Service Manual

Pioneer

FORD

ORDER NO.
CRT2465

CD PLAYER

YPM-2306ZF

WL

● The CD mechanism employed in this model is one of S8.1 series.

CONTENTS

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● CD Player Service Precautions

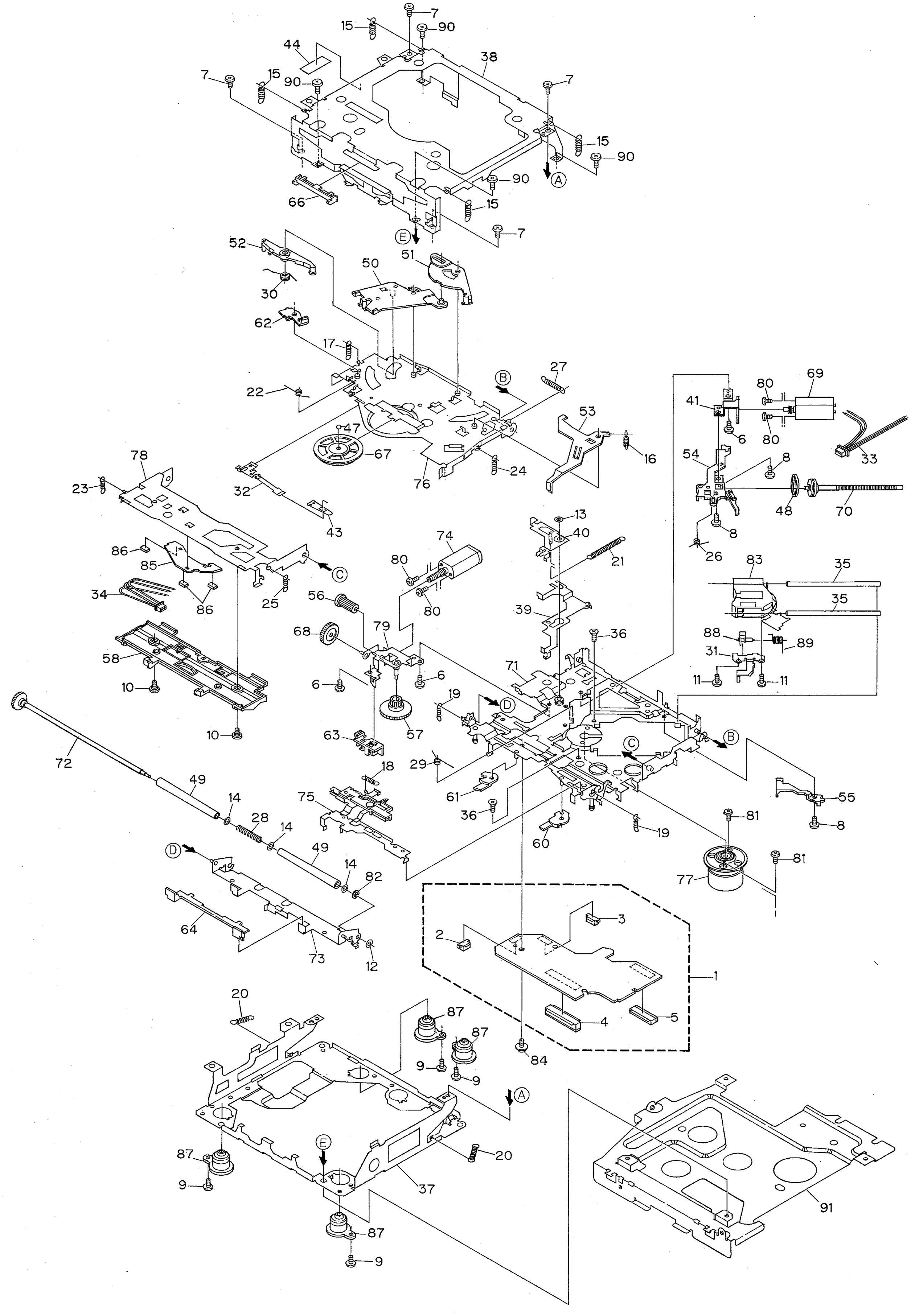
1. For pickup unit(CXX1285) handling, please refer to"Disassembly"(see page 24).
   During replacement, handling precautions shall be taken to prevent an electrostatic discharge(protection by a short pin).
2. During disassembly, be sure to turn the power off since an internal IC might be destroyed when a connector is plugged or unplugged.
3. Please checking the grating after changing the service pickup unit(see page 18).

1. SAFETY INFORMATION

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.

2. EXPLODED VIEWS AND PARTS LIST

2.1 CD MECHANISM MODULE



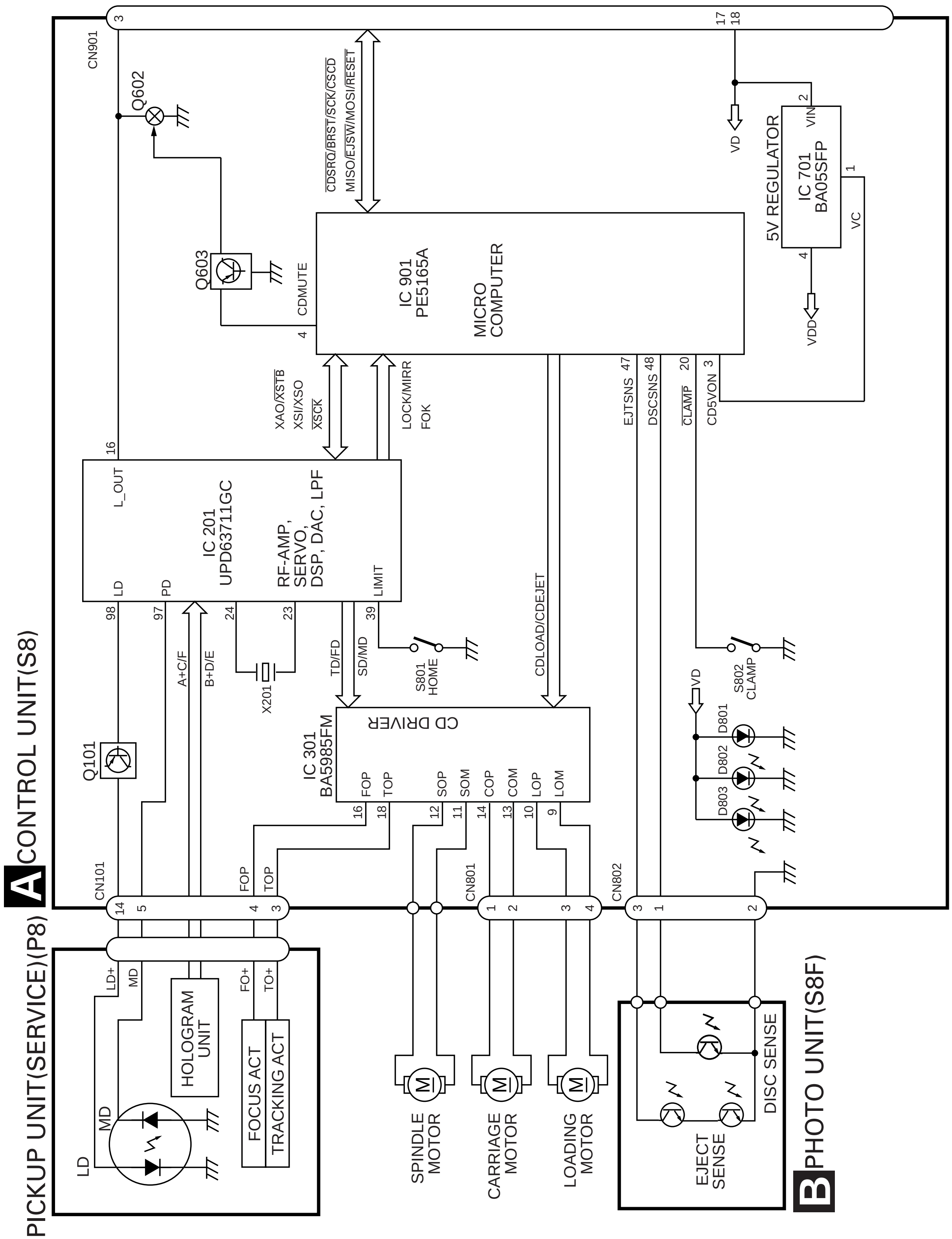
● CD MECHANISM MODULE SECTION PARTS LIST

Mark	No.	Description	Part No.
	1	Control Unit(S8)	CWX2435
	2	Connector(CN802)	CKS2192
	3	Connector(CN801)	CKS2193
	4	Connector(CN901)	CKS2767
	5	Connector(CN101)	CKS3486
	6	Screw	BMZ20P030FMC
	7	Screw	BSZ20P040FMC
	8	Screw(M2x3)	CBA1077
	9	Screw(M2x6)	CBA1489
	10	Screw	CBA1243
	11	Screw(M2x4)	CBA1362
	12	Washer	CBF1037
	13	Washer	CBF1038
	14	Washer	CBF1060
	15	Spring	CBH2372
	16	Spring	CBH2079
	17	Spring	CBH2117
	18	Spring	CBH2314
	19	Spring	CBH2373
	20	Spring	CBH2282
	21	Spring	CBH2318
	22	Spring	CBH2115
	23	Spring	CBH2324
	24	Spring	CBH2118
	25	Spring	CBH2161
	26	Spring	CBH2163
	27	Spring	CBH2189
	28	Spring	CBH2249
	29	Spring	CBH2260
	30	Spring	CBH2262
	31	Bracket	CNC8568
	32	Spring	CBL1369
	33	Connector	CDE5531
	34	Connector	CDE5532
	35	Shaft	CLA3304
	36	Screw(M2.6x6)	CBA1458
	37	Frame	CNC8682
	38	Frame	CNC8603
	39	Lever	CNC8694
	40	Arm	CNC8663
	41	Bracket	CNC8567
	42	•••••	
	43	Spacer	CNM3315
	44	Sheet	CNM6659
	45	•••••	

Mark	No.	Description	Part No.
	46	•••••	
	47	Ball	CNR1189
	48	Belt	CNT1086
	49	Roller	CNV4509
	50	Arm	CNV6102
	51	Arm	CNV6094
	52	Arm	CNV5248
	53	Arm	CNV6095
	54	Guide	CNV5254
	55	Guide	CNV5255
	56	Gear	CNV5257
	57	Gear	CNV5256
	58	Guide	CNV6176
	59	•••••	
	60	Arm	CNV6096
	61	Arm	CNV6031
	62	Arm	CNV5361
	63	Guide	CNV6012
	64	Guide	CNV5510
	65	•••••	
	66	Guide	CNV5751
	67	Clamper	CNV6013
	68	Gear	CNV5813
	69	Motor Unit(M1)	CXB5827
	70	Screw Unit	CXB4726
	71	Chassis Unit	CXB5811
	72	Gear Unit	CXB4728
*	73	Arm Unit	CXB5753
	74	Motor Unit(M2)	CXB5828
	75	Lever Unit	CXB4730
	76	Arm Unit	CXB4731
	77	Motor Unit(M3)	CXB5829
	78	Arm Unit	CXB5689
	79	Bracket Unit	CXB4795
	80	Screw	JFZ20P025FMC
	81	Screw	JGZ17P025FZK
	82	Washer	YE20FUC
	83	Pickup Unit(Service)(P8)	CXX1285
	84	Screw	IMS26P030FMC
*	85	Gathering PCB	CNX3265
	86	Photo Transistor(Q1, 2, 3)	CPT231SXTU
	87	Damper	CNV5266
	88	Rack	CNV6014
	89	Spring	CBH2315
	90	Screw	BSZ26P060FMC
*	91	Bracket	CNC8814

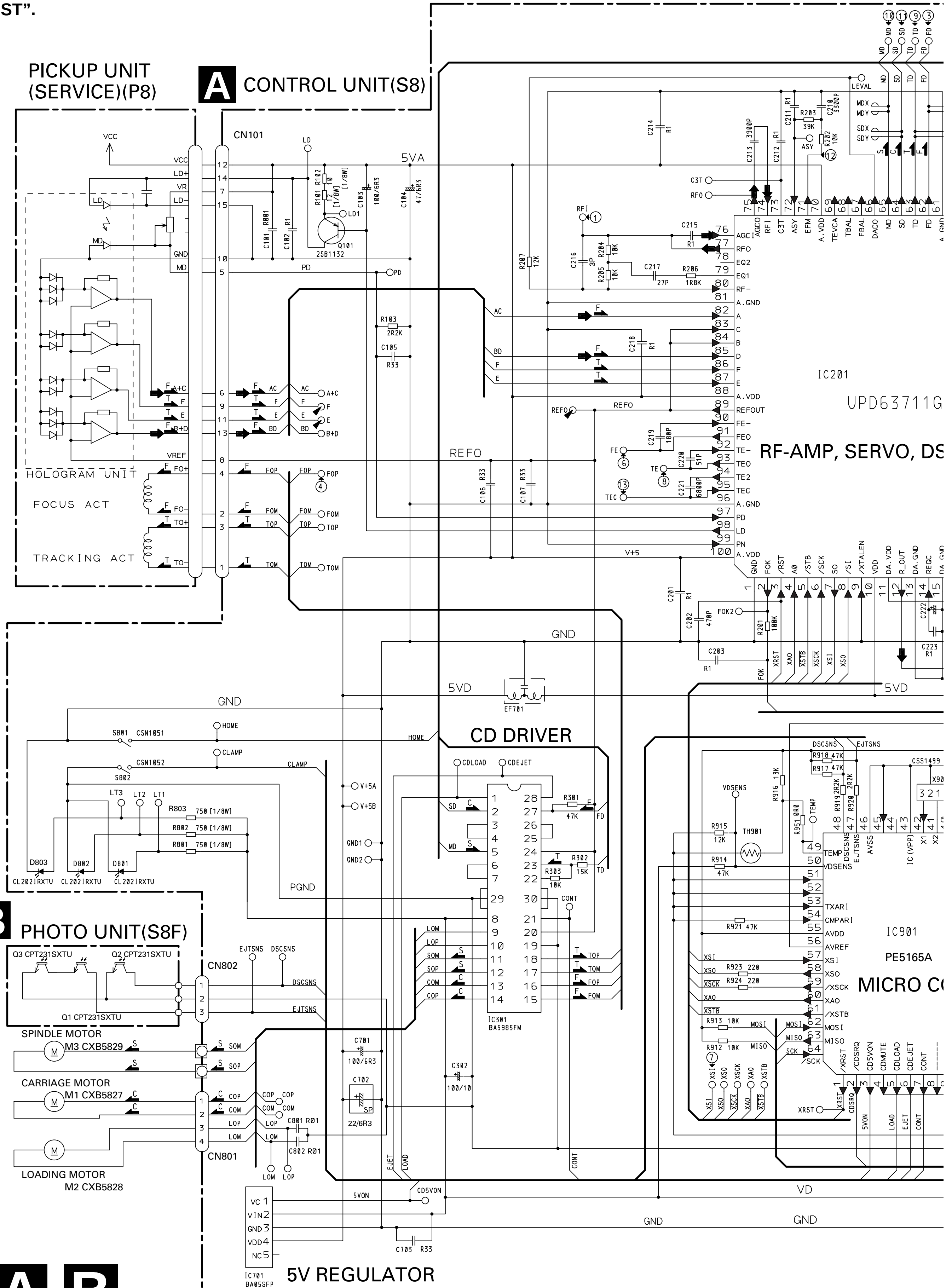
3. BLOCK DIAGRAM AND SCHEMATIC DIAGRAM

3.1 BLOCK DIAGRAM

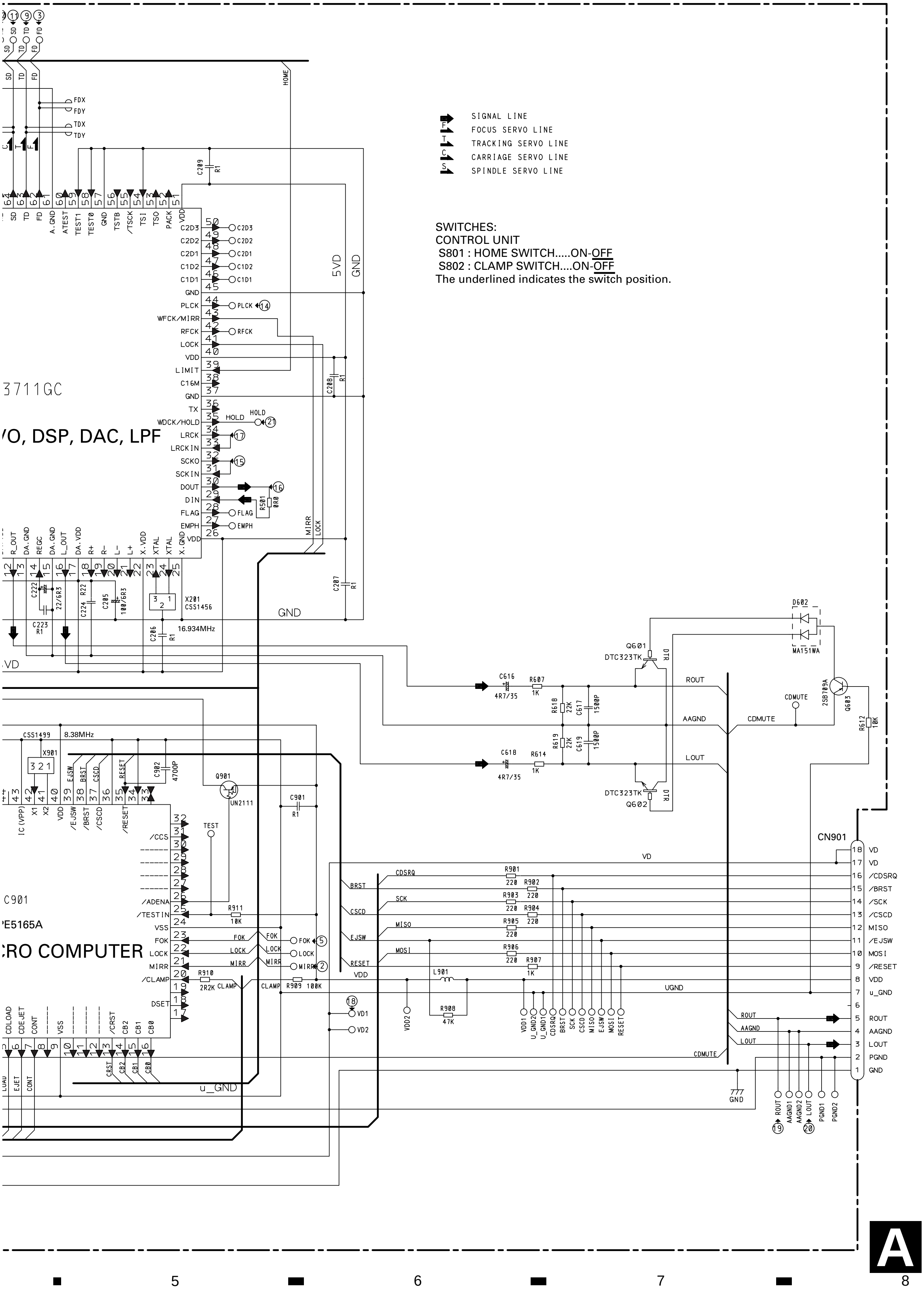


3.2 CD MECHANISM MODULE

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



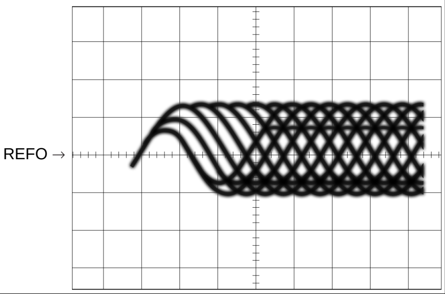
A B


SIGNAL LINE
FOCUS SERVO LINE
TRACKING SERVO LINE
CARRIAGE SERVO LINE
SPINDLE SERVO LINE
SWITCHES:
CONTROL UNIT
S801 : HOME SWITCH.....ON-OFF
S802 : CLAMP SWITCH....ON-OFF
The underlined indicates the switch position.
3711GC
VO, DSP, DAC, LPF
C901
PE5165A
CRO COMPUTER
X201 CSS1456
16.934MHz
CSS1499
8.38MHz
X901
Q901 UN2111
Q601 DTC323TK
Q602 DTC323TK
Q603 2SB709A
D602 MA151WA
CN901
GND
5VD
u_GND
UGND
VD
ROUT
AAGND
LOUT
CDMUTE

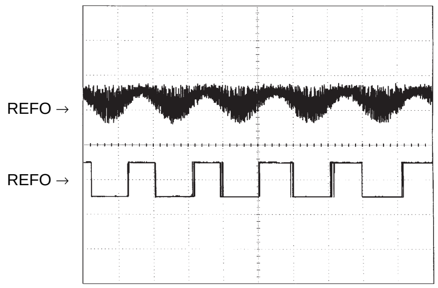
Note:1. The encircled numbers denote measuring pointes in the circuit diagram.
2. Reference voltage
REFO:2.5V

● Waveforms

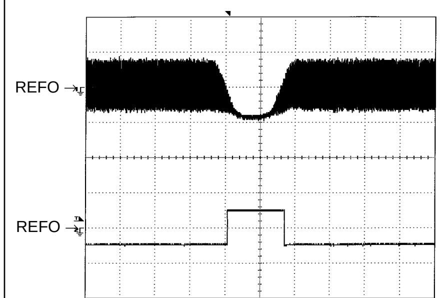
① RFI 0.5V/div. 0.5µs/div.
Normal mode: play



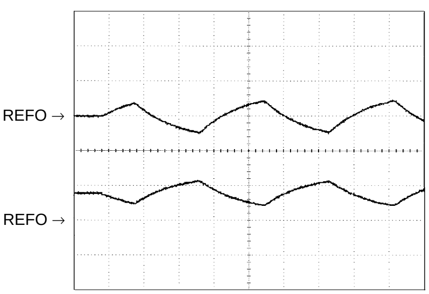
① CH1: RFI 1V/div. 0.5ms/div.
② CH2: MIRR 5V/div.
Test mode: Tracking open



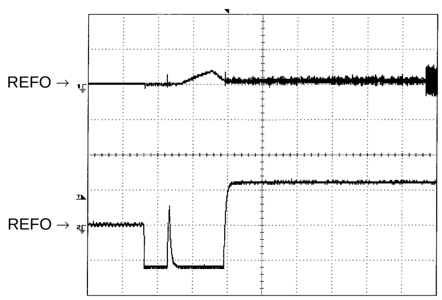
① CH1: RFI 1V/div. 0.5ms/div.
② CH2: MIRR 5V/div.
Normal mode: The defect part passes 800µm



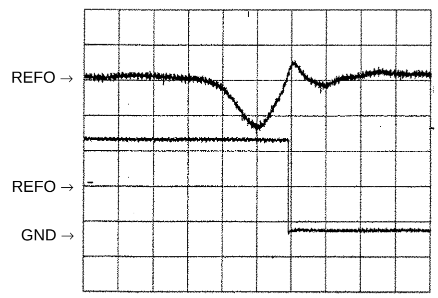
③ CH1: FD 0.5V/div. 0.2s/div.
④ CH2: FO+ 2V/div.
Test mode: No disc, Focus close



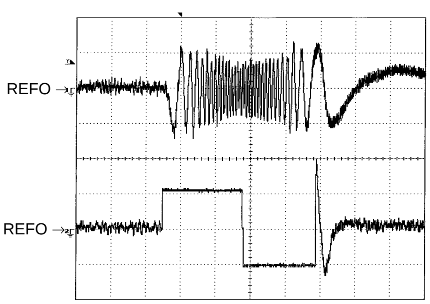
③ CH1: FD 0.5V/div. 0.2s/div.
⑤ CH2: FOK 2V/div.
Normal mode: Focus close



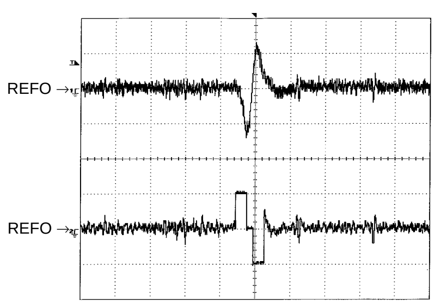
⑥ CH1: FE 0.5V/div. 1ms/div.
⑦ CH2: XSI 2V/div.
Normal mode: Focus close



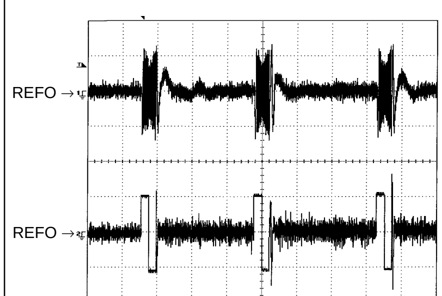
⑧ CH1: TE 0.5V/div. 0.5ms/div.
⑨ CH2: TD 0.5V/div.
Test mode: 32 tracks jump (FWD)



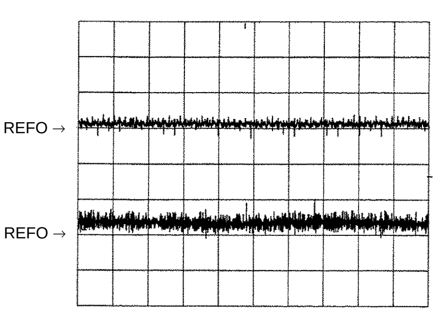
⑧ CH1: TE 0.5V/div. 0.5ms/div.
⑨ CH2: TD 0.5V/div.
Test mode: Single jump (FWD)



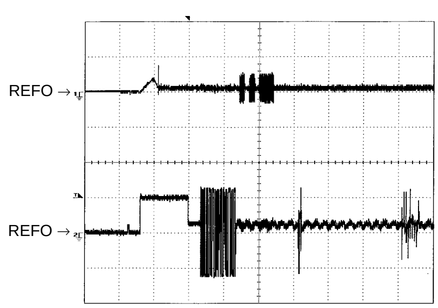
⑧ CH1: TE 0.5V/div. 5ms/div.
⑨ CH2: TD 0.5V/div.
Test mode: 100 tracks jump (FWD)



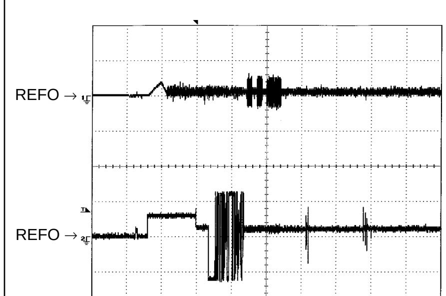
⑥ CH1: FE 0.1V/div. 20ms/div.
③ CH2: FD 0.2V/div.
Normal mode: Play



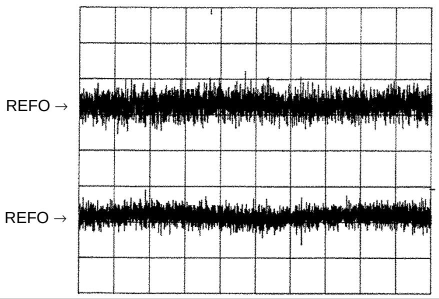
③ CH1: FD 0.5V/div. 0.5s/div.
⑩ CH2: MD 1V/div.
Normal mode: Focus close (12cm)



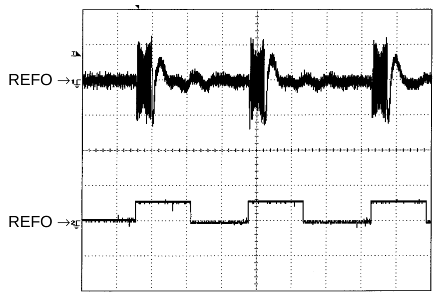
③ CH1: FD 0.5V/div. 0.5s/div.
⑩ CH2: MD 1V/div.
Normal mode: Focus close (8cm)



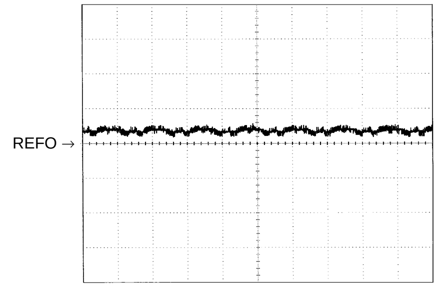
⑧ CH1: TE 0.2V/div.
⑨ CH2: TD 0.2V/div.
20ms/div.
Normal mode: play



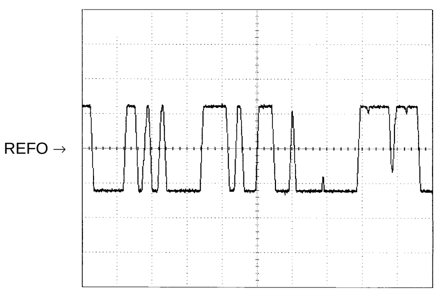
⑧ CH1: TE 0.5V/div.
⑪ CH2: SD 0.5V/div.
5ms/div.
TEST mode: 100 Tracks jump(FWD)



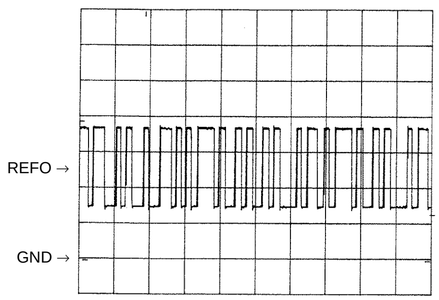
⑩ MD 0.5V/div. 0.1s/div.
Normal mode: Play (12cm)



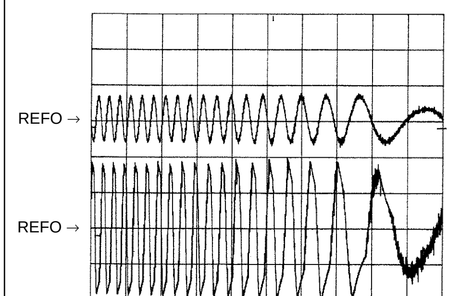
⑩ MD 1V/div. 10ms/div.
Normal mode:
Long Search (12cm)



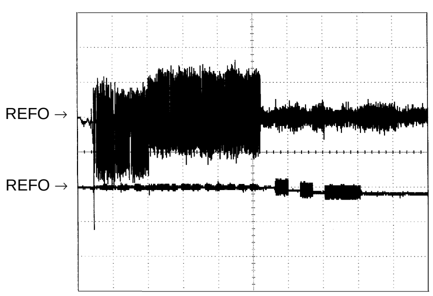
⑫ EFM 1V/div. 5µs/div.
Normal mode: play



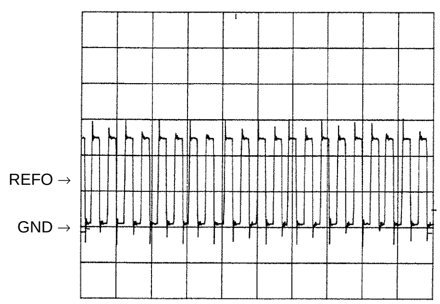
⑧ CH1: TE 1V/div.
⑬ CH2: TEC 1V/div.
2ms/div.
Test mode: Focus close
Tracking open



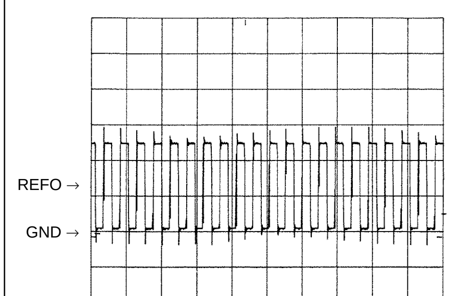
⑧ CH1: TE 0.5V/div.
⑥ CH2: FE 0.5V/div.
0.2s/div.
Normal mode: AGC after focus close



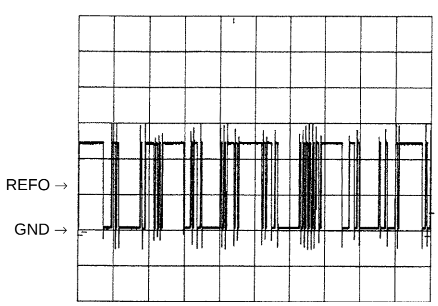
⑭ PLCK 2V/div. 0.5µs/div.
Normal mode: play



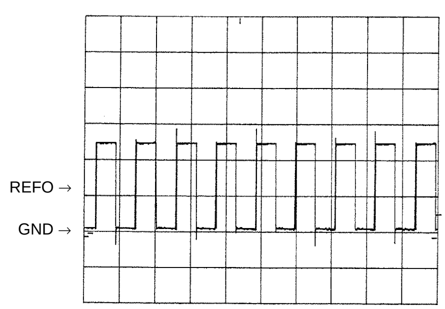
⑮ SCKO 2V/div. 1µs/div.
Normal mode: play



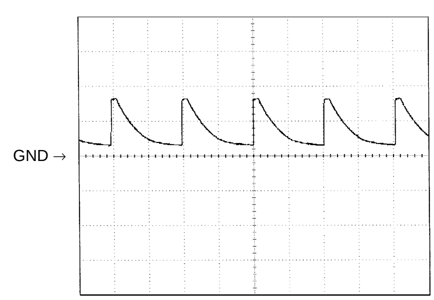
⑯ Dout 2V/div. 10µs/div.
Normal mode: play



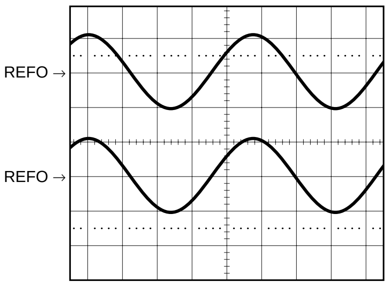
⑰ LRCK 2V/div. 20µs/div.
Normal mode: play



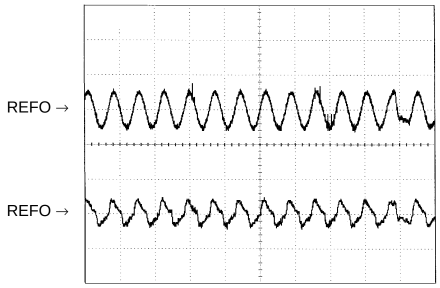
⑱ VD 5V/div. 50ms/div.
Normal mode: No disc



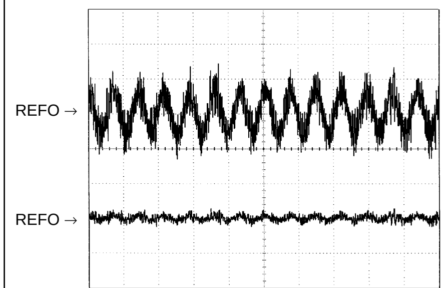
⑲ CH1: R OUT 1V/div.
⑳ CH2: L OUT 1V/div. 0.2ms/div.
Normal mode: Play (1kHz 0dB)



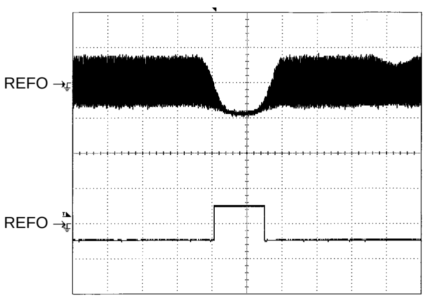
⑥ CH1: FE 0.2V/div.
③ CH2: FD 0.5V/div. 1ms/div.
Normal mode: During AGC



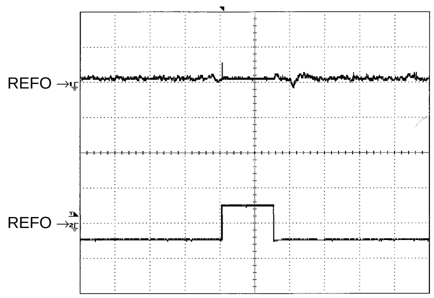
⑧ CH1: TE 0.2V/div.
⑨ CH2: TD 0.5V/div. 1ms/div.
Normal mode: During AGC



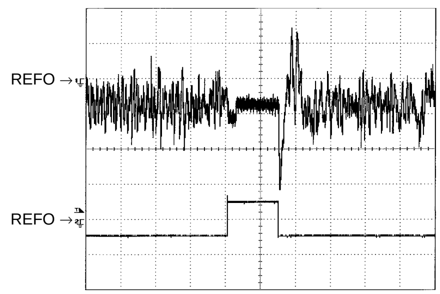
① CH1: RFI 1V/div.
㉑ CH2: HOLD 5V/div. 0.5ms/div.
Normal mode: The defect part passes 800µm(B.D)



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



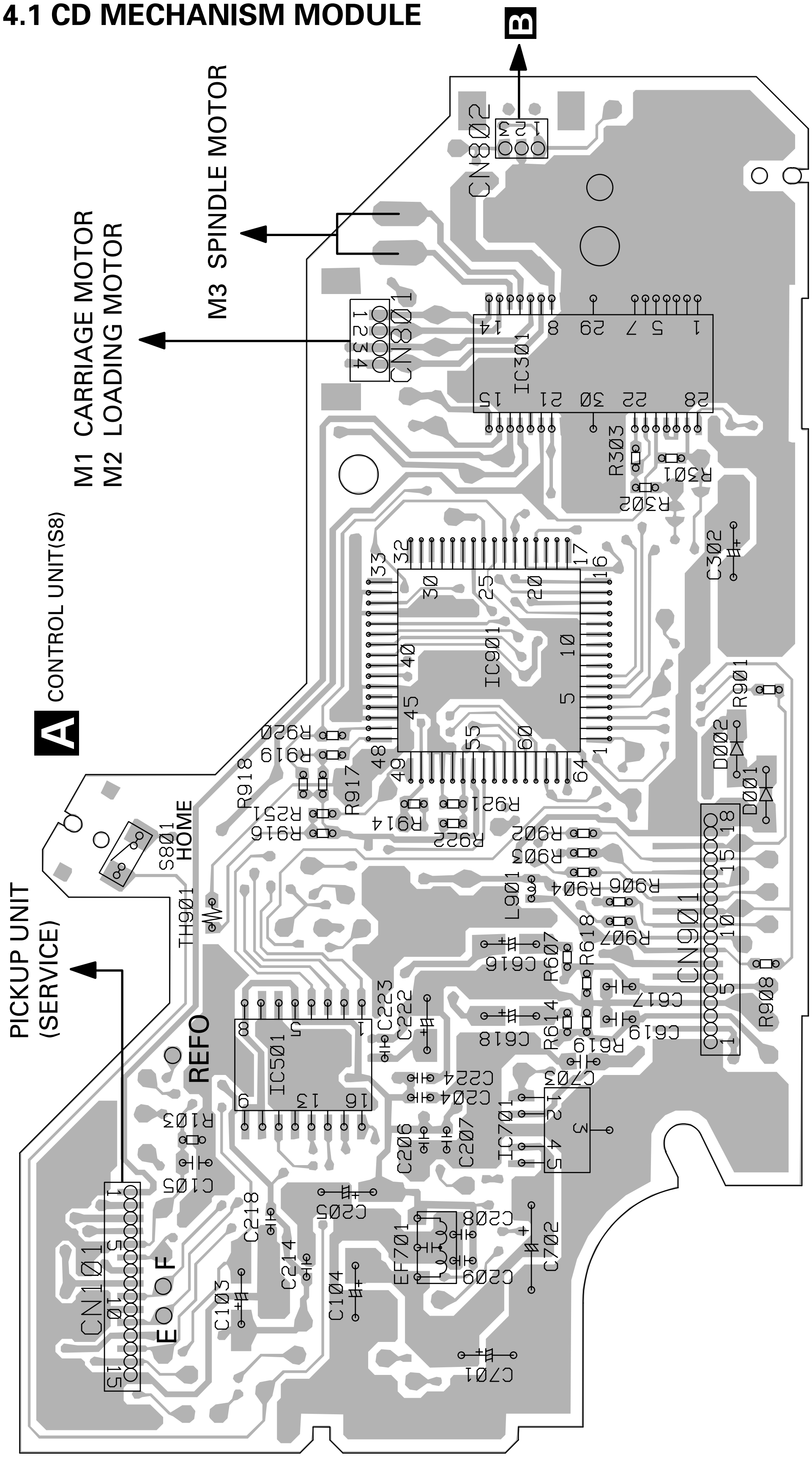
⑨ CH1: TD 0.1V/div.
㉑ CH2: HOLD 5V/div. 0.5ms/div.
Normal mode: The defect part passes 800µm(B.D)



4. PCB CONNECTION DIAGRAM

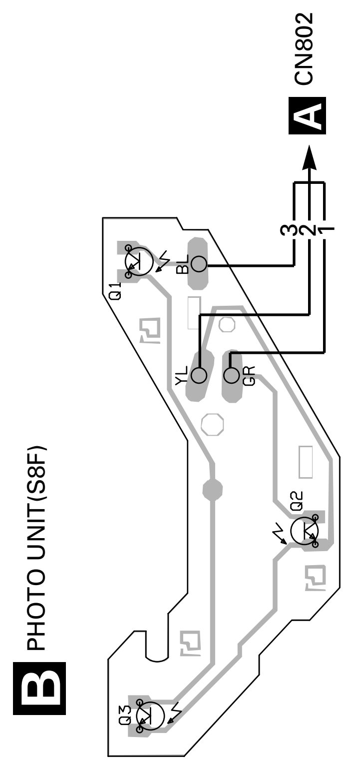
4.1 CD MECHANISM MODULE

SIDE A



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



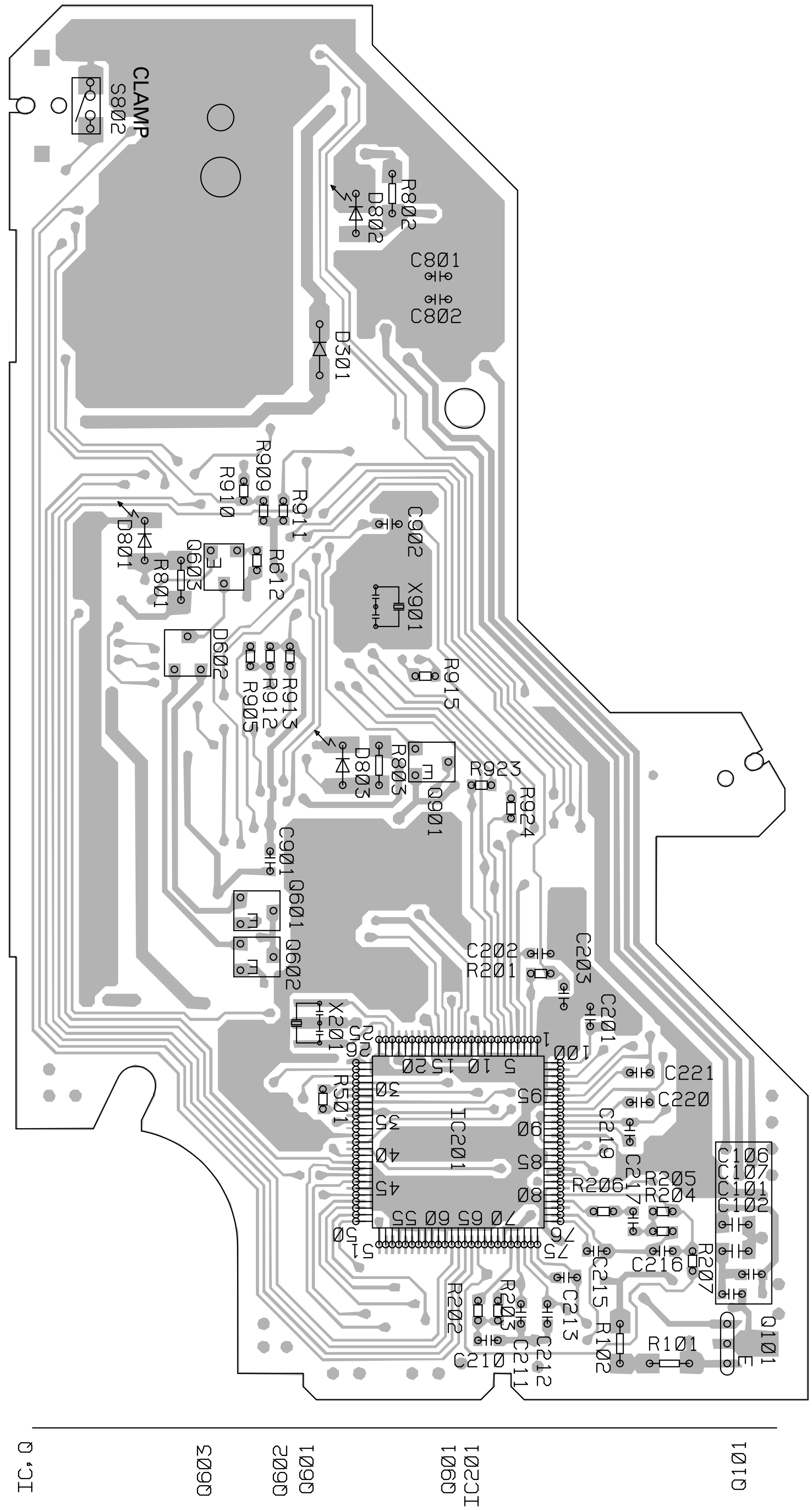
IC, Q IC501 IC901 IC701 IC301

A B

SIDE B

A B C D

A CONTROL UNIT(S8)



5. ELECTRICAL PARTS LIST

NOTES:

- 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.....

=====Circuit Symbol and No.===Part Name Part No.

A Unit Number : CWX2412 Unit Name : Control Unit

MISCELLANEOUS

Symbol	No.	Part Name	Part No.
IC	201	IC	UPD63711GC
IC	301	IC	BA5985FM
IC	701	IC	BA05SFP
IC	901	IC	PE5165A
Q	101	Transistor	2SB1132
Q	601	Transistor	DTC323TK
Q	602	Transistor	DTC323TK
Q	603	Transistor	2SB709A
Q	901	Transistor	UN2111
D	602	Chip Diode	MA151WA
D	801	Chip LED	CL202IRXTU
D	802	Chip LED	CL202IRXTU
D	803	Chip LED	CL202IRXTU
L	901	Inductor	LCTB4R7K1608
TH	901	Thermistor	CCX1037
X	201	Ceramic Resonator 16.934MHz	CSS1456
X	901	Ceramic Resonator 8.38MHz	CSS1499
S	801	Spring Switch(HOME)	CSN1051
S	802	Spring Switch(CLAMP)	CSN1052
EF	701	EMI Filter	CCG1051

RESISTORS

Symbol	No.	Part Name	Part No.
R	101		RS1/8S120J
R	102		RS1/8S100J
R	103		RS1/16S222J
R	201		RS1/16S104J
R	202		RS1/16S103J
R	203		RS1/16S393J
R	204		RS1/16S103J
R	205		RS1/16S103J
R	206		RS1/16S182J
R	207		RS1/16S123J
R	301		RS1/16S473J
R	302		RS1/16S153J
R	303		RS1/16S103J
R	501		RS1/16S0R0J
R	607		RN1/16SE1001D
R	612		RS1/16S103J
R	614		RN1/16SE1001D
R	618		RS1/16S2202F
R	619		RS1/16S2202F
R	801		RS1/8S751J
R	802		RS1/8S751J
R	803		RS1/8S751J
R	901		RS1/16S221J
R	902		RS1/16S221J
R	903		RS1/16S221J
R	904		RS1/16S221J
R	905		RS1/16S221J
R	906		RS1/16S221J
R	907		RS1/16S102J
R	908		RS1/16S473J
R	909		RS1/16S104J
R	910		RS1/16S222J
R	911		RS1/16S103J
R	912		RS1/16S103J
R	913		RS1/16S103J
R	914		RS1/16S473J
R	915		RS1/16S123J
R	916		RN1/16SE1302D
R	917		RS1/16S473J
R	918		RS1/16S473J
R	919		RS1/16S222J
R	920		RS1/16S222J
R	921		RS1/16S473J
R	923		RS1/16S221J
R	924		RS1/16S221J
R	951		RS1/16S0R0J

CAPACITORS

Symbol	No.	Part Name	Part No.
C	101		CCSRCH102J50
C	102		CKSRYB104K16
C	103		CEV101M6R3
C	104		CEV470M6R3
C	105		CKSQYB334K16
C	106		CKSQYB334K16
C	107		CKSQYB334K16
C	201		CKSRYB104K16
C	202		CKSRYB471K50
C	203		CKSRYB104K16
C	205		CEV101M6R3
C	206		CKSRYB104K16
C	207		CKSRYB104K16
C	208		CKSRYB104K16
C	209		CKSRYB104K16
C	210		CKSRYB332K50
C	211		CKSRYB104K16
C	212		CKSRYB104K16
C	213		CKSRYB392K50
C	214		CKSRYB104K16
C	215		CKSRYB104K16
C	216		CCSRCJ3R0C50
C	217		CCSRCH270J50
C	218		CKSRYB104K16
C	219		CCSRCH181J50
C	220		CCSRCH510J50
C	221		CKSRYB682K50
C	222		CEV220M6R3
C	223		CKSRYB104K16
C	224		CKSRYB224K10
C	302		CEV101M10
C	616		CEV4R7M35
C	617		CCSQSL152J50
C	618		CEV4R7M35
C	619		CCSQSL152J50

=====Circuit Symbol and No.===Part Name			Part No.
---	------	--	-------------------------
C	701		CEV101M6R3
C	702	22μF/6.3V	CCH1300
C	703		CKSQYB334K16
C	801		CKSRYB103K25
C	802		CKSRYB103K25
C	901		CKSRYB104K16
C	902		CKSRYB472K50

B Unit Number :
Unit Name : Photo Unit(S8F)

MISCELLANEOUS

Q	1	Photo-transistor	CPT231SXTU
Q	2	Photo-transistor	CPT231SXTU
Q	3	Photo-transistor	CPT231SXTU

Miscellaneous Parts List

		Pickup Unit(Service)(P8)	CXX1285
M	1	Motor Unit(CARRIAGE)	CXB5827
M	2	Motor Unit(LOADING)	CXB5828
M	3	Motor Unit(SPINDLE)	CXB5829

6. ADJUSTMENT

6.1 CD ADJUSTMENT

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.

• This unit is adjusted in a combination with the CD control unit(GGF1298). Each regulator key should be operated at the unit.

• Test mode starting procedure
Switch ACC, back-up ON while pressing the **4** and **6** keys together.

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

• Disc detection during loading and eject operations is performed by means of a photo transistor in this unit.Consequently, if the inside of the unit is exposed to a strong light source when the outer casing is removed for repairs or adjustment, the following malfunctions may occur.
*During PLAY, even if the eject button is pressed,the disc will not be ejected and the unit will remain in the PLAY mode.
*The unit will not load a disc.
When the unit malfunctions this way, either re-position the light source, move the unit or cover the photo transistor.

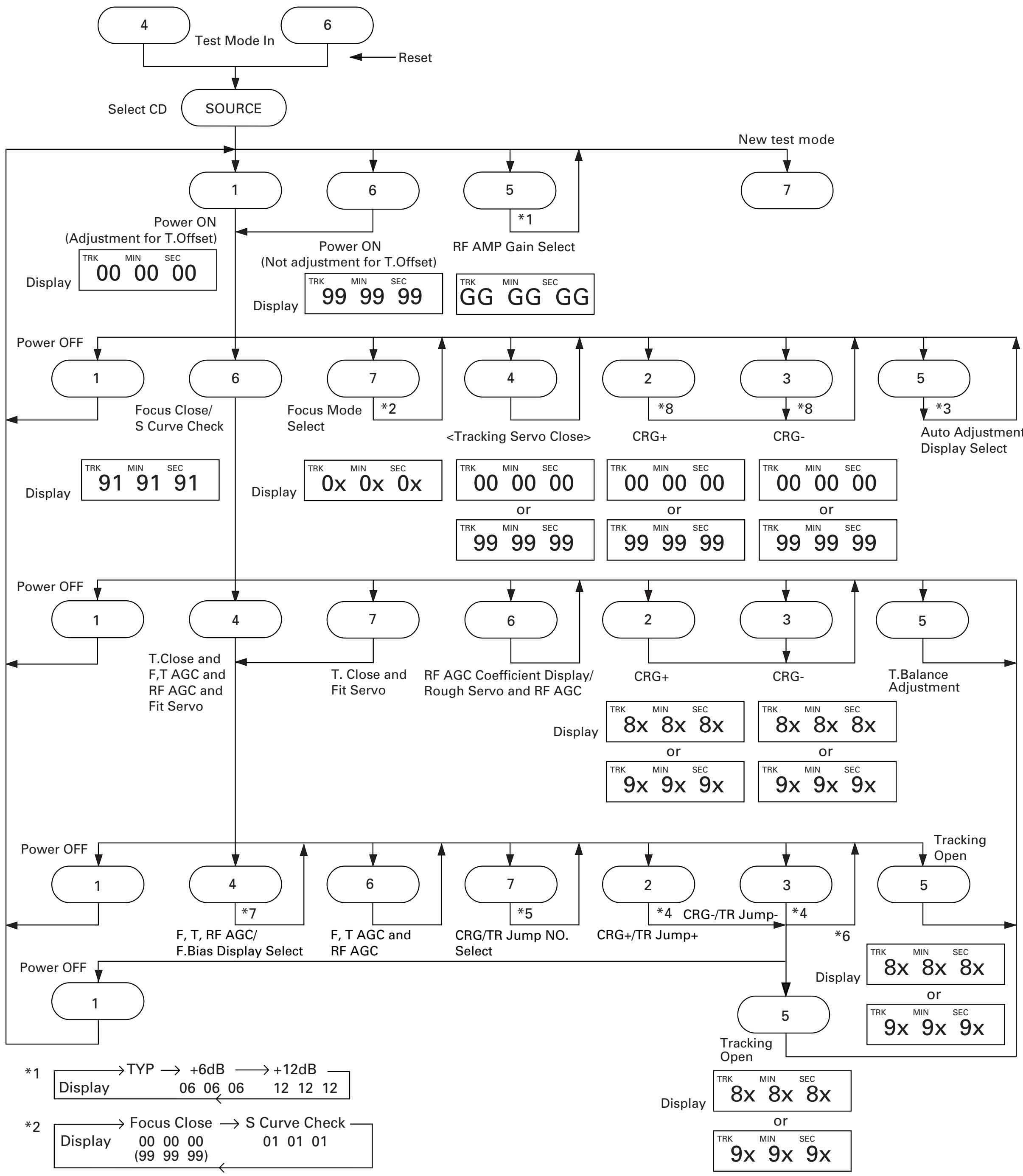
• When loading and unloading discs during adjustment procedures, always wait for the disc to be properly clamped or ejected before pressing another key. Otherwise, there is a risk of the actuator being destroyed.

• Turn power off when pressing the button 2 or the button 3 key for focus search in the test mode. (Or else lens may stick and the actuator may be damaged.)

• SINGLE/4TRK/10TRK/32TRK will continue to operate even after the key is released.Tracking is closed the moment C-MOVE is released.

• JUMP MODE resets to SINGLE as soon as power is switched 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]

6.2 CHECKING THE GRATING AFTER CHANGING THE PICKUP UNIT

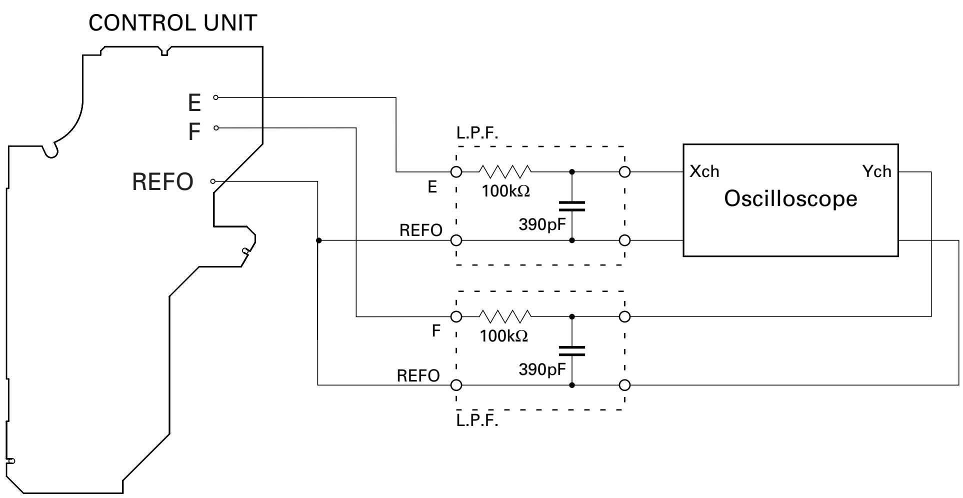
• **Note :**
The grating angle of the PU unit cannot be adjusted after the PU unit is changed. The PU unit in the CD mechanism module is adjusted on the production line to match the CD mechanism module and is thus the best adjusted PU unit for the CD mechanism module. Changing the PU unit is thus best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

• **Purpose :**
To check that the grating is within an acceptable range when the PU unit is changed.

• **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 taking a long time for track searching.

• **Method :**

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



• **Checking Procedure**
1. In test mode, load the disc and switch the 5V regulator on.
2. Using the **2** and **3** buttons, move the PU unit to the innermost track.
3. Press key **6** to close focus, the display should read "91". Press key **5** to implement the tracking balance adjustment the display should now read "81". Press key **6** 2 times. The display will change, returning to "81" on the fourth press.
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 PU 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.

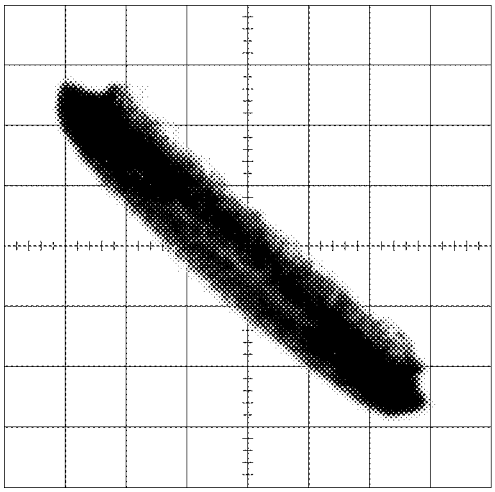
• **Note**
Because of eccentricity in the disc and a slight misalignment of the clamping center the grating waveform may be seen to "wobble" (the phase difference changes as the disc rotates). The angle specified above indicates the average angle.

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

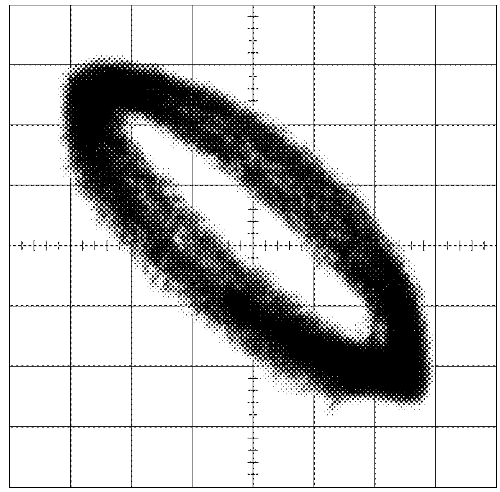
Grating waveform

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

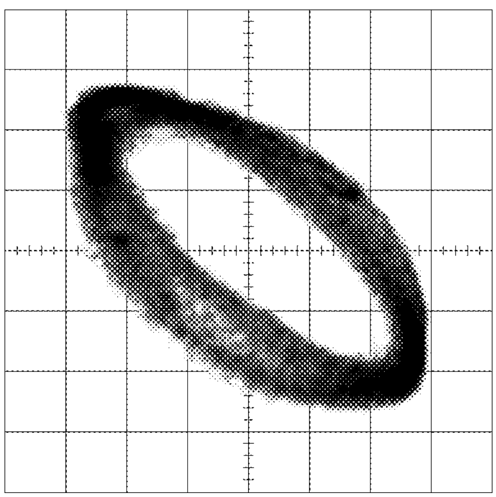
0°



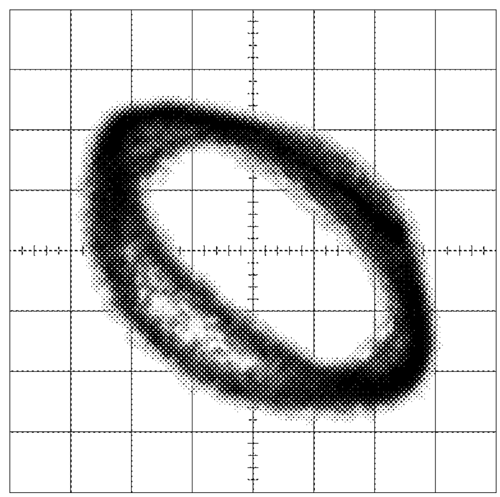
30°



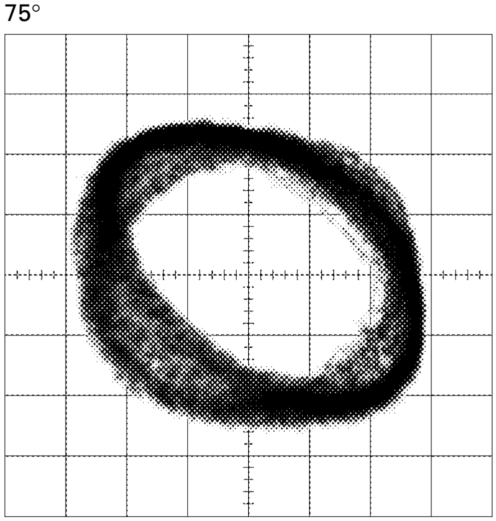
45°



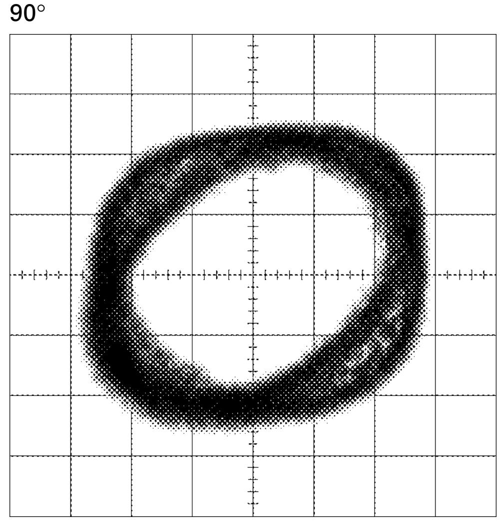
60°



75°



90°



7. GENERAL INFORMATION

7.1 DIAGNOSIS

7.1.1 TEST MODE

● **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	E–xx
	OR	
	Err–xx	

(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).

Remarks: Mechanical errors are not displayed (because a CD is turned off in these errors).
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

S-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 key (it varies between the products).

② Select S-CD for the source through the specified procedure including use of the [SOURCE] key, and inserting the disc. Then, press the [Jump Mode Selector] key while maintaining the regulator turned off.

③ After the above operations, the new test mode remains on irrespective of whether the S-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 (Example)	Test mode		New test mode	
	Power Off	Power On	In-play	Error Production
1	To power on (offset adjustment performed)	To power off	–	Time/Err.No. switching
2	–	FWD-Kick	FF/TR+	–
3	–	REV-Kick	REV/TR-	–
4	–	T.Close (AGC performed) /parameter display switching	Scan	–
5	RF AMP gain switching	Parameter display switching /T.BAL adjustment/T.Open	Mode	–
6	To power on (offset adjustment not performed)	F.Close/RF AGC/F.T.AGC	–	–
7	–	F.Mode switching /T.Close (no AGC)/Jump switching	Auto/Manu	T.No./Time switching

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
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

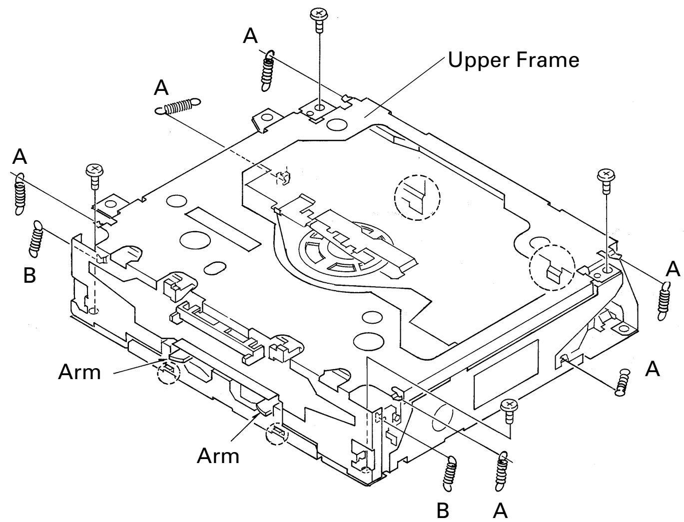
An example: Error #40 (Off focus is detected)

ERROR-40

7.1.2 DISASSEMBLY

● Removing the Upper Frame

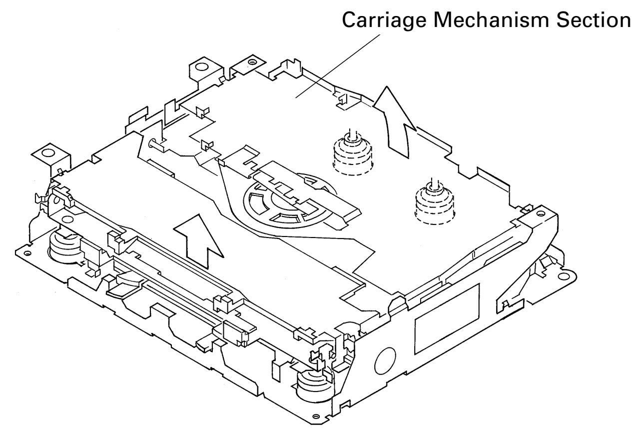
1. Remove six Springs A, two Springs B and four Screws.
2. Remove two Tabs situated on rear side of the Upper Frame, remove two Arms on the front side, then remove two Tabs on the front side.



● Removing the Carriage Mechanism Section

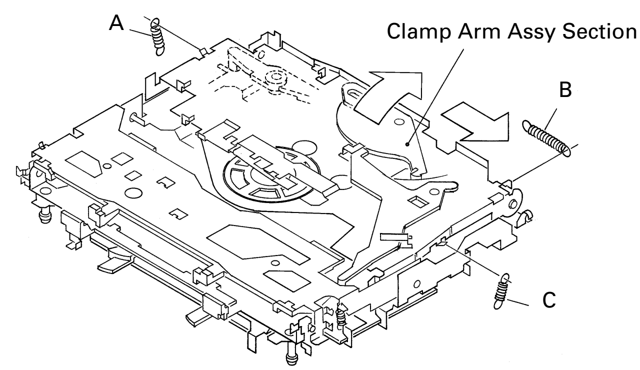
1. Disengage the Carriage Mechanism from the two dampers situated in the front side by driving it up, then disengage and remove the mechanism from the two dampers by driving it up aslant into front side direction.

Note : When assembling the Carriage Mechanism, coat the dampers with alcohol prior to the assembly.



● Removing the Clamp Arm Assy Section

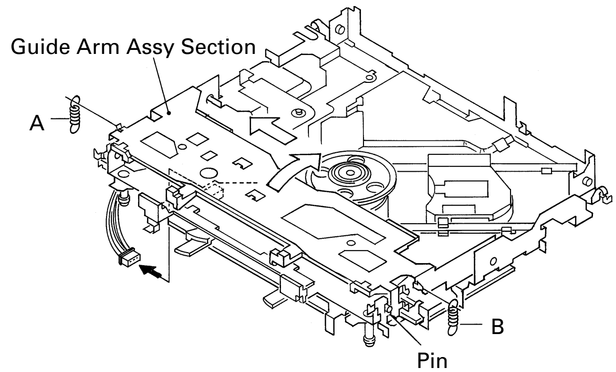
1. Remove a Spring A, a B and a Spring C.
2. Drive the Clamp Arm Assy up into rear side direction, then disengage the arm from its current position Finally, drive the assembly approximately 45 degrees upward, then slide the assembly toward right side to remove it.



● Removing the Guide Arm Assy Section

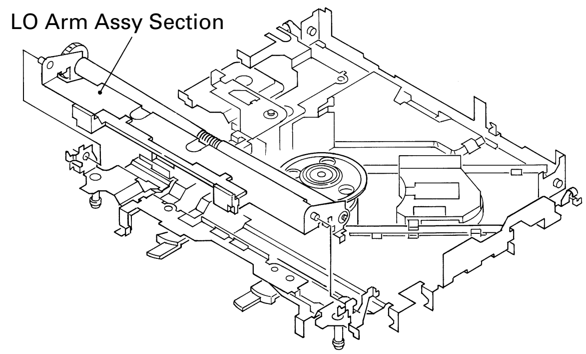
1. Remove a connector, a spring A and B.
2. Drive the Guide Arm Assy up aslant into rear side direction, then remove it from a Pin. Finally, drive the assembly approximately 45 degrees upward, then slide the assembly toward left side to remove it.

Note : When assembling the guide arm assembly, route the cord inside the assembly. In this operation, care must be exercised so that cord may be caught by the gear.



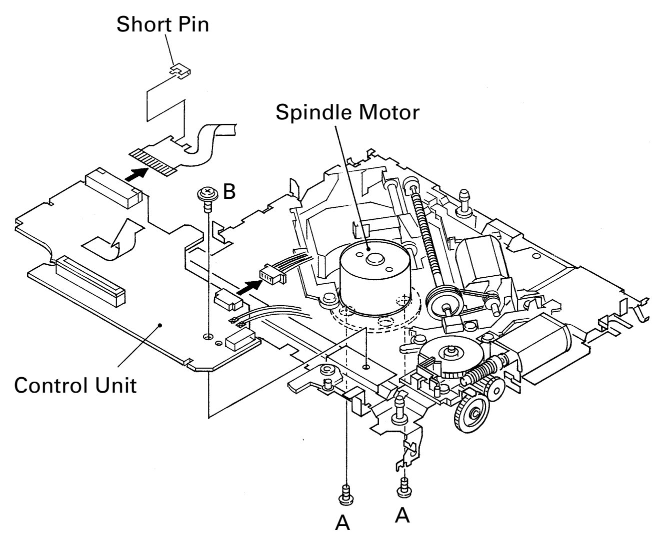
● Removing the LO Arm Assy Section

1. Remove two Pins to dismount the LO Arm Assy.



● Removing the Control Unit and the Spindle Motor

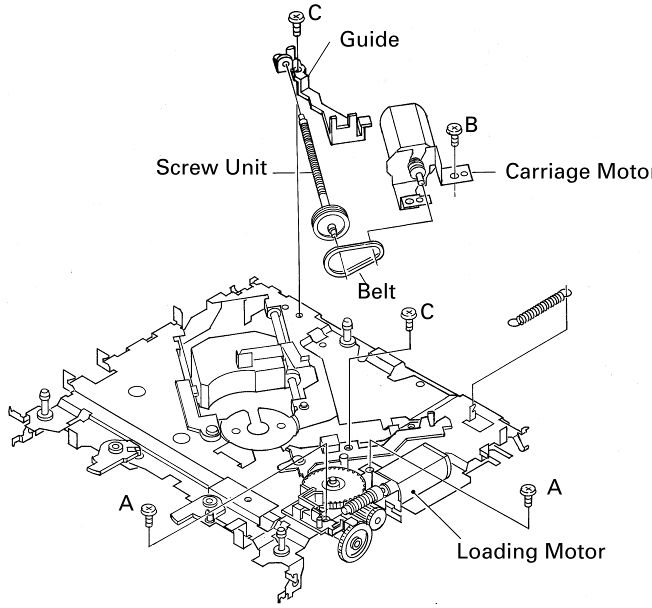
1. Remove from the connector after mounting the short pin on the flexible PCB of the pickup unit.
2. Remove two Soldered joints, then remove two Screws A.
3. Remove two connectors and a Screw B.
4. Disengage the Control Unit from two Tabs, then dismount the unit by sliding it toward left.
5. Dismount the Spindle Motor.



● Removing the Loading Motor and Carriage Motor

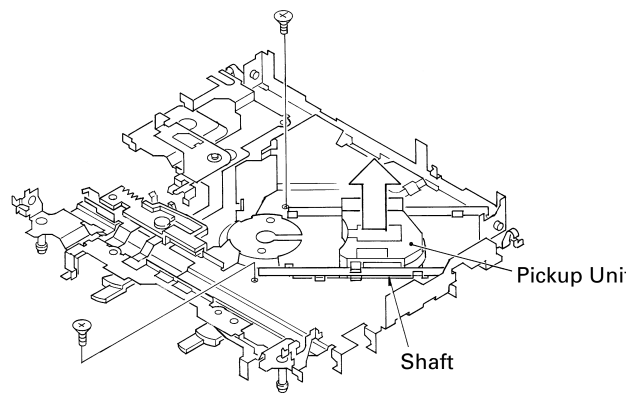
1. Remove the Spring and two Screws A.
2. Dismount the Loading Motor.
3. Remove the Belt, a Screw B, two Screws C, a Guide and a Screw Unit.
4. Dismount the Carriage Motor.

Note : When assembling the Belt, use care so that it may not be contaminated by grease.



● Removing the Pickup Unit

1. Remove two Screws and a Shaft.
2. Dismount the Pickup Unit.



7.2 IC

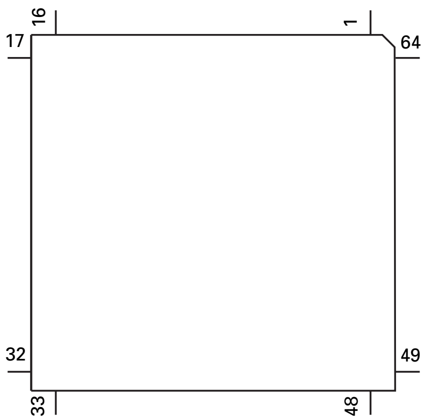
● **Pin Functions(PE5165A)**

Pin No.	Pin Name	I/O	Format	Function and Operation
1	XRST	O	C	CD LSI reset output
2	CDSRQ	O	C	F-Bus SRQ/ACK output
3	CD5VON	O	C	CD +5V power supply control output
4	CDMUTE	O	C	CD mute control output
5	CDLOAD	O	C	Load/Eject motor loading control output
6	CDEJET	O	C	Load/Eject motor eject control output
7	CONT	O	C	Servo driver power supply control output
8	VDCONT	O	C	VD power supply control output(Open)
9	VSS			GND
10	BMUTE	O	C	Bus mute output
11	NC	O		Open
12	NC	O	C	Open
13	CRST	O	C	Compression IC reset output
14-16	CBANK2-0	O	C	Compression IC bank switch output 2-0
17	NC	O	C	Open
18	DSET	O	C	Disc set indicator lighting output(Open)
19	NC	O	C	Open
20	CLAMP	I		Disc clamp input
21	MIRR	I		Mirror detection input
22	LOCK	I		Spindle lock input
23	FOK	I		Focus OK input
24	VSS			GND
25	TESTIN	I		Test program start input
26	ADENA	O	C	A/D reference voltage supply control output
27-30	NC	O	NM	Open
31, 32	NC	O	C	Open
33	NC	I/O	/C	Open
34	NC	I		VDD or VSS
35	RESET	I		System reset input
36	NC			VDD or VSS
37	CSCD			F-Bus chip select input
38	BRST			F–Bus reset input
39	EJSW			Eject key input
40	VDD			Power supply(+5V)
41	X2			Main clock oscillator connection(8.38MHz)
42	X1	I		Main clock oscillator connection(8.38MHz)
43	IC(VPP)			Internally conected(VSS)
44	NC			Open
45	NC	I		VDD or VSS
46	AVSS			A/D GND
47	EJTSNS			Disc eject position sense input
48	DSCSNS			Disc load position sense input
49	TEMP			Temperature sense input
50	VDSENS			Over voltage sense input
51, 52	NC	I		VDD or VSS
53	TXARI	I		Set up of TX output select input
54	CMPARI	I		Compression function select input
55	AVDD			A/D analog power supply
56	AVREF			A/D reference voltage input
57	XSI	I		CD LSI serial data input
58	XSO	O	C	CD LSI serial data output
59	XSCK	O	C	CD LSI serial clock output
60	XAO	O	C	CD LSI data discernment control signal output
61	XSTB	O	C	CD LSI strobe output
62	MOSI	I		F-Bus serial data input
63	MISO	O	C	F-Bus serial data output
64	SCK	I		F-Bus serial clock input/output

Output Format	Meaning
C	C MOS output
NM	Middle N channel open drain

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

*PE5165A



7.3 EXPLANATION

7.3.1 CIRCUIT DESCRIPTIONS

The LSI (UPD63711GC) used on this unit comprises six main blocks ; the pre-amp section, servo, signal processor, DAC, CD text decoder (not used on this model) and LPF. It also equips with nine automatic adjustment functions.

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 UPD63711GC (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.

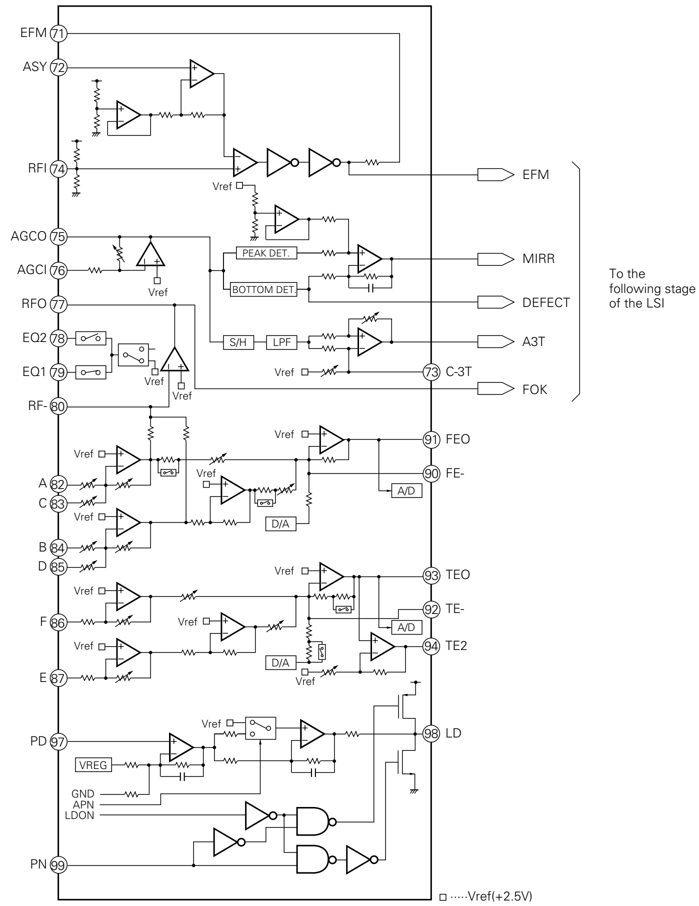


Fig.1 : BLOCK DIAGRAM OF BUILT-IN RF AMPLIFIER

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.

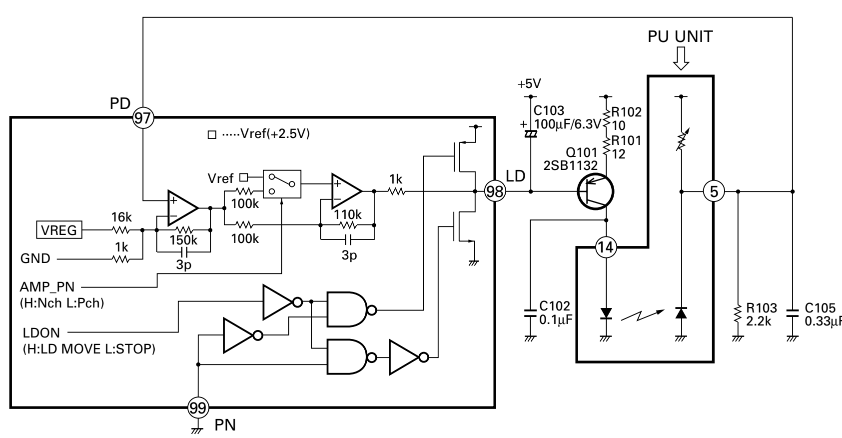


Fig.2 : APC CIRCUIT

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.

R207 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) RFOK 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 2 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.

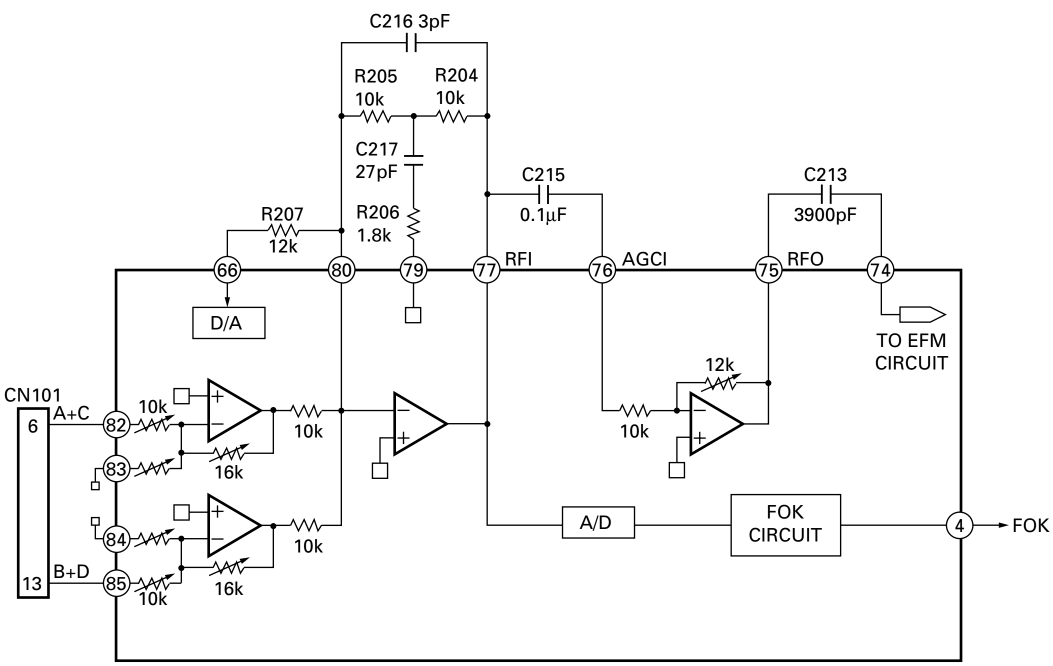


Fig.3 : RFAMP, RFAGC AND FOK CIRCUIT

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 :

$$FE = (A + C - B - D) \times \frac{16k}{10k} \times \frac{80k}{(20k + 5k)}$$
$$= (A + C - B - D) \times 5$$

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.

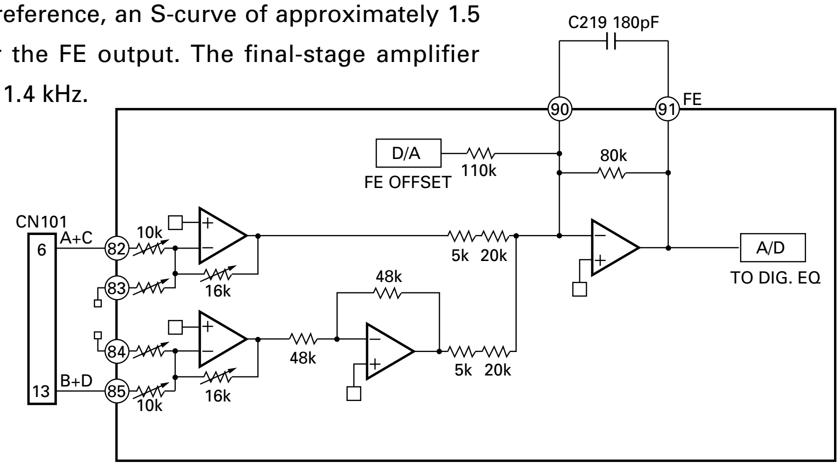


Fig.4 : FOCUS ERROR AMPLIFIER

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 :

$$TE = (E - F) \times \frac{224k}{112k} \times \frac{160k}{48.7k}$$

= (E − F) × 6.6 (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.

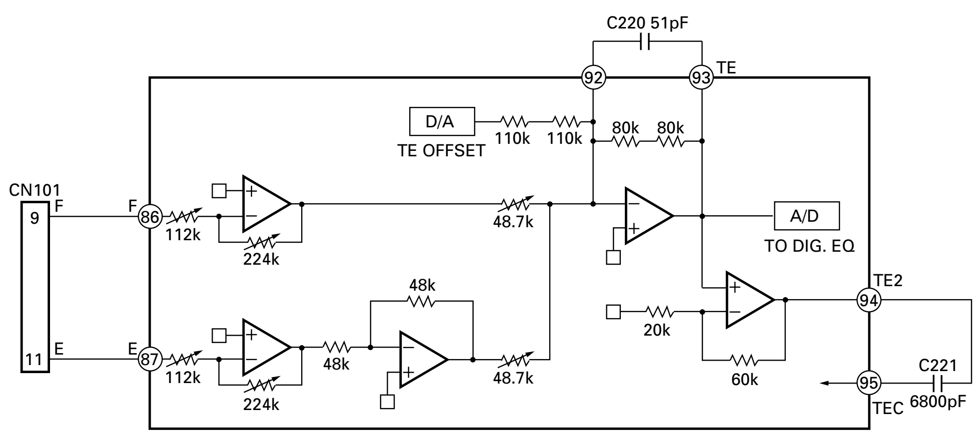


Fig.5 TRACKING ERROR AMPLIFIER AND TRACKING ZERO CROSSING AMPLIFIER

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 35). 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 43.

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.

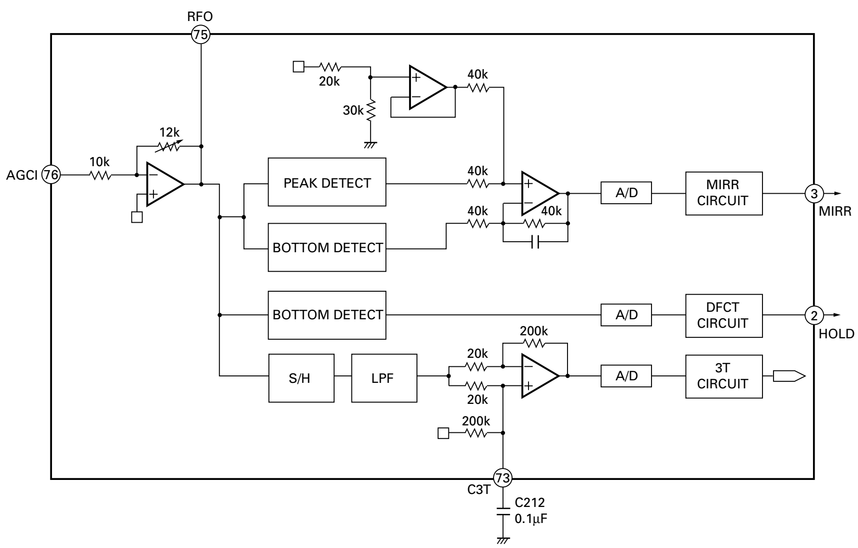


Fig.6 : DFCT, MIRR AND 3T DETECTION CIRCUIT

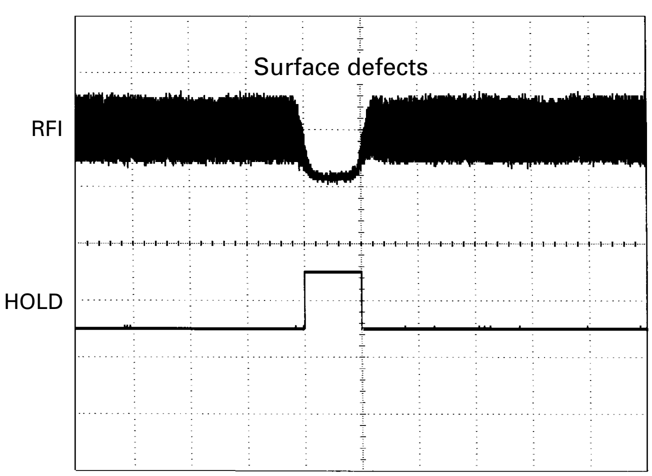


Fig.7 : HOLD OUTPUT WAVEFORM
(When surface defects are present)

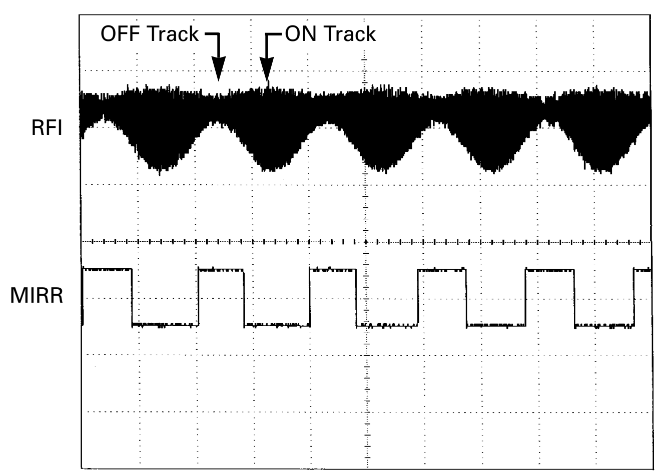


Fig.8 : MIRR OUTPUT WAVEFORM
(When an access is made)

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.

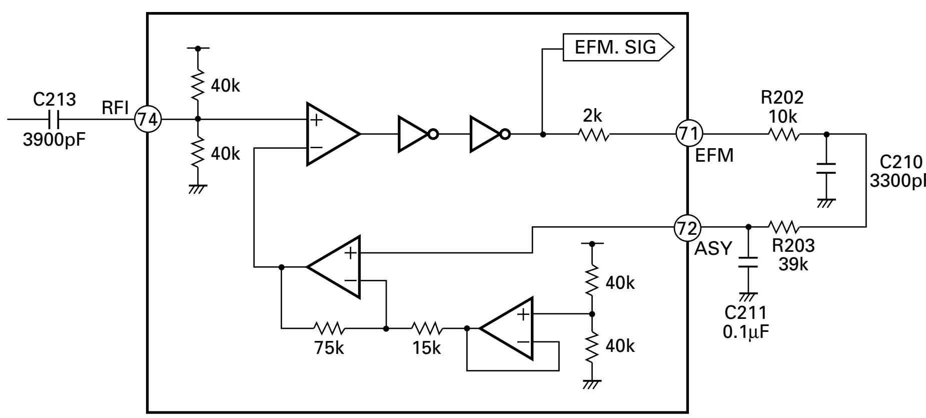


Fig.9 : EFM CIRCUIT

2. SERVO SECTION (UPD63711GC : 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 BA5985FM (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.

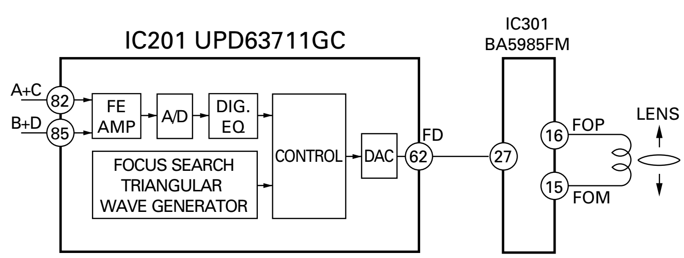


Fig.10 : FOCUS SERVO BLOCK DIAGRAM

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.

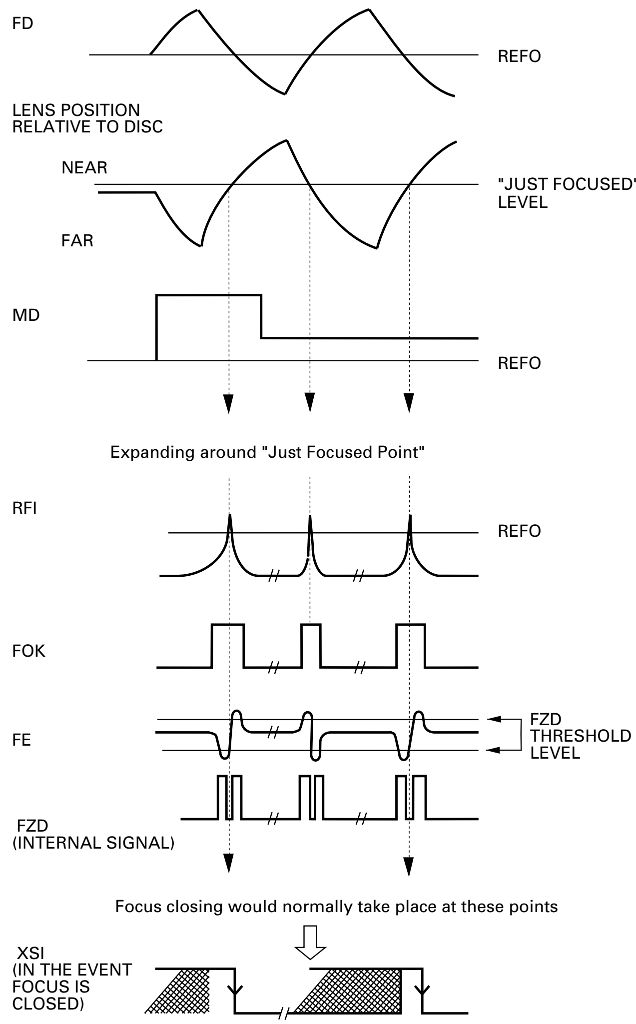


Fig.11 : FOCUS CLOSE SEQUENCE

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.

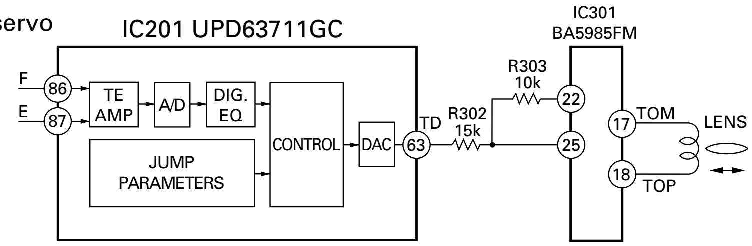


Fig.12 : TRACKING SERVO BLOCK DIAGRAM

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.

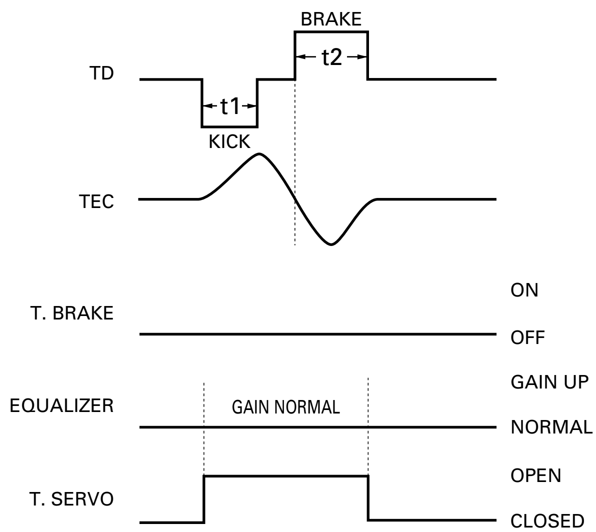


Fig.13 : SINGLE TRACK JUMP

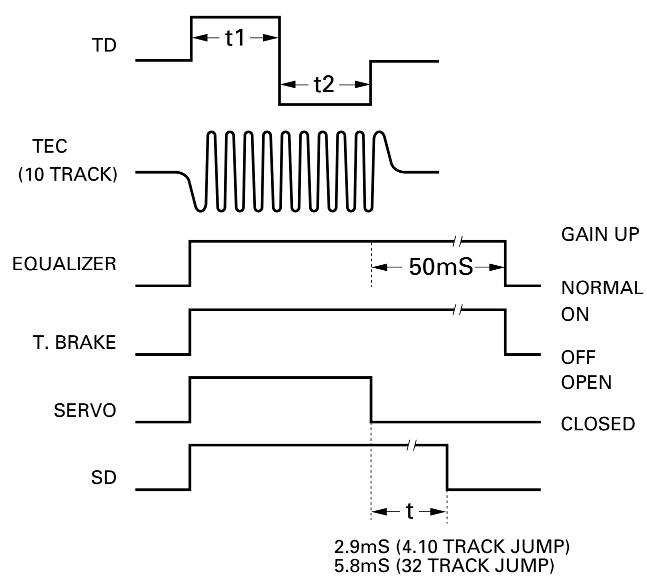
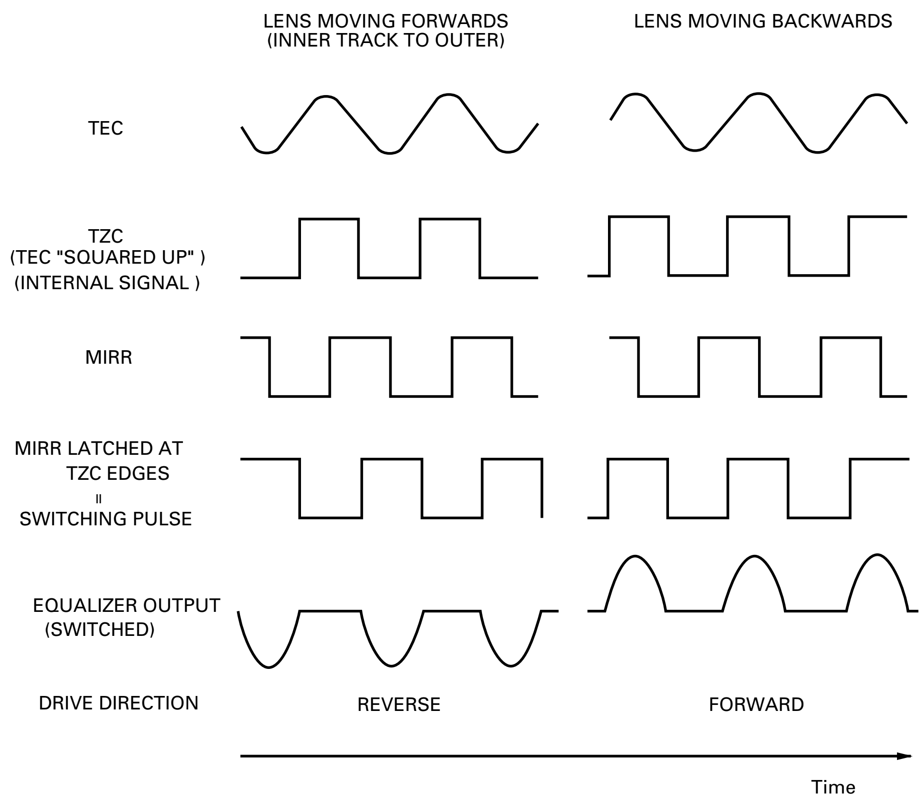


Fig.14 : MULTI-TRACK JUMP

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.

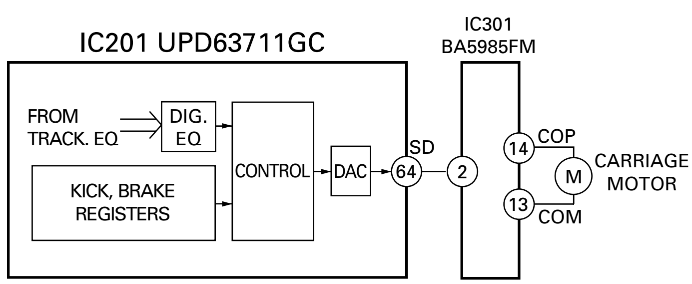


Fig.16 : CARRIAGE SERVO BLOCK DIAGRAM

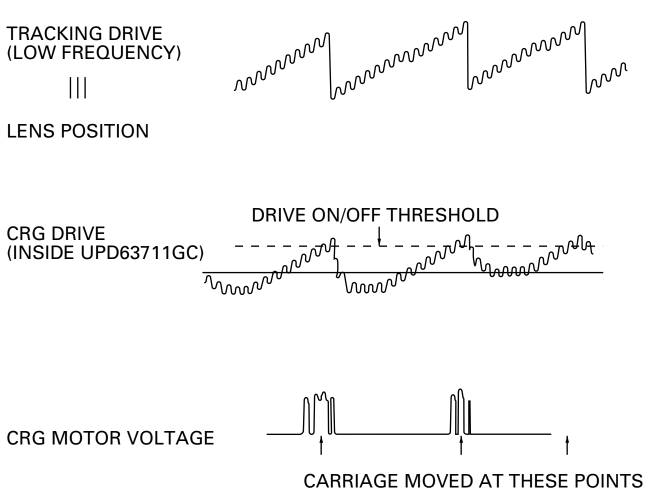


Fig.17 : CARRIAGE SIGNAL WAVEFORM

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.

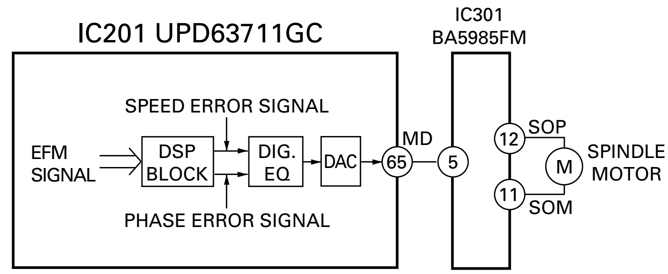


Fig.18 : SPINDLE SERVO MOTOR BLOCK DIAGRAM

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 :

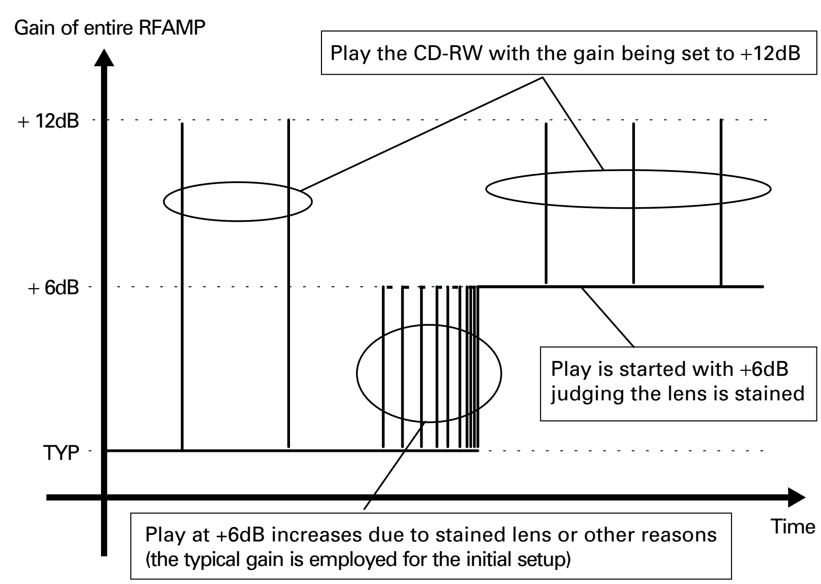


Fig.19 : CONCEPTUAL DIAGRAM OF PRE-AMP GAIN ADJUSTMENT

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.

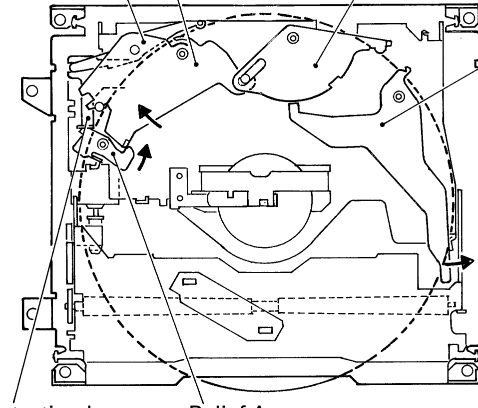
Maximum gain = Typically +6.5dB. Coefficient at this time is 15.

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

7.3.2 MECHANISM DESCRIPTIONS

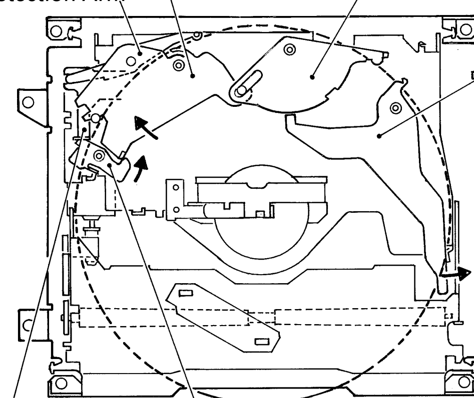
● Loading Operation (when a 12 cm disc is used)

1. Insert a 12 cm disc (the sensor turns on the motor revolution).
2. The disc pushes the Lock Lever in, thereby resetting the lock currently applied to the Centering Arms.
3. The disc further pushes the Centering Arms in.
4. The right side and left side arms are engaged to perform centering of the disc.
5. The disc pushes the Disc Detection Arm in, thereby pushing the Disc Detection Lever forward.
6. Clamping action retracts the Disc Detection Lever toward forward side, thereby rotating the Relief Arm.
7. The Relief Arm further pushes the Centering Arm in, thus detaching it from the disc.



● Loading Operation (when a 8 cm disc is used)

1. Insert an 8 cm disc (the sensor turns on the motor revolution).
2. The disc does not contact against the Lock Lever, thus centering of the disc is performed by the Centering Arm being locked.
3. When the right side slot is used, the lock currently applied to the Centering Arm remains turned on even if the disc may touch the Lock Lever because the disc leaves the lever before it reaches the Centering Arm.
4. Succeeding procedures are the same as that for 12 cm discs.



● Clamping Operation

1. Insert a disc.
2. The Detection Arm pushed forward by the Detection Lever turns on rotation of the Jump In Rack.
3. The Jump In Rack then engages with the Two Step Gear and moves toward right.
4. At the same time, the Mode Selector Lever connected to the Jump In Rack starts moving toward right, thereby rotating the Lock Arm and resetting the mechanical lock. The Clamp Up Arm too is rotated by the above action and, thus, the Clamp Up Arm now being lifted by shape of the cam of the Clamp Arm is lowered.
   And, the Guide Arm is also moved down because of shape of the cam of the Mode Selector Lever.
5. By use of the cam shape, the Jump In Rack being moved toward right retracts the Disc Detection Lever in forward direction, thereby turning on rotation of the Relief Arm.