DX-1500
DX-2500

SERIAL NO. 329(

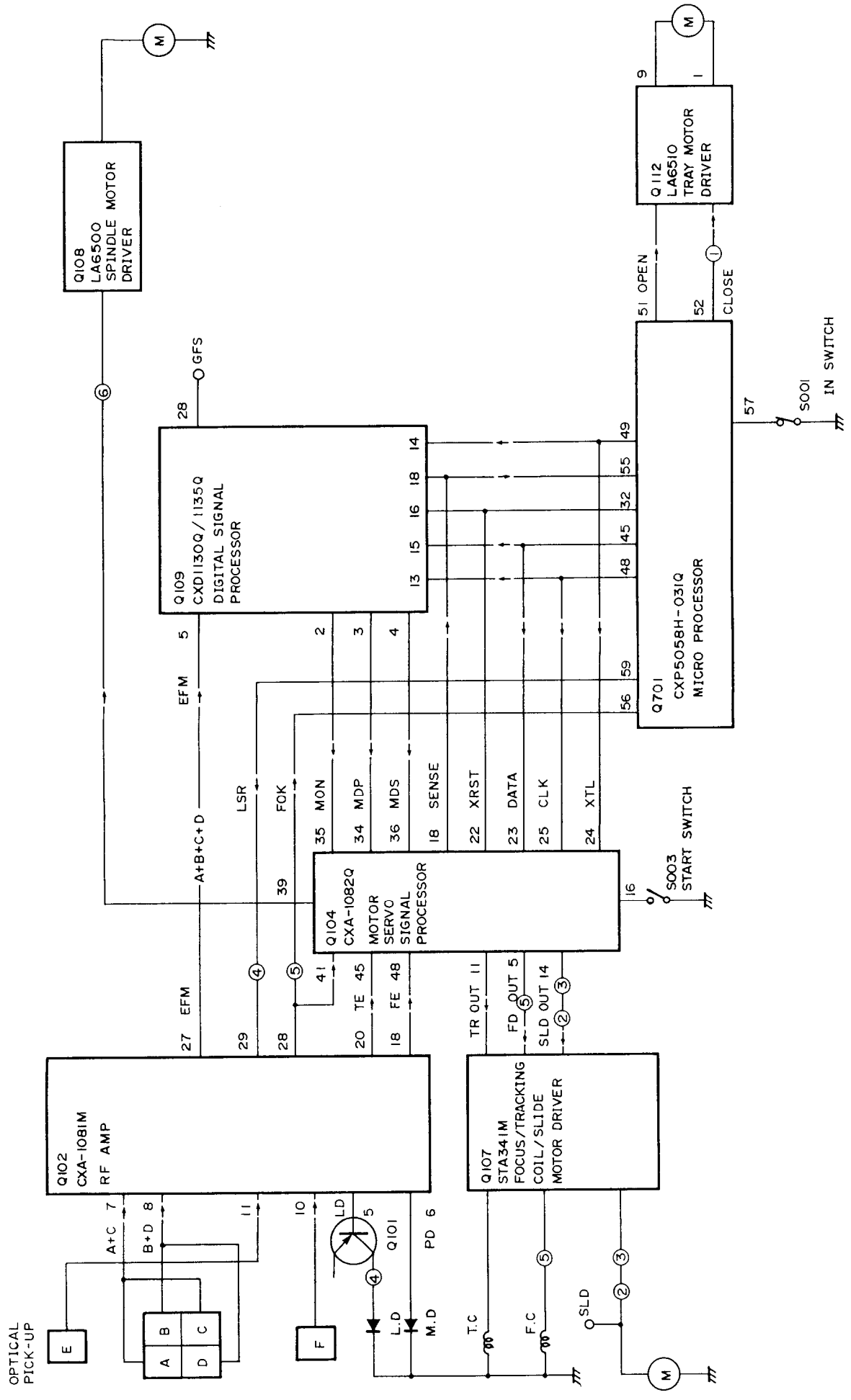
ONKYO SERVICE MANUAL

COMPACT DISC PLAYER
TROUBLESHOOTING AND REPAIR
MODEL DX-1500/DX-2500

For additional information see DX-2500 service manual.

ONKYO®
AUDIO COMPONENTS

OPERATION WHEN POWER IS TURNED ON



〈Fig.1〉

1. Close the tray (even if the tray is shut, the operation is the same).
About 1 second after power is turned ON, the Q701 close terminal goes low, Q112 pin 1 goes high (4V), pin 9 goes low, and the tray IN switch turns ON.

2. Optical pickup return to innermost circumference
When Q701 receives the data of the IN switch being ON, the command is given from Q701 (XTL, CLK, DATA) to Q104 to return the pickup to the inner circumference, SLD terminal goes low (−5V), the slide motor turns ON, the pickup returns to the innermost circumference, and the start switch turns ON.
XTL: Command execution CLK: Clock for command
DATA: Command content

3. Return of optical pickup to top area
The S.SW terminal interprets the data of the start switch going ON, and in order to return the pickup to the top area, the SLD OUT terminal goes high momentarily, the slide motor goes ON when the SLD OUT becomes high, the pickup returns to the top area, and the start switch goes OFF. This data is transmitted to Q701 sense terminal from Q104.

4. Optical pickup light emission
The LSR terminal goes from 5V to 0V, the APC circuit operates, the Q101 collector goes to 2V, and the pickup emits light.

5. In order to confirm the existence or non-existence of a disc, the focus coil moves up and down 3 times.
The moment the pickup emits light, a command is given from Q701 to Q104 to move the focus coil, 3 triangular wave pulse are issued from the FO OUT terminal, 3 triangular wave pulses are issued from the Q107 FO terminal, and the focus coil moves up and down 3 times. (When there is no disc, the operation ends.)
When there is a disc, with the A + C and B + D and signals internal to the IC of Q102, addition and subtraction are carried out, and at the point that is obtained for focus, FOK goes high, and that data is given to Q701 from Q102.

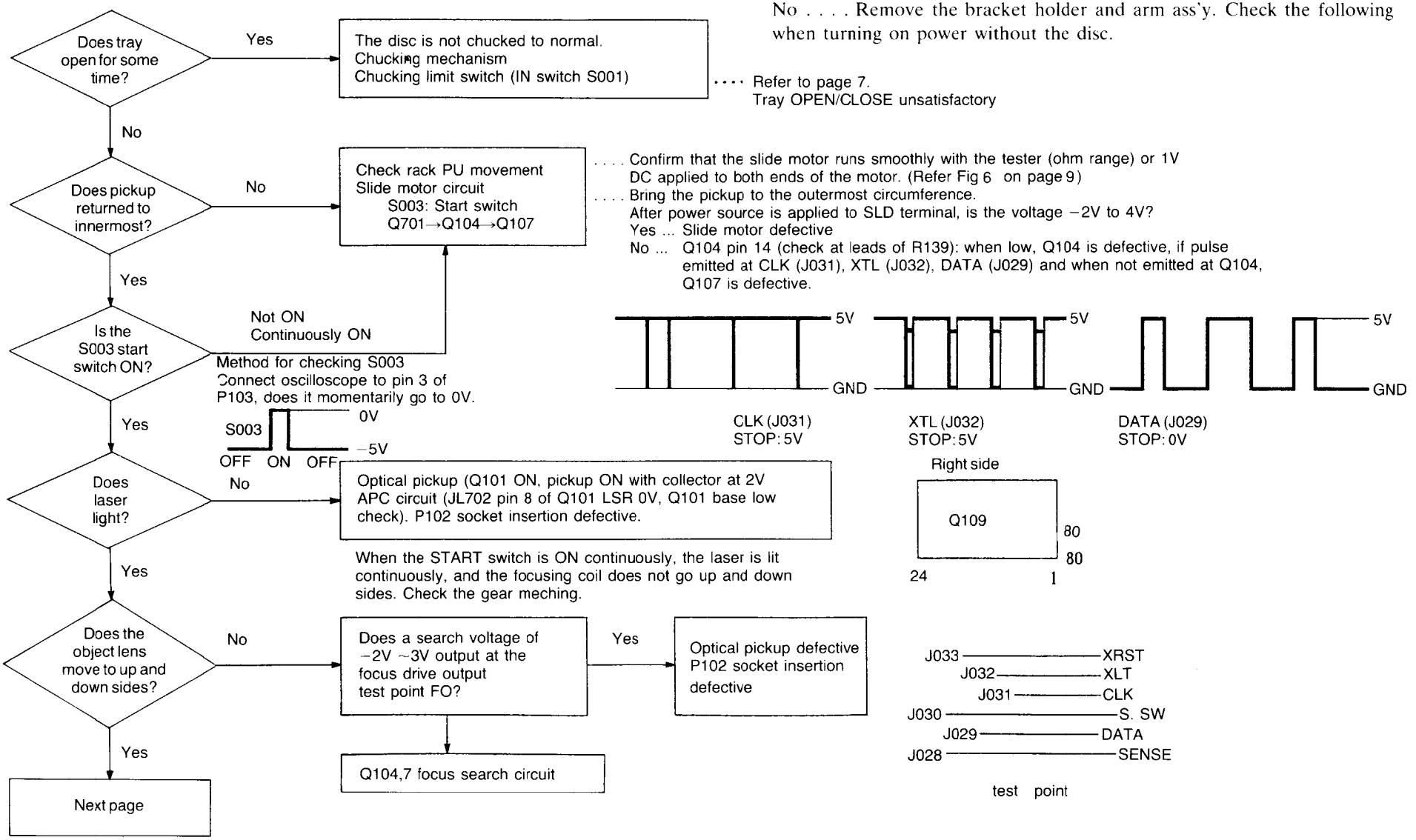
6. Making spindle motor rotate
Next, when the command is given from Q701 to Q109 to make the spindle rotate, the MDS terminal goes high, the SPD OUT terminal goes high (+4V), the spindle begins to rotate, the tracking servo and PLL lock, CLV starts, and TOC is read from the HF signal.
(GFS terminal goes high: 5V)
When the TOC is read, the display use data (sub codes) is fed from Q109 to Q701, the entire number of musical selections and the entire performance time is displayed.

TROUBLESHOOTING GUIDE

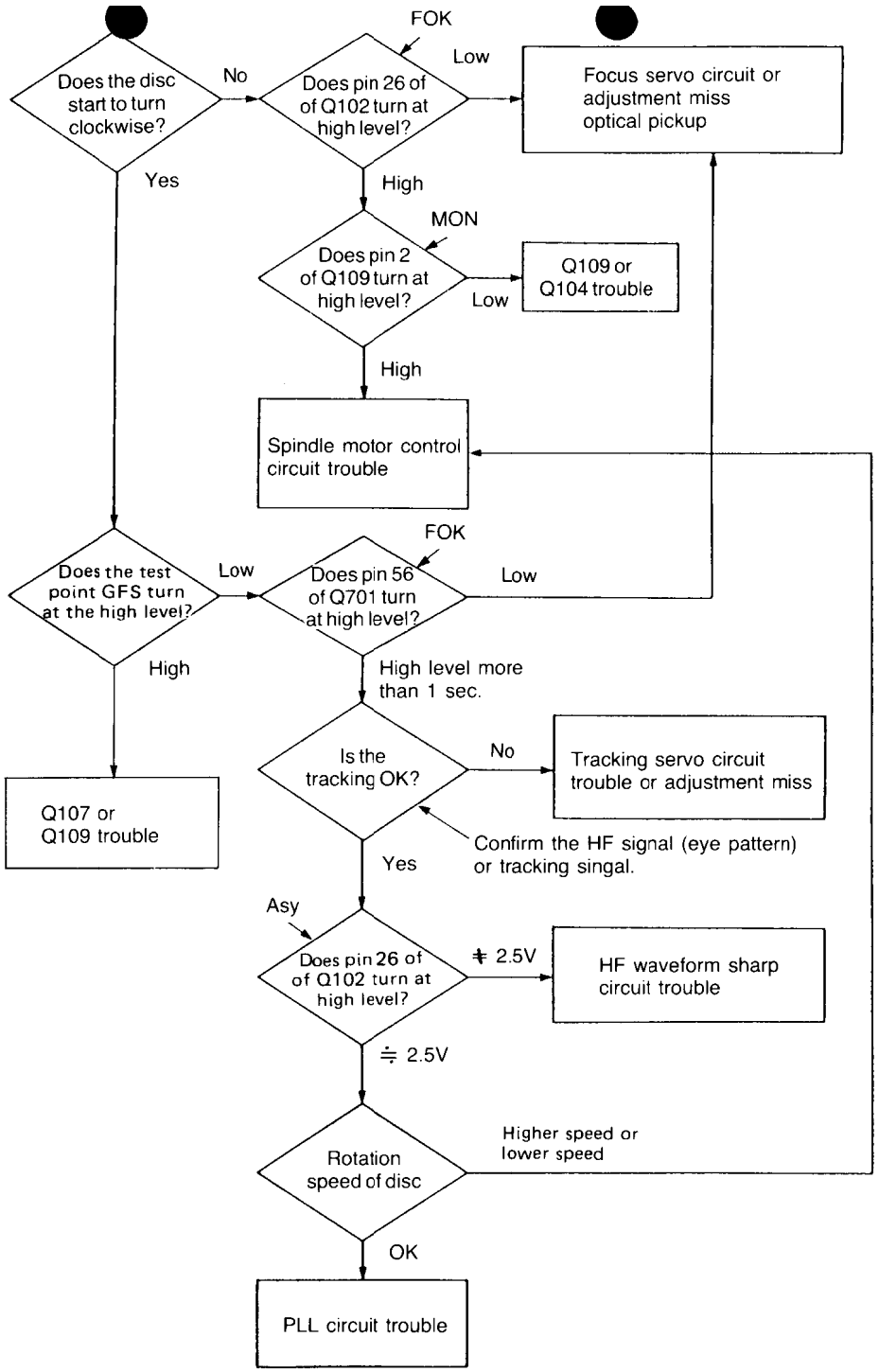
Symptom: Defective reading (No RF signal emitted)

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

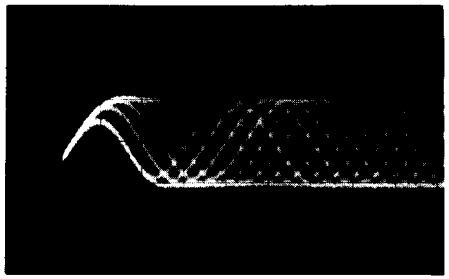
1. Remove the top cover.
2. Does the disc turn clockwise? . . . . . Yes . . . . . Next page
   No . . . . Remove the bracket holder and arm ass'y. Check the following when turning on power without the disc.



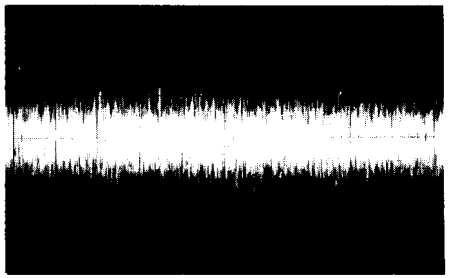
NOTE: There is the possibility that the pickup lens is so dirty that it is impossible to read. Clean with a lens cleaner.



- Use the high impedance probe. (10:1)
- Play the track 2 of test disc. (YEDS-18)



RF signal
P109 pin 2 (HF)
V: 50mV/div
H: 0.5μS/div

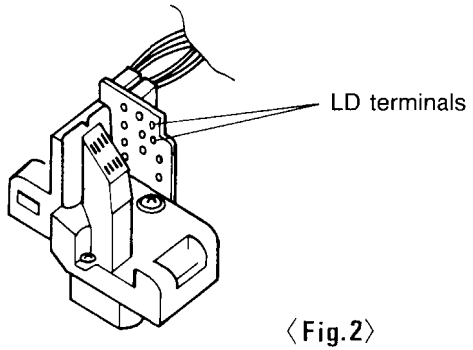


Tracking signal
P108 pin 4 (HF)
V: 20mV/div
H: 0.5mS/div

Care should be taken with the optical pickup.

The optical pickup is sensitive to static electricity, surge currents, and other high electrical noise, and because there is the possibility of damage to performance, in the handling of the pickup, the utmost care must be taken, particularly with regard to static electricity.

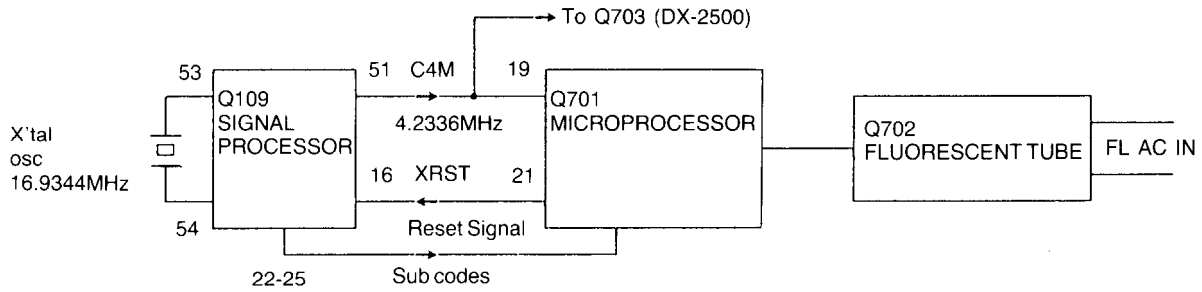
1. When checking the laser terminal, avoid making connections using the probes of a tester or oscilloscope, or an ordinary power supply.
2. When replacing the optical pickup, first short the LD terminals and remove the connector. Also, when attaching the new optical pickup, after attaching the connector, unsolder the LD terminals.



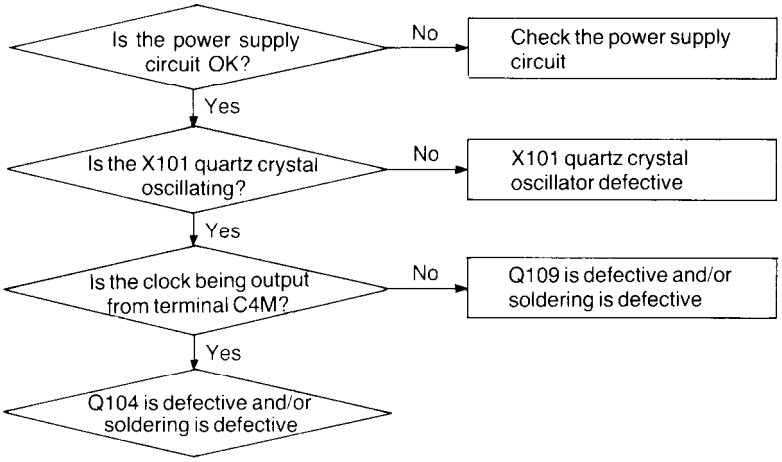
〈Fig.2〉

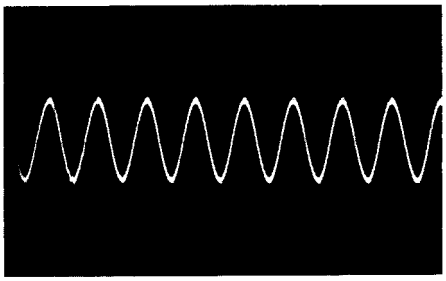
Optical pickup

Symptom: Operation does not occur and the display of the fluorescent tube is random



When power is turned on, the internal RESET circuit of the Q701 operates, the microprocessor goes to its initial condition, and a signal is output from XRST terminal to RESET Q104 and Q109. In addition, the microprocessor clock uses the 1/4 frequency division of the X101 block of Q104. This signal is output from pin 51 C4M of Q109.

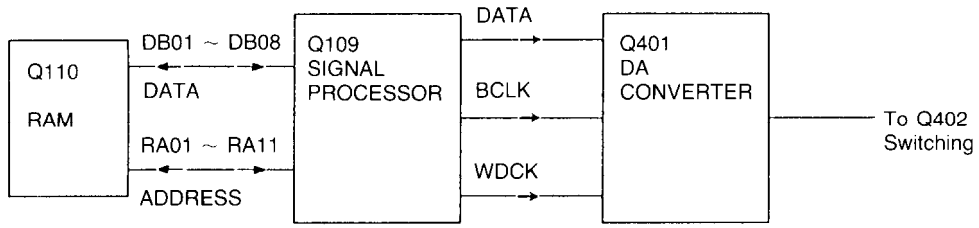




Clock
Q109 pin 53
V: 0.2V/div
H: 0.1μS/div

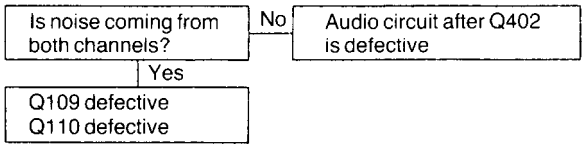
CAUTION: When the display fluorescent tube at times goes into random display condition, if the tray is in the operating condition, a check should be made for defective soldering of the X101 and a defective quartz crystall oscillator as well as defective soldering at the C4M terminal.

Symptom: Noise is emitted

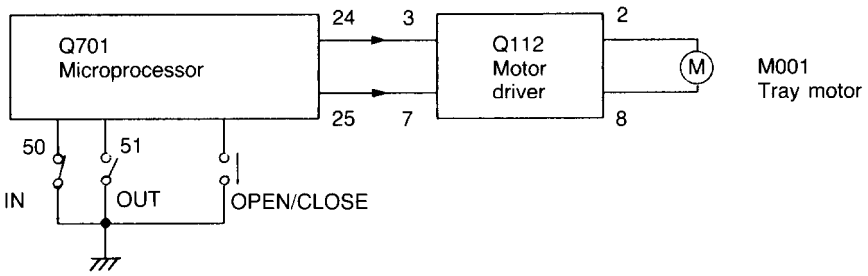


The main cause of noise (sound distortion) occurs from the exchange of data between the processor and the RAM, and due to a defective processor or RAM, and defective soldering, there is a lack of address or a repetition, and the data inside the processor cannot be corrected, causing the noise to be emitted.

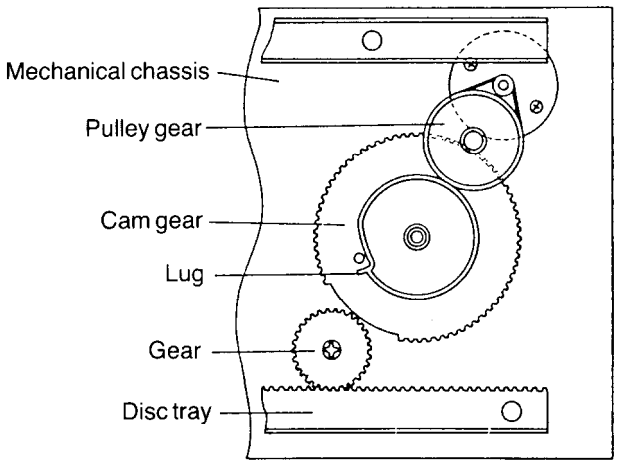
Because the noise component cannot be identified even if it is observed in the waveform, the IC must be replaced.



Symptom: Tray OPEN/CLOSE unsatisfactory



The open/close condition is detected by the IN/OUT switch, this information is fed back to the microprocessor, and by means of pushing the OPEN/CLOSE switch is pushed, the OPEN terminal goes from 5V to 0V, pin 8 of Q112 goes to 4V, and pin 2 goes to $-2 \sim -4$V, the tray motor turns clockwise to drive the belt, pulley gear, and cam gear. Next, the cam gear and gear mesh, and the tray comes out to the front surface. When the tray comes out, the OUT switch turns ON, that information is transmitted to the microprocessor, and the tray motor is turned off. When the tray closes, the CLOSE terminals goes from 5V to 0V, and the reverse operation is carried out.



〈Fig.3〉

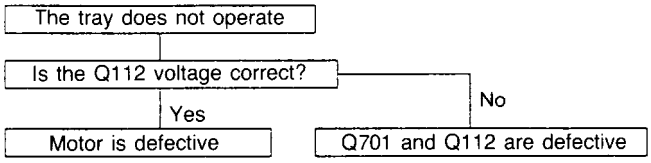
Voltage of Q112

Pin 2	Pin 8	Pin 3	Pin 7	MODE
O	O	H	H	STOP
L	H	H	L	OPEN
H	L	L	H	CLOSE
OUTPUT		INPUT		

H:4V L:−4V H:5V L:0V

After the tray closes, it immediately comes out again . . .
The IN switch does not go ON.

After the tray comes out, it immediately closes again . . .
The OUT switch does not go ON.



Symptom: Interrupted sound (skipping)

Possible causes are scratches on the disc, and dust and clouding of the pickup lens (soiling of the lens). (Wipe clean with a soft cottontipped cleaner. If there is heavy soiling, wipe clean with a lens cleaner.)

Is the lock screw completely released? — No → Turn the lock screw counter-clockwise.

Yes

Is there noise carried with the RF (HF)? — No → Defective pickup

Yes

Is the lead wire from the pickup set properly? — No → Set the lead wire in the proper form

Yes

Is the adjustment still in the proper position? — No → Readjust
Focus gain/offset
Tracking offset/gain

Note: When the VCO free run frequency has shifted slightly, starting cannot be done from the outer direction, and this is a cause of skipping.

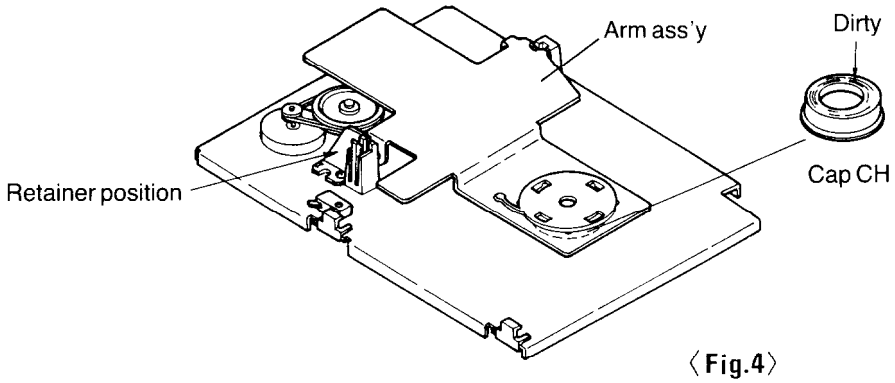
Yes

Remove the mechanism and apply 1V DC to both sides of the slide motor. (When starting, because the load is large, the operation may not occur.)

Does the pickup go to the outermost position without getting stuck? — No → Soiled shaft
Insufficient slide motor torque
Check mounting position of PU rack

Yes

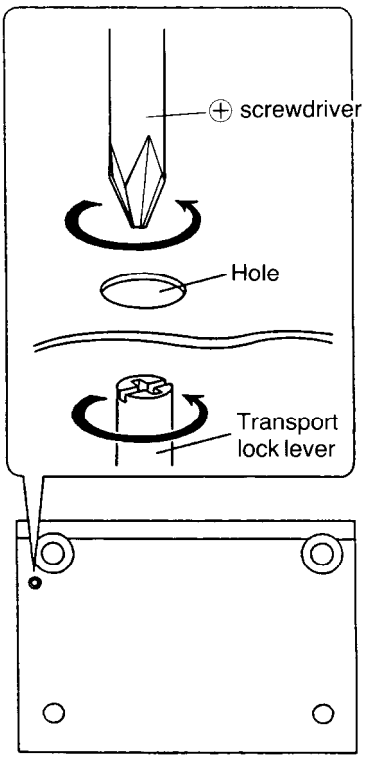
Retainer position faulty
Distorted arm ass'y
Dirty of arm CH



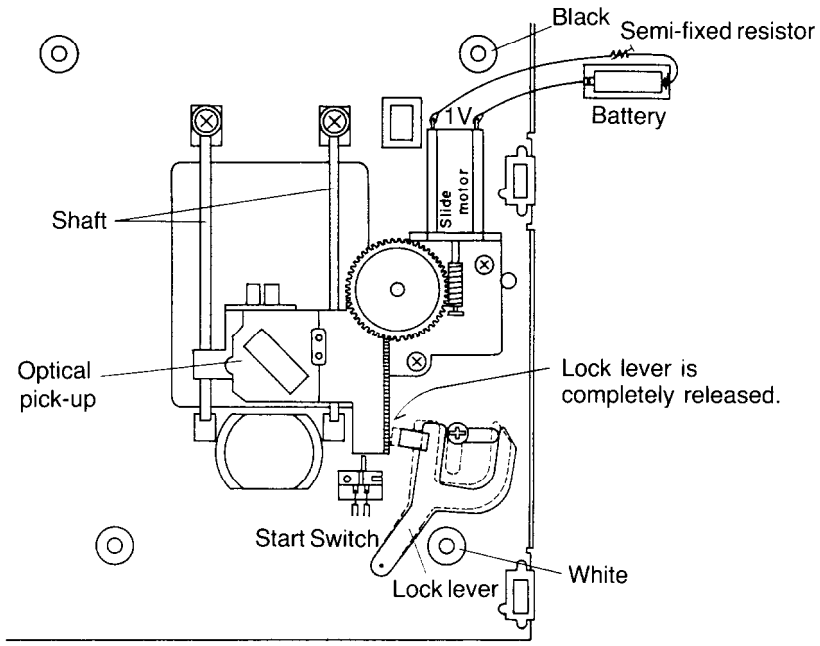
〈Fig.4〉

Regarding the lock for transport protection

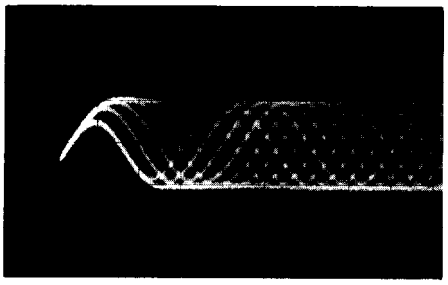
For the protection of the laser and optical parts during transport, a lock is provided on the bottom surface of the machine. When using the machine, turn the transport lock lever 180° counterclockwise to release the optical pickup. If the lock is not turned completely, the section at the beginning of the recording will be interrupted. When this symptom occurs, check the position of the lock lever.



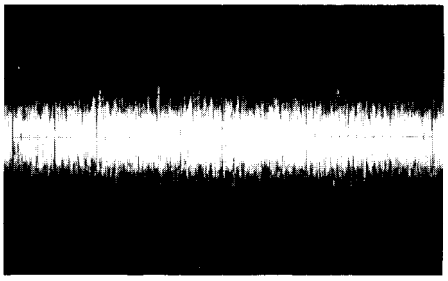
〈Fig.5〉



〈Fig.6〉



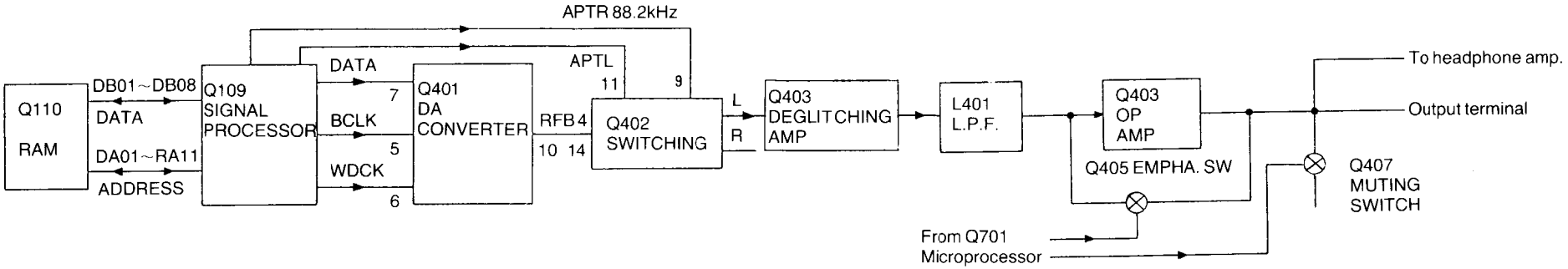
RF signal
P109 pin 2 (HF)
V: 50mV/div
H: 0.5μS/div

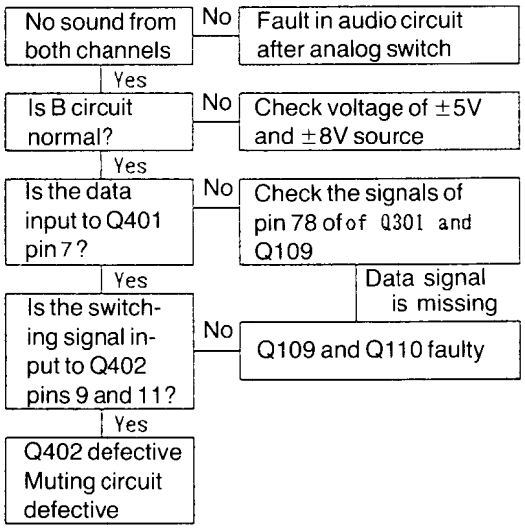


Tracking signal
P108 pin 4
V: 20mV/div
H: 0.5mS/div

NOTE: Replace the disc motor when there is the periodicity noise on the tracking signal.

Symptom: No sound



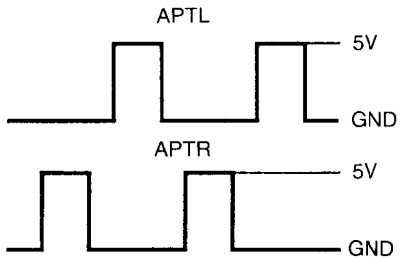


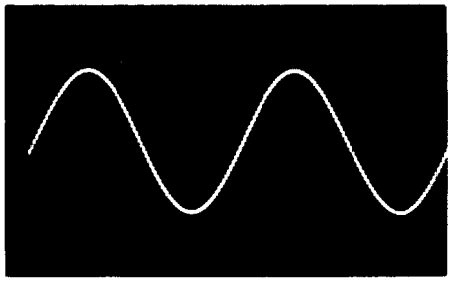
Analog circuit

This analog circuit converts the digital signal stored in memory to the original analog signal.

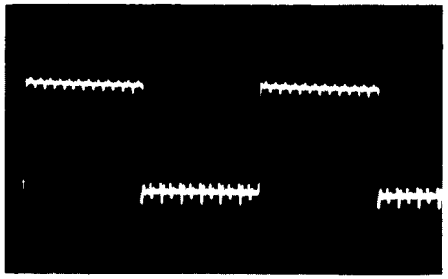
With CXD1130Q/5Q (Q109), the demodulated digital signal which has once been stored in the RAM (Q110), is transmitted to the CXD1130Q/5Q that has been synchronized to the crystal clock. This signal is transmitted from the DATA terminal and is input to the Q401 DA converter pin 7 DATA terminal; here the analog signal is converted, then the switched L/R signal at 88.2kHz is output from pin 10 and is input to pins 4 and 14 of Q402 analog switch. Also, at the same time, the 88.2kHz switching signal is input to pins 9 and 11 of Q402, and from these signals, at the 88.2kHz rate, the left and right channel signals are obtained from pins 13 and 1.

Next, in order to remove the distortion created by the DA converter, after the distortion is removed by the Q403 and Q404 deglitching amplifier, after the signal below 20kHz is input to the de-emphasis amplifier, it is output by means of the L401 and L402 LPF.

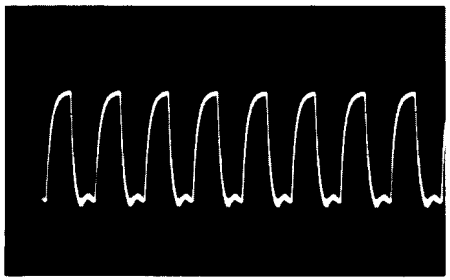




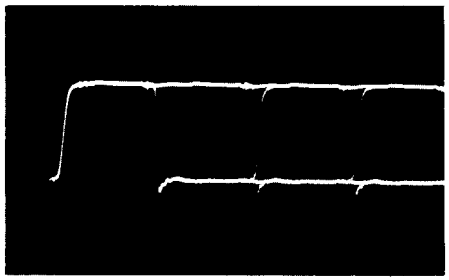
RFB
Q401 pin 10
V: 0.1V/div
H: 0.2mS/div



WDCK
Q401 pin 6
V: 0.2V/div
H: 1μS/div



BCLK
Q401 pin 5
V: 0.2V/div
H: 0.2μS/div



DATA
Q401 pin 7
V: 0.2V/div
H: 0.1μS/div

CIRCUIT DESCRIPTIONS

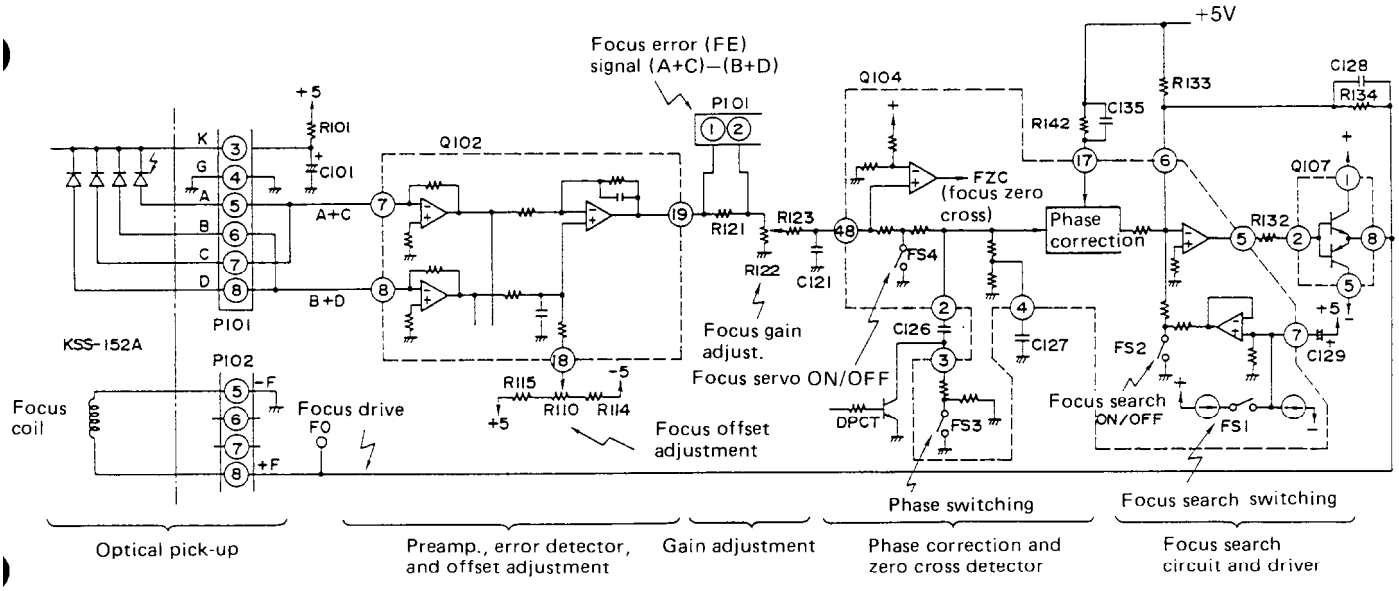


Fig. 1 Focus servo circuit

1. Focus servo circuit

From the optical pickup objective lens, the emitted laser beam is focused on the disc reflecting surface, an this circuit controls the movement of the lens up and down.

1-1. Error detecting circuit

The error is detected by means of the astignatic aberration method and obtains its focus error signal from the optical pickup output signal (A+C)−(B+D).

The individual signals (A+B) and (C+D) input to pins 7 and 8 of Q102 are subtracted by means of the IC internal op amp, and from pin 19, the F.E. signal is output. Also, in order to eliminate the focus error, offset adjustment is carried out by the semi-fixed resistor R110 of pin 18 of Q102.

1-2. Phase correction and driver circuit

By means of the semi-fixed resistor R122, the gain adjusted F.E. signal passes by way of the phase correction circuit from pin 48 of Q104, and from pin 5 of Q104 to the driver Q107, and is feedback to the coil used for driving the optical pickup KSS-152A objective lens. In addition, there are the FS4 servo ON/OFF switch and FS3 phase characteristic selector switch.

1-3. Focus zero cross circuit and focus search circuit

In order to have mandatory drive of the objective lens in the capture range of only 10μm at the focus point it is necessary to turn off the above mentioned FS4 and close the servo loop. The timing diagram for that operation is shown in Fig. 2.

The triangular wave generated by means of the focus search circuit internal to Q104 shifts the objective lens up/down direction, and at the correct focus point, the fall of F.E. signal is detected by the focus zero cross (FZC) circuit to close the servo loop. At this time, it is necessary that the focus OK (FOK) signal be in the high level. In Fig. 2, the dotted line is the waveform of the focus capture failure.

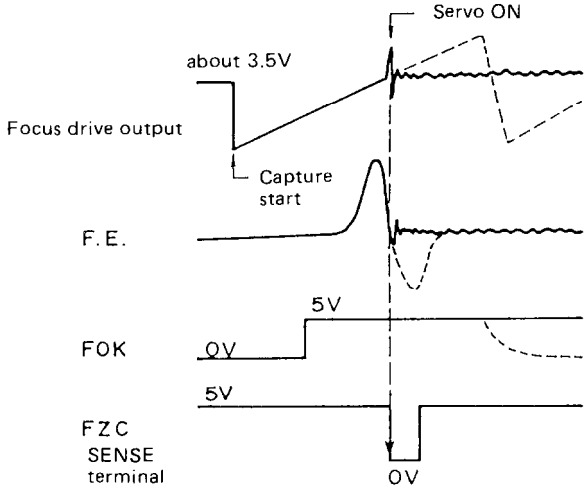
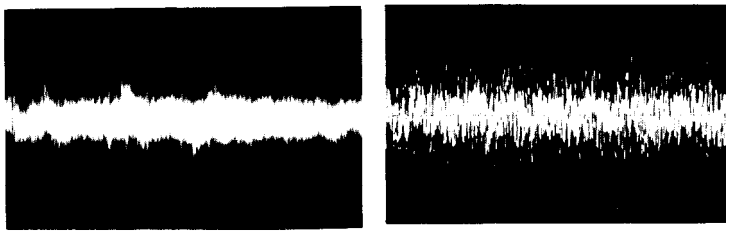


Fig. 2 Capture operation of focus



Focus signal
P108 pin 2
V: 10mV/div
H: 0.5mS/div

Focus signal
Q107 pin 2
V: 50mV/div
H: 0.5mS/div

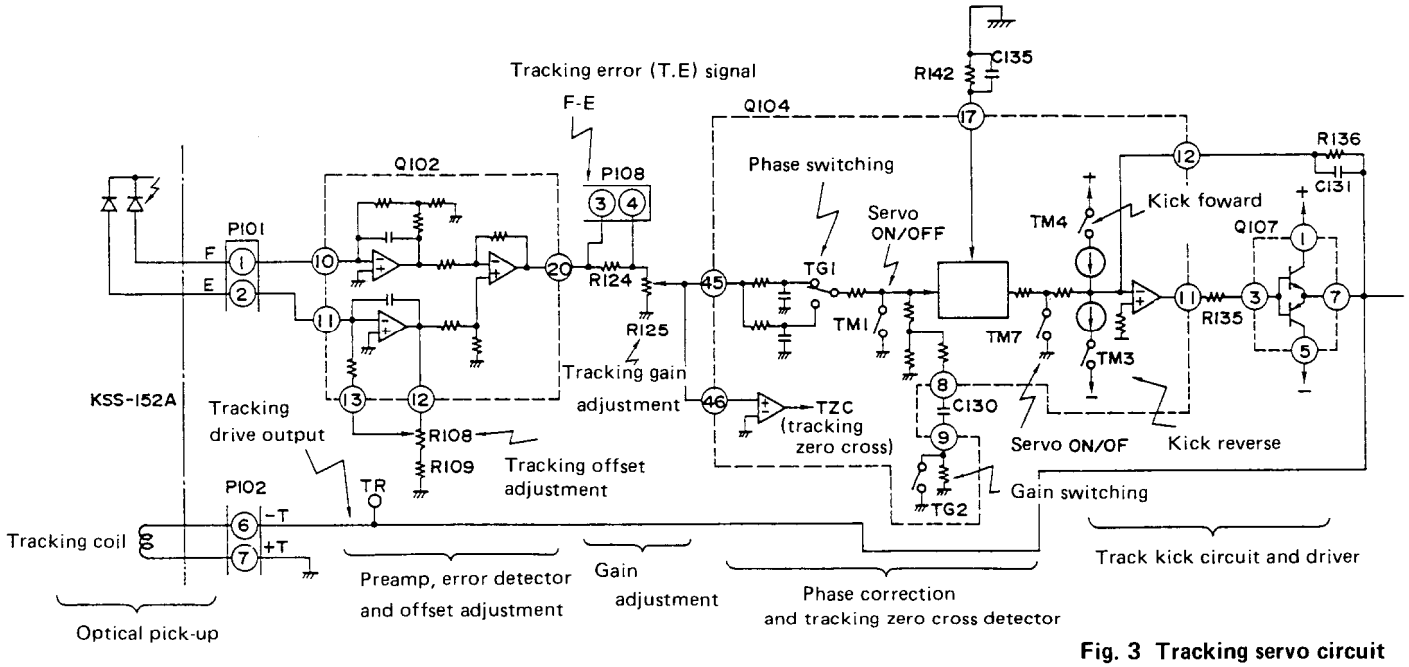


Fig. 3 Tracking servo circuit

2. Tracking servo circuit

On the disc at a pitch of 1.6μm, the laser beam accurately traces the center of the pits cut into the disc, and this is the control circuit that shifts the objective lens in the radial direction.

2-1. Error detection circuit

The F-E is obtained from the tracking error (T.E.) signal by means of a 3 beam method. The F.E. signal input to pins 10 and 11 of Q102 is subtracted internally, and is output as the T.E. signal from pin 20. R108 is the semi-fixed resistor control for tracking offset.

2-2. Phase correction and driver circuit

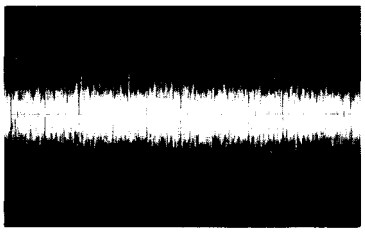
The T.E. signal adjusted for gain by means of the semi-fixed resistor R125 passes through the phase correction circuit from pin 45 of Q104, and from pin 11 by way of driver Q107 objective lens. TM1 and TM7 are used as the tracking servo ON/OFF switches, and TG1 and TG2 respectively are used as the phase selector and gain selector switches.

2-3. Tracking zero cross and track kick circuit

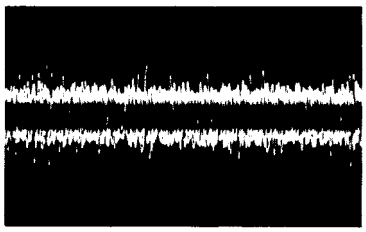
At the time the head comes out and when there is manual fast forward, in the event that is it necessary to skip over the track being traced, the T.E. signal receives a kick pulse, and by mens of this, shifting of the objective lens can be achieved.

TM3 and TM4 respectively are the switches for providing the forward and reverse direction kick pulses. Also, the tracking zero cross (TZC) circuit counts the number of tracks skipped over and produces the signal in order to determine the timing of the servo ON/OFF.

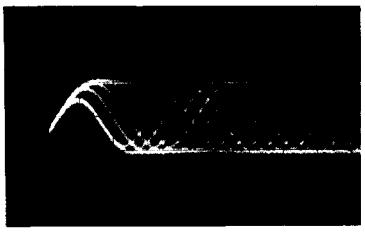
The ON/OFF command for these switches is output from the microcomputer.



Tracking signal
P108 pin 4
V: 20mV/div
H: 0.5mS/div



Tracking signal
Q107 pin 3
V: 0.1V/div
H: 0.5mS/div



RF signal
P109 pin 2 (HF)
V: 50mV/div
H: 0.5μS/div

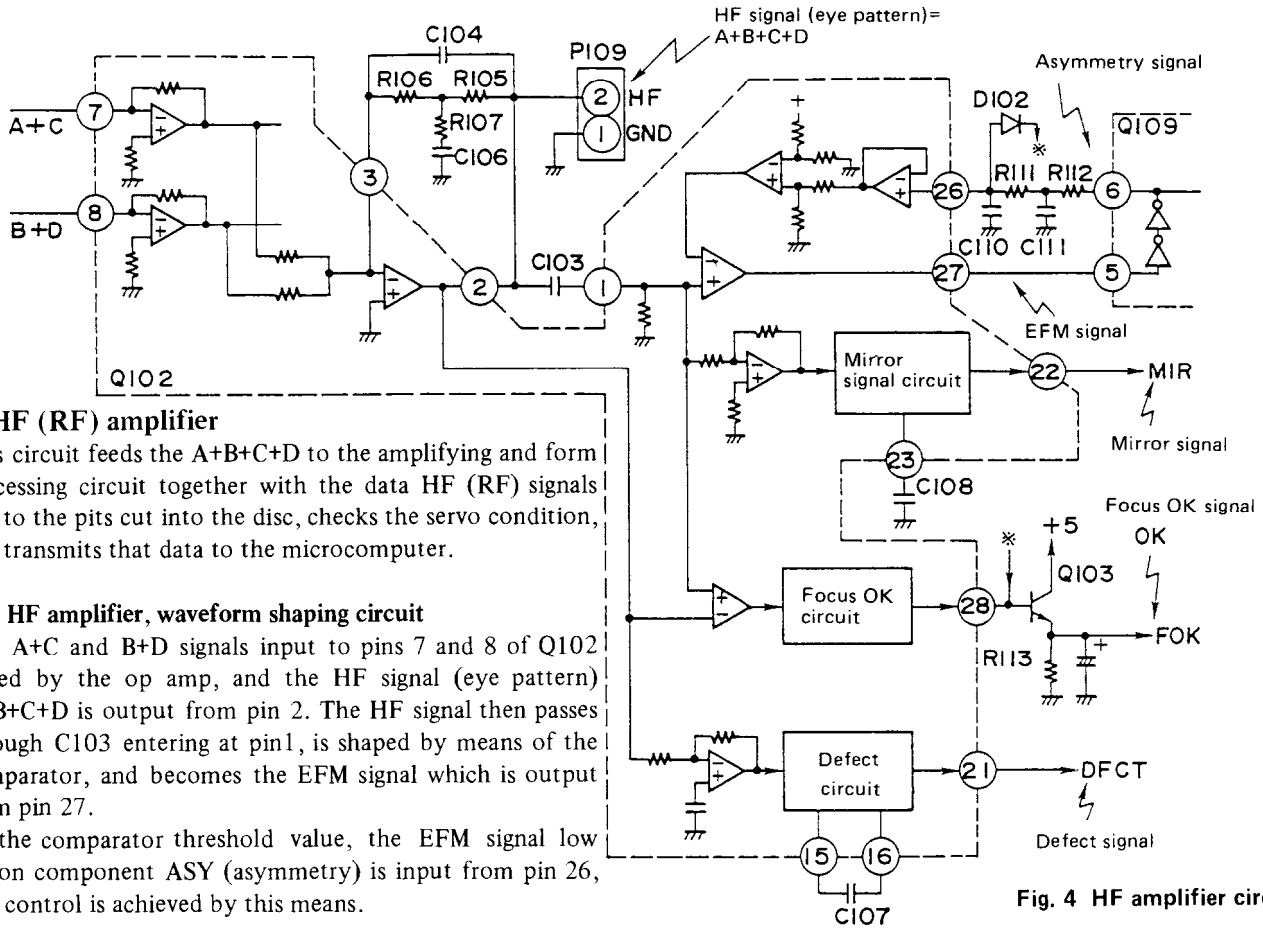


Fig. 4 HF amplifier circuit

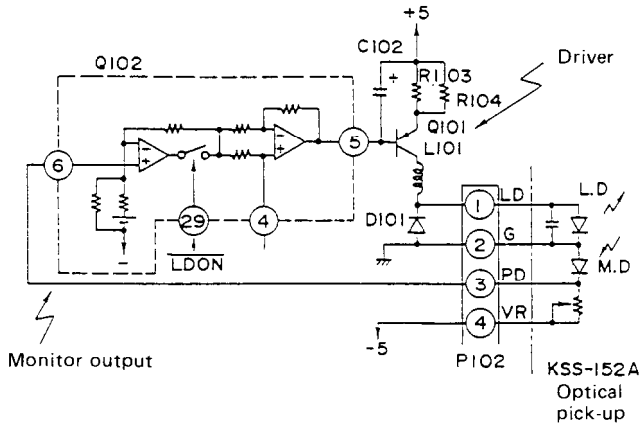


Fig. 5 APC circuit

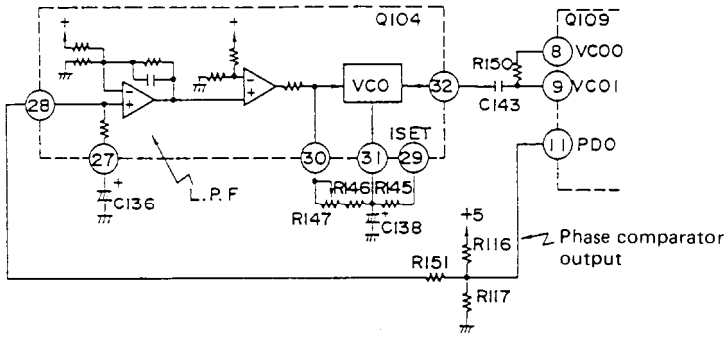


Fig. 6 PLL circuit

3. HF (RF) amplifier

This circuit feeds the A+B+C+D to the amplifying and form processing circuit together with the data HF (RF) signals due to the pits cut into the disc, checks the servo condition, and transmits that data to the microcomputer.

3-1. HF amplifier, waveform shaping circuit

The A+C and B+D signals input to pins 7 and 8 of Q102 added by the op amp, and the HF signal (eye pattern) A+B+C+D is output from pin 2. The HF signal then passes through C103 entering at pin1, is shaped by means of the comparator, and becomes the EFM signal which is output from pin 27.

In the comparator threshold value, the EFM signal low region component ASY (asymmetry) is input from pin 26, and control is achieved by this means.

3-2. MIR circuit, FOK circuit, and DFCT circuit

After the HF signal is processed the detection, shaping, etc, respectively the MIR, FOK, and DFCT signals are output from pins 22, 28, and 21.

3-2-1. MIR (mirror) signal

When the head is extended, at the time the signal becomes high at the disc track and between tracks, the number of tracks is counted, and this is used for determining the timing for the ON/OFF of the servo.

3-2-2. FOK (focus OK) signal

This signal goes high at the time the focus servo is required. (Refer to 1–3)

3-2-3. DFCT (defect) signal

If there is a defect (scratch, dirt, etc.) in the disc, this signal goes high, the servo and gain are controlled, and the circuit prevents a sound outburst.

4. APC circuit

By means of feedback from the monitor, this circuit controls the light output due to a bad condition resulting from the temperature characteristic of the laser diode.

For the pin 29 LDON (laser diode ON) signal, when the APC ON/OFF control signal is LOW, the laser is emitted.

5. CLV servo circuit

In the compact disc there is a CLV system (constant linear velocity), and at the replay position, because the disc rotary speed varies, the clock is taken out of the HF signal, and

the PLL circuit and its clock must be synchronized to control the spindle motor.

5-1. PLL circuit

As shown in Fig. 6, for the phase comparator, in Q109 the LPF and VCO are each built into Q104. The semi-fixed resistor R147 is the control for adjusting the 8.6436 MHz free run frequency (WFCK = 7.35 KHz).

5-2. Spindle motor control circuit

The output of the phase comparator (MDP) and frequency comparator (MDS) from pins 3 and 4 of Q109 is fed to pins 34 and 36 of Q104. Also, the spindle motor ON/OFF signal (MON) from pin 2 of Q109, and the phase selector signal (FSW) from pin 1, are output and fed to pin 36 of Q104. After these signals are processed in Q104, they are passed from pin 39 through the driver Q108, and are supplied to the spindle motor.

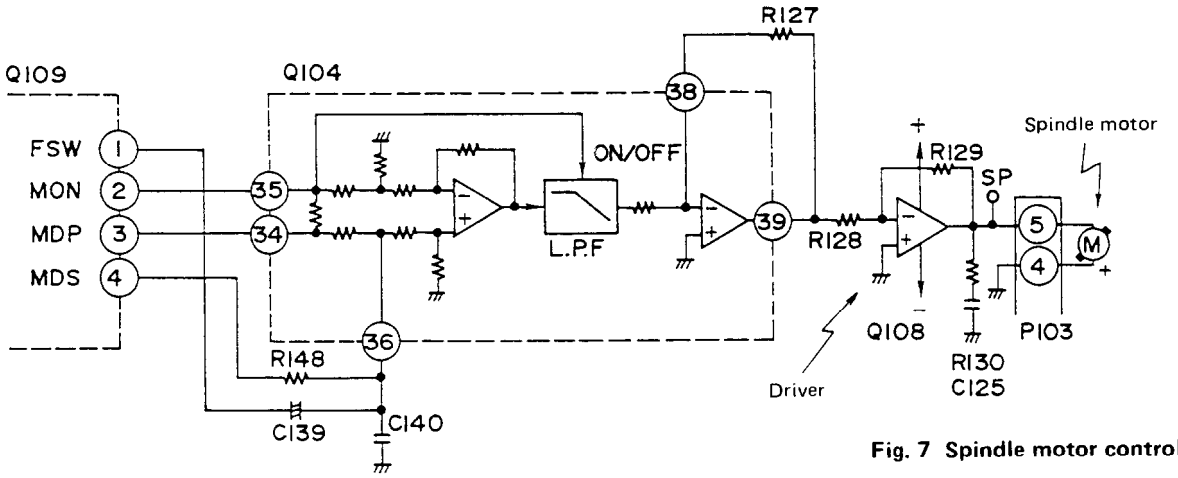


Fig. 7 Spindle motor control circuit

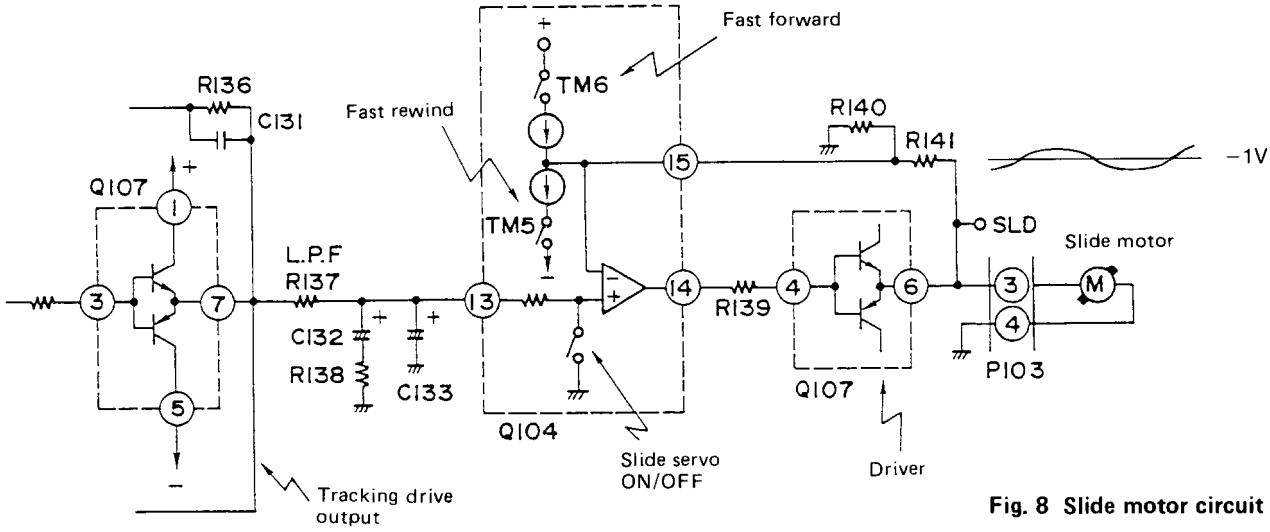


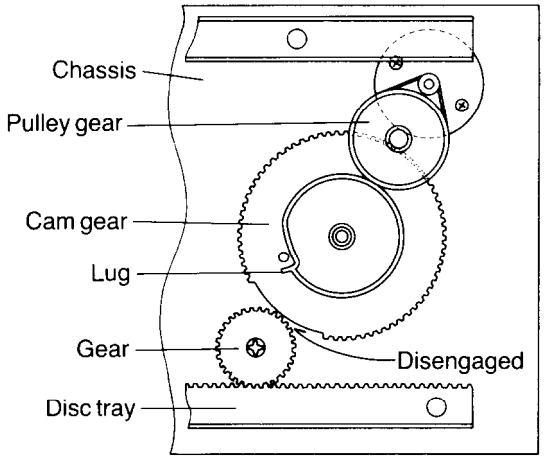
Fig. 8 Slide motor circuit

6. Slide motor circuit

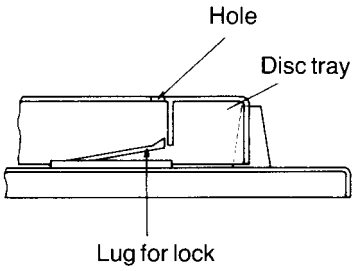
This circuit controls the slide motor which is used for moving the optical pickup from inside the disc to the outside. In the normal playback time, the low region component of the tracking driver output is amplified and fed to the motor, but when the head is extended, switches TM5 and TM6 internal to Q104 control the ON/OFF.

DISASSEMBLING PROCEDURES

Method for removing the tray



1. Set the position so that the cam gear and gear are disengaged.
2. Pull the tray to the front.

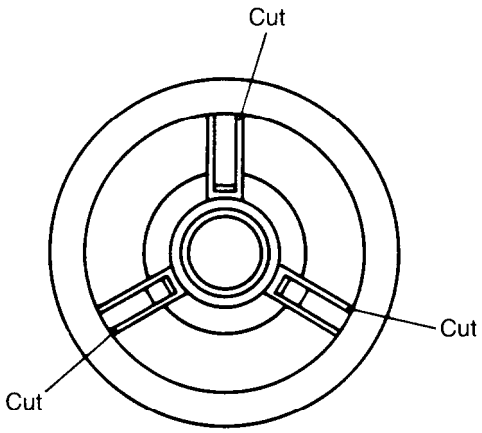


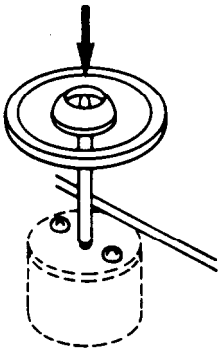
3. Insert a small flat-bladed screw driver into the hole section of the right side of the back of the tray, and push the lug used for locking the tray to bring the tray to the front.

CAUTION: When inserting the tray, the cam gear and gear parts are not in the meashing position.

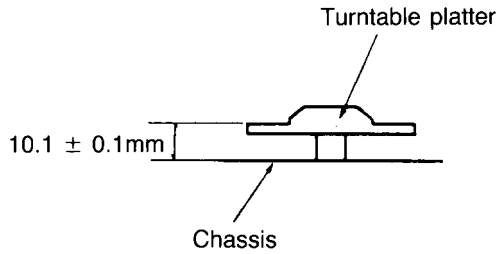
Method for removing disc motor

1. Remove the tray.
2. Remove the holder, then remove the arm.
3. Remove the 3 screws that fasten the mechanism chassis to the main chassis.
4. Cut the turntable platter with a nipper.
5. Remove the soldering of the disc motor, and remove the 2 fastening screws.
6. When inserting the turntable platter onto the motor shaft, hold the platter at a right angle to the motor shaft and push it onto the shaft until it touches the bottom.

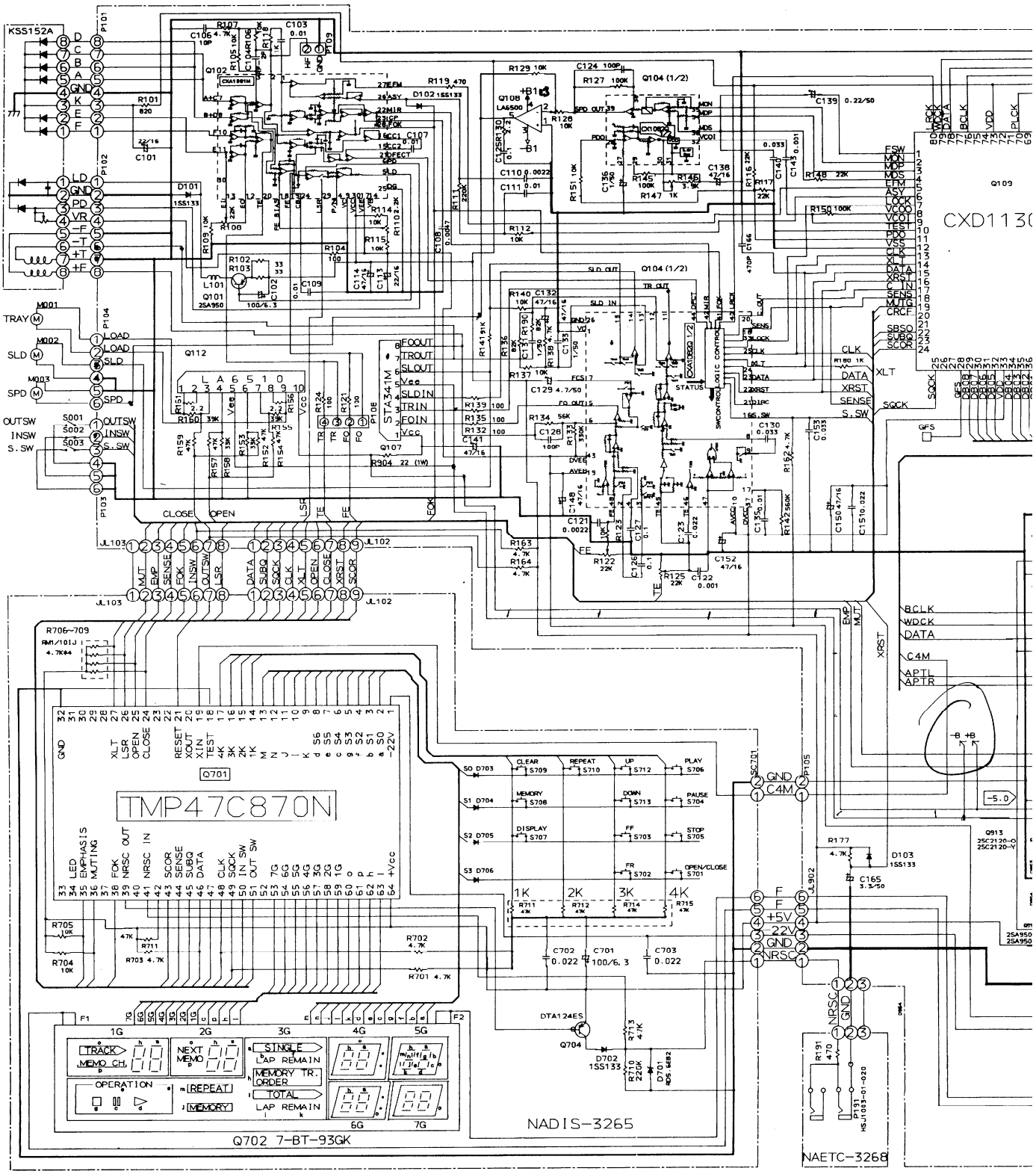




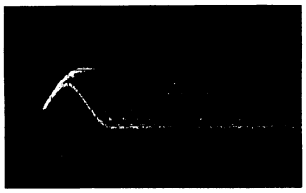
Height of turntable platter.



SCHEMATIC DIAGRAM

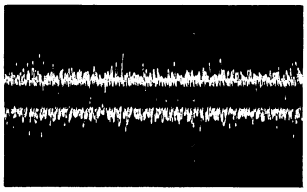


Play the track 2 of test disc YEDS-18.
Use the high impedance probe (10: 1)

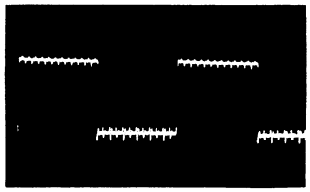


RF signal
P109 Pin2 (HF)
V:50mV/div.
H:0.5μs/div.

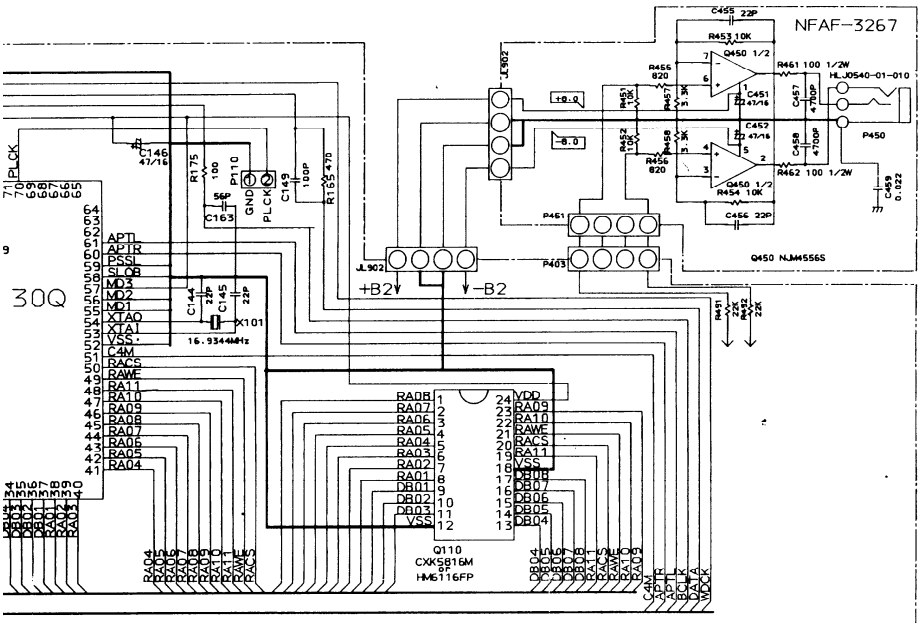
Focusing signal
P108 Pin2
V:10mV/div.
H:0.5ms/div.

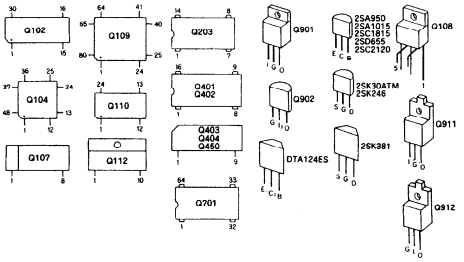


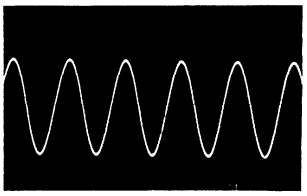
Tracking signal
Q107 Pin3
V:0.1 V/div.
H:0.5ms/div.



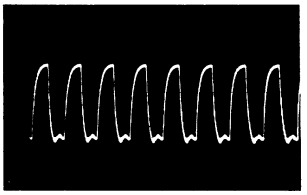
WDCK
Q401 Pin6
V:0.2V/div.
H:1μs/div.



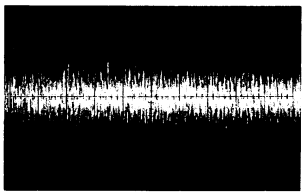




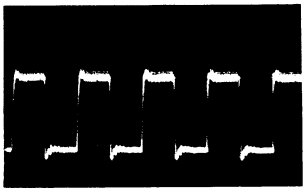
Audio signal
Q403 Pin6
V:50mV/div.
H:0.5ms/div.



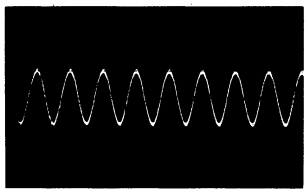
BLCK signal
Q401 Pin5
V:0.2V/div
H:0.2μs/div.



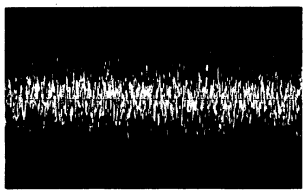
Tracking signal
P108 Pin4
V:20mV/div.
H:0.5ms/div.



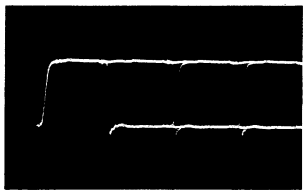
Clock
P110 Pin1 (PLCK)
V:0.2V/div.
H:0.1μs/div.



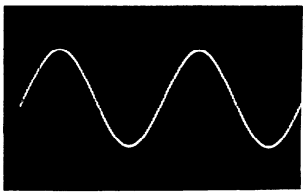
Clock
Q109 Pin53 (C145)
V:0.2V/div.
H:0.1μs/div.



Focusing signal
Q107 Pin2
V:50mV/div.
H:0.5ms/div.



DATA signal
Q401 Pin7
V:0.2V/div .
H:0.1μs/div.



Q401 Pin10
V:0.1V/div.
H:0.2ms/div.

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