unit" in pages 17 and 18), remove the feed screw, remove the lighting conductor, belt ,and feed screw holder.

● Removing the Spindle Motor Assy

1. Rotate the tray motor until the clamp joint arm moves.
2. Slide and remove the clamp spring as shown in Fig. 25.
3. Remove the clamper.
4. As shown below, match the positions of the holes of the support wheel and screws F. Then remove the two screws F and spindle motor assy.

* When removing the clamper, be careful not to lose the ball mounted between the clamper and clamp spring.

Release the clamp spring from the hook(s), and then slide it in the direction indicated with an arrow.

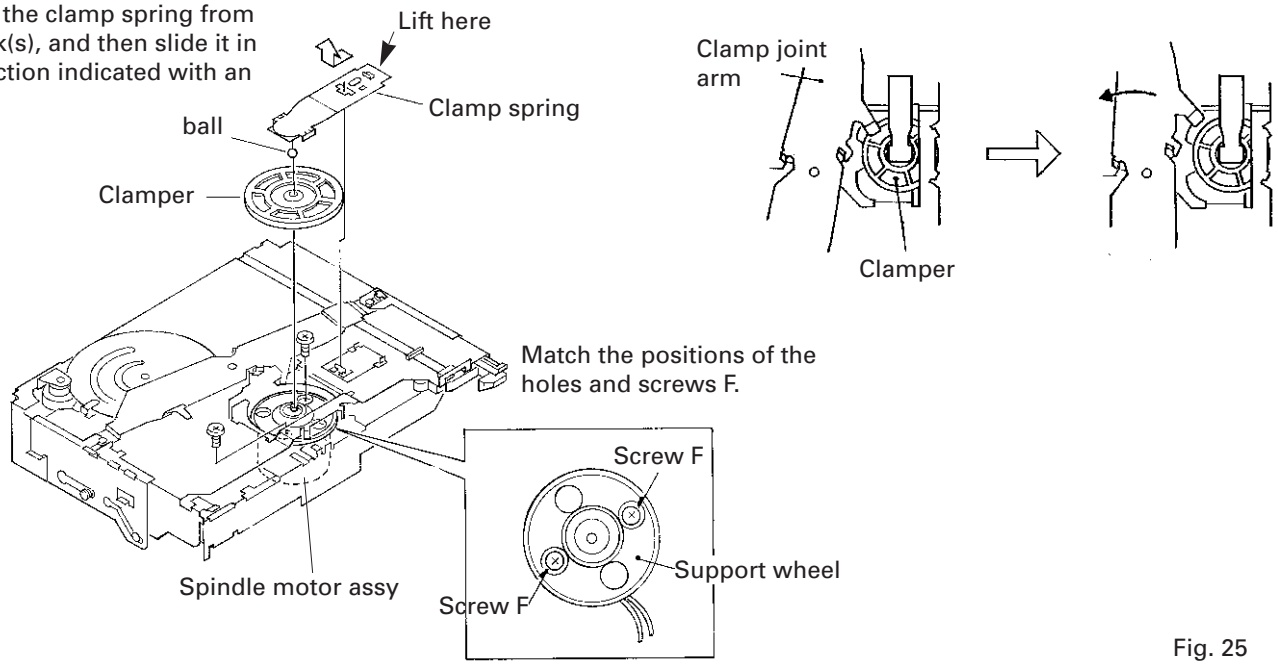


Fig. 25

● Cautions on Mounting the Spindle Motor Assy

1. Mount the spindle motor assy so that the lead wires face the rear of the mechanism unit (see Fig. 26).

Mechanism unit - bottom view Front side (magazine insertion port)

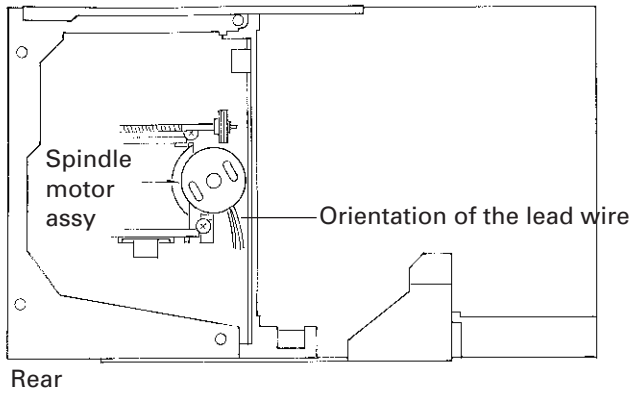


Fig. 26

2. Check that the torsion spring presses the side pressure plate (see Fig. 27).

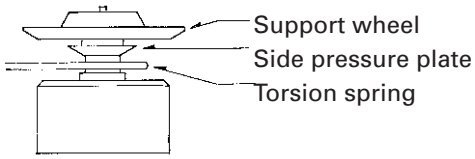


Fig. 27

3. When mounting the clamper, confirm that the ball has been installed.

● Removing the Tray Motor Assy (see Fig. 28)

1. Remove screw G.
2. Remove the elevation joint arm spring.
3. Remove the polyslider washer and the 2-stage gear.
4. Move the front lever to move the stage mechanism unit to the "2" position on the front lever.
5. Remove screw H.
6. Move the front lever again to move the stage mechanism unit to the uppermost stage.
7. Remove the tray motor assy.

● Cautions on Mounting the Tray Motor Assembly (see Fig. 28)

When mounting the 2-stage gear, verify that the positions of the holes of the 2-stage gear and the stage chassis match each other. For easy confirmation, check that the shapes of the 2-stage gear and the stage chassis form a concentric circle, as shown in the figure.

● Removing the Elevation Motor bracket Assy (see Fig. 28)

1. Remove the elevation joint arm spring.
2. Remove the polyslider washer and the 2-stage gear.
3. Remove two screws I and the elevation motor bracket assy

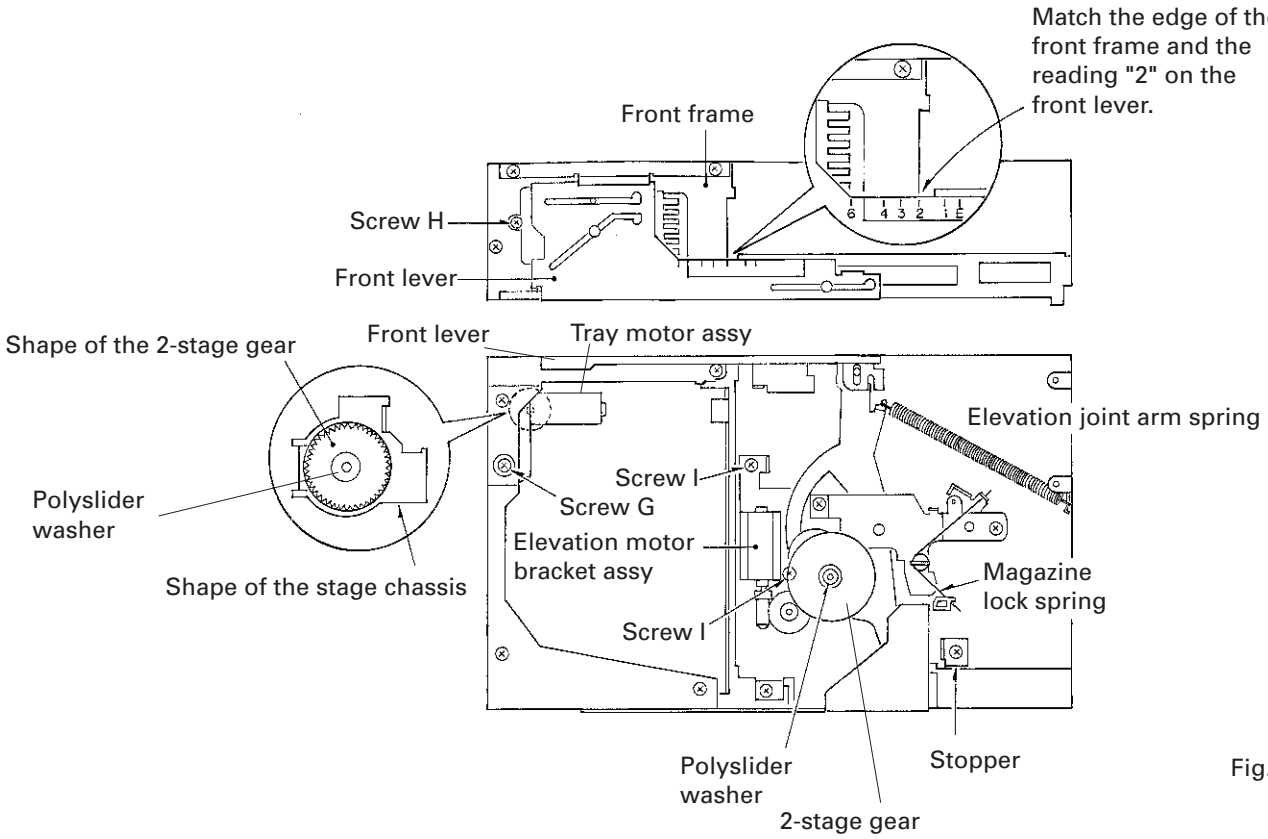
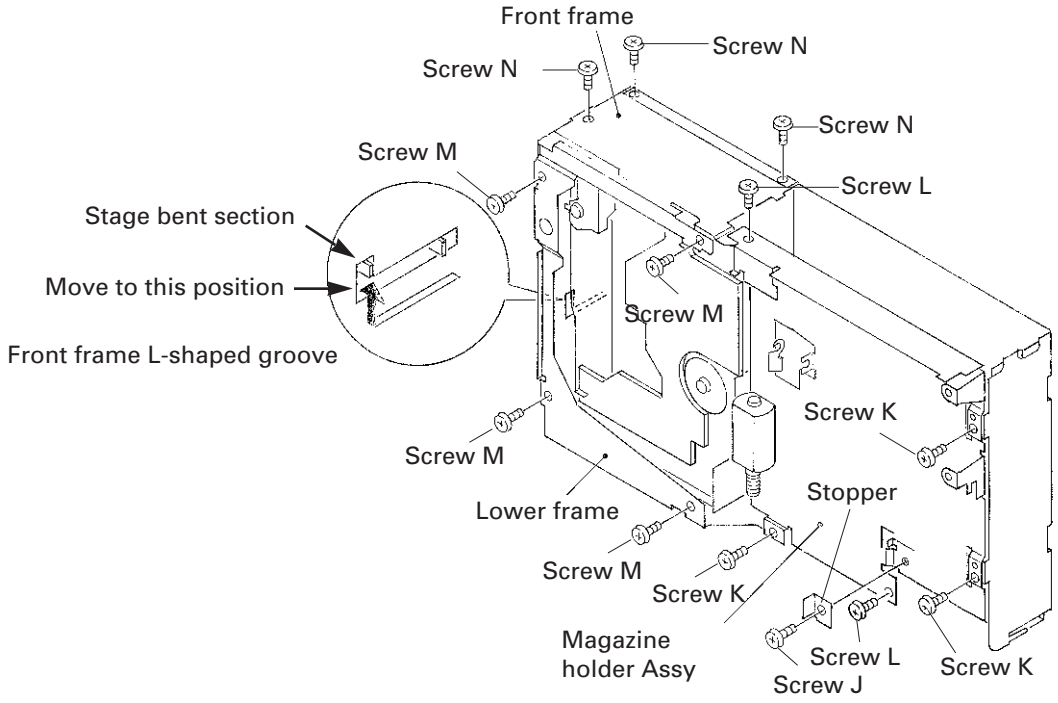


Fig. 28

● Removing the Stage Mechanical Unit Section (see Fig. 29)

1. Remove the elevation joint arm spring.(See Fig. 28)
2. Remove the magazine lock spring.(See Fig. 28)
3. Remove the 2-stage gear.(See Fig. 28)
4. Remove the screw J and then the stopper.
5. Fully slide the front lever in the direction that the stage mechanism assy moves upwards. Then, the front lever and the rear lever can be removed at the same time.
6. Remove three screws K and two screws L, and then the magazine holder Assy.
7. Remove four screws M and then the lower frame.
8. Remove three screws N and then the front frame.
9. Move the stage mechanism assy to the lowest position. Slide the bent section of the stage mechanism assy along the L-shaped groove in the front frame to remove the stage mechanism assy.



Rear view of the CD mechanism module with the front and rear levers removed.

Fig. 29

3. MECHANISM DESCRIPTIONS

● Inserting the Magazine

1. When the magazine is inserted against the force of the EJECT lever spring, the lock arm comes in along the groove in the rear side of the magazine to lock (see Fig. 30).

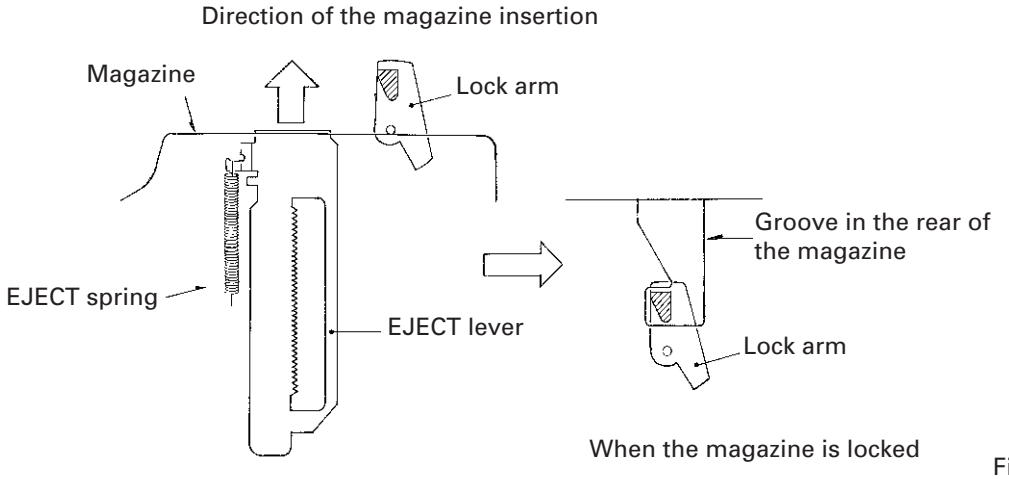


Fig. 30

2. The magazine lock is detected when the detection arm moves along the EJECT lever cam section and presses the magazine detection switch mounted on the CD core unit.
   When the magazine is not inserted, the detection arm is held at the SW OFF position by the EJECT lever cam (see Fig. 31).
   When the magazine starts insertion, the lock arm starts moving along the groove in the rear of the magazine. Then the lock arm stops at the detection arm "stop" position. Although the detection arm tries to move in the SW ON direction, the lock arm stops it. (See Fig. 32.)
   When the magazine is completely inserted, the magazine to lock. At the same time, the detection arm is released to press the magazine detection switch with spring force. (See Fig. 33)

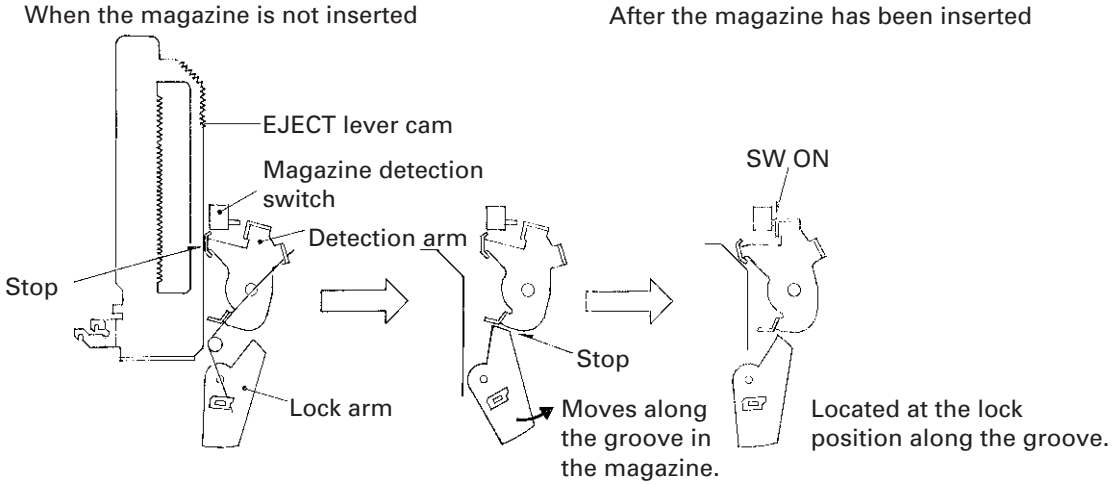


Fig. 31 Fig. 32 Fig. 33

● Elevation Operation (see Fig. 34)

When the elevation motor is driven, the elevation joint arm rotates. The front and rear levers, engaged with the ends of the elevation joint arm respectively, slide to move the stage mechanism unit up and down.

● Detecting Elevation (see Fig. 35).

When the elevation joint arm rotates, the front lever slides.
Because the knob of the linear position sensor (slide control: VR801) is inserted in the U-shaped groove of this front lever, the elevation joint arm moves in synchronization with the lever and detects the voltage at that time.

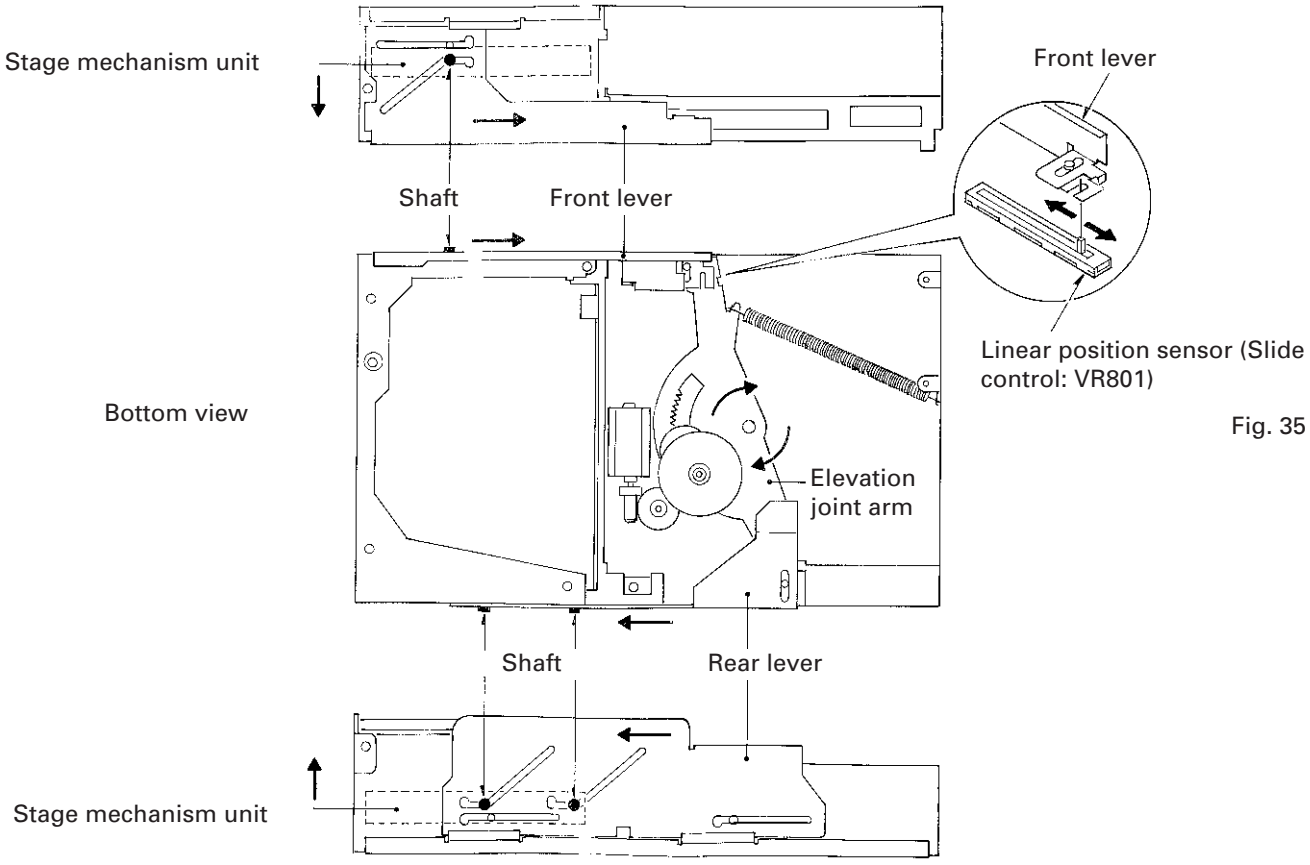


Fig. 35

Fig. 34

● Tray Extraction to Clamp Operation (Loading Motor Drive Section) (See Fig. 36.)

When the loading motor drives the cam gear, the cam gear moves the tray extraction arm along the cam groove to extract the tray. At that time, the carriage assy (including the spindle motor assy and tray positioning pin) waits until the tray passes it. When tray extraction has been completed, the cam gear swings the clamp joint arm and slides the clamp lever engaged with the clamp joint arm. The shaft of the carriage assy is lifted along the step-shaped groove as the clamp lever slides. The carriage assy swings toward the stage chassis. Subsequently, the spindle motor assy comes to a CD disc to load and lift it up from the tray.

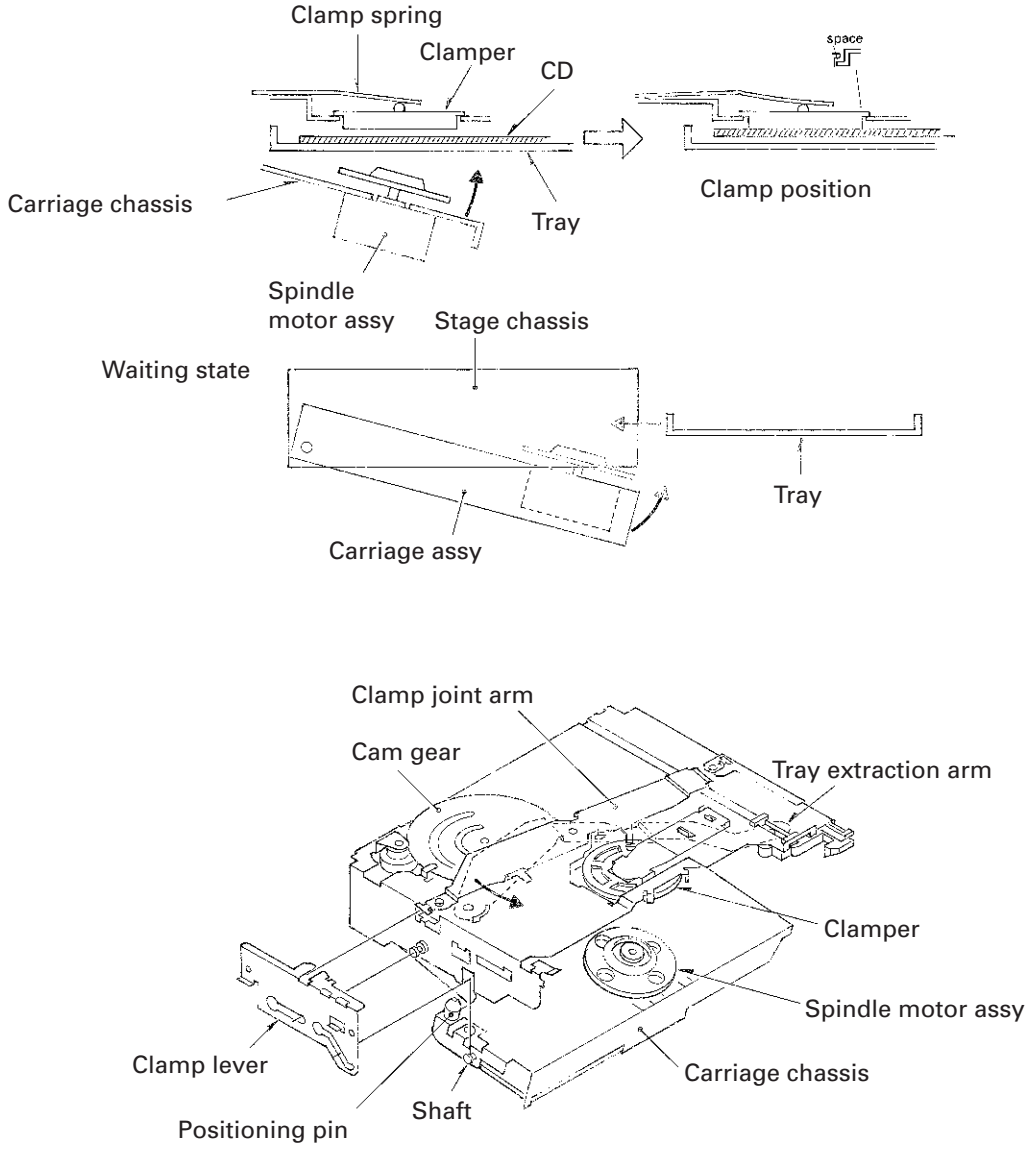


Fig. 36

● Elevation Mechanism - Play Elimination

Immediately before the clamp operation is completed, the bent sections of the clamp lever comes into the frame stopper section and press it downward to control the vertical position. This operation can press the stage downward by means of the elevation mechanism. At this time, the elevation motor stops, not by the detection of the pressed position, but in a certain period of time after the elevation mechanism moves up to the limit of the movement. (See Fig. 37)
The figure 37 shows the pressing mechanism. When the clamp lever bent sections press the framestopper section, the carriage chassis shaft inserted into the clamp lever groove is lifted up until it is pressed against the end of the vertical groove in the stage chassis. At this time, the stage chassis shaft, which is also inserted into the other groove in the clamp lever, is located at the wider portion of the groove so that the carriage chassis shaft can move to the end of the vertical groove in the stage chassis. This pressing operation eliminates the play at each of the stage chassis, carriage chassis, clamp lever, and the frame to improve the resistance against vibration. (See Fig. 39.)

* The elevation joint arm spring has been installed to keep this pressing state.

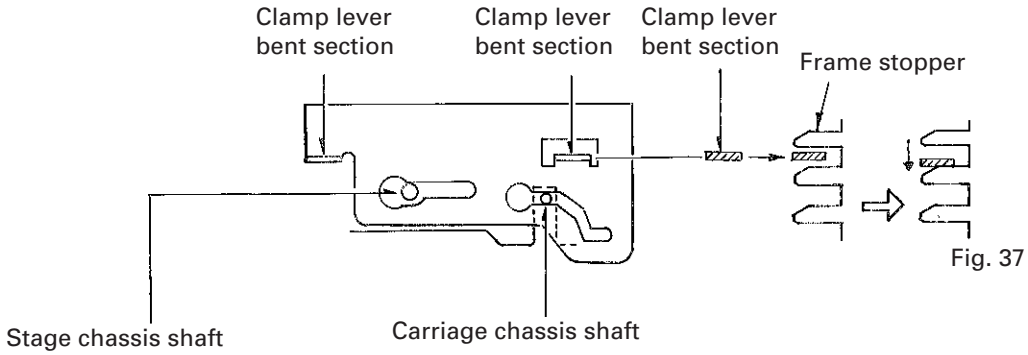


Fig. 37

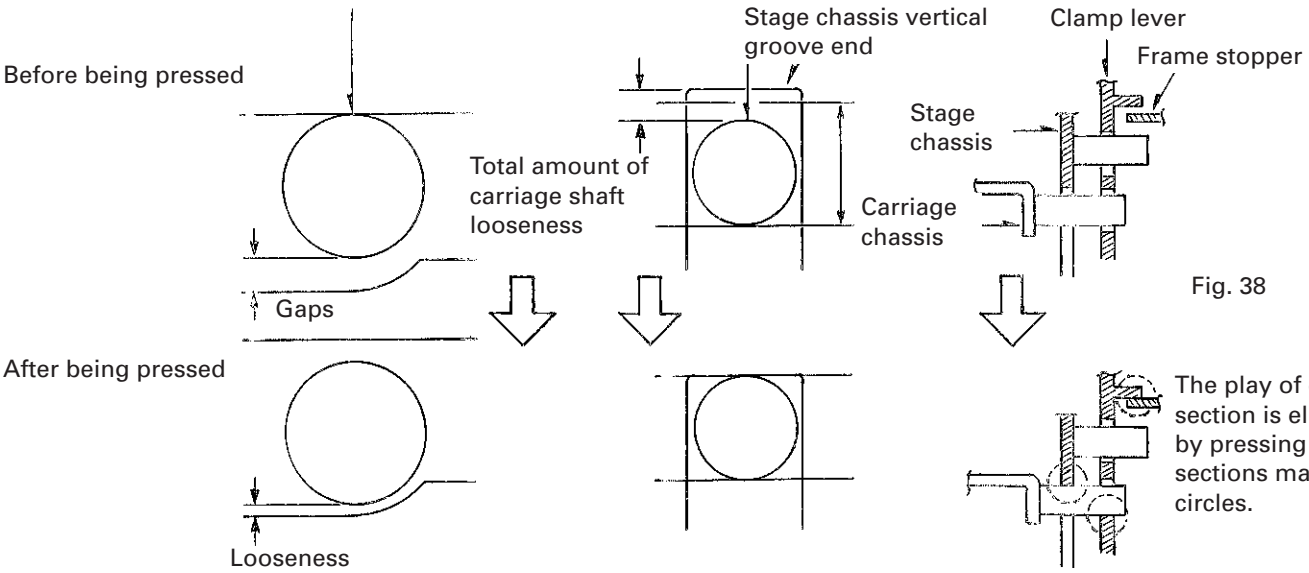


Fig. 38

The play of each section is eliminated by pressing the sections marked by circles.

Fig. 39

● Disc detection

The cam gear for tray extraction operation moves the DSP switch lever to turn the DSP switch (S852) ON and OFF. The photo sensors (Q851 and D852) detect the presence of discs and their types (8 or 12 cm) with a certain timing.

● Detecting Tray Extraction and Return

A) Tray extraction (Fig. 40)
The clamp joint arm moves the clamp lever and performs clamping. After clamping has been completed, the protrusion on the clamp joint arm presses the TRP switch (S851) via the TRP switch (S851) via the plate spring on the DSP switch lever and turns on the switch.

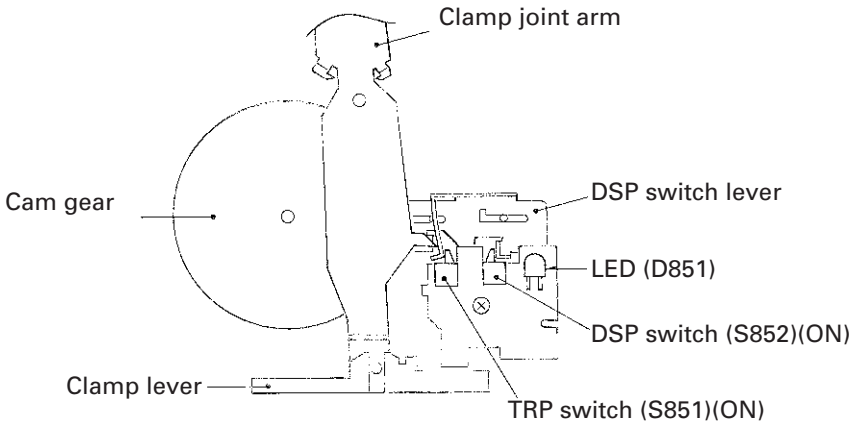


Fig. 40

B) Tray return (see Fig. 41)
The TRP switch (S851) is turned on by the DSP switch lever moved by the cam gear.

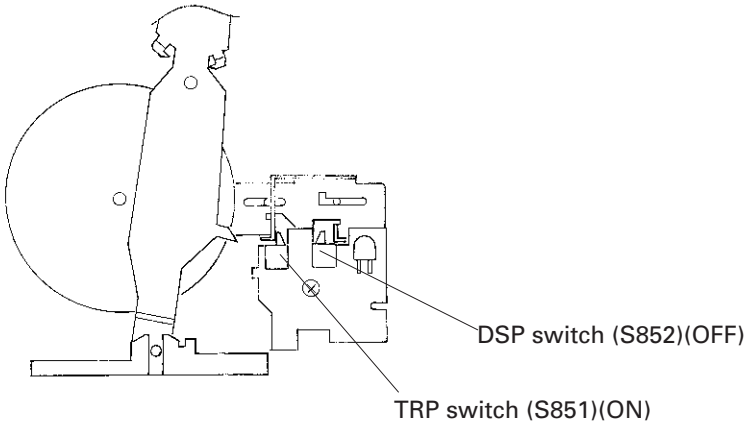


Fig. 41

● Tray Lock Mechanism

In other modes than the PLAY mode, the tray bouncing prevention spring is deflected by the rear lever and functions as a stopper to prevent the tray from coming out of the magazine. (Fig. 43)
In the PLAY mode, the window in the rear frame catches the projection of the tray bouncing prevention spring. Accordingly, the spring is not deflected to enable the tray's insertion and extraction. (Fig. 42)
Consequently, in other modes than the PLAY mode (during the waiting mode), the tray will not come out of the magazine even if external shock is applied to it. (Fig. 43)

When set in the PLAY position

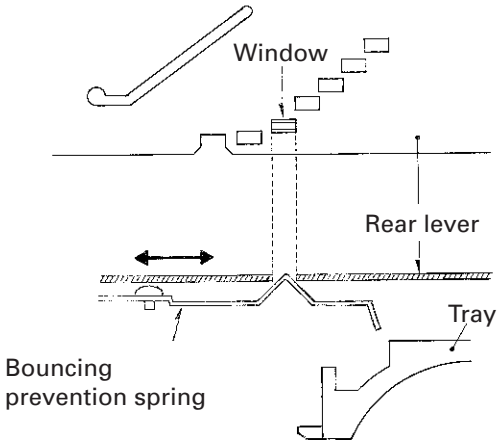


Fig. 42

When set to a position other than PLAY

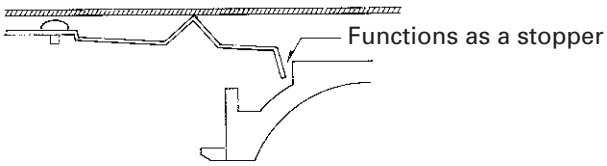


Fig. 43

● Ejecting the Magazine (see Fig. 44)

When the rear lever is further driven from the uppermost stage position of the elevation, the bent end face of the rear lever presses the boss on the lock arm to release the lock and the magazine is ejected by the EJECT lever.

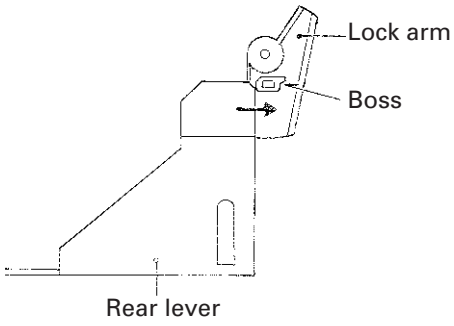
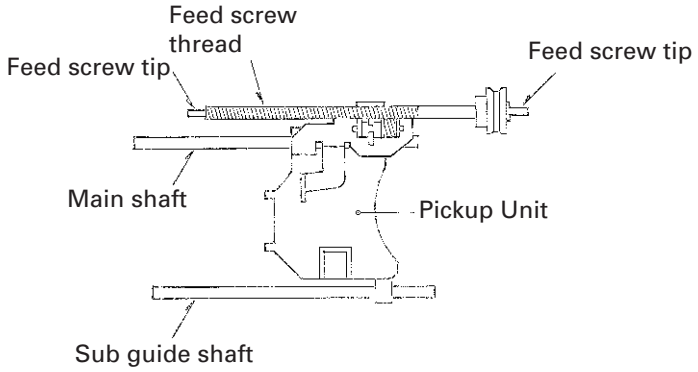


Fig. 44

● Lubrication points (Fig. 45)

(1) Around the pickup assy ->
Use EM-60L for all points.



(2) Slide section with clamp ball

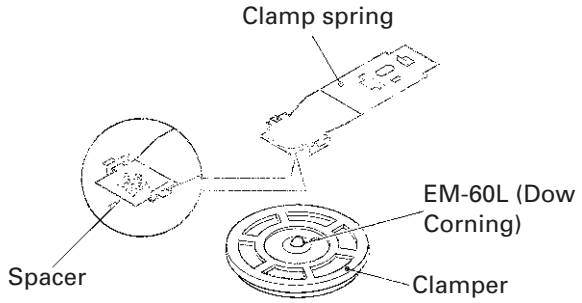


Fig. 45

(3) For the other sections, use the E paste.