

ONKYO® SERVICE MANUAL

COMPACT DISC AUTOMATIC CHANGER MODEL DX-C600

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

SAFETY-RELATED COMPONENT WARNING!!

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

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

SPECIFICATIONS

Audio Characteristics

Number of Channel	2 (Stereo)
Frequency Response	20 – 20,000 Hz
Signal-to-Noise Ratio	96 dB (at 1 kHz)
Channel Separation	85 dB (at 1 kHz)
Total Harmonic Distortion	0.03% (at 1 kHz)
Wow and Flutter	Below threshold of measurability
Output Level	2 Volts, r.m.s.

Signal Format

Sampling Frequency	88.2 kHz
Quantization	16 Bits
Filter	Two times over sampling Digital Filter + Analogue Filter

Disc

Diameter	120 mm (4-3/4")
	500 – 200 rpm (inside – Outside)
Tracking Pitch	1.6 μ m
Play Time	60 Min.
Tracking System	Non-Contact Solid State Laser PCM Wavelength 0.79 μ m

General

Power Requirements

USA & Canadian Models	AC 120V, 60 Hz
Worldwide Model	AC 110, 120, 220, 240V switchable, 50/60 Hz

Power Consumption	14 Watts
Dimensions (W x H x D)	435 x 114 x 348 mm 17-1/8" x 4-1/2" x 13-11/16"
Weight	6.6 kg, 14.6 lbs
Supplied Accessories	• Output Signal Cord • Remote Control Transmitter RC-109C • "AA" size (UM-3) battery x 2 • CD Magazine • Instruction Manual

Specifications are subject to change without notice.

ONKYO
AUDIO COMPONENTS

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SERVICE PROCEDURES

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

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

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

Specifications: more than 10Mohm at 500V.

2. Procedures for replacement of flat packaged ICs

1. Tools to be used:

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

Form of soldering iron's tip:

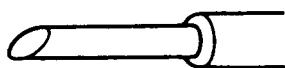


Fig. 1

- (2) **Magnifying glass** for checking of finished works
- (3) **Tweezers** for handling of IC and forming of leads
- (4) **Grounding ring** Countermeasure for electrostatic breakdown
- (5) **Nipper** for removing defective IC
- (6) **Small brush** for application of flux

3. Work Procedures:

(1) Remove the defective IC

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

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

Get rid of the remaining leads and solder.

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

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

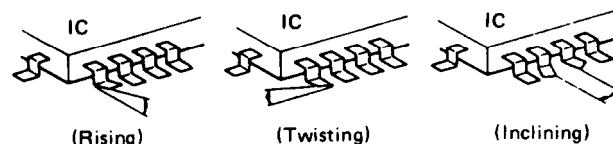


Fig. 2

(4) Apply flux to the PC board.

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

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

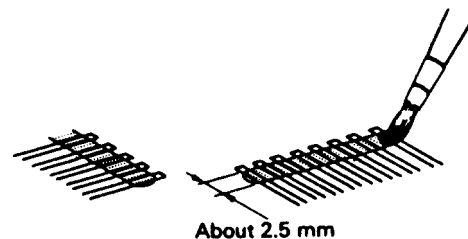


Fig. 3

(5) Temporarily tighten the IC

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

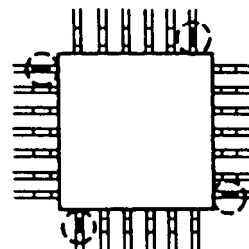
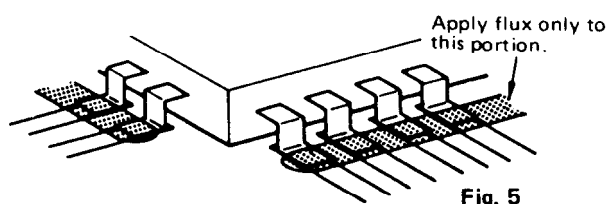


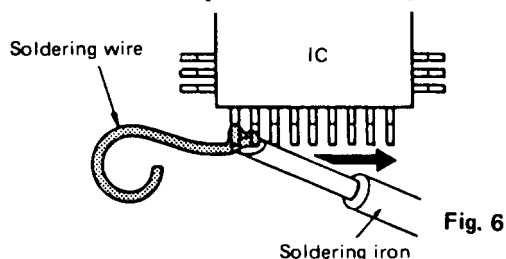
Fig. 4

(6) Apply flux to IC's leads

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

**(7) Soldering**

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

**CAUTION**

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

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

NOTE ON COMPACT DISC**• Holding Compact Discs**

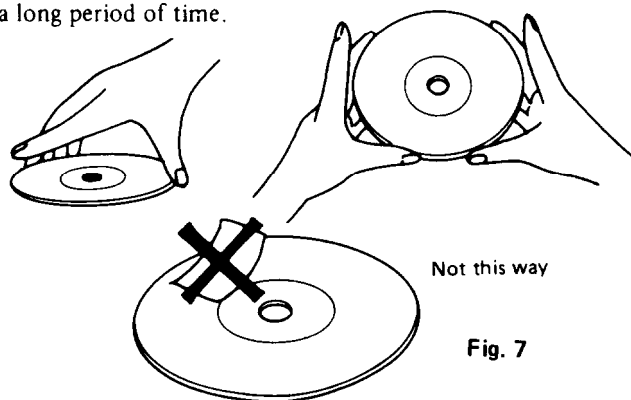
Hold Compact Discs by the edges so that you do not touch the surface of disc. Remember that the side of the disc with the "rainbow" reflection is the side containing the audio information.

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

• Storing Compact Discs

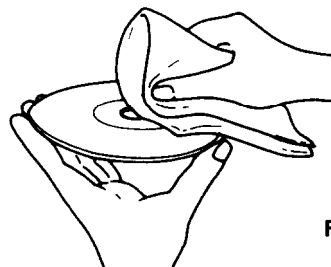
Store Compact Discs in a location protected from direct sunlight, high heat and humidity and extremely high and low temperatures. Discs should never be left in the trunk or interior of an automobile in the sun since the temperature can become very high in such a closed environment.

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

**• Cleaning Compact Discs**

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

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

**Problems Caused by Dew**

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

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

Regarding Marketed Compact Discs

Among compact discs being marketed, nonstandard discs may occasionally be produced in a lot and marketed without being sifted out at inspection.

Trouble areas and symptoms of these are as outlined below:

- **Scratches or dirt on the playback surface**

To some extent, a disc will play even with scratches or dirt, but if its condition is bad enough, there will be skips in the playback or in the time display, or playback may become impossible.

- **The external dimensions are too big**

If a disc larger than standard size ($120 \pm 0.3\text{mm}$) is inserted, the disc may not be ejected from the magazine and the player reacts as though there is no disc. The same symptom may occur if there are rough edges on the disc.

- **When the modulation depth is too shallow**

Standard is 0.6 or above, but occasionally a disc with less than 0.6 may appear in a lot and be marketed. The disc will be ignored by the player.

The modulation depth of discs may vary even within the same lot, and in some cases, tracks may differ within the same disc.

$$\text{Modulation depth} = \frac{V_o}{V}$$

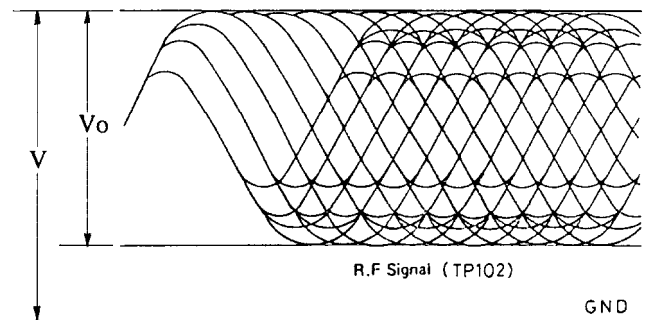


Fig-9

DISPLAY INDICATORS

OP: When the EJECT operation has occurred, this lights until the magazine has been extended.

CH: This displays the memory number. Up to 32 songs can be memorized.

E: When there is condensation on the optical pickup, or the operation of the changer is obstructed in some way, an E is displayed.

DP: ($\frac{\square}{\square} \frac{\square}{\square} \frac{\square}{\square} \frac{\square}{\square}$:Decimal point)

This blinks when the changer mechanism is operating.

DM: Disc Mark (This disappears when no disc is entered, but appears when PLAY is pressed.)

PROTECTION OF EYES FROM LASER BEAM DURING SERVICING

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

WARNING!!

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

Laser Diode Properties

- Material: GaAS/GaAlAs
- Wavelength: 790nm
- Emission Duration: continuous
- Laser output: max. 0.2mW*

*This output is the value measured at a distance about 2mm from the objective lens surface on the Optical Pick-up Block.

CERTIFICATION LABEL

This label is located on the back panel.

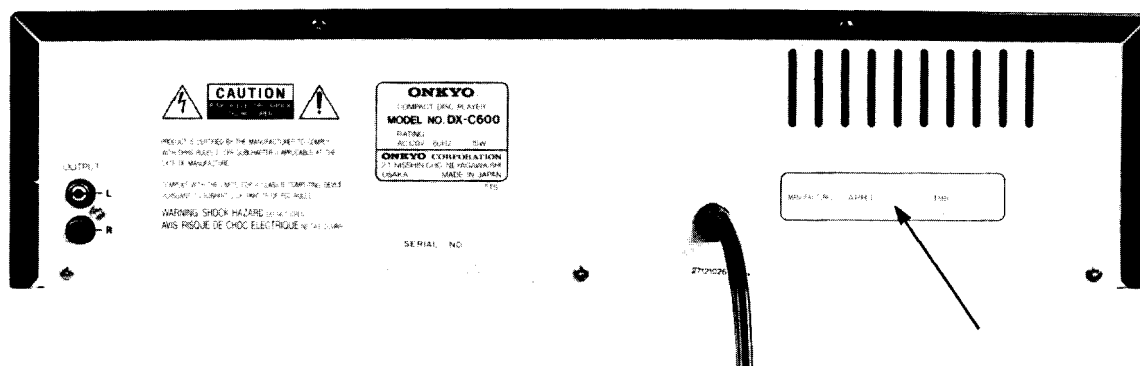


Photo 1

CAUTION ON REPLACEMENT OF PICK-UP

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

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

PRECAUTIONS

1. Ground for the work-desk.

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

2. Grounding for the test equipment and tools.

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

3. Grounding for the human body.

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

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

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

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

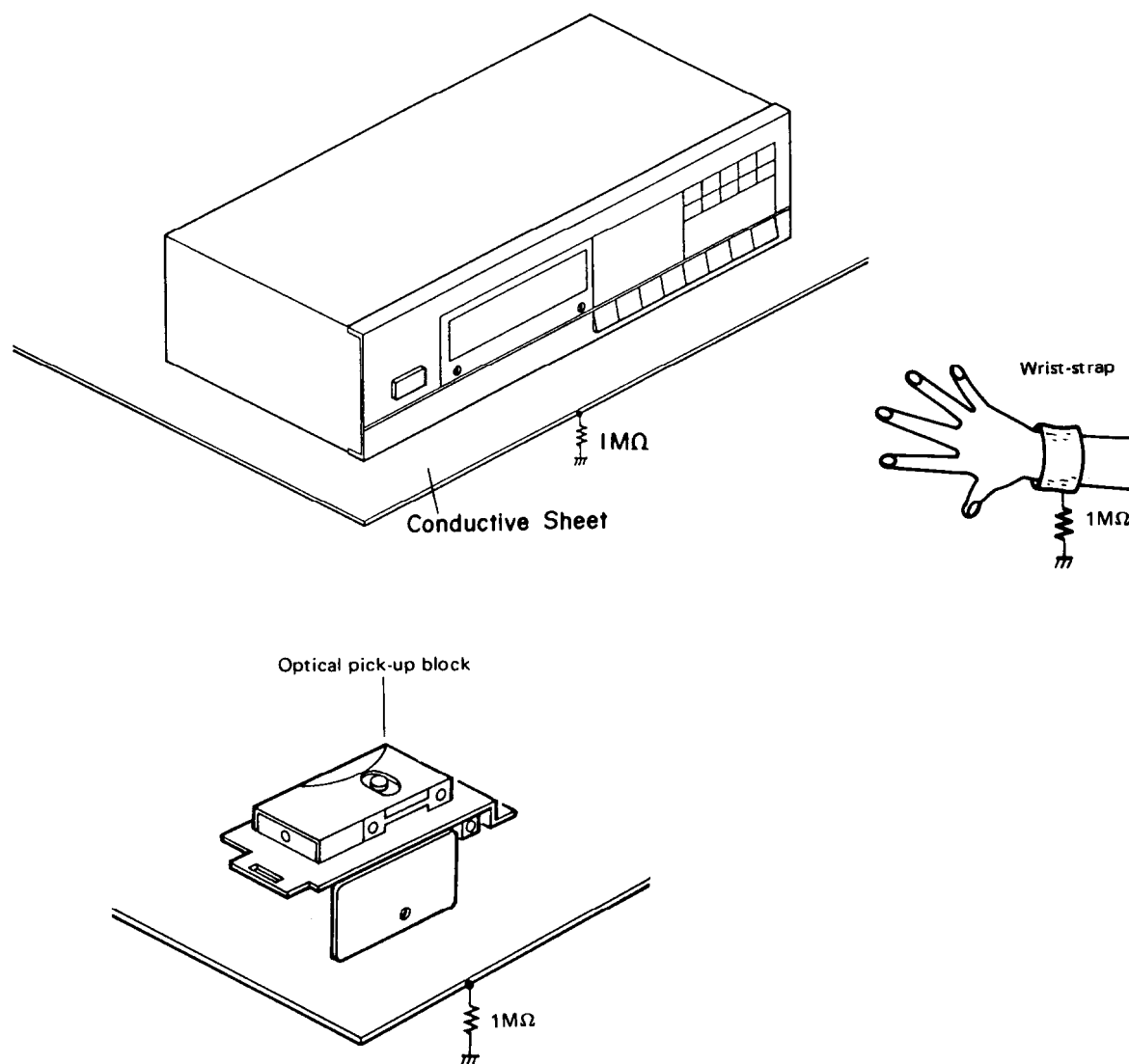
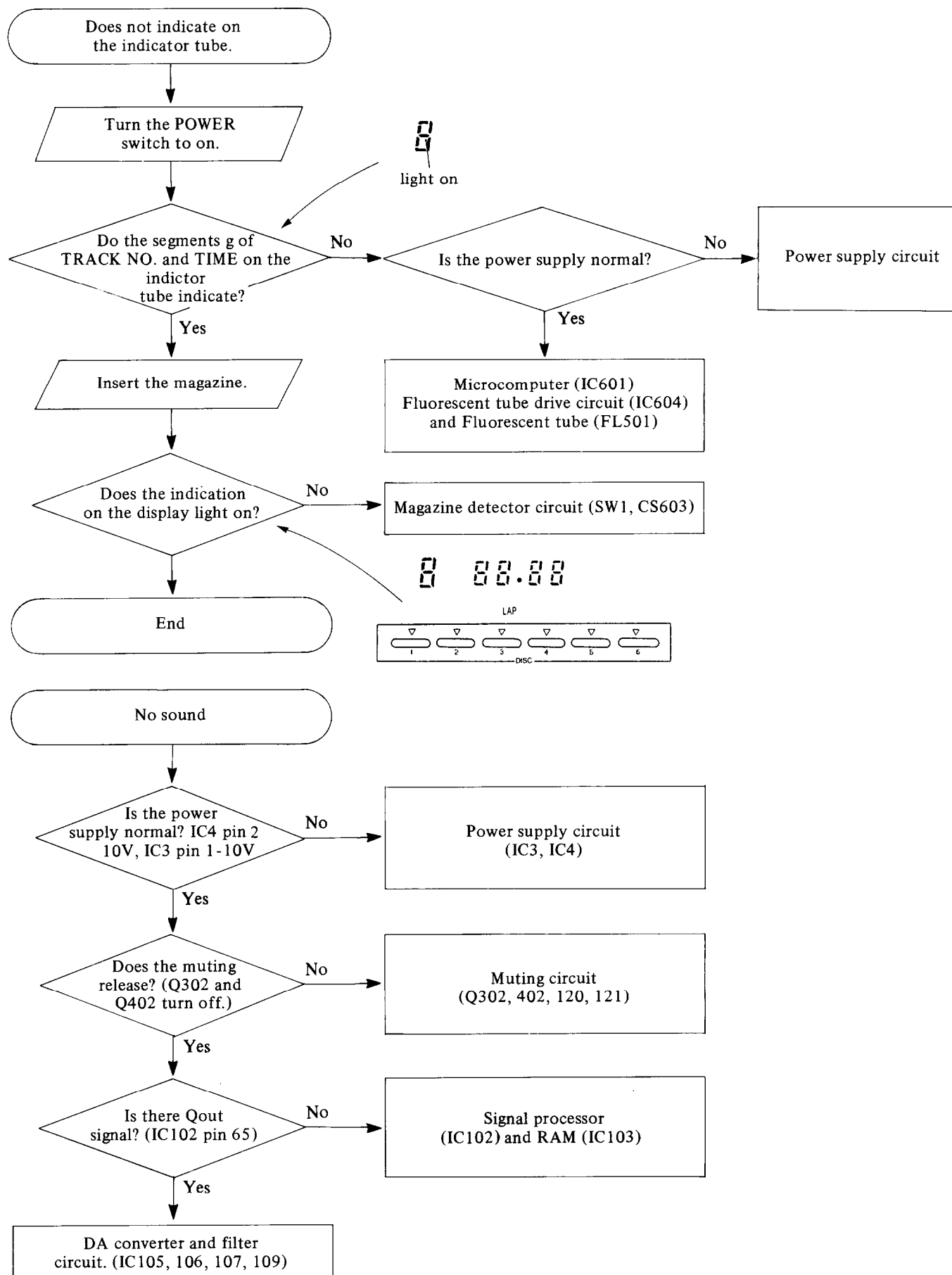
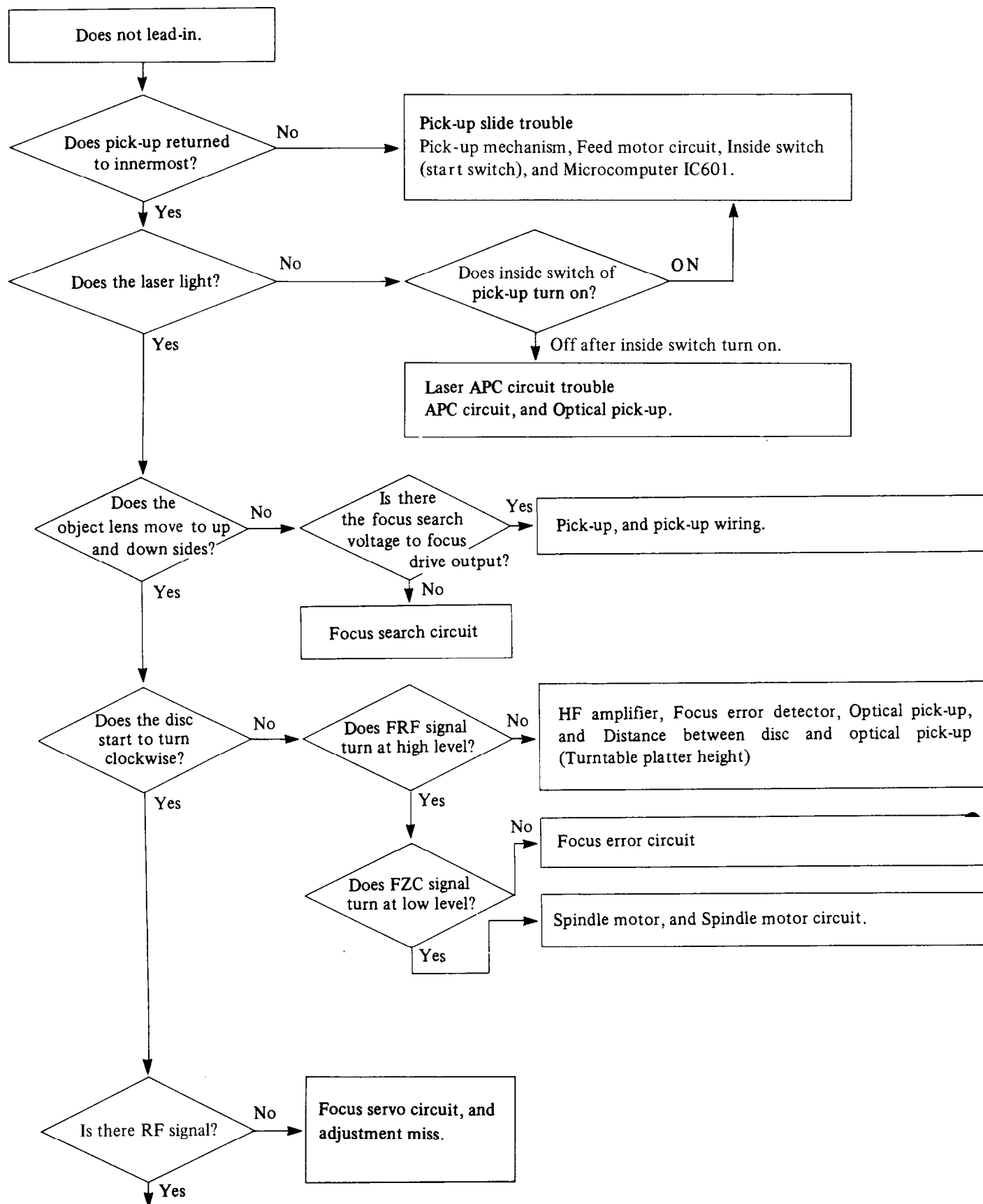


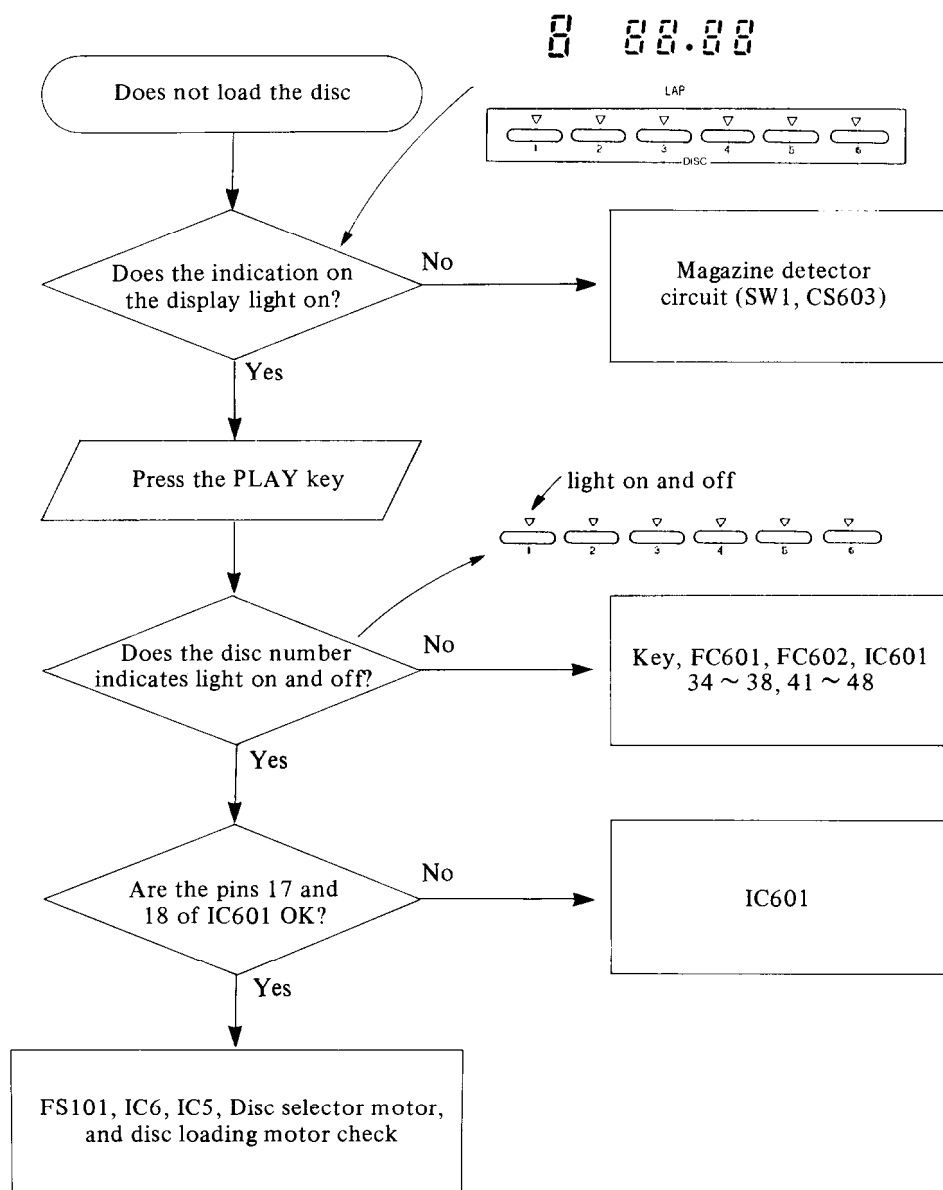
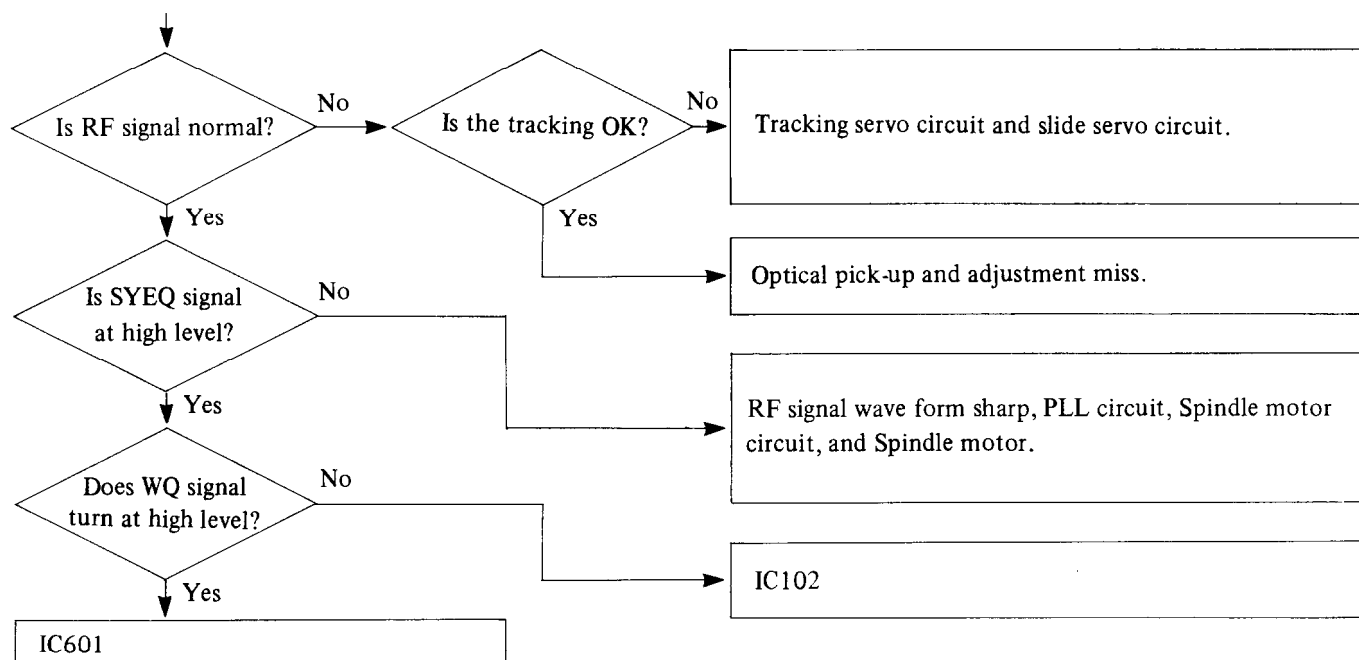
Fig-10

TROUBLE SHOOTING GUIDE





(Continued on the next page)



CIRCUIT DESCRIPTIONS

1. Focus Servo Circuit

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

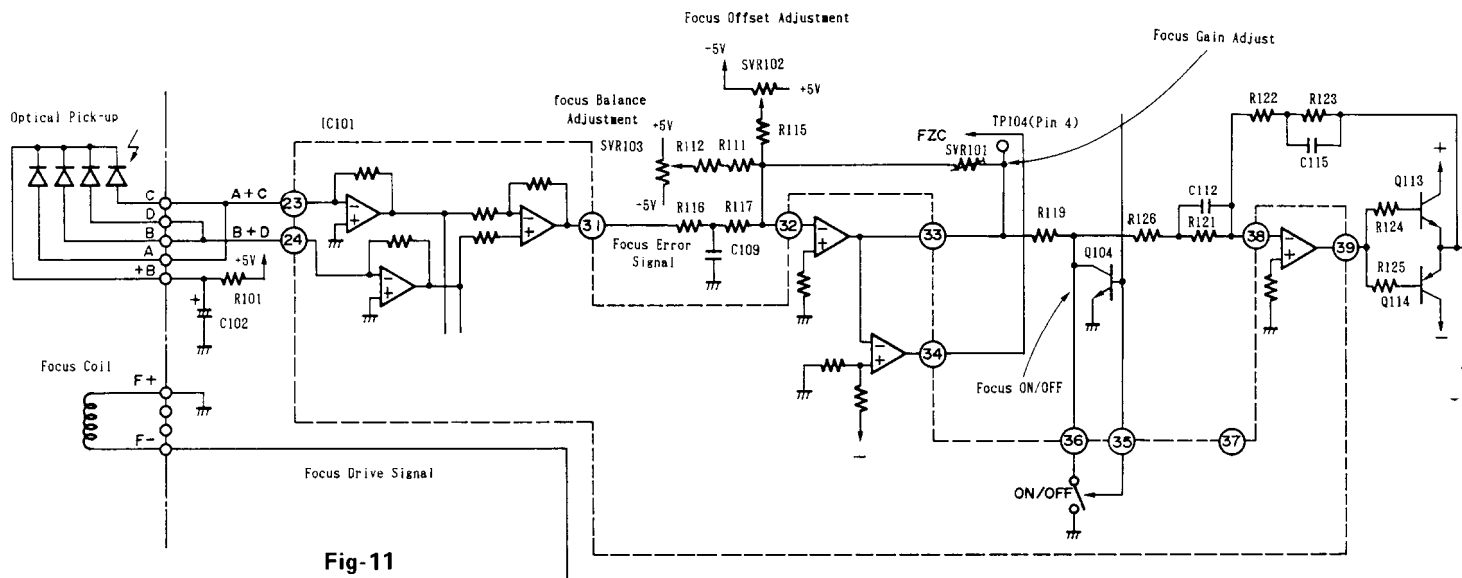


Fig-11

1-1. Focus Error Detector

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

$$FE (\text{focus error}) = (A + C) - (B + D)$$

(A + C) and (B + D) are input into pin 23 and pin 24 of IC101 respectively. The FE signal is calculated by the three opamps in IC101 and output via pin 31.

1-2. Phase Correctors - Drivers

The focus error signal is relayed from IC101 pin 31 to pins 32, 33, 38 and 39 in succession. Then, after passing through drivers Q113 and Q114, it is fed back to the focus coil of the pickup.

C109, C112 and C115 are phase correctors which enhance the servo's stability. Semi-fixed resistors SVR101, SVR102 and SVR103 are used to regulate offset, balance, and gain in the servo circuitry. Q207 and the switch in pin 36 turn the servo loop on and off. Control is maintained by means of the FCS signal sent from microprocessor IC102.

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

The focusing servo's capture range is only approximately $10\mu\text{m}$, so, when the objective lens is being moved up or down, the above-mentioned servo on/off

switch must be controlled to close the loop when the point of focus of the laser beam is positioned precisely. When a focus search command is received from the microprocessor, the LSR signal switches to LOW and a laser beam is emitted (see fig. 12). At the same time, the FCS signal switches to HIGH.

As the laser beam approaches the point of focus, the FE signal builds up (+) electrical potential which falls when optimum focus is reached. This comparator's output FZC signal is output from pin 34 of IC101. According to this timing, FCS changes to LOW, and Q104 and the switch of pin 36 shut off, closing the servo loop.

Fig. 12 illustrates the timing. The dotted lines show the waveforms produced by focus capture errors.

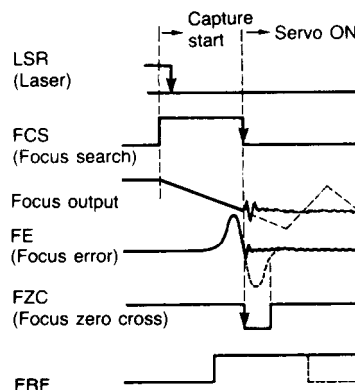


Fig-12

2. Tracking servo

This control circuit moves the objective lens radially to keep the laser beam precisely centered in the tracks on the disc surface (which are only $1.6\mu\text{m}$ wide).

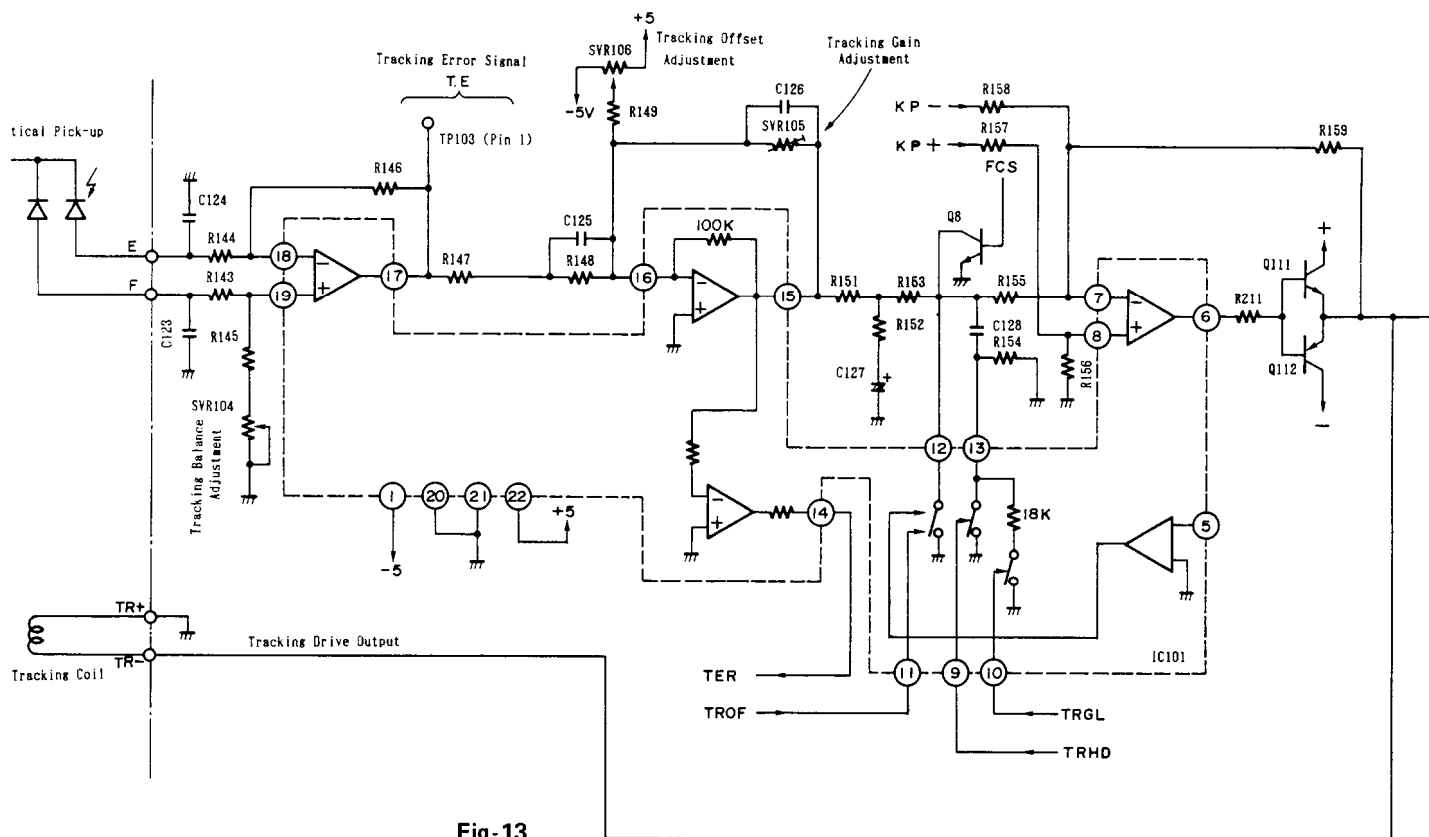


Fig-13

2-1. Tracking Error Sensor

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

$$\text{T.E. (tracking error)} = F - E$$

The E and F signals are input into pins 18 and 19 of IC101, the difference is obtained by an internal opamp, and the T.E. signal is output from pin 17.

2-2. Phase Correctors – Drivers

The tracking error signal is relayed from IC101 pin 17 to pins 16, 15, 7 and 6 in succession. After passing through drivers Q111 and Q112 it drives the tracking coil of the pickup. C125, C127 and C128 are capacitors which perform phase corrections. Balance, offset and gain are regulated by semi-fixed resistors SVR104, SVR106 and SVR105 respectively.

The switches incorporated in pins 12 and 13 of IC101 turn the servo on and off and switch the high frequency range loop gain on and off, thereby helping to stabilize transient operation during access times. The timing of these switches

is determined by the input into pins 9 –11 of IC101. The commands are as follows:

TROF (tracking OFF) FEOF (feed OFF)

TRGL (tracking gain low) TRHD (tracking high down)

Signals are output from IC102 in response to commands from microprocessor IC 601.

2-3. TER circuit

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

2-4. Track Kick Circuit

This circuit is used to move the laser beam to a target pit over relatively short distances (approximately 1 – 100 tracks) during such operations as disc access and cue review. In conjunction with the on/off switching discussed above, it sends positive and negative “kick pulses” (KP+ and KP-) to pins 7 and 8, thereby shifting the tracking coil by the desired amount.

The timing is determined by signals such as the TER signal and the HFD signal (see below). Fig. 14 illustrates the timing during a typical “kick” operation (forward).

3. HF (RF) Amp

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

$$\text{H.F. (R.F.)} = A + B + C + D \leftarrow \text{Eye-Pattern}$$

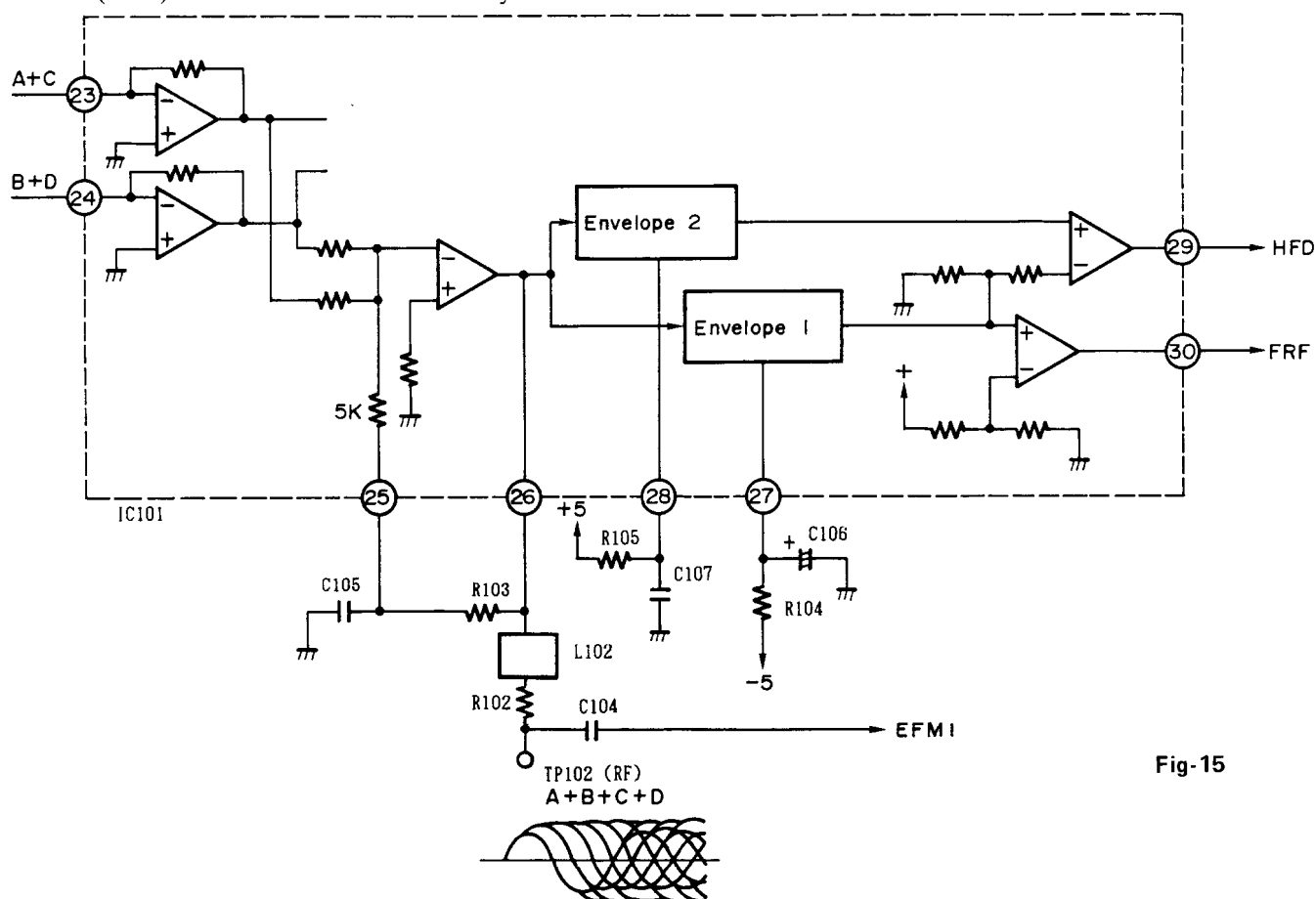


Fig-15

3-1. HF Amp

The A + C and B + D signals are input from pins 23 and 24 of IC101. They are added together by an opamp and the resulting signal (the HF signal) appears at pin 26. The HF signal is then passed through C104 and sent to the EFM I terminal of IC102 for signal processing.

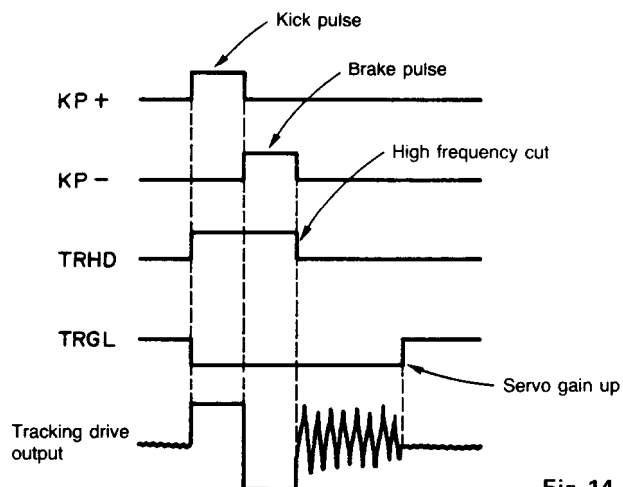


Fig-14

3-2. HFD and FRF Signals

The HF signal is input into C106 and C107, two envelope detection circuits with different time constants. The output is put through a comparator at a certain level and the HFD and FRF signals are then output via pins 29 and 30. The FRF signal indicates that focus is on; it is HIGH when focus is on. The HFD (HF detector) detects such things as the flat sections between pits and scratches on the disc surface. Together with the TER signal, it determines switching timing during disc access, etc.

4. Slide Motor (Feed Motor) Circuit

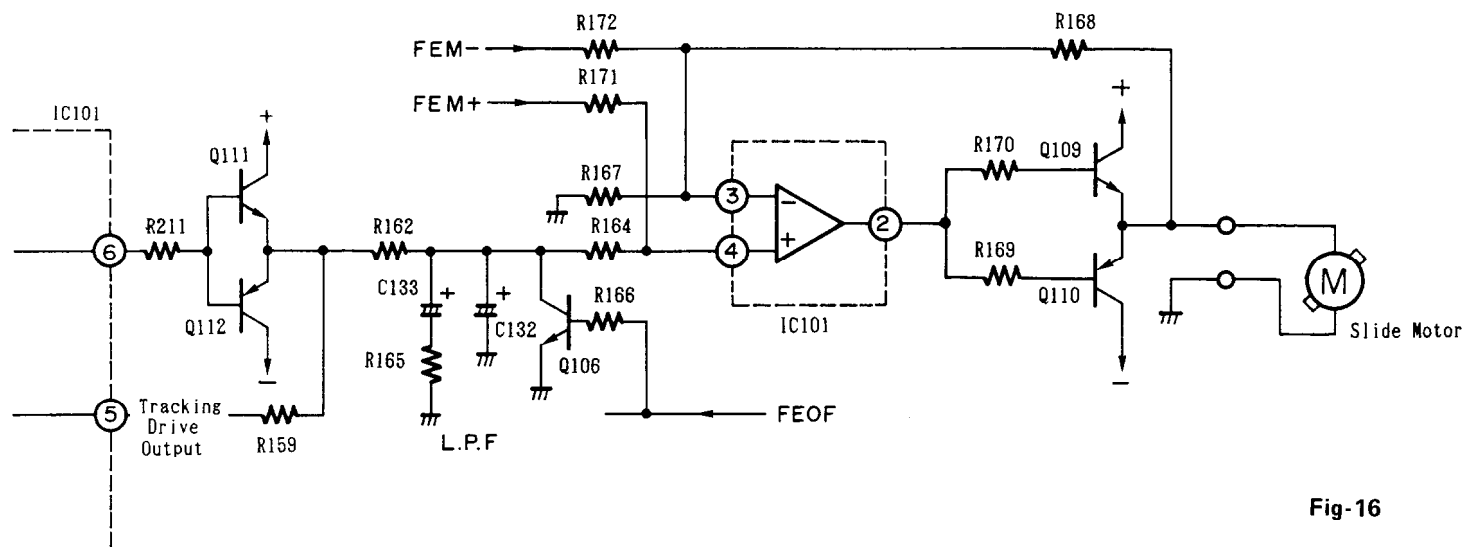


Fig-16

This servo circuit moves the entire pickup assembly from the disc's hub to its outer edge, ensuring that the objective lens stays close to the optical axis.

C132, C133, etc. remove low-frequency elements from the tracking drive's output. It then passes successively through pins 4 and 2 of IC101 and then drives the motor via drivers Q109 and Q110.

Q106 is the transistor that turns the slide servo on and off. It is controlled by the FEOF (feed off) signal sent from IC102.

Motor fast forward and reverse are initiated by FEM- (feed motor -) and FEM+ (feed motor +) signals input into pins 3 and 4 of IC101 for smooth disc access.

5. Spindle Motor Servo

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

5-1. PLL Circuit

The PLL circuit consists of VCO, LPF and a phase comparator in IC102 as shown in fig. 17.

The 8.64MHz VCO oscillator output is divided in half inside IC102. The phase of the HF signal and the waveform-shaped EFM signal edge are compared and the result output through pin 4.

When this signal is added to the VCO, the synchronous signal detected by the EFM is matched to the synchronous signal of the internal counter of IC102.

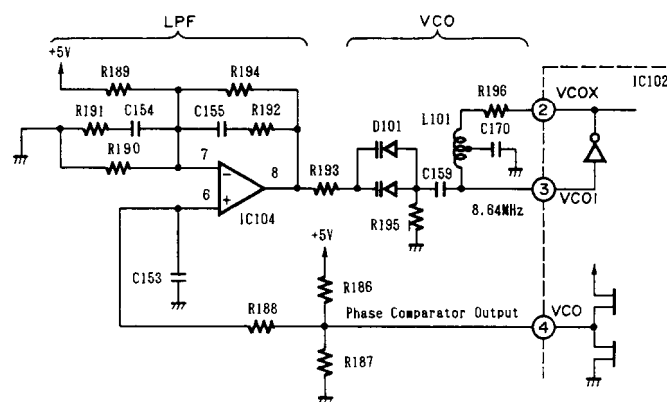
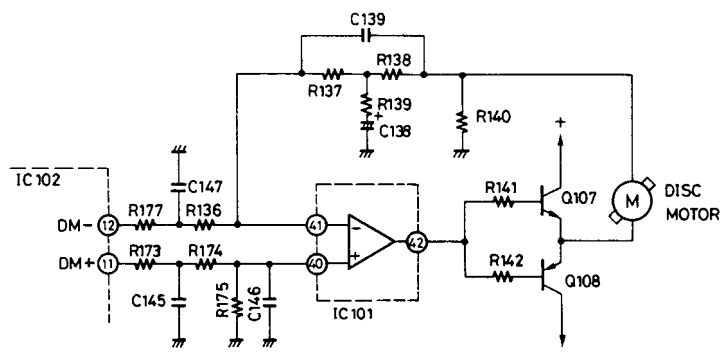


Fig-17

5-2. Spindle Motor Circuit

The spindle motor is controlled by DM+ (disc motor +) and DM- (disc motor -) commands output from pins 11 and 12 of IC102. Two opamps perform phase correction and amplify the signals which are then sent to the spindle motor via driver Q107 and Q108.



6. HF Signal Waveform-shaping Circuit

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

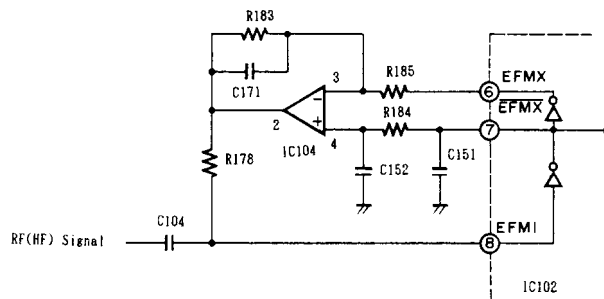


Fig-19

7. Microcomputer Peripheral Circuit

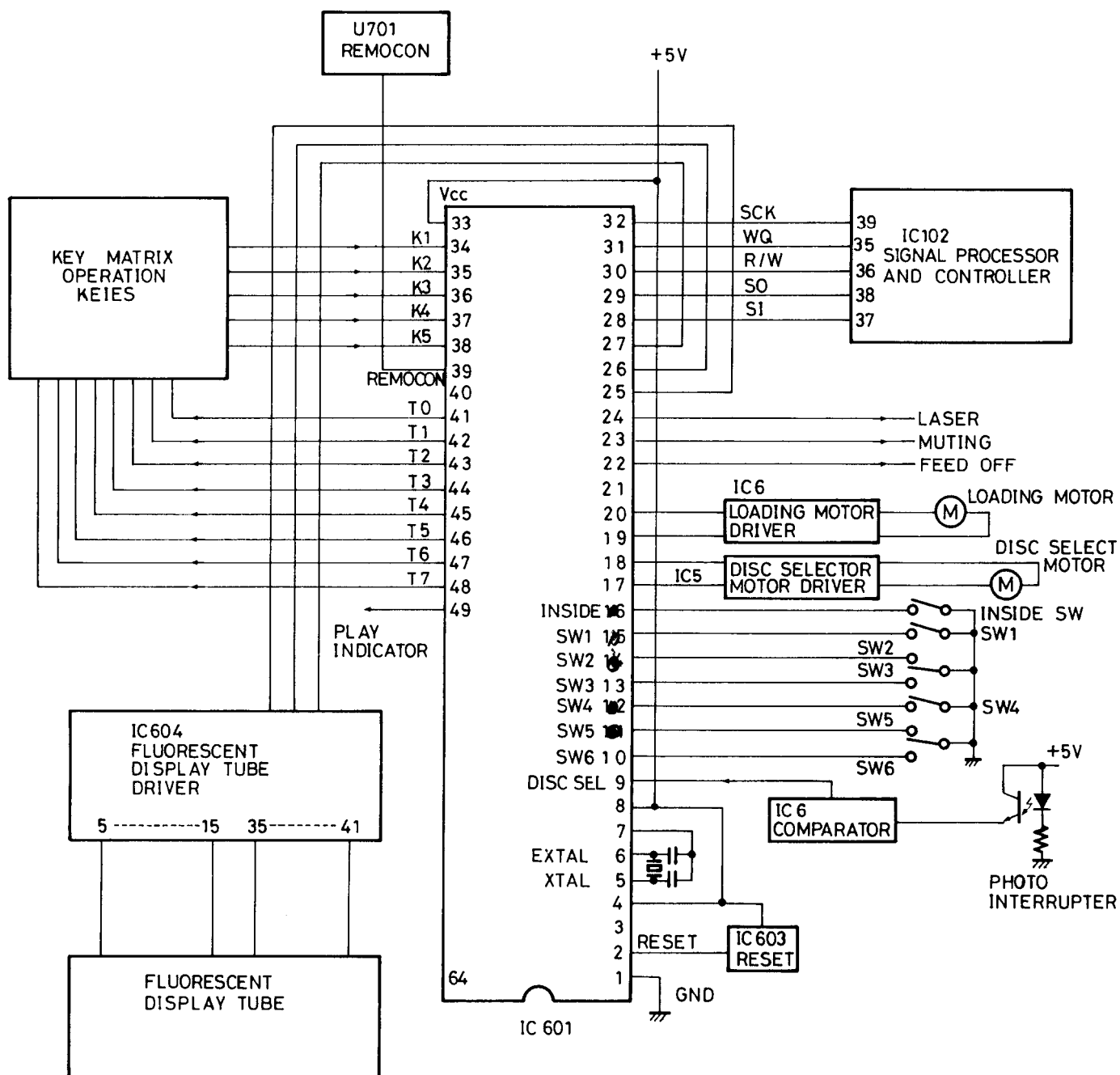


Fig-20

7. Microcomputer Peripheral Circuit (IC601)

7-1. Display Control (IC604)

When data is sent from microcomputer (IC601) pins 25 ~ 27, display operations take place through the microcomputer (IC604) which is used for driving the fluorescent character display tube. Seven-digit data is output by IC604 pins 35 ~ 41, and 11-segment data is output by pins 5 ~ 15 (dynamic scan method). One digit is approximately 1ms.

7-2. Key Input Operation

The timing pulse is output by IC601 pins 41 ~ 48, while an 8 × 5 matrix structure for key input is made up of IC601 pins 34 ~ 37.

7-3. Remote Control Operation

When the output of the Optical Reception Module U701 is received by the 39 pin of IC601, data code operation takes place internally.

7-4. Servo System Control and Sub-Code Demodulation (IC601)

Commands to the servo as well as information and subcode data, etc. are transmitted serially between IC601 and IC102.

SO Communicates command data from the microcomputer to the servo system. 8-bit configuration.

SI Communicates servo system conditions and subcode data to the microcomputer. 8 ~ 88-bit configuration.

SCK . . . Serial data clock. Downshift.

R/W . . . When sending commands from the microcomputer, the signal becomes high-level.

WQ . . . When sending information to the microcomputer, the signal becomes high.

7-5. Changer Mechanism Control

IC601 pins 9 ~ 15 and 17 ~ 20 are for mechanism control input and output. SW1 15 pin detects with LOW/HIGH whether there is a magazine or not. SW2 14 pin (when LOW) and SW3 13 pin (when HIGH) input whether the disc is on the turntable or in the magazine (not on the turntable). SW4 12 pin tells the microcomputer with LOW/HIGH whether or not there is a disc. SW5 11 (when LOW) and SW6 10 (when HIGH) inform the computer that the trigger is at its lowest level, or, in the opposite case, at the EJECT level. Also, a detection signal from the photo interrupter is reshaped by IC602 and sent to the DISC SEL pin no. 9. The INSIDE switch is LOW when the PICKUP is at its innermost circumference (16 pin). Pin 17 and 18 are ACTIVE LOW with the reverse control signal of the disc select motor. At STOP they are both high. Pins 20 and 19 are ACTIVE LOW with the control signal of the disc load motor. With STOP, they are both HIGH.

7-6. Other Controls

24 pin With the laser diode control signal, HIGH and LASER ON.

23 pin With the audio muting signal, ACTIVE HIGH At LOW, there is output.

22 pin Turns the feed circuit of FOCUS to OFF. ACTIVE HIGH.

8. Mechanism Operation

1. Disc Loading Operation

1. Take out the designated disc from the magazine.
 2. Put the selected disc on the turntable for chucking. With the above steps, the disc loading process is completed. This operation launches a series of operations set in motion by the gear ring operation of plate side A and plate side B, which are attached at the left and right of the mechanism.
- This series of operations is driven by the DC motor. When the DC motor is running, plate side A operates, and lever gear ring is introduced, upon which plate side B also begins gear ring operation. When plate side A operates in the direction shown in Figure 21, the disc is loaded.

When the gear ring operation is taking place on plate side A, the lever mechanism of the selected disc in the magazine moves, and the selected disc is brought out of the magazine and is sent to a designated position. (A-Operation of Figure 22) Next, the disc is lowered to the turntable of the CD mechanism section and is chucked. (B-Operation) With this, the loading operation of the disc is finished.

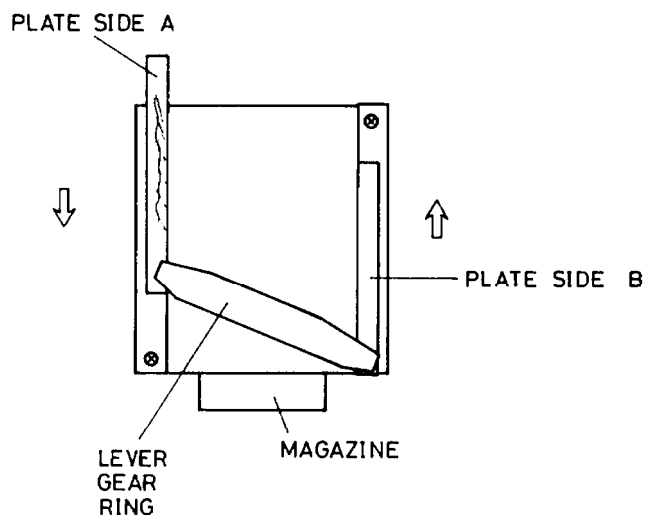


Fig-21

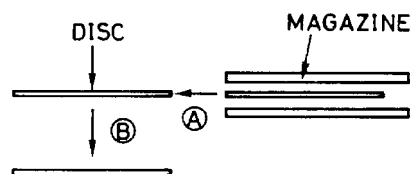


Fig-22

2. Disc Eject Operation

If plate side A and plate side B are operating in the opposite direction of the disc loading operation, disc eject operation takes place.

When the disc chucking is cancelled, the disc is raised, and returns to a designated slit in the magazine. With this action, the disc eject operation is finished.

3. Disc Select Operation

Disc selection occurs when the base trigger is moved up and down by the DC motor operation. There are six slits corresponding to Nos. 1 ~ 6 of the base trigger. When the DC motor is driven and the special screw rotates, the base trigger is moved up and down. When the sensor find the designated disc slit, the base trigger is brought to the designated disc position.

When this has taken place, disc selection is finished.

4. Magazine Eject Operation

The magazine is held inside the mechanism by a stopper. When the base trigger has been lowered to its lowest position, (When the sensor find the slit for eject) the stopper is pushed down, and the stopper is detached from the magazine. The magazine pops up by means of a spring. When this occurs, the magazine eject operation is finished.

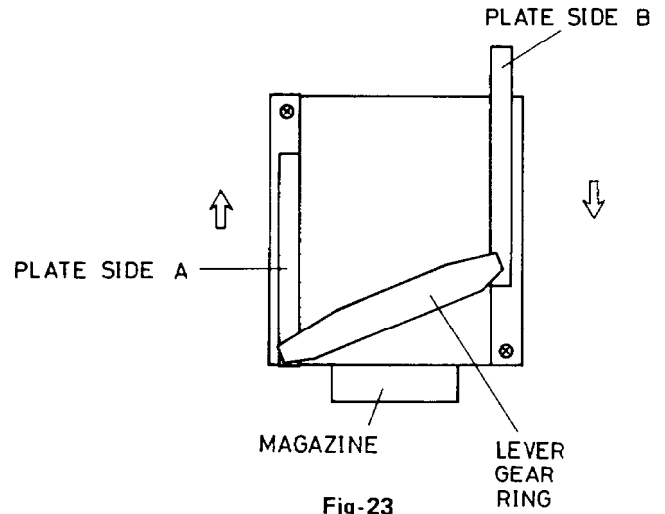


Fig-23

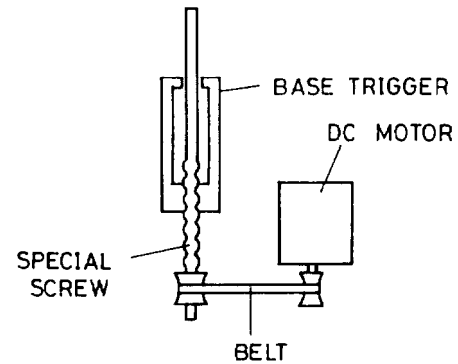


Fig-24

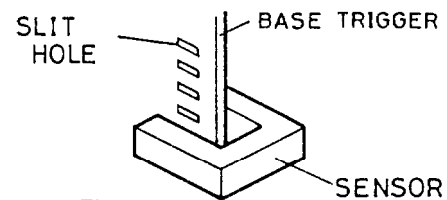


Fig-25

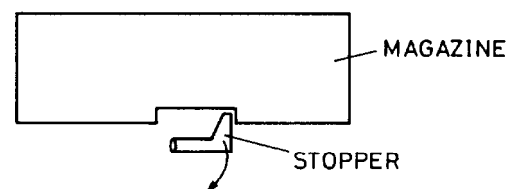
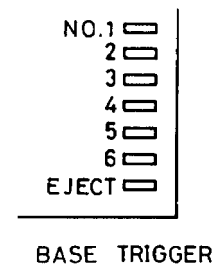
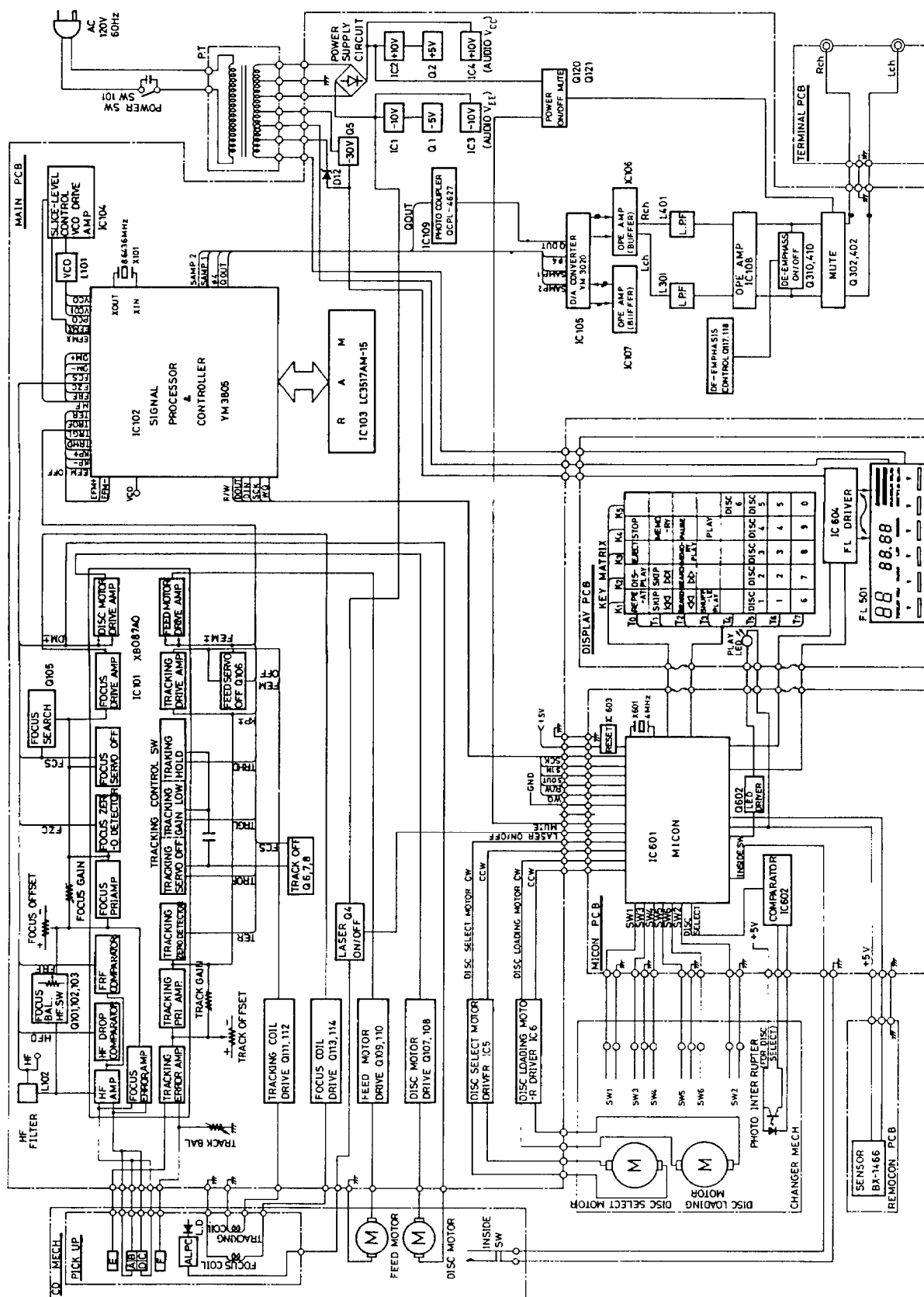
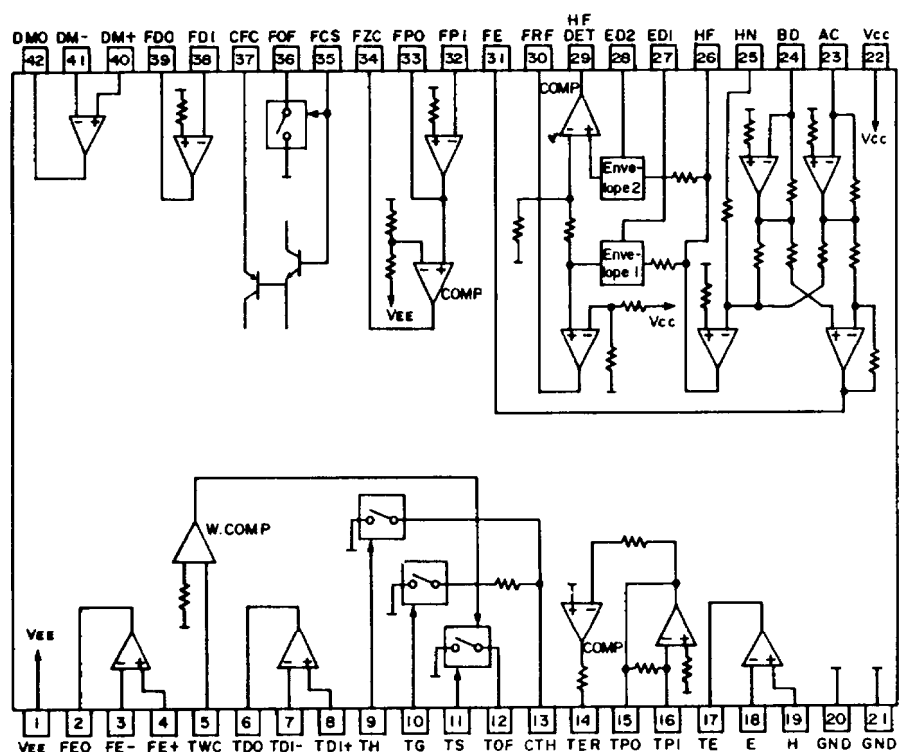


Fig-26



IC DESCRIPTIONS

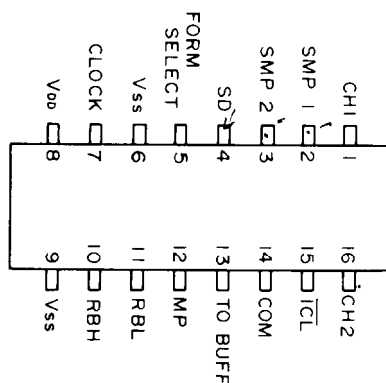
XB087A0(Servo Linear Circuit)



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

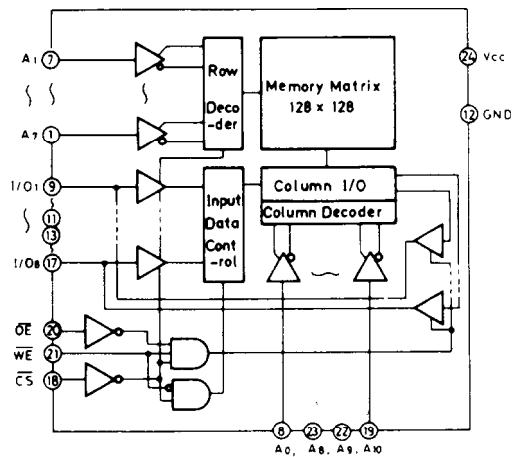
Pin No.	Designation	Function
34	FZC	Use when the focus search. Same as FRF
35	FCS	Signal input terminal to pull the focus.
36	FOF	Attenuator terminal.
37	CFC	Terminal to make the ramp waveform of focus search ramp circuit.
38~39	FDi, FDo	Input/output terminals of focus drive amplifier.
40~42	DM+, DM-,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

YM3020 (D/A CONVERTER)

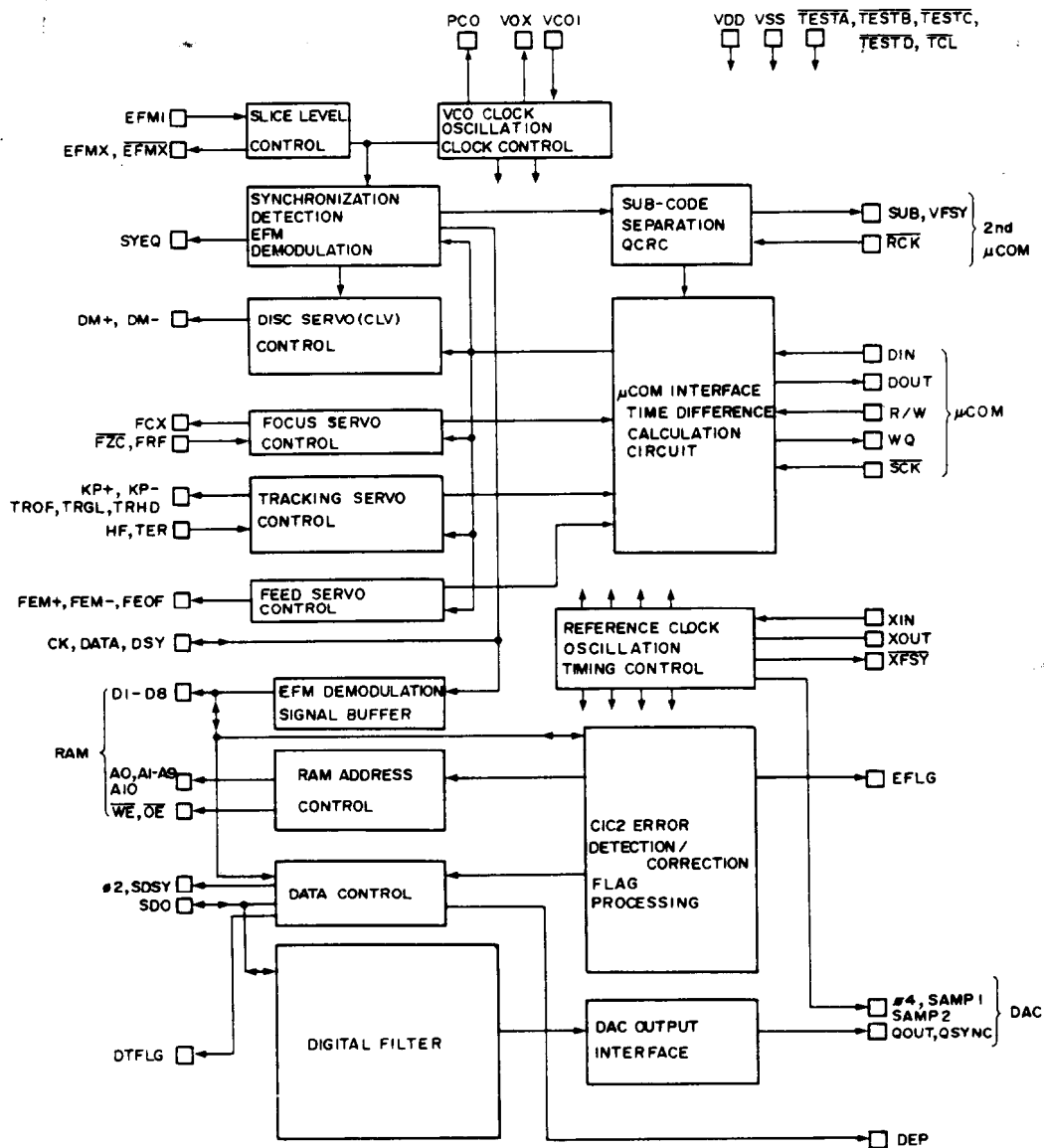


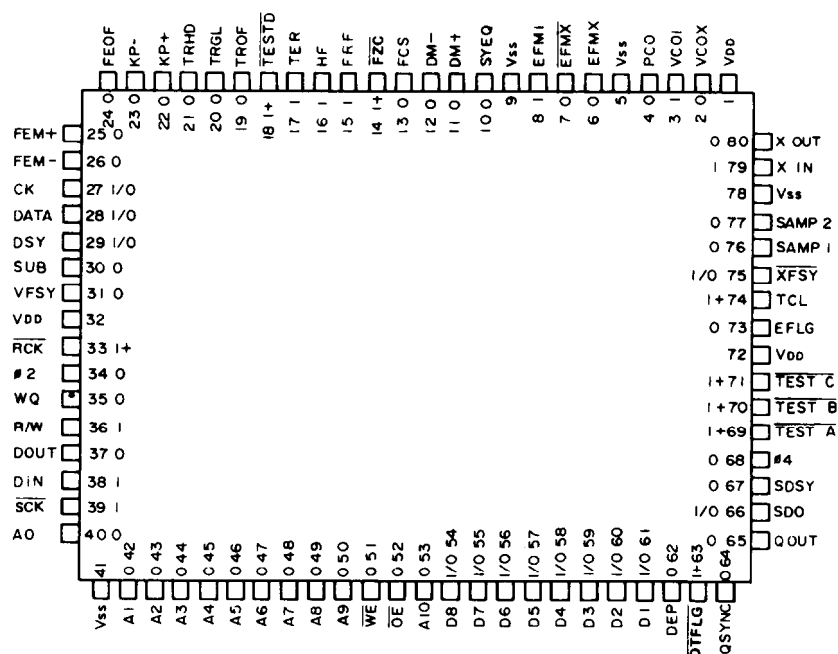
Pin No.	Designation	Function (Assignment)
1.	V OUT CH1	Sample-hold analog switch output for Channel 1.
2.	SMP 1	Interval of signal at state "1" will be the sampling time of CH1.
3.	SMP 2	Interval of signal at state "1" will be the sampling time of CH2. The rising edge of SMP 1 and SMP 2 is used to generate the internal signal to latch the serial data. The level frequency characteristics will be improved as the signal time of SMP 1 and SMP 2 becomes longer.
4.	SD	Serial input of converted digital signal.
5.	FORM SELECT	Corresponds to binary input at state "1", and corresponds to 2's complement input at state "0".
6.	VSS	Low-potential side power (GND).
7.	CLOCK	Clock to drive shift-resistor and time-generator ($\phi 4$).
8.	VDD	High-potential side reference power.
9.	VSS	Low-potential side reference power (GND).
10.	RBH	Since the same resistance is inserted between the RBH pin and the internal VDD power supply and between the RBL pin and the internal VSS (GND) power supply, a high precision voltage of $1/2 V_{DD}$ can be obtained when both pins are connected. This voltage is applied on the MP pin through the buffer operational amplifier.
11.	RBL	As in the case of the basic circuit, the drift from $1/2 V_{DD}$ can be corrected by providing an appropriate external resistance on either one of the two pins.
12.	MP	An exponential analog shift is executed with the potential applied on MP as the reference. Normally, bias is applied for $1/2 V_{DD}$.
13.	TO BUFF	Analog output of DAC is input to buffer operational amplifier.
14.	COM	Common input of analog switch for CH1 and CH2.
15.	ICL	"1": Normal operation. "0": Will become no-signal output regardless of D signal.
16.	VOUT CH2	Sample-hold analog switch output for CH2.

LC3517AM15 (16bit RAM)



YM3805 (Signal Processor & Controller)





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

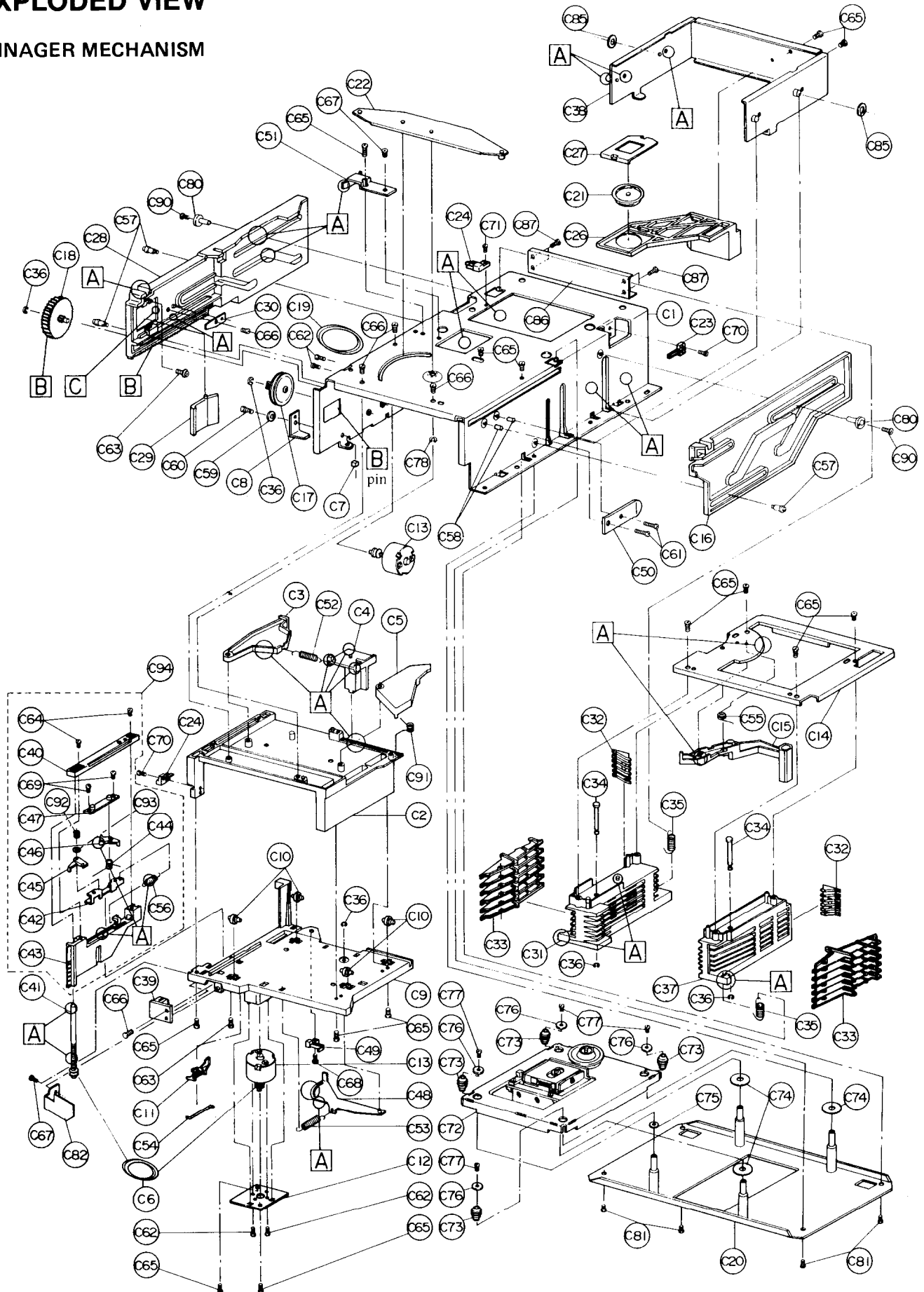
EXPLODED VIEW**CHNAGER MECHANISM**

Fig-28

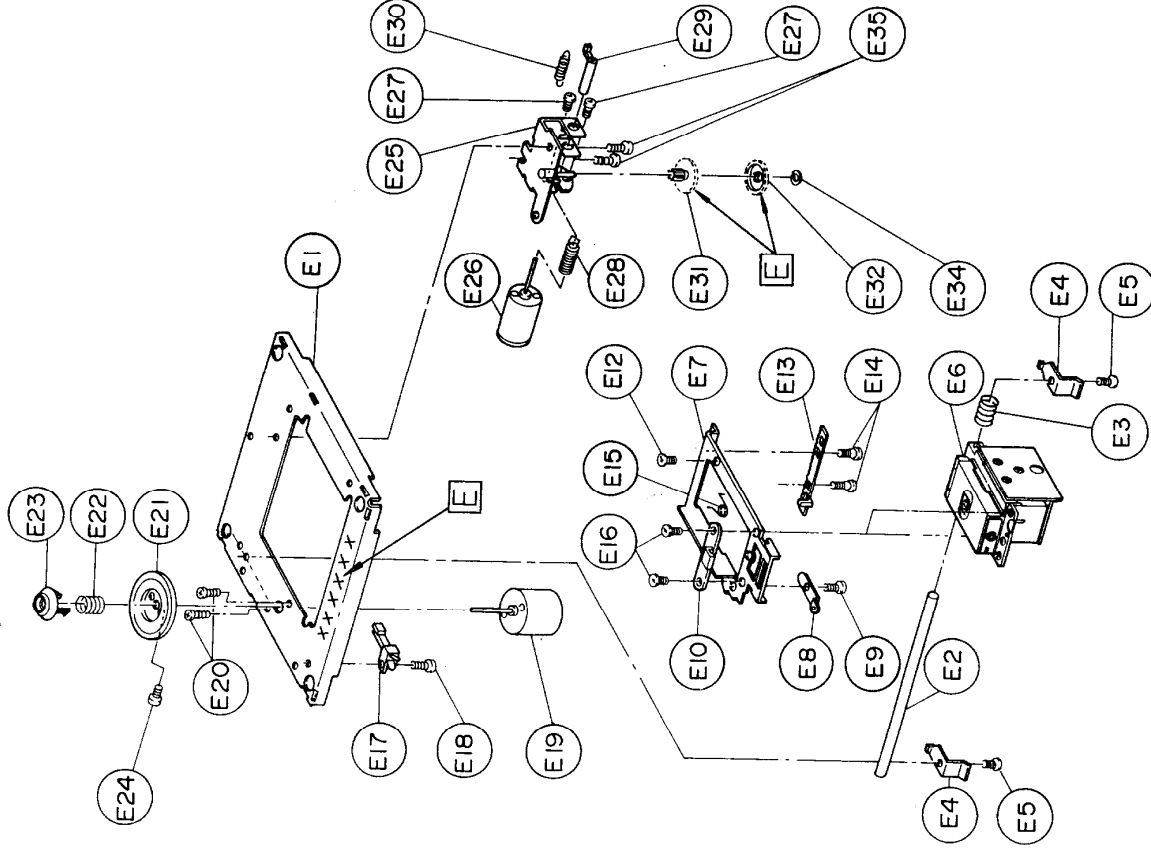
PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
C1	27100142	Chassis
C2	27262430	Plate, upper
C3	27300951	Lever
C4	27300952	Arm, slide
C5	27300953	Lever
C6	27300954	Belt
C7	27260234	Bracket, shaft
C8	27300955	Stopper, thrust
C9	27262451	Plate, lower
C10	27300956	Roller
C11	27300957	Stopper
C12	24502220	Bracket, motor
C13	24502221	DC motor
C14	27262452	Plate
C15	27300958	Lever, reset
C16	27262453	Plate, side R
C17	27300959	Pulley
C18	27300960	Gear
C19	27300961	Belt
C20	27130485	Bracket, mechanism CD
C21	27301013	Flange
C22	27300962	Lever, gear
C23	24505183	Leafswitch
C24	24505184	Leafswitch
C26	27255002	Clamper
C27	27262455	Plate
C28	27262454	Lever
C29	27300963	Plate spring
C30	27180342	Case, lift B
C31	27301014	Case, lift B
C32	27180343	Plate spring
C33	27300964	Lever, disc center
C34	27300965	Pin
C35	27180344	Coil spring
C36	24506740	Special washer
C37	27301015	Case, lift A
C38	27130495	Frame
C39	27300966	Sensor
C40	27262456	Plate
C41	24506741	Special screw
C42	27300967	Lever, trigger
C43	27300968	Base, trigger
C44	27180345	Torsion spring
C45	27300969	Lever A
C46	27300970	Lever B
C47	27262457	Plate
C48	27300971	Lever, eject
C49	24505185	Leafswitch
C50	27130486	Bracket B
C51	27130487	Bracket A
C52	27180346	Coil spring
C53	27180347	Coil spring
C54	27180348	Wire spring
C55	27180349	Torsion spring
C56	27180350	Coil spring
C57	24506742	Special screw
C58	24506743	Spacer
C59	24506744	Special washer
C60	24506745	Special screw
C61	82143015	3P+15FN(BC), Pan head screw
C62	82142604	2.6P+4F(BC), Pan head screw
C63	830430068	3STC+6B(BC), Tapping screw
C64	833430080	3TTP+8P(BC), Tapping screw
C65	838430088	3TTB+8B(BC), Tapping screw
C66	838430068	3TTB+6B(BC), Tapping screw
C67	82143004	3P+4FN(BC), Pan head screw
C68	838426088	2.6TTB+8B(BC), Tapping screw

REF. NO.	PART NO.	DESCRIPTION
C69	833426060	2.6TTP+6B(BC), Tapping screw
C70	833420080	2TTP+8B(BC), Tapping screw
C71	833420068	2TTP+6B(BC), Tapping screw
C72	24506734	DM-12, CD mechanism
C73	24505198	Cushion, damper
C74	8761401610	W4x1.5F, Washer
C75	8761400810	W4x8F, Washer
C76	8761201005	W2x1.0F, Washer
C77	82142604	2P+4F(BC), Pan head screw
C78	89302015	ES-2S, Ring E
C80	27270231	Collar
C81	838430068	3TTB+6B(BC), Tapping screw
C82	27130511	Bracket
C85	27270232	Special washer
C86	27130512	Bracket
C87	82142604	2.6P+4F(BC), Pan head screw
C89	82143012	3P+1.2F(BC), Pan head screw
C90	24503161	Torsion spring
C91	24503162	Compression spring
C92	27270233	Special washer
C93	27301080	Trigger
C94	27301080	Chassis
E1	27100145	Shaft, pick-up
E2	27260235	Compression spring
E3	27180354	Plate spring
E4	27180355	Optical pick-up
E5	82142604	2.6P+4F(BC), Pan head screw
E6	24505187	Bracket, pick-up
E7	27130492	Plate spring
E8	27180356	Plate spring
E9	82142604	2.6P+4F(BC), Pan head screw
E10	27130493	Bracket
E12	82142604	2.6P+4F(BC), Pan head screw
E13	27301017	Rack
E14	24506736	Special screw
E15	27180357	Torsion spring
E16	82142606	2.6P+6F(BC), Pan head screw
E17	24505186	Leafswitch
E18	834426068	2.6TTS+6B(BC), Tapping screw
E19	-24502218	DC motor
E20	24506737	Special screw
E21	27300983	Turntable platter
E22	27180358	Compression spring
E23	27300984	Adjuster, disc
E24	24506738	Special screw
E25	-27130494	Bracket
E26	-24502219	DC motor
E27	82142603	2P+3F(BC), Pan head screw
E28	27300985	Worm
E29	27300988	Stopper, thrust
E30	27180359	Coil spring
E31	27300986	Gear, led
E32	27300987	Gear, worm
E33	24506739	Special washer
E34	82142604	2.6P+4F(BC), Pan head screw
E35	24505208	2P, Socket
	24505209	4P, Socket

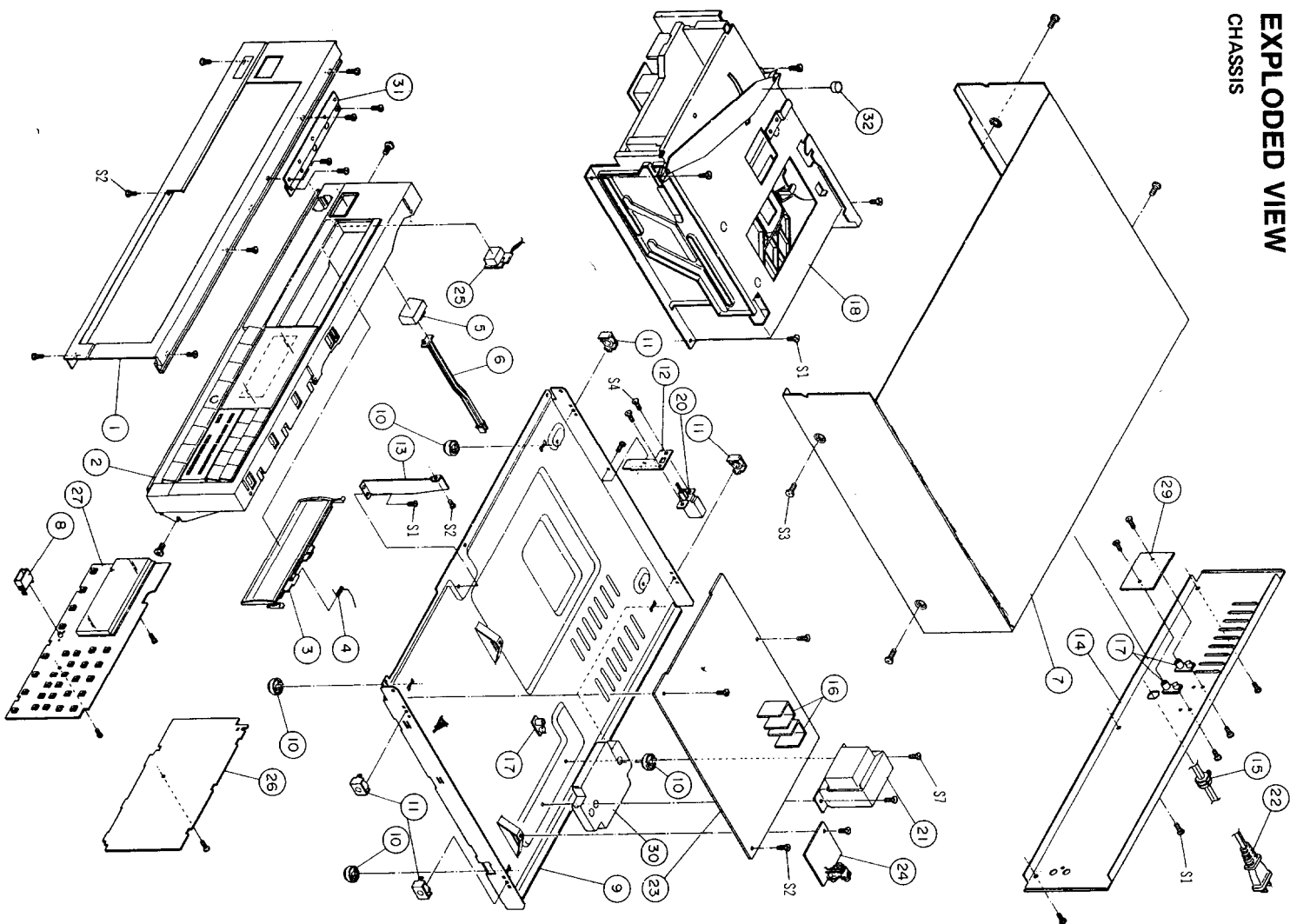
Lubrication
A: DYNAMAX EP-2
B: MOLIKOTE EM50L
C: FLOIL GP-570
D: FLOIL G-3470A
E: FLOIL G-31KB

CD MECHANISM



EXPLODED VIEW

CHASSIS



PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
1	27210891	Front panel ass'y
2	27100143	Front bracket ass'y
3	22301002	Door ass'y
4	27180352	Torsion spring
5	27301009	Knob
6	27273080	Joint
7	27301011	Top cover
8	27190551	Holder, LED
9	27301012	Bottom board
10	27301010	Base
11	27130488	Bracket
12	27130490	Bracket
13	27130489	Bracket
14	27121026	Back panel <D>
15	27121027	Back panel <U>
16	270280	SR-4K-4, Strainrelief
17	27130491	Bracket
18	24506733	CDM-500, CD mechanism
19	24506732	Magazine CD
20	25035295	Push switch (SW101)
	24505210	Voltage selector switch <U>
	27130523	Bracket for voltage selector switch <U>
21	2300257	Δ NPT-971D, Power transformer <D>
22	2300258	Δ NPT-971ADGQ, Power transformer <U>
23	253112A	Δ AS-UC-4, Power supply cord
24	24505199	Main circuit pc board ass'y
25	24505203	Terminal pc board ass'y
26	24505202	Remote control circuit pc board ass'y
27	24505201	Microcomputer pc board ass'y
29	24505207	Display pc board ass'y
30	27270214	Filter pc board ass'y
31	27130522	Base
32	28140788	Bracket
	3500065A	Base
	27300601	Δ IS capacitor
	838430068	Cover for C1
	838430088	3TTB+6B(BC), Tapping screw
	8344300168	3TTB+8B(BC), Tapping screw
	82143006	3TTS+16B(BC), Tapping screw
	83143008	3P+6FN(BC), Pan head screw
	863430	3P+8FN(BC), Pan head screw
	838440068	N-3F-N(BC), Nut
	260208	4TTB+6B(BC), Tapping screw
		Binder for lead wire

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

MAGAZINE

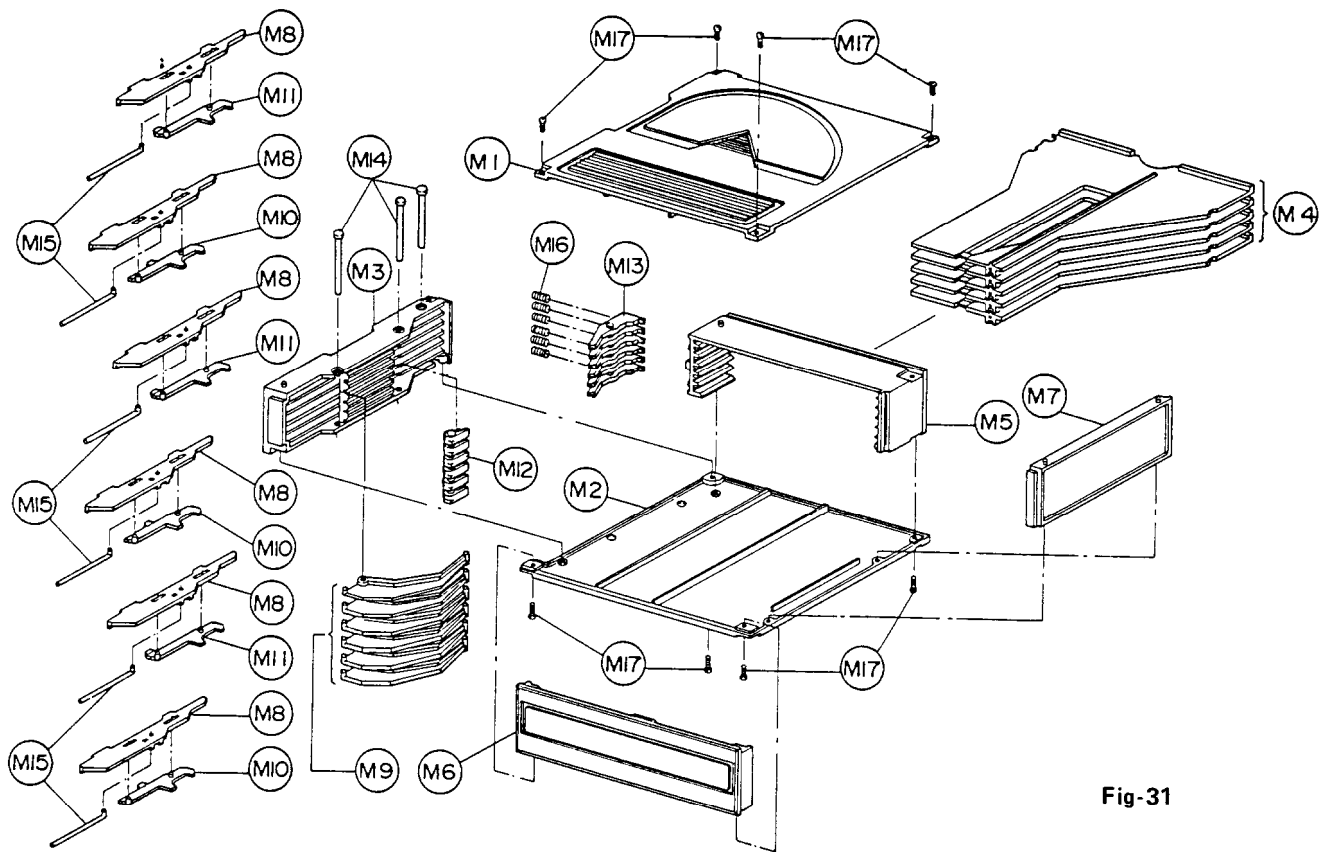


Fig-31

REF. NO.	PART NO.	DESCRIPTION
M1	27300972	Cover, top
M2	27300973	Cover, bottom
M3	27301016	Case, lever
M4	27267510	Guide
M5	27130496	Frame
M6	27300974	Cover, front
M7	27300975	Cover, side
M8	27300976	Lever, mechanical
M9	27300977	Lever, eject
M10	27300978	Lever, manual A
M11	27300979	Lever, manual B
M12	27300980	Cam
M13	27300981	Stopper
M14	27300982	Pin
M15	27180351	Wire spring
M16	27180352	Compression spring
M17	833420068	2TTP+6B(BC), Tapping screw
M18	830430068	3STC+6B(BC), Tapping screw
	29360935	Label, top
	27262447	Plate

PACKING VIEW

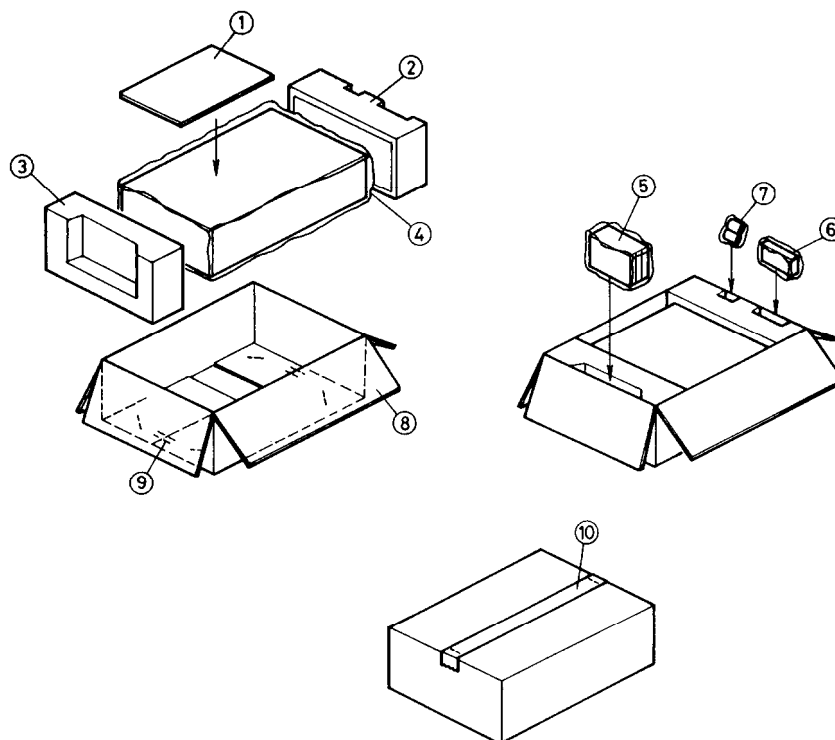


Fig-32

REF. NO.	PART NO.	DESCRIPTION
1	29341174	Instruction manual
	29365019	Warranty card <D>
	29365021	Warranty card <U>
	29358002E	Service station list
	2010098	Connection cord
	29360936	Label INDEX for magazine
	25055251	CV-CP, Conversion plug <U>
	29100005A	240x320mm, Poly bag
2	29091191	Pad R
3	29091192	Pad L
4	29100049	620x640mm, Poly bag
5		Magazine
6	24140012	RC-109C, Remote controller
7	3010054	UM-3, Two batteries
8	29051573	Master carton box <D>
	29051593	Master carton box <U>
9	282301	Sealing hook
10	260012	Dampilon tape

DISASSEMBLING PROCEDURES

Changer Mechanism

Remove the top cover.

Remove the bracket on the front panel.

Detach the 7 connectors leading to the PC board from the mechanism.

Remove screws A and B.

Pull plate side A forward and remove screws C and D.

If plate side A is facing the opposite direction, remove it from screws C and D.

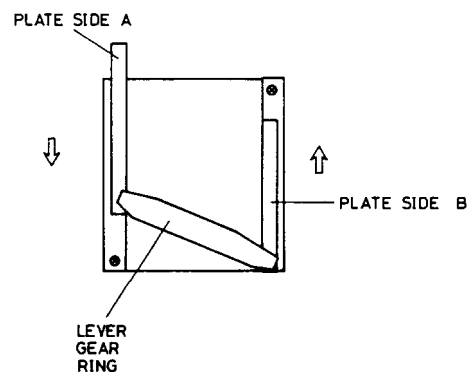


Fig-33

CD Mechanism

Remove the changer mechanism.

Remove the 4 screws holding the bracket mechanism and CD mechanism to the underside of the changer mechanism section.

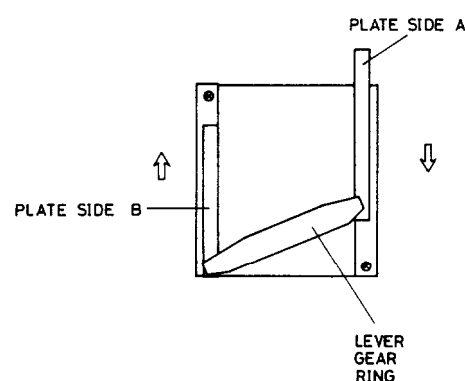


Fig-34

ADJUSTMENT PROCEDURES

Step	Item	Mode	Adjust	Adjust for	Connection	Output Indication
1	VCO	STOP	L101	4.322MHz±5kHz	Fig. 36	Frequency counter
2	FOCUS BALANCE	PLAY	SVR103	Maximum output	Fig. 37	Oscilloscope
3	FOCUS GAIN	PLAY	SVR101	TP105-TP104 = 7dB	Fig. 38	2 ch AC voltmeter
4	FOCUS OFFSET	STOP	SVR102	Within ±25mV	Fig. 39	Oscilloscope
5	TRACKING BALANCE	PLAY	SVR104	Center . . GND level	Fig. 40	Oscilloscope
6	TRACKING GAIN	PLAY	SVR105	TP105-TP103 = 7dB	Fig. 41	2 ch AC voltmeter
7	TRACKING OFFSET	STOP	SVR106	Within ±25mV	Fig. 42	Oscilloscope

Instrument required

Oscilloscope, Two channel AC voltmeter, Oscillator
Frequency counter and DC power supply.

Disc/jig

Disc YEDS-18 (TYPE 4)

Jig Two B.P.Fs (Refer Fig.35)

Resistors 22kohm and 220kohm

Ceramic capacitor 0.047 μ F

Shorted clip

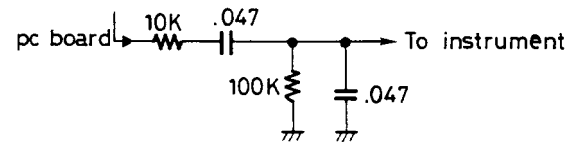


Fig-35 B. P. F

1. VCO frequency adjustment

Connect the ceramic capacitor 0.047 μ F between TP102 and ground.
Connect the frequency counter to TP101.

Adjust L101 until the frequency counter reading 4.322 $\pm$ 0.005MHz.

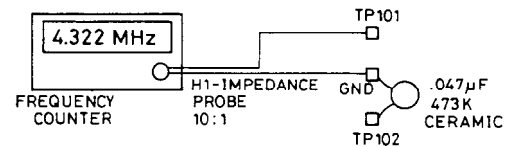


Fig-36

2. Focus balance adjustment

Load the test disc YEDS-18 and playback the track 2.

Connect the oscilloscope to TP102.

Adjust SVR103 until RF signal becomes the maximum output.
(Refer Photo 2)

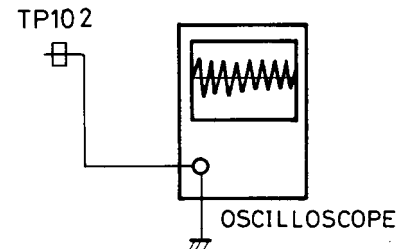


Fig-37

3. Focus gain adjustment

Load the test disc YEDS-18 and playback the track 2.

The filters are passed through and AC voltmeter is connected at the pin 3 of TP105 and pin 4 of TP104.

With an oscillator connected at pin 1 of TP104, 800Hz, 150mV is passed through 22kohm and input.

Adjust SVR101 until the output discrepancy between pin 3 of TP105 and pin 4 of TP104 is 7dB $\pm$ 1dB. TP105>TP104

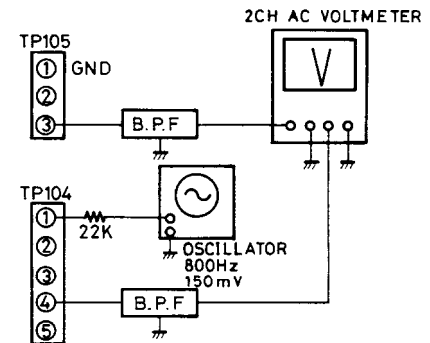


Fig-38

4. Focus offset adjustment

Connect the oscilloscope to pin 3 of TP105.

Adjust SVR102 until the waveform becomes within $\pm$ 25mV of GND level.

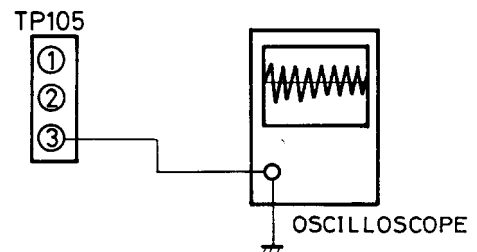


Fig-39

5. Tracking balance adjustment

Load the test disc YEDS-18 and playback the track 2.
Connect the oscilloscope to pin 1 of TP103.
Connect pins 3 and 5 of TP104 to the ground.
Adjust SVR104 until the waveform of pin 1 of TP103 becomes symmetrical with GND level.
(Refer photo 3)

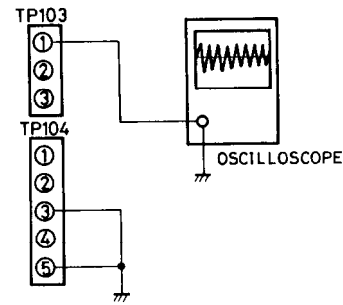


Fig-40

6. Tracking gain adjustment

Load the test disc YEDS-18 and playback the track 2.
The filters are passed through and AC voltmeter is connected at pin 3 of TP103 and pin 2 of TP105.
With an oscillator connected at pin 2 of TP104, 800Hz, 150mV is passed through 220kohm and input.
Adjust SVR105 until the output discrepancy between pin 2 of TP105 and pin 3 of TP103 is 7dB $\pm$ 1dB. TP105>TP103

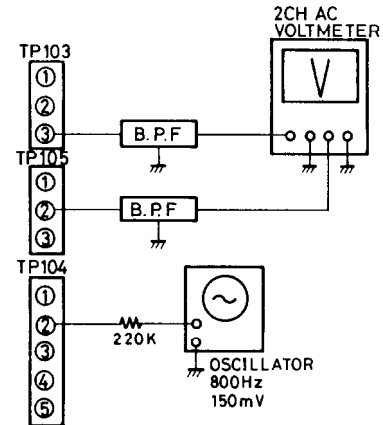


Fig-41

7. Tracking offset adjustment

Connect the oscilloscope to pin 2 of TP105.
Adjust SVR106 until the waveform becomes within $\pm 25\text{mV}$ of GND level.

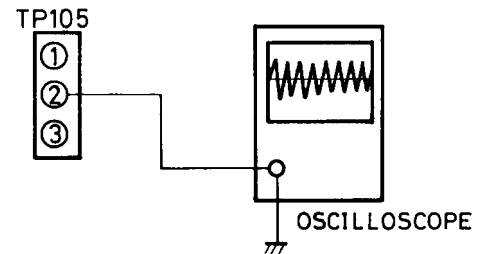


Fig-42

MECHANISM ADJUSTMENT

Height of turntable platter

Adjust the adjustment screw so that the distance between the turntable platter and chassis becomes $9.1 \pm 0.1\text{mm}$.

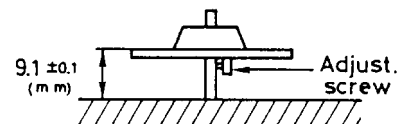


Fig-43

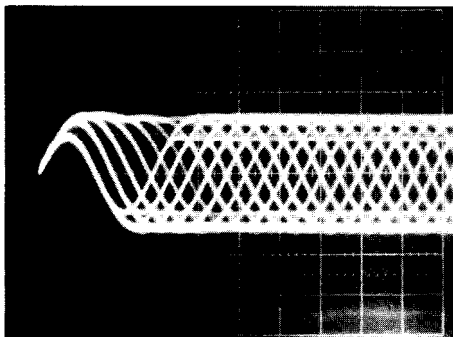


Photo 2

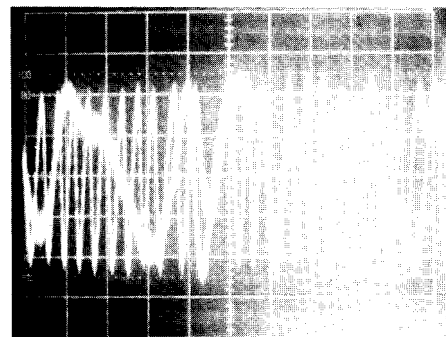


Photo 3

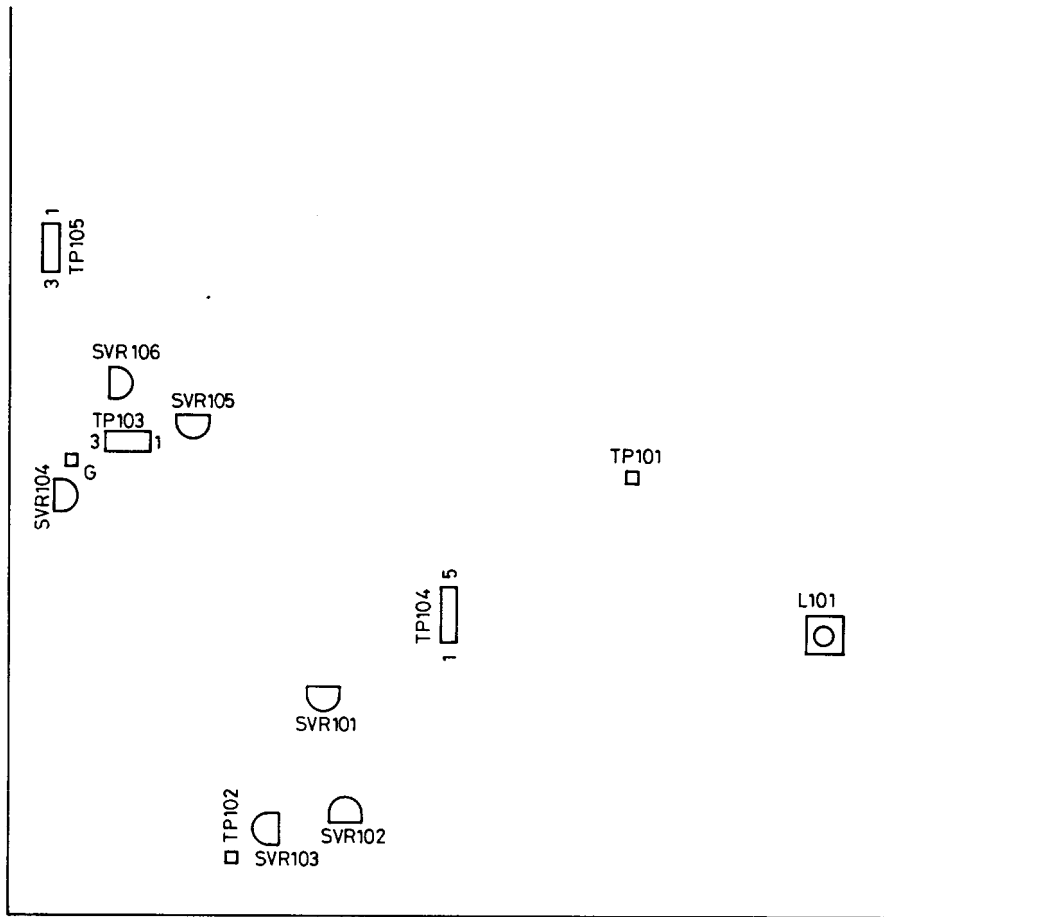


Fig-44

GRATING ADJUSTMENT

Proceed the grating adjustment when the optical pick-up has been replaced.

1. Load the test disc YEDS-18.(Chucking condition)
2. Connect the DC power supply to pins 1 and 2 of CP104 (with the + side to pin 2) and move the pick-up to the outermost side.
3. Turn the inside switch (start switch) to ON.(Connect the shorted clip to CP601)
4. Turn the pick-up to ON.(Connect the shorted clip between the base of Q3 and the ground.)
5. Connect the DC power supply or battery to pin 3 of CP104.(Ground:pin 4)
6. Adjust the output of DC power supply until the disc motor rotates.(1V~2V)
7. Press the PLAY key.(Focus is ON)
8. Connect the oscilloscope to pin 3 of TP103.
9. Connect the pin 3 of TP104 and pin 2 of TP103.
10. While confirming the waveform of the pin 3 of TP103, move the pick-up manually to the outermost track of the disc and perform adjustment for the maximum amplitude of vibration at the grating adjustment point.

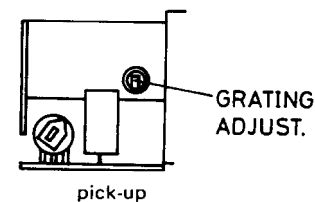


Fig-45

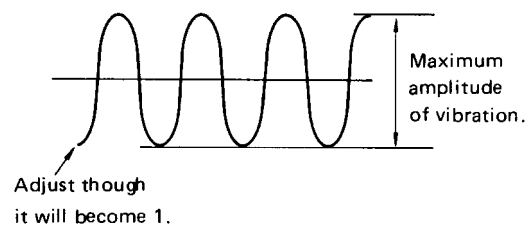
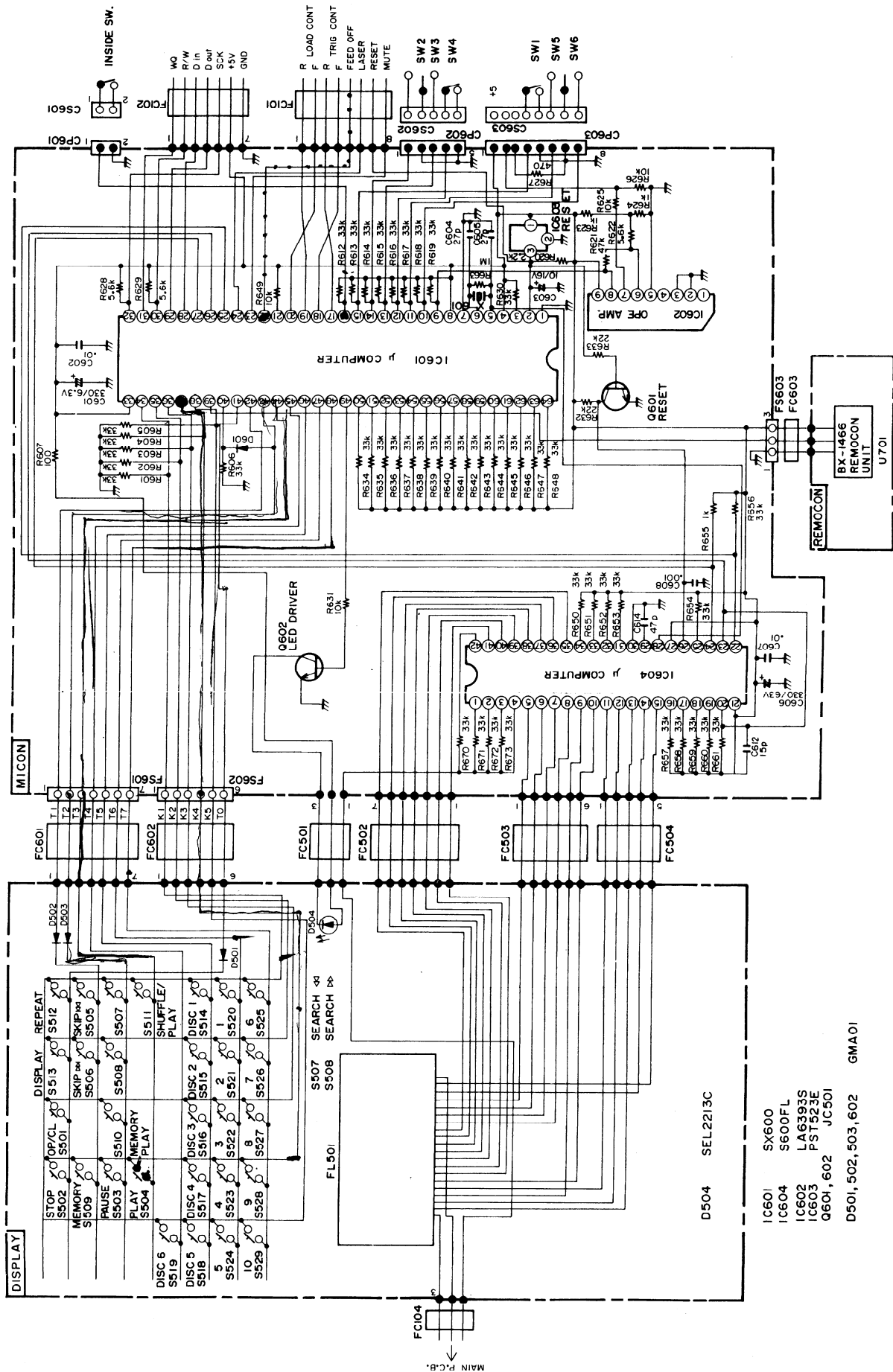


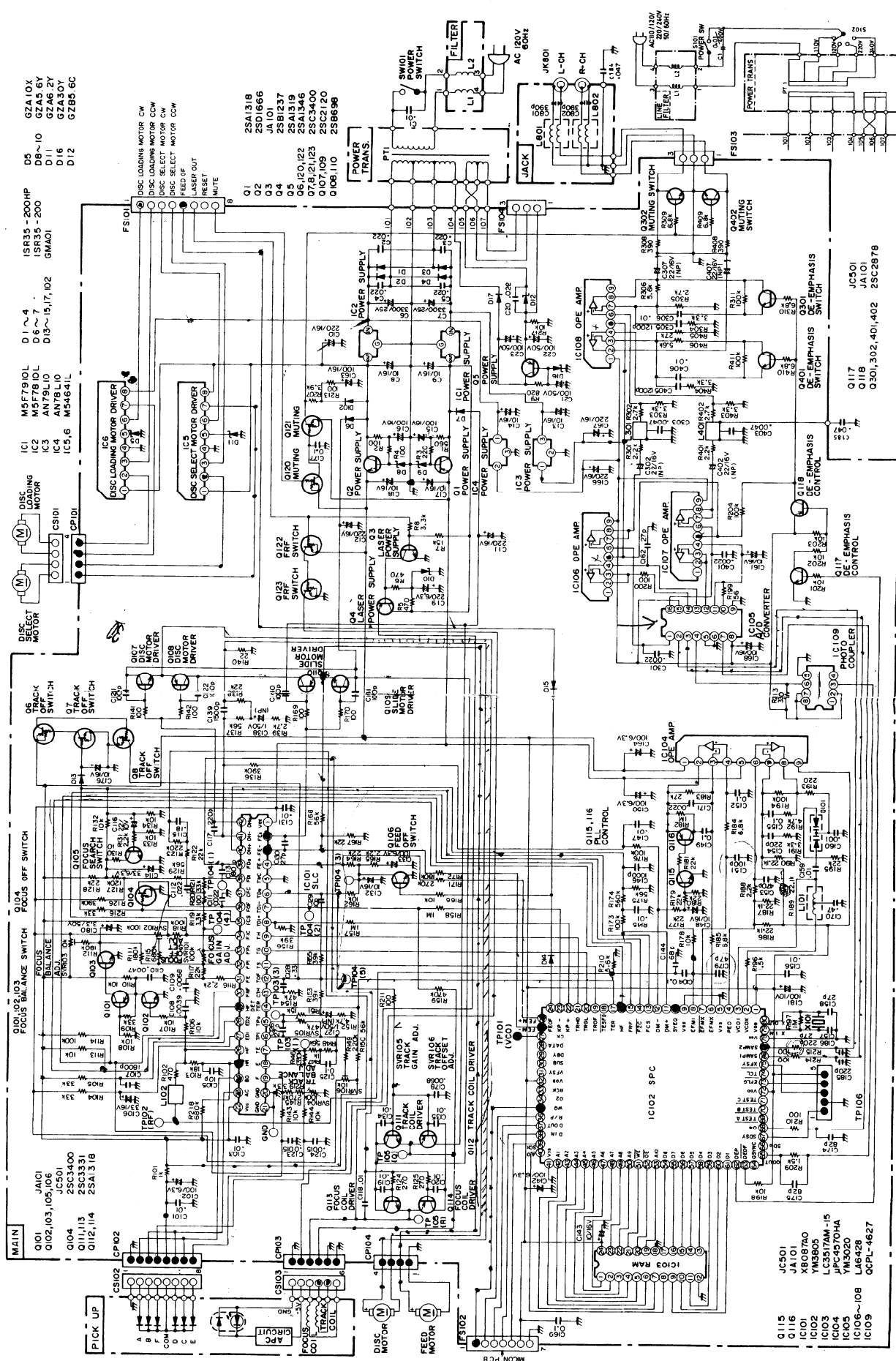
Fig-46

SCHEMATIC DIAGRAM

CONTROL CIRCUIT SECTION



D5	GZA10X
D8~10	GZA5.6Y
D11	GZA6.2Y
D16	GZA30Y
D12	GZB5.6C



X-C600**MICROCOMPUTER PC BOARD**

CIRCUIT NO.	PART NO.	DESCRIPTION
ICs		
IC601	22240136	SX600
IC602	22240104	LA6393S
IC603	22240105	PST523E-2
IC604	22240137	S600FL
Transistors		
Q601, Q602	2212485, 2211255 or 2212115	JC501-Q, 2SC1815-GR or 2SC2458-GR
Diode		
D601	223163 or 223180	1SS133 or GMA01
OSC element		
X601	3010126	KBR-4. 0MS, Ceramic
Capacitors		
C601, C606	354723319	330 μ F, 6.3V, Elect.
C603	354741009	10 μ F, 16V, Elect.
Plugs		
CP601	25055146	NPLG-2P-130
CP602	25055149	NPLG-5P-133
CP603	25055152	NPLG-8P-136
Sockets		
FS601	24505195	7P
FS602	24505197	6P
FS603	24505196	3P

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

REMOTE CONTROL CIRCUIT PC BOARD

CIRCUIT NO.	PART NO.	DESCRIPTION
U701	24130002	BX1466, IC

OUTPUT TERMINAL PC BOARD

CIRCUIT NO.	PART NO.	DESCRIPTION
JK1	25000003	Terminal
L801, L802	231066	NCH-1118, Choke coil
C801, C802	372523914	390pE $\pm$ 5%, 50V, Styrole capacitor

LINE FILTER PC BOARD

CIRCUIT NO.	PART NO.	DESCRIPTION
L1, L2	231142	 40 μ H, Choke coil
	25108018	Terminal

