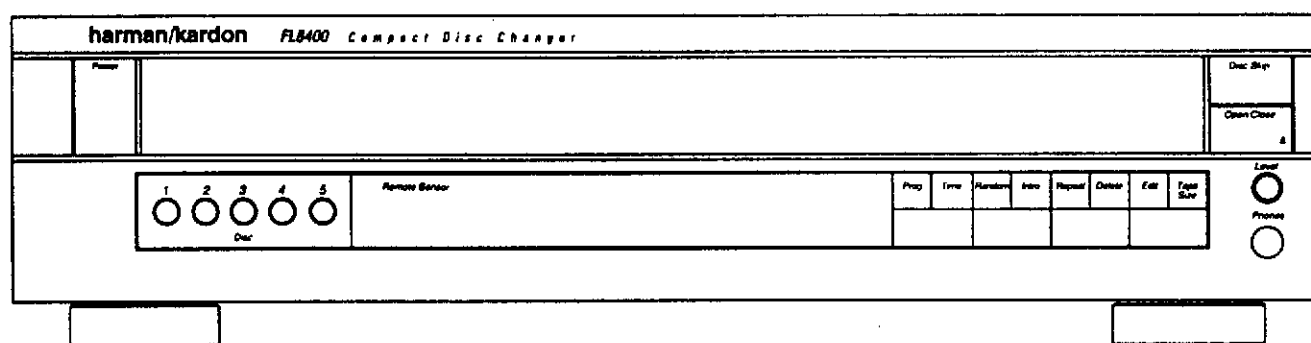


The Harman Kardon Model FL8400 COMPACT DISC CHANGER

Manual A

Technical Manual



■ CONTENTS ■

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DANGER: Invisible laser radiation when open and interlock failed or defeated.
AVOID DIRECT EXPOSURE TO BEAM.

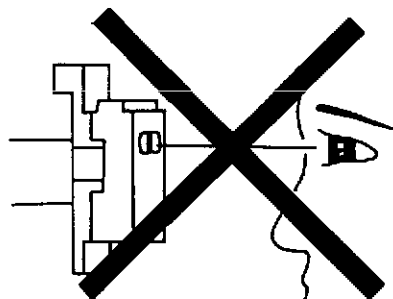
harman/kardon

Parts and Service Office
80 Crossways Park West, Woodbury, N.Y. 11797
1112-FL8400A P9501 1500 Printed in Korea

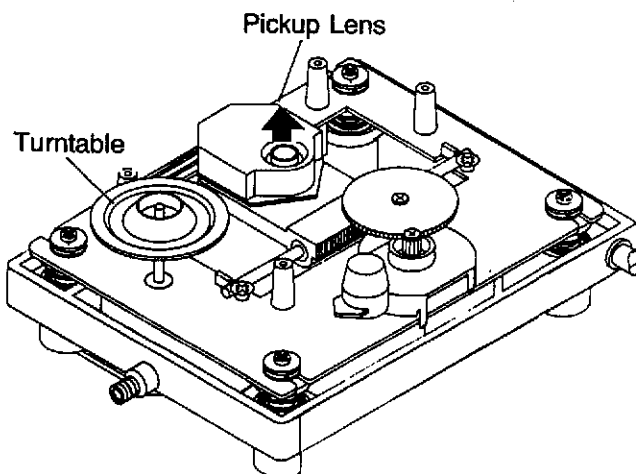
LASER BEAM SAFETY PRECAUTIONS**CLASS 1 LASER PRODUCT****CLASS 1
LASER PRODUCT****CAUTION****Invisible laser radiation when the unit is open. DO not stare into beam.**

CAUTION: USE OF ANY CONTROLS, ADJUSTMENT, OR PROCEDURES OTHER THAN THOSE SPECIFIED HEREIN MAY RESULT IN HAZARDOUS RADIATION EXPOSURE.

Do not look directly at the laser beam coming from the pickup or allow it to strike against your skin.



This compact disc player uses a pickup that emits a laser beam. The laser beam is emitted from the location shown in the figure. When checking the laser diode, be sure to keep your eyes at least 1 foot away from the pickup lens when the diode is turned on. Do not look directly at the laser beam.

**CAUTION:**

Using controls and adjustment, or doing procedures other than those specified herein, may result in hazardous radiation exposure.

SAFETY PRECAUTIONS



WARNING

To prevent fire or shock hazard, do not expose the unit to rain or moisture.



This symbol is intended to alert the user to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.



This symbol is intended to alert the user to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

Caution: To prevent electric shock do not use this (polarized) plug with an extension cord, receptacle or other outlet unless the blades can be fully inserted to prevent blade exposure.

Attention: Pour prévenir les chocs électriques ne pas utiliser cette fiche polarisée avec un prolongateur, une prise de courant ou une autre sortie de courant, sauf si les lames peuvent être insérées à fond sans en laisser aucune partie à découvert.

HANDLING LASER PICKUP

The laser diode in the optical system of this player can be damaged by electrostatic discharge from your clothes or your body. Proper electrostatic grounding for service personal is required during servicing.

BEFORE REPAIRING THE COMPACT DISC PLAYER

Preparation

- Human Body Grounding:

Many of the components used in this compact disc player, including the laser pickup, are sensitive to electrostatic discharge. Service personal should be grounded with an electrostatic armband (1 Mohm).

- Caution:

Static charge on clothing does not escape through a body grounding wrist band. Be careful not to contact the pickup or electrical components with your clothing.

- Workbench and Tool Grounding:

A properly-grounded electroconductive plate (1 Mohm) or metal sheet should be fitted to the workbench surface. Tools and instruments (such as soldering irons and scopes) should be grounded to prevent AC leakage.

Incorrect



Figure 1

Correct
Grounded Conductive
Wrist for Body

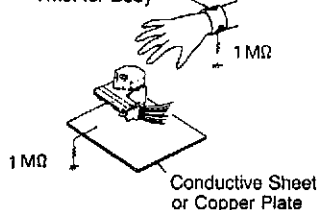


Figure 2

Note: Laser diodes are so susceptible to damage from static electricity that, even if a static discharge does not ruin a diode, it can shorten its life or cause it to work improperly.

LEAKAGE TEST

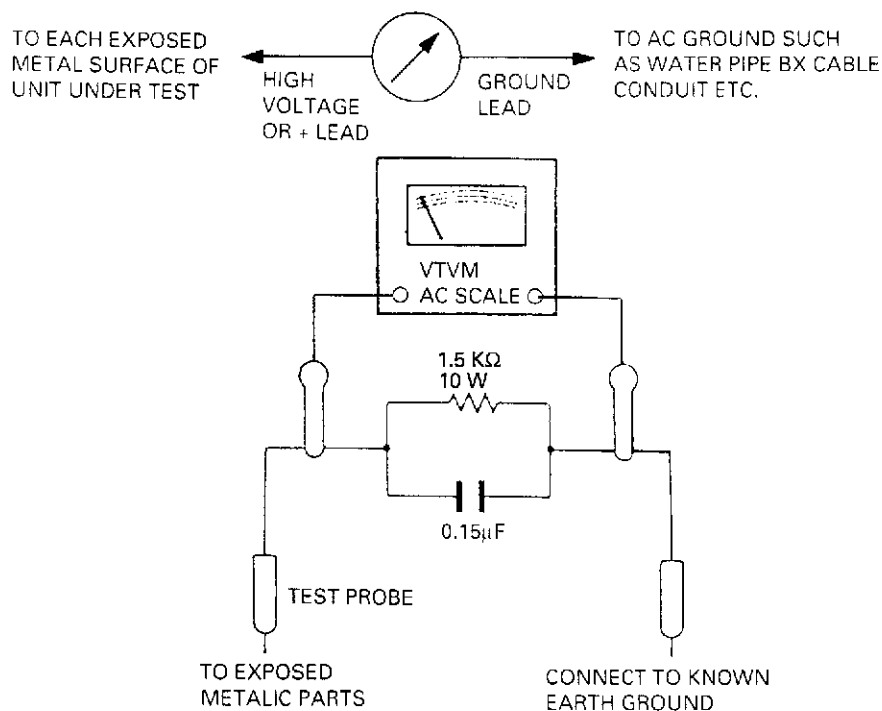
Before returning the unit to the user, perform the following safety checks:

1. Inspect all lead dress to make certain that leads are not pinched or that hardware is not lodged between the chassis and other metallic parts in the unit.
2. Be sure that any protective devices such as nonmetallic control knobs, insulating fishpapers, cabinet backs, adjustment and compartment covers or shields, isolation resistor-capacity networks, mechanical insulators, etc. Which were removed for servicing are properly reinstalled.
3. Be sure that no shock hazard exists; check for leakage current using Simpson Model 229 Leakage Tester, standard equipment item no. 21641, RCA model WT540A or use alternate method as follows: plug the power cord directly into a 120-volt AC receptacle (do not use an Isolation transformer for this test).

Using two clip leads, connects a 1500 ohm, 10-watt resistor paralleled by a 0.15 μ F capacitor, in series with all exposed metal cabinet parts and a known earth ground, such as a water pipe or conduit. Use a VTVM or VOM with 1000 ohms per volt, or higher sensitivity to measure the AC voltage drop across the resistor. (see diagram) Move the resistor connection to each exposed metal part having a return path to the chassis (antenna, metal cabinet, screw heads, knobs and control shafts, escutcheon, etc.) and measure the AC voltage drop across the resistor. (This test should be performed with the power switch in both the on and off positions.)

A reading of 0.35 volt RMS or more is excessive and indicates a potential shock hazard which must be corrected before returning the unit to the owner.

SIMPSON MODEL 229 ETC. FOR LEAKAGE TEST



SPECIFICATIONS

General

Transmission bit rate	4.3218 Mbit/sec
Transmission on clock	16.9344 MHz
Error correction	CIRC C1, C2 double correction

Pickup

System object lens drive type	Optical pickup
Object lens drive system	2 dimensional parallel drive system
Optical source	Semiconductor AlGaAs laser
Wave length	760-800 nm
Tracking system	3 beam tracking servo type

Others

Digital filter	8 times oversampling type
Analog filter	2 pole RC type
D/A converter	1 bit twin with digital filter.
Power consumption	12 W
Dimensions (HWD)	3.7 × 17.3 × 14.9 inches 95 × 440 × 380 mm
Weight (net)	6.5 kg (14 lbs 5 oz)

Electrical

Test Item	Unit	Nominal	Limit
Output voltage at 1 kHz	V	1.97	1.97 ± 0.2
Distortion and noiser without filter:			
20 Hz	%	0.14	0.2
1 kHz	%	0.029	0.035
10 kHz	%	0.29	0.35
16 kHz	%	0.13	0.45
18 kHz	%	0.13	0.2
20 kHz	%	0.12	0.2
Distortion and noise with filter 30 kHz:			
20 Hz	%	0.04	0.05
1 kHz	%	0.006	0.009
S/N ratio without filter	dB	96	90
S/N ratio with filter 30 kHz	dB	101	100
Dynamic range at 1 kHz	dB	94	90
Frequency response: (0 dB at 1kHz)			
20 Hz	dB	±0	±0.5
100 Hz	dB	±0	±0.5
10 kHz	dB	±0.15	±0.2
20 kHz	dB	-0.05	±0.1
De-emphasis:			
1 kHz	dB	-0.4	-0.4 ± 0.2
5 kHz	dB	-4.5	-4.5 ± 0.6
16 kHz	dB	-8.75	-8.75 ± 10
Channel separation	dB	97	90
Channel Balance	dB	0	±0.5
Minimum operation voltage (% of normal supply voltage)	dB	80	85

ENVIRONMENTAL

Test to specification

Temperature between 59° F (15° C) and 95° F (35° C) and relative humidity between 45% and 75%, with power supply voltage of $\pm 10\%$ the normal supply voltage.
Test disc: SONY YEDS-7 Type-3 or ABEX TCD-781

Operation

Unit must work properly and correctly at the temperature range from 32° F (0° C) to 113° F (45° C) and the relative humidity from 40% to 80%, and with the supply voltage.

Storage

Temperature test: 48 hours each at -40° F (-40° C) and 149° F (65° C)
Humidity test: 95° F (40° C) 95% relative humidity.

Notes:

1. Nominal specs represent the design specs. All unit should be able to approximate these—some will exceed and some may drop slight below these specs. Limit specs represent the absolute worst condition that still might be considered acceptable; in no case should a unit fail to meet limit specs.
2. This manual is based on the American standard, and provides information on regional circuit modification through the use of alternate schematic diagrams or wiring diagrams, and information on regional component variations through the use of parts lists. Design and specifications subject to change without notice.

CONTROL AND FUNCTIONS

POWER SWITCH

Press the POWER switch to turn on this unit and press it again to turn it off.

For system operation, plug the AC input cord into the switched AC outlet, keep the power switch ON and control power ON/OFF with the main POWER switch on the amplifier or receiver.

DIS
This
first
first

RANDOM

This button automatic on each C random.

TIME BUTTON

This button is use elapsed playing ti beginning of the c remaining playing track or remaining disc.

PROGRAM/REVIEW

This button is used for your favorite tracks or reviewing the program selections.

DISC TRAYS (1-5)

One disc per tray can be loaded with the labelled side up.

FL-8400

harman/kardon FL8400 Compact Disc Changer

Power

Compact
disc
DIGITAL AUDIO1 2 3 4 5
Disc

Remote Sensor

PROGRAM	REPEAT	ALL 1 DISC	AC	▶	AUTO	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DELETE	A SPACE	INTRO	TRACK	▶	REVERSE																				

MULTI FUNCTION DISPLAY

This display shows the corresponding information according to each mode.

DISC SELECTOR BUTTONS

These buttons are used for selecting the disc to be played.

INFRARED RECEIVER WINDOW

This receives the infrared signals transmitted by the commander and converts it into the electrical signal to control this unit.

BACKWARD SKIP SEARCH BUTTON

This button is used for the beginning of the returning to a previous searching for a partial fast reverse.

DISC INTRO BUTTON

This button is used for playing the first 10 seconds of each track or the first track on CDs.

RANDOM PLAY BUTTON

This button is used to let the unit automatically select and play tracks on each CD or discs and tracks at random.

TIME BUTTON

This button is used for checking the elapsed playing time from the beginning of the current track, remaining playing time of the current track or remaining playing time of the disc.

PROGRAM/REVIEW BUTTON

This button is used for programming your favorite tracks or discs or reviewing the programmed selections.

with

REPEAT BUTTON

This button is used for repeating one track, one disc or all discs.

DELETE BUTTON

This button is used for deleting the undesired tracks or discs.

EDIT BUTTON

This button is used for editing the tracks to be recorded onto the cassette tape.

TAPE SIZE BUTTON

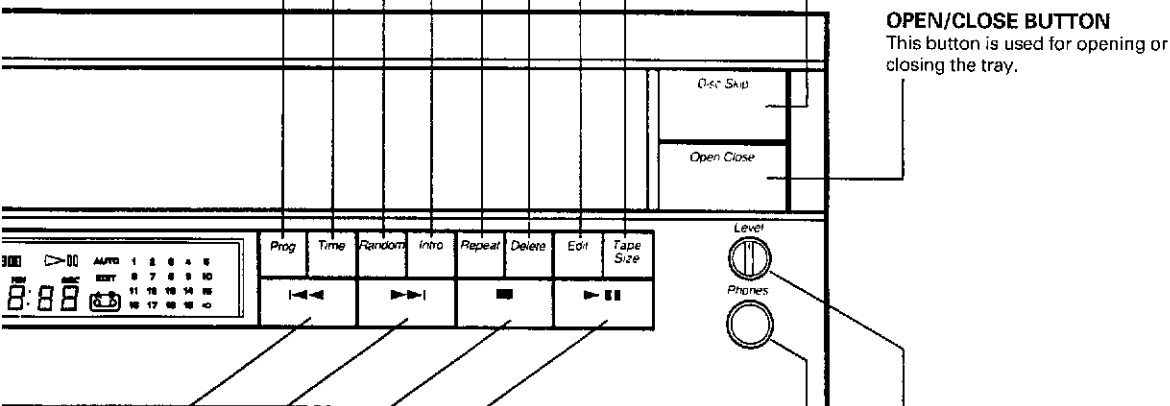
This button is used for selecting the tape length.

DISC SKIP BUTTON

Each time this button is pressed to load or unload the disc, the carousel will rotate to the next tray position clockwise.

OPEN/CLOSE BUTTON

This button is used for opening or closing the tray.



DISPLAY

corresponding to each mode.

PLAY/PAUSE BUTTON

This button is used for starting play, holding play at the beginning of a track or interrupting play.

STOP/CLEAR BUTTON

This button is used for stopping play, clearing programmed selections or recovering the deleted selections.

FORWARD SKIP/SEARCH BUTTON

This button is used for moving on to a next track or searching for a particular passage in fast forward.

BACKWARD SKIP/SEARCH BUTTON

This button is used for replaying from the beginning of the current track, returning to a previous track or searching for a particular passage in fast reverse.

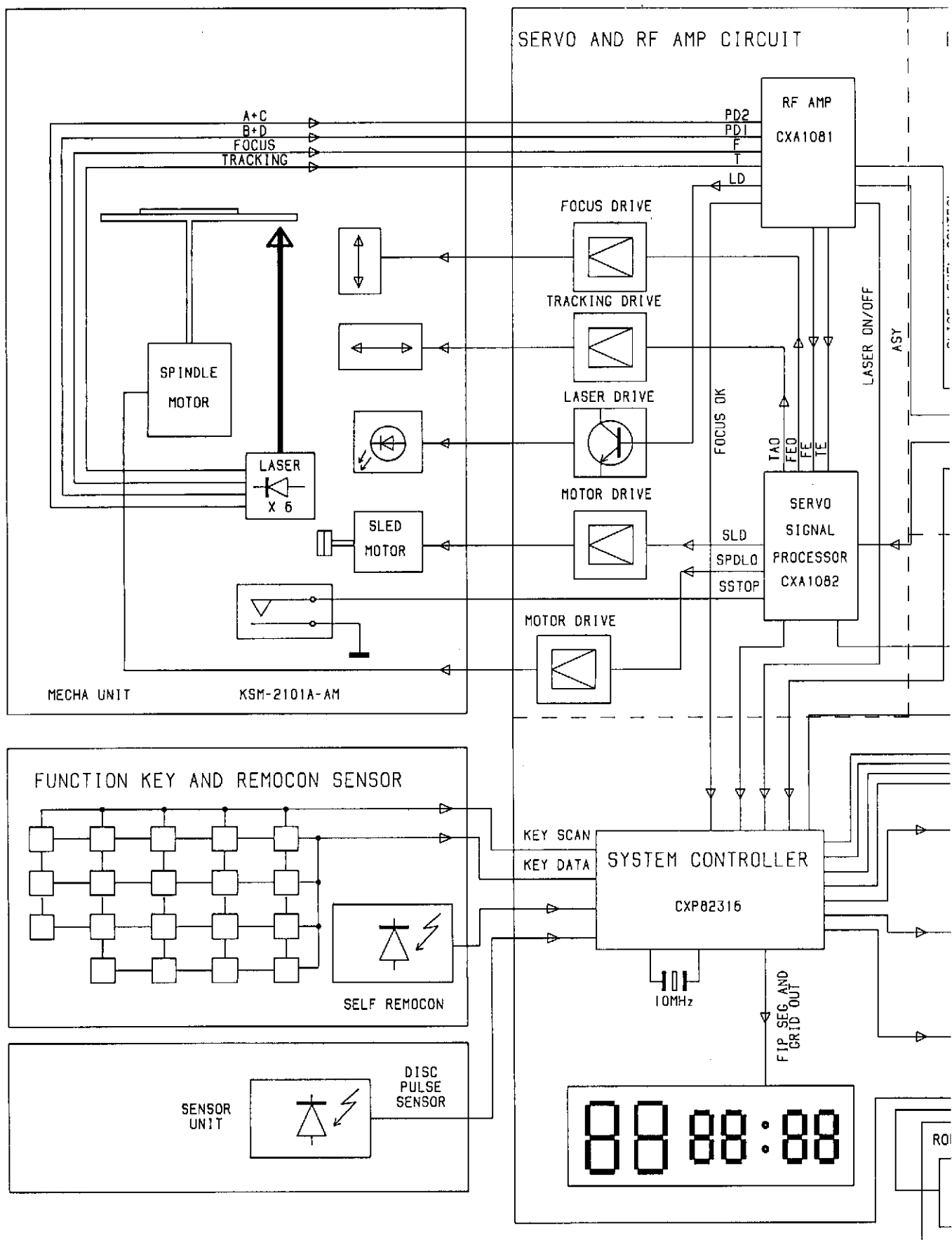
HEADPHONE VOLUME

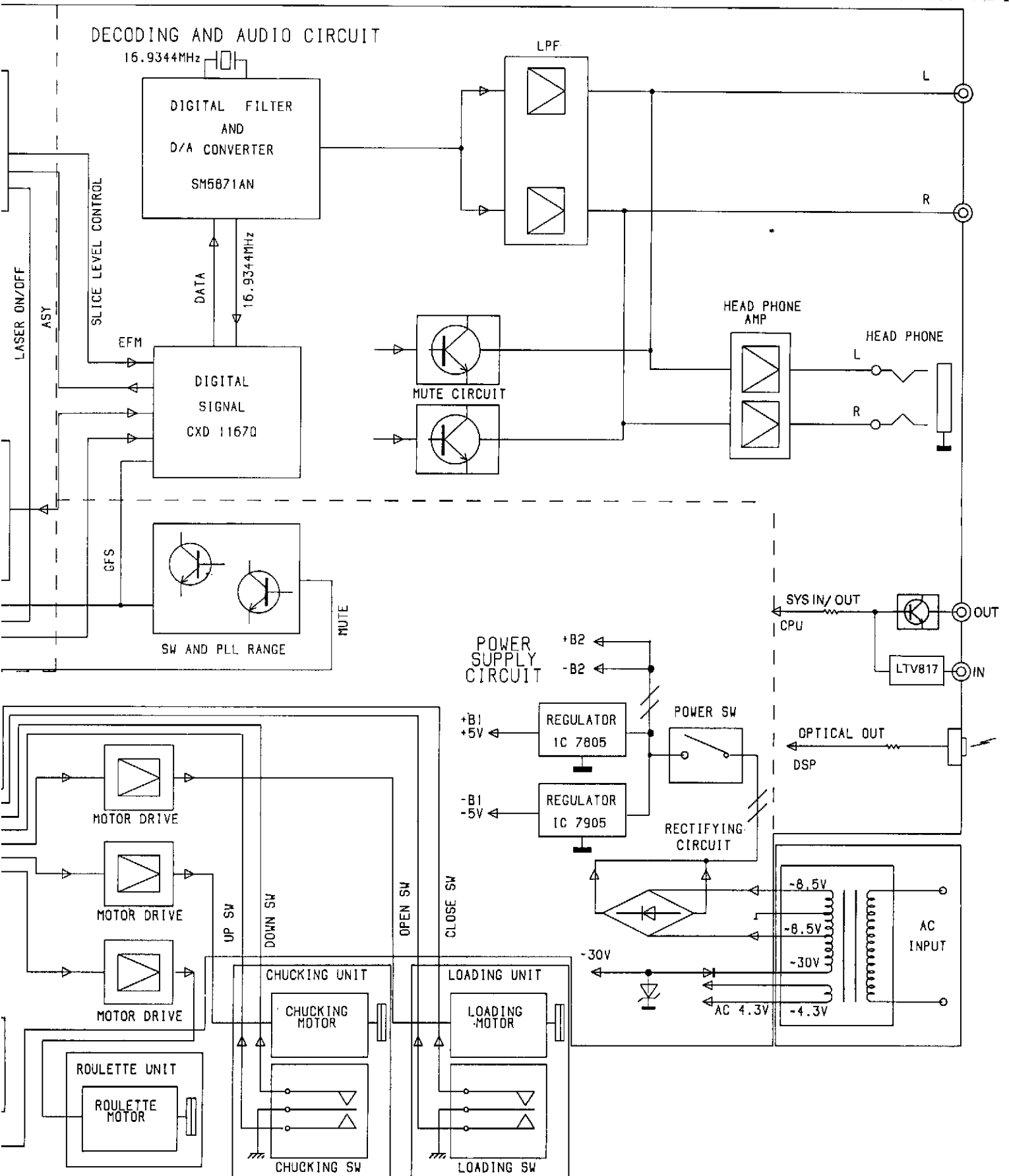
This is used for the adjustment of the headphone level.

HEADPHONE JACK

This is used for listening with the headphones.

BLOCK DIAGRAM





DISASSEMBLY INSTRUCTIONS

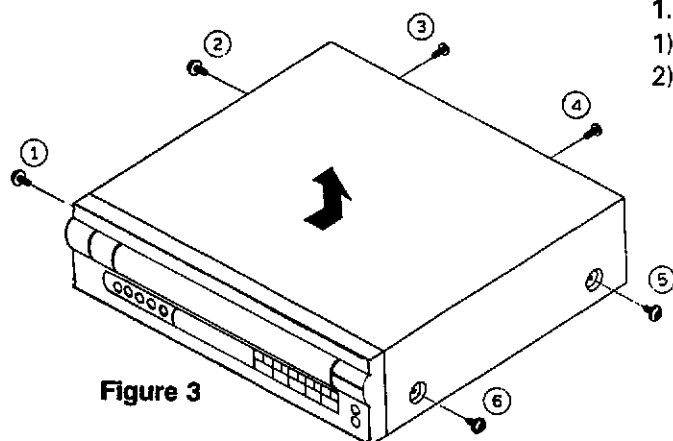


Figure 3

1. Remove the top cover (Figure 3).

- 1) Remove 6 screws (① to ⑥) holding the top cover.
- 2) Remove 1 screw and then lug wire from the bottom chassis.

2. Remove the bottom cover (Figure 4).

- 1) Turn the set over.
- 2) Remove 9 screws (① to ⑨) from the bottom chassis.
- 3) Remove 2 screws (⑩, ⑪) from the back chassis.

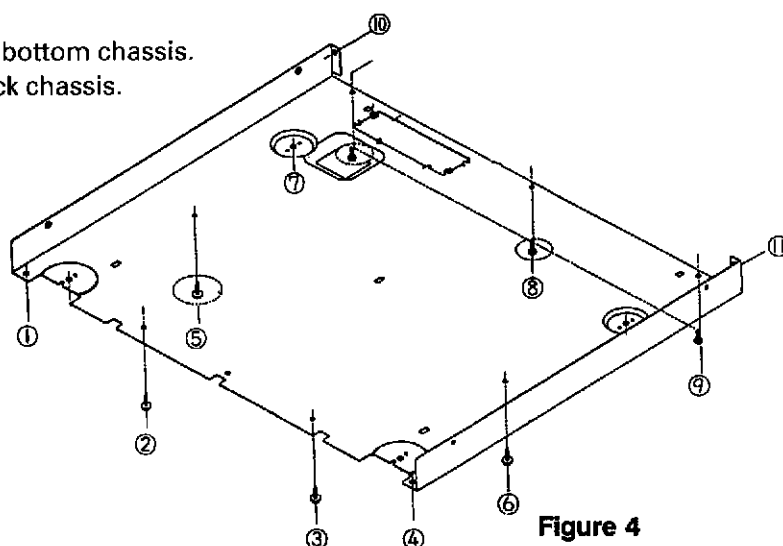


Figure 4

3. Remove the front panel (Figure 5).

- 1) Remove 3 screws (① to ③).
- 2) Remove 2 connectors (CNT105, CNT109) from the main B'D.
- 3) Remove 3 screws (④ to ⑥).
- 4) Turn to the clockwise gear loading of the assembly lock gear (see figure 6).
- 5) Hold the cover tray and then pull it up.
- 6) Remove 2 connectors (CNT111, CNT112) from the main B'D.

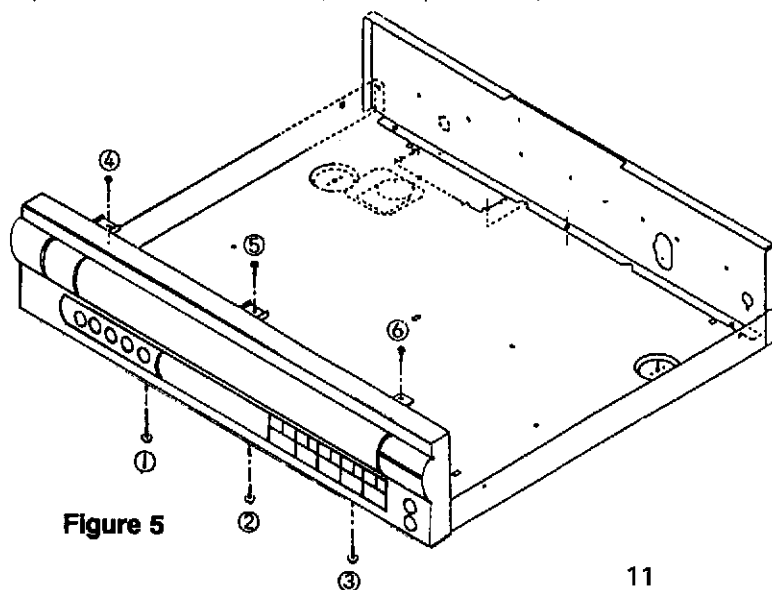
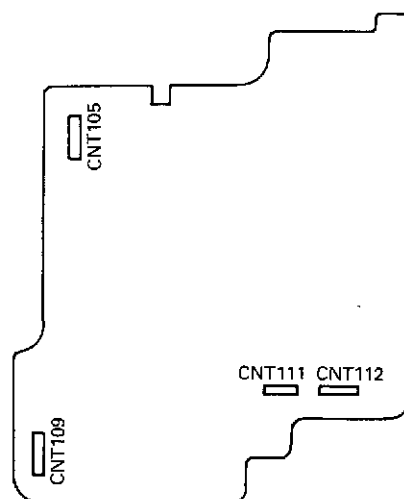


Figure 5



4. Remove the loading table (Figure 6).

- 1) Remove 4 screws (① to ④) holding the frame body.
- 2) Remove 4 screws (⑤ to ⑧) holding the assembly chuck.
- 3) Remove the assembly chuck.
- 4) Stretch out the frame body and then remove.
- 5) Remove 2 screws (⑨ and ⑩) holding the left guide tray (F) (same as right guide tray).
- 6) Pull the roulette tray up to the front and hold it up.
- 7) Remove the lead assembly 4P from CNT107-A on the sensor B'D.

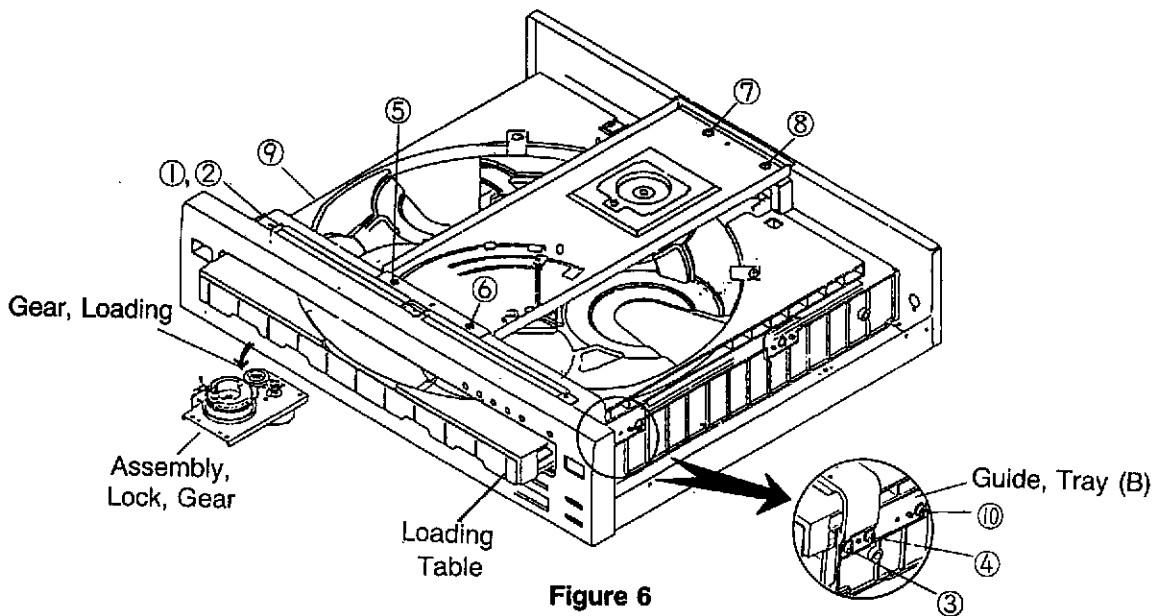


Figure 6

5. Remove the main board (Figure 7).

- 1) Disconnect all lead assembly.
- 2) Release the 4 tabs (attached to the main board) from the body mechanism.

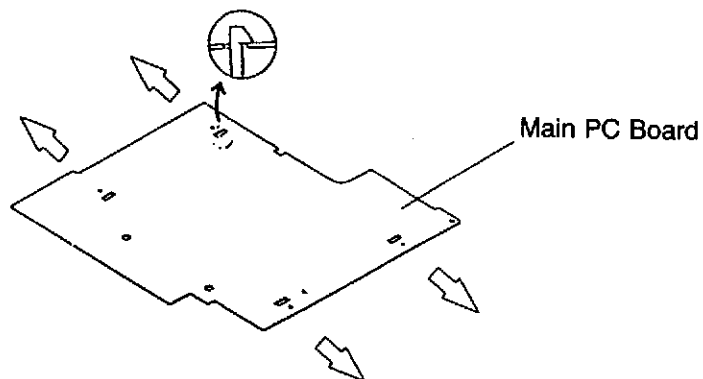


Figure 7

PICKUP REPLACEMENT

Caution:

Laser diodes are extremely susceptible to damage from static electricity. Even if a static discharge does not ruin the diode, it can shorten its life or cause it to work improperly. When replacing the pickup, take appropriate measures, such as using a conductive mat and a grounded soldering iron, to protect the laser diode from static damage.

1. Remove the CD mechanism assembly by referring to the "exploded view" (See Figure 8).

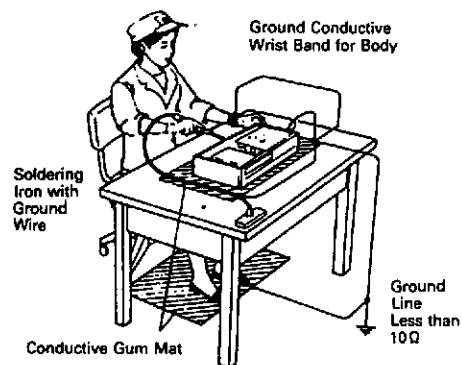


Figure 8

2. Remove four screws S12 (See Figure 9).

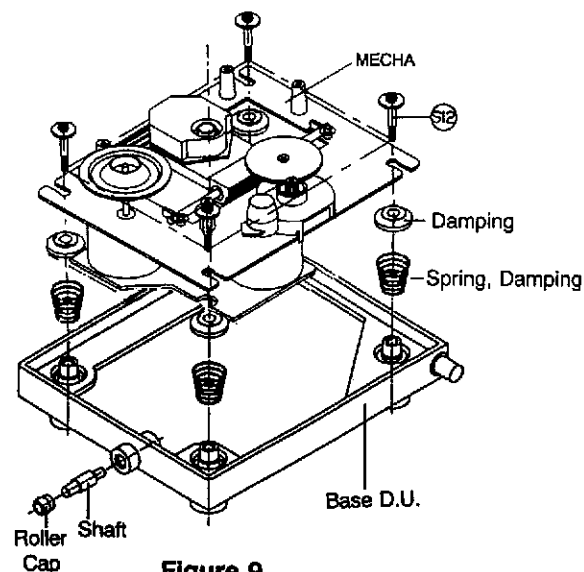


Figure 9

3. Remove the gear A (See Figure 10).
4. Pull out the slide shaft.

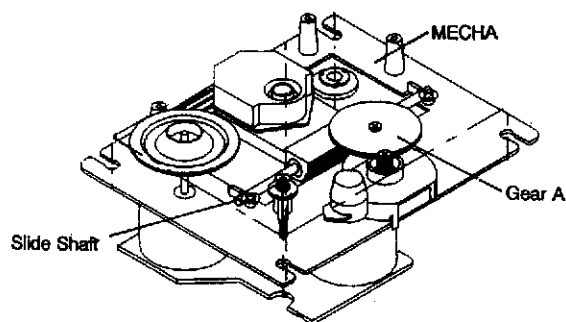


Figure 10

5. Remove the pickup (See Figure 11).

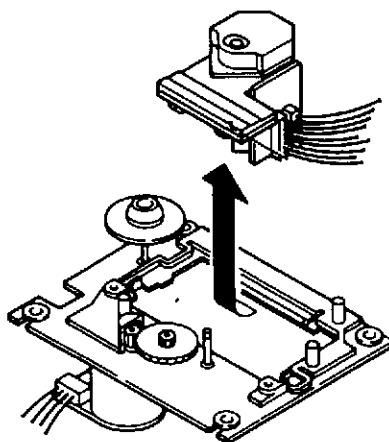


Figure 11

6. After you connect the wire connector, desolder and remove the shorting tab (See Figure 12).

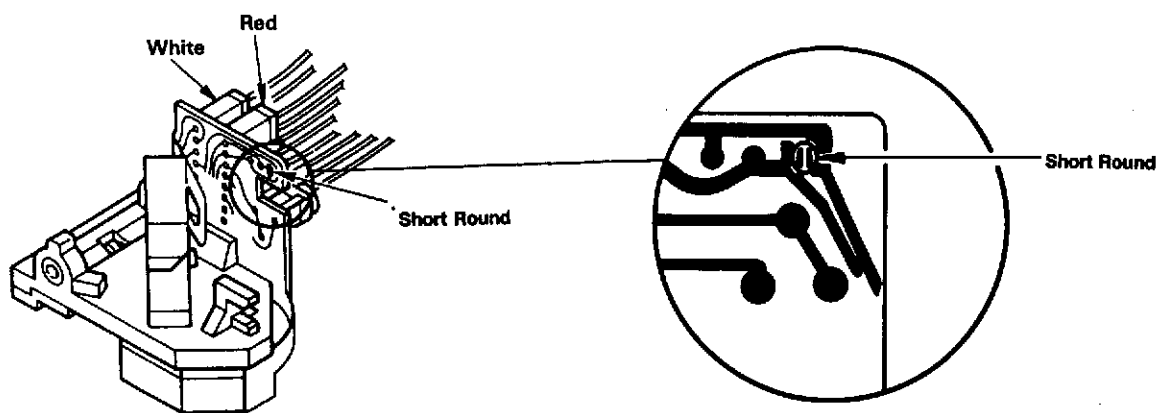


Figure 12

7. Refer to the exploded view of the compact disc mechanism on page 39 for detailed illustrations.

OPERATION CHECK

When the power switch is turned on after the chucking arm is removed, observe the objective lens and check the following. (The optical system block should be at the lead-in position when it is checked.)

1. The disc table should be at the innermost position after the chucking arm is removed.
2. The diffused light of the laser beam can be seen when the power switch is turned on.
3. Vertical (up and down) movement of the objective lens take place (2 or 3 times).

CIRCUIT DESCRIPTION

1. APC CIRCUIT

A semiconductor laser is used as the light source for the optical pickup. As the laser diode has large negative temperature characteristics in its optical output when driven with a constant current, a circuit must be provided to stabilize this output. For this purpose, a monitor diode which detects the optical output of the laser diode is used in the semiconductor laser.

As the laser diode emits light from its bonded surface, light is emitted both in front and behind. The light emitted behind is monitored with the monitor diode installed on its rear surface, and the optical output is thus controlled. The light emitted in front becomes the light source for the pickup.

Fig. 1 Shows the APC circuit.

When the temperature rises and the optical output decreases, the monitor diode current (I_S) decreases, the electric potential of IC104 pin 5 rises, the base current of the driving transistor increases, and the laser diode current increases. This causes the reduced optical output to return to its former level.

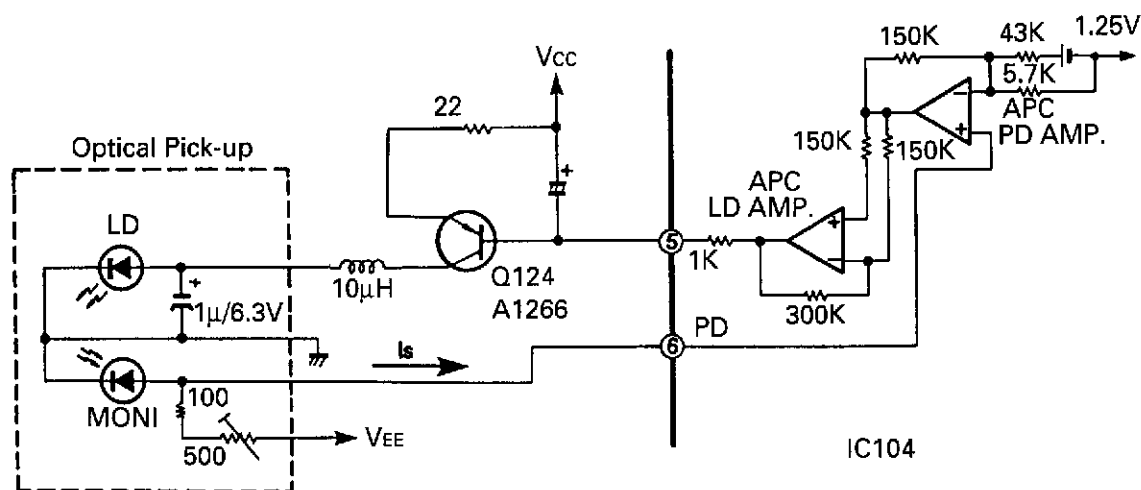


Fig. 1

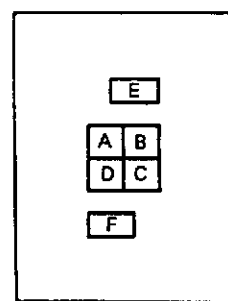
2. FOCUS SERVO

2-1. Optical pickup

This set employs a three-beam optical pickup comprised of six division photodiodes, A through F as shown in Fig. 2. The four photodiodes (A through D) at the center provide focus error detection by using their property to allow the beam to focus into a round image only at a certain point.

The sums of outputs from diagonal two elements of four division photodiodes (A+C and B+D) are compared by the differential amplifier in IC104 to detect the shape of the beam image.

The remaining two diodes (E and F) provide tracking error detection by means of sub-beam spots.



Three spotted (six-division)
photo diodes

Fig. 2

2-2. Focus error detecting operation

The reflected laser beam from a disc is polarized 90° with the beam-splitter and sent to the cylindrical lens. The beam passed through this cylindrical lens is then sent to the four division photodiodes and focuses into an image whose shape varies with the distance between the disc and the objective lens. Such change in the beam shape causes the current flowing from the photodiodes to vary.

Shown in Fig. 3 is the principle of the focus error detection.

The currents from the photodiodes (A+C and B+D) are applied to pins 7 and 8 of IC104 and converted to voltage by RF I-V amplifiers (1) and (2) included in IC104.

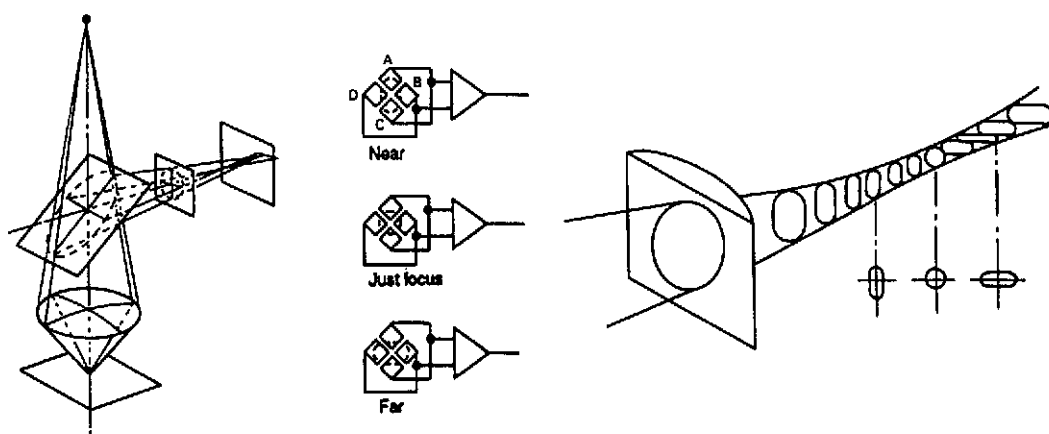


Fig. 3

2-3. Focus servo control operation

The focus error signal, after being converted to voltage by the RF I-V amplifier, is transmitted to the operation amplifier in the IC and output from pin 19.

When the disc to objective lens distance is in focus, the beam forms a true round. In this state, the beams applied to four elements of four division photodiodes become equal and thus the output provided then is 0(zero). When the disc to objective lens distance is too close (near focus), the beam is reflected divergently to form an oval in crosswise direction. In this state, the outputs provided from photodiodes A and C are higher than those from B and D, resulting in negative (-) output voltage. On the other hand, when the distance is too far (far focus), the beam is reflected convergently to form an oval in longitudinal direction. Then the outputs from photodiodes B and D are higher, resulting in positive (+) output.

The output voltage (focus error signal) from pin 19 of IC104 passes through IC103, in from pin 6 and out from pin 11, as shown in Fig. 4. It is amplified in IC103 and fed to the focus coil which then drives the objective lens of the pickup.

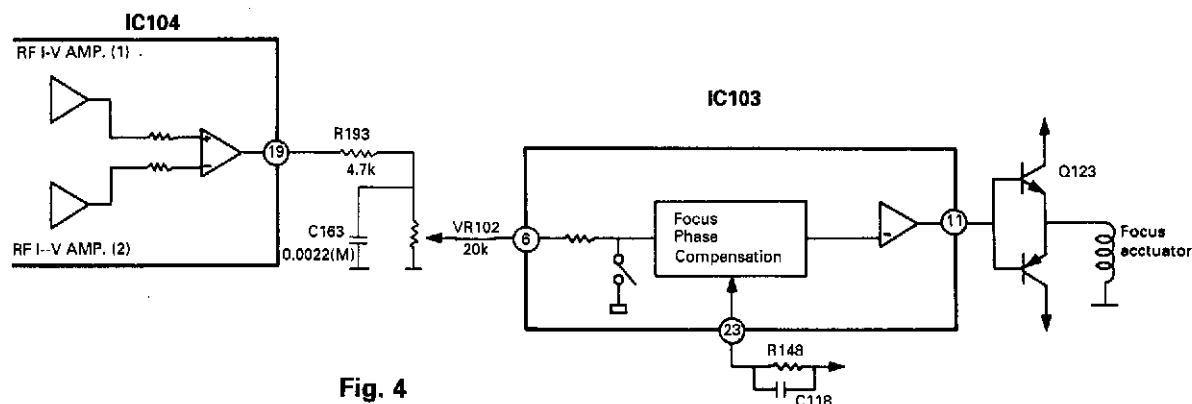


Fig. 4

2-4. Tracking error detection system

Fig. 5 Shows the principle of the tracking error detection system which employs the three beam system. The laser beam is divided into the main beam and two sub-beams by diffraction grating and they are arranged on one line. The center line connecting these three beams has a slight offset angle against the main beam. The main beam is received by photodiodes A, B, C and D and two sub-beams by E and F respectively.

Fig. 5-A shows the on-track state. As both auxiliary beams 1 and 2 are slightly on the track in this state, the outputs of photodiodes E and F are equal and the tracking signal is 0(zero). When the track is shifted to the left (Fig. 5-B), the auxiliary beam 1 is off the pit. This allows more light to be received by the photodiode E, resulting in positive (+) tracking signal output. On the other hand, when the track is shifted to the right (Fig. 5-C), the amount of light received by the photodiode F increases, resulting in negative (-) tracking signal output. And these extreme signals are detected as tracking error signals.

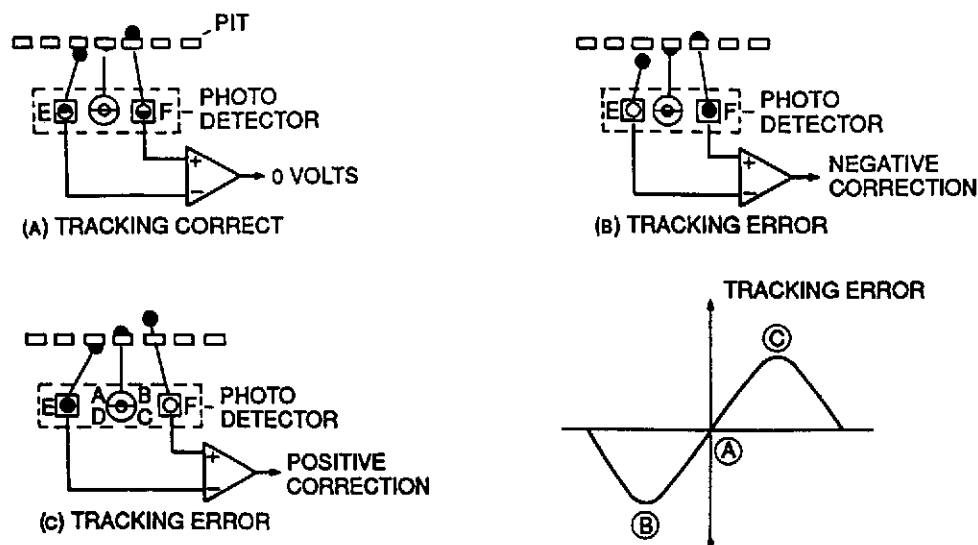


Fig. 5

2-5. Tracking servo control operation

When a tracking error signal is detected by photodiodes E and F, it is fed to pins 17 and 10 of IC104 respectively as shown in Fig. 6. In IC104, the signal is converted into voltage by the E I-V amplifier and F I-V amplifier, transmitted to the tracking error amplifier and output through pin 20. While it passes through IC103, in from pin 3 and out from pin 17, it is amplified in IC103 and sent to the tracking coil to adjust pickup so that the amount of track shift is reduced as closely to none as possible.

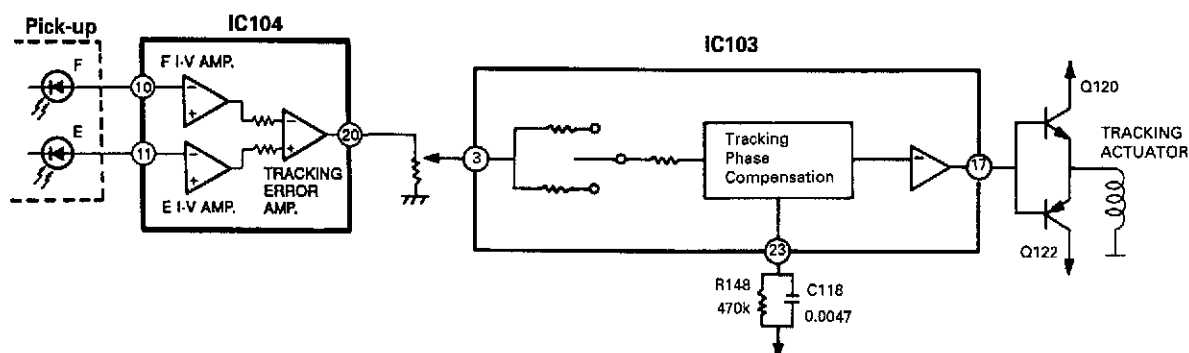


Fig. 6

3. Regenerative Circuit

3-1. RF circuit

The currents from photodiodes (A, B, C and d) are fed to IC104 through pins 7 and 8 and converted to voltage by RF I-V amplifiers (1) and (2) respectively there, added by the RF summing amplifier and output from pin 2 as a signal. It can be checked at the test point (RF T.P.) provided on its way by means of the eye pattern check.

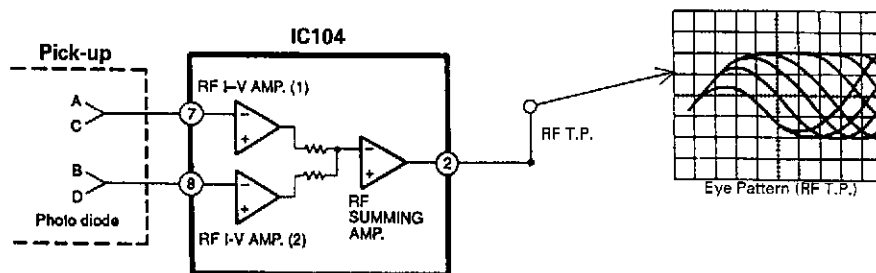


Fig. 7

3-2. EFM demodulation, error correction, serial/parallel conversion

The EFM comparator changes RF signal into a binary value. As the asymmetry generated due to variations in disc manufacturing cannot be eliminated by the AC coupling along, the reference voltage of EFM comparator is controlled utilizing the fact that the generation probability of 1, 0 is 50% each in the binary EFM signals.

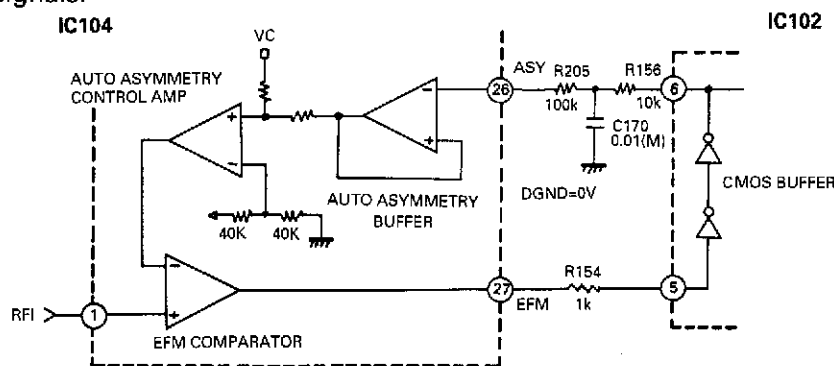


Fig. 8

As this comparator is a current SW type, each of the H and L levels does not equal the power supply voltage, requiring feedback through a CMOS buffer.

R8, R9, C8, and C9 form a LPF to obtain $(V_{cc} - DGND)/2V$, When f_c (cut-off frequency) is made more than 500 Hz the EFM low-frequency component leaks badly, degenerating the block error rate.

3-3. Digital Signal Processor

The EFM signals from pin 27 of IC104 are sent to pin 5 of IC102, then demodulated from 14 bits to 8 bits by EFM readjustment. At the same time any error, if found, is corrected (CIRC) and the signals are sent to the D/A converter interface. After that they are output as 16-bit digital signals from pins 76, 78 and 80 of IC102 and fed to the D/A Converter of IC107. In this case, EFM demodulation, error correction and serial/parallel conversion are performed by the internal circuitry of IC102.

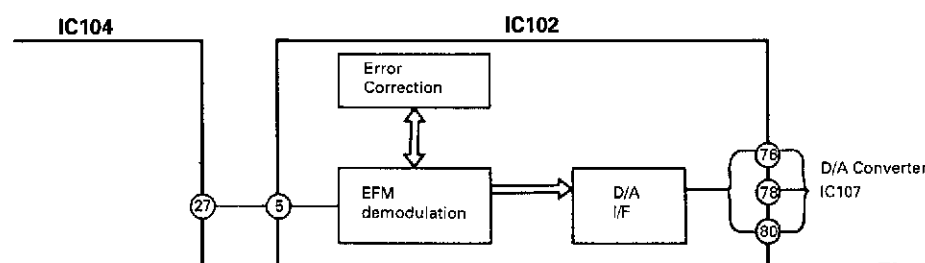


Fig. 9

4. 1-bit D/A Converter

Fig. 10 Shows the configuration of the SM5871.

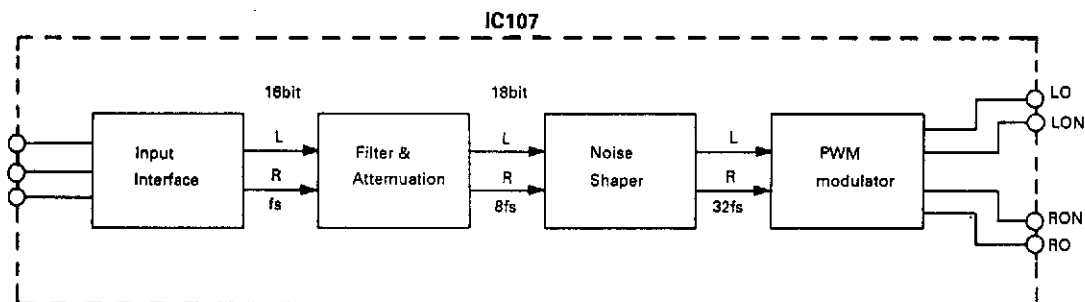


Fig. 10

The sampling frequency of the input data is expressed in f_s , so the 3rd order noise shaping circuit operates at $32f_s$. This means that a 32-times oversampling filter is required.

In this LSI, oversampling is carried out the multiple stage. Fig. 11 shows the configuration of filter, attenuation, and noise shaper.

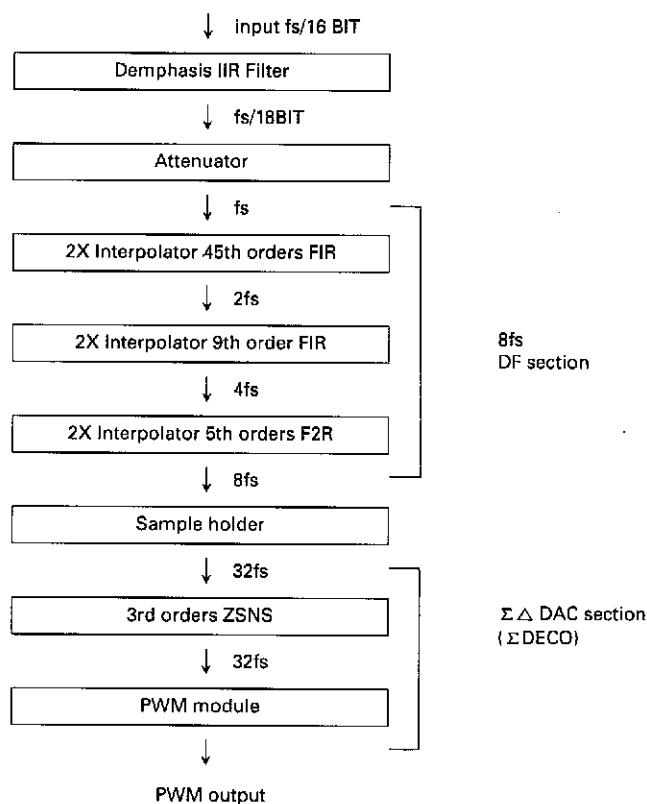


Fig. 11

5. Audio Circuit.

Fig. 12 Shows a schematic diagram of the audio circuit.

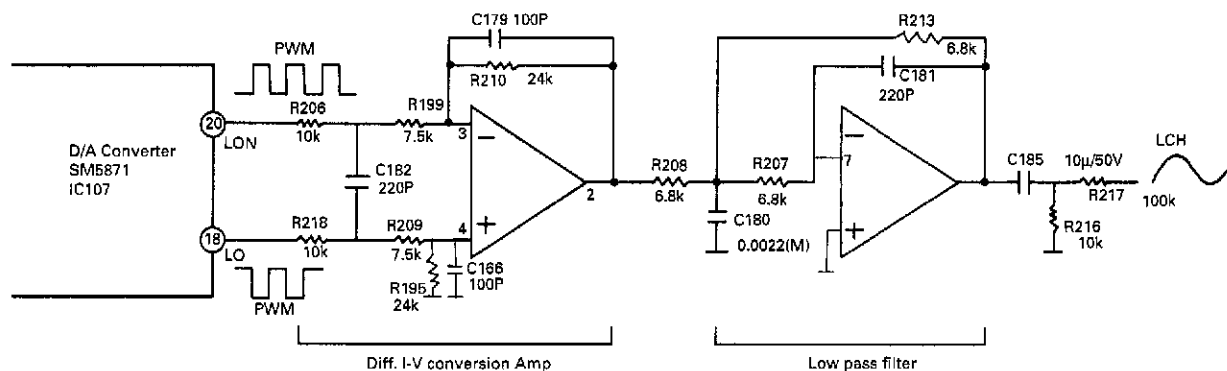


Fig. 12

The output from pin 18(LO) and pin20(LON) of the IC107 D/A Converter SM5871 is input to the differential I-V conversion amplifier. The output fed to the stage of low pass filter.

ALIGNMENT AND ADJUSTMENT

TEST POINT LOCATION

EQUIPMENT REQUIRED:

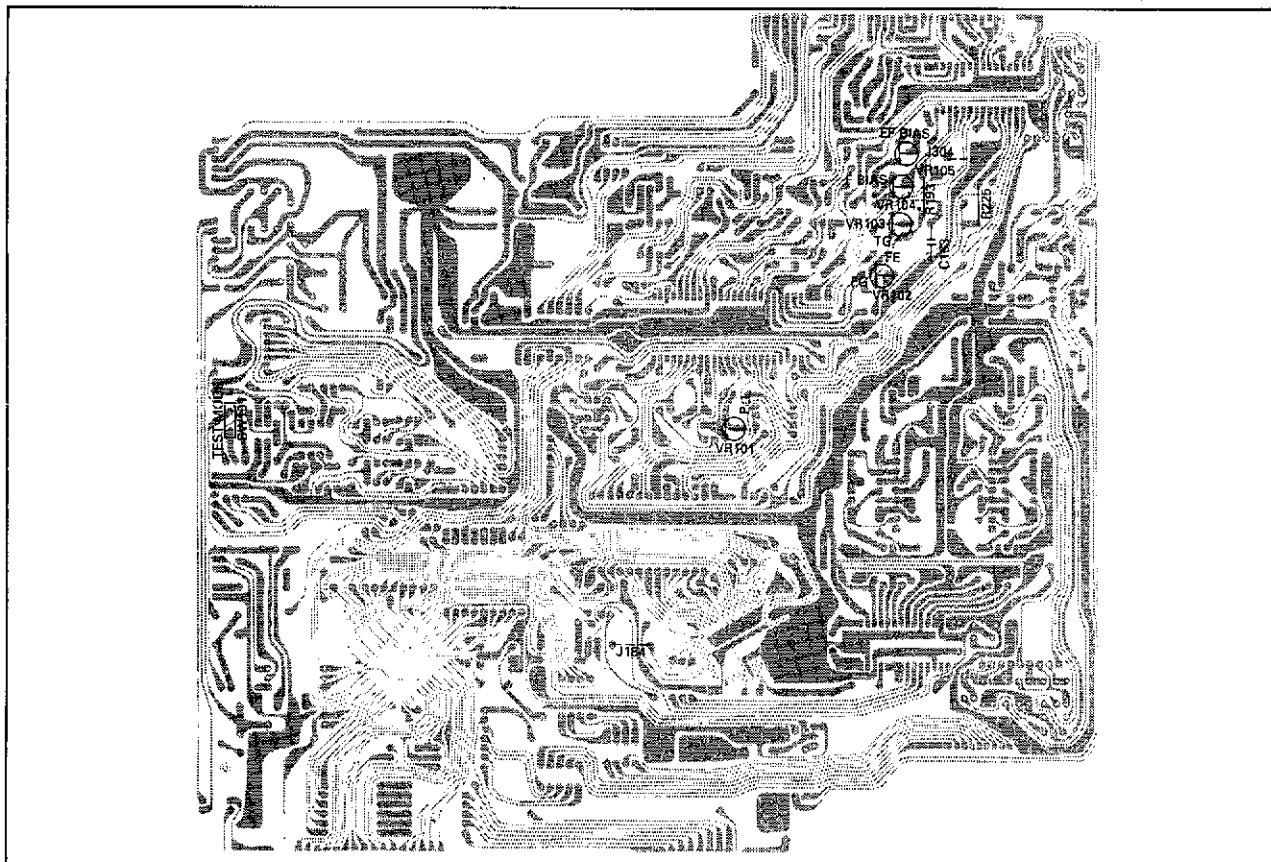
- Oscilloscope over 50 MHz
- Frequency counter
- Test disc PHILIPS 5A
- A regular compact disc
- SONY YEDS-7 Type 3 or ABEX TCD 781

BEFORE ADJUSTMENTS:

- Make adjustments in numerical order.
- Use the dualtrace oscilloscope with high impedance (greater than 10 Mohm).
- How to enter into the test mode:
 - 1) Open the disc tray.
 - 2) Turn off power.
 - 3) Turn on power while pressing "SW101 (TEST MODE)".
 - 4) "0" or all segments appear in the display indicates the test mode
 - 5) If you press PLAY, the test mode change to TEST MODE 1.
 - 6) If you press PLAY, again the test mode change to TEST MODE 2.
 - 7) If you press PLAY, again the test mode change to TEST MODE 3.
- Initial semi-fixed VR setting.

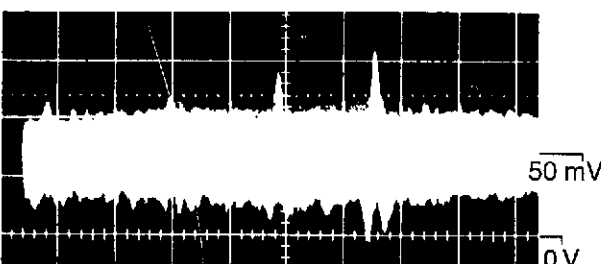
Set the semi-fixed resistance tentatively as follows:

VR101 (PLL)	Center position
VR102 (F. Gain)	Turn fully counterclockwise
VR103 (T. Gain)	Turn fully clockwise
VR104 (F. Bias)	Center position
VR105 (EF Balance)	Center position



Test point Locations

CIRCUIT ADJUSTMENT

Step	Connect	Setting	Adjust	Remarks
Focus Gain Adjustment				
1	See figure 13	In TEST MODE 2	VR102	 Focus error signal of about 50 mV.
2	To increase the focus gain, turn VR102 clockwise.			
Tracking Gain Adjustment				
1	See figure 14	In TEST MODE 2	VR103	 Obtain a tracking drive signal of about 200 mV.
2	Place PHILIPS test disc 5A in the tray and play section with the 800μm black dot, Confirm there is no skipping.			
3	If there is any skipping, adjust VR103 to reduce the tracking servo gain until no skipping occurs. To reduce the gain, turn VR103 clockwise.			

VOLT/DIV : 50 mV

TIME/DIV : 5 ms

Oscilloscope

Set

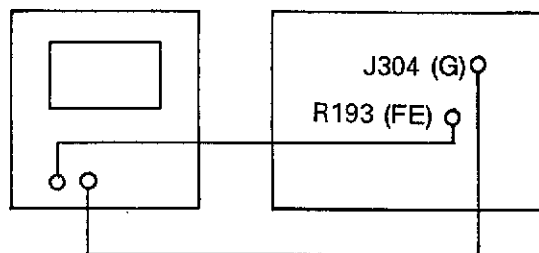


Figure 13. Focus Gain Adjustment

VOLT/DIV : 100 mV

TIME/DIV : 1 ms

Oscilloscope

Set

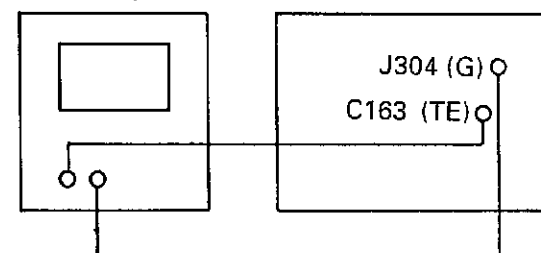
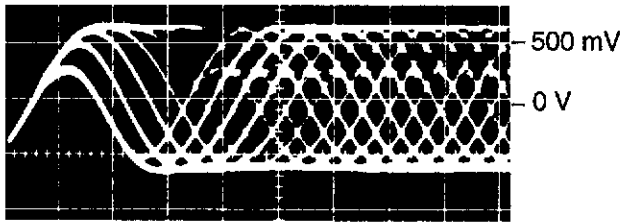


Figure 14. Tracking Gain Adjustment

Step	Connect	Setting	Adjust	Remarks
Focus Offset Adjustment				
1	See figure 15	In TEST MODE 2	VR104	Obtain the maximum amplitude and the biggest diamond windows of the eye pattern. 
2	To make the diamond windows in the portion large and clear, turn VR104 clockwise.			

Coupling : AC
VOLT/DIV : 500 mV
TIME/DIV : 0.2 μ S

Oscilloscope

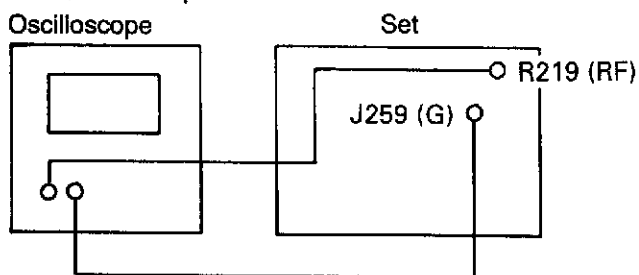
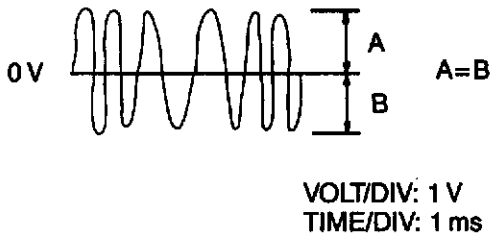


Figure 15. Focus Offset Adjustment

Step	Connect	Setting	Adjust	Remarks
PLL (Phase Locked Loop) Adjustment.				
1	See figure 16	In TEST MODE 0	VR101	Counter reading should be 4.3218 MHz
2	Disconnect between J304 (GND) and R225 (ASY).			
3	Check the counter reading to be 4.3218 $\pm$ 0.0025 MHz in TEST MODE 0.			
EF Balance Adjustment				
1	See figure 17	In TEST MODE 1		 VOLT/DIV: 1 V TIME/DIV: 1 ms
2		Turn a disc gently with your finger and adjust VR105 to obtain a symmetrical waveform.	VR105	
Obtain a symmetrical waveform.				
3	The above adjustments must be made very carefully, as misadjustment may cause skipping.			

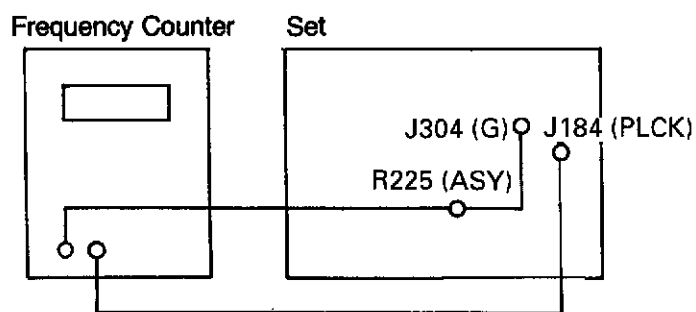


Figure 16. PLL Adjustment

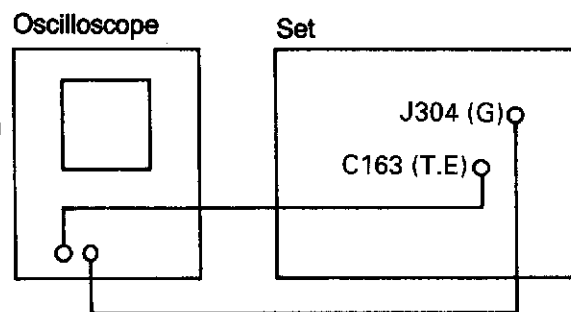
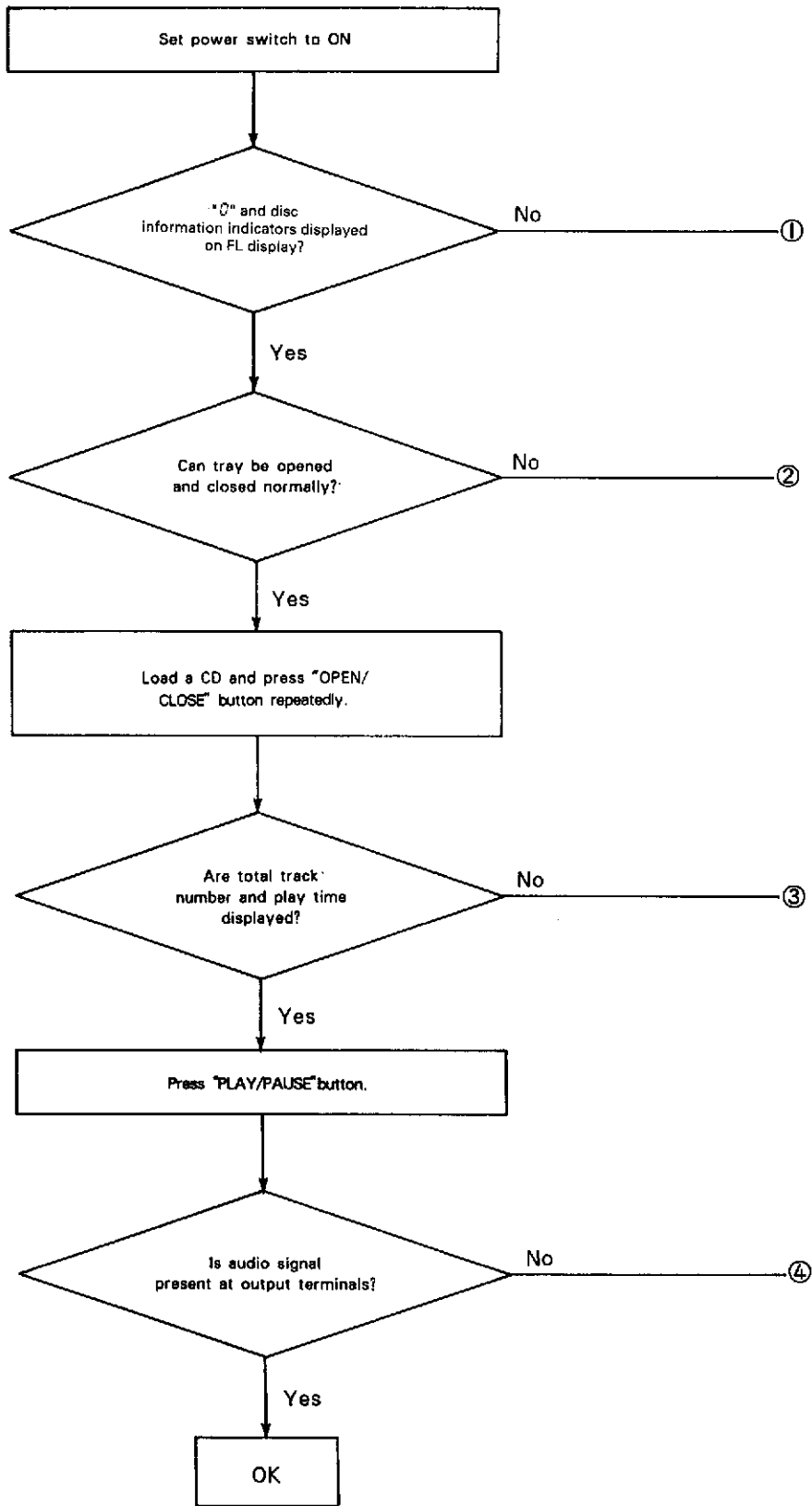
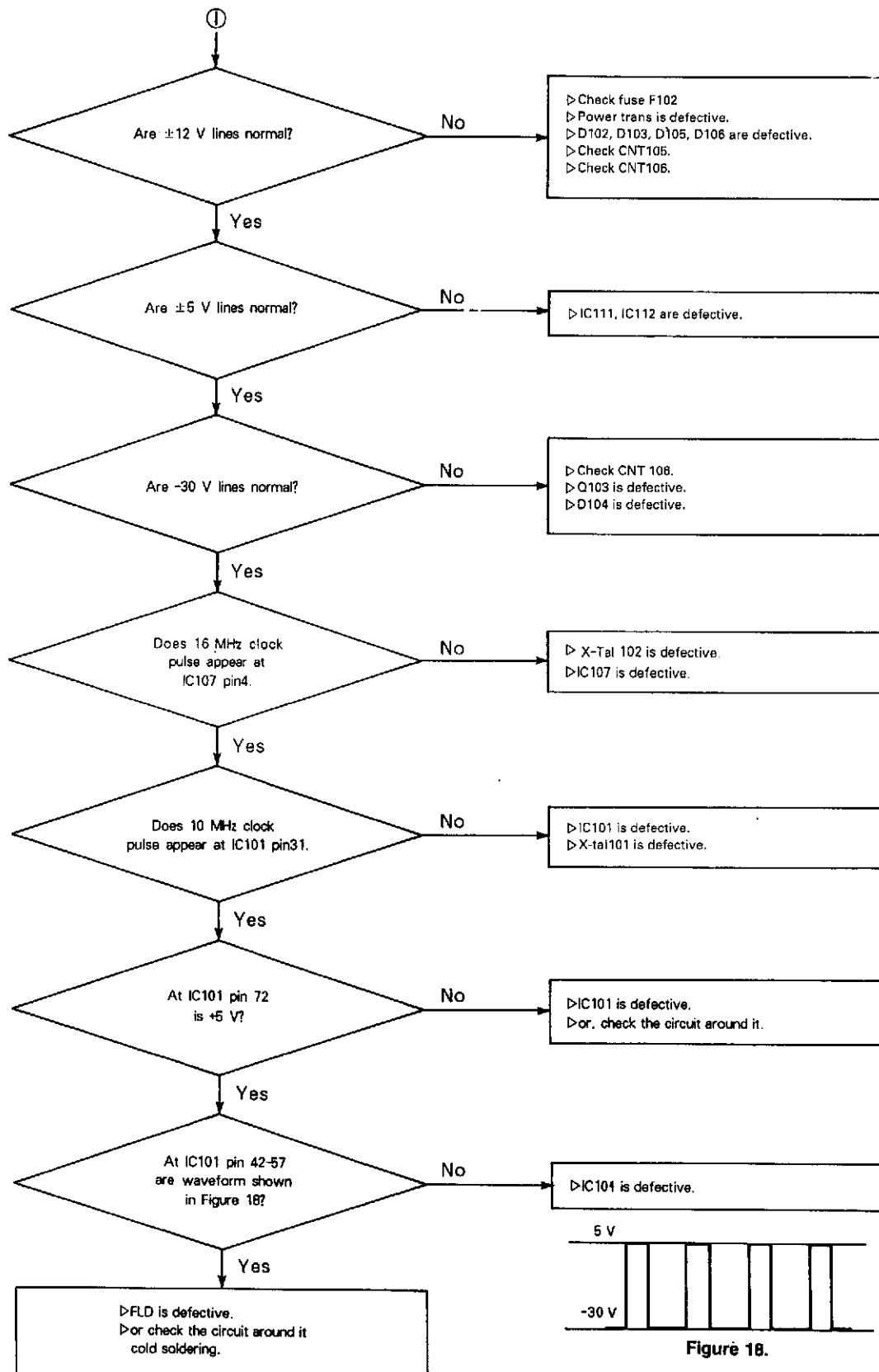


Figure 17. EF Balance Adjustment

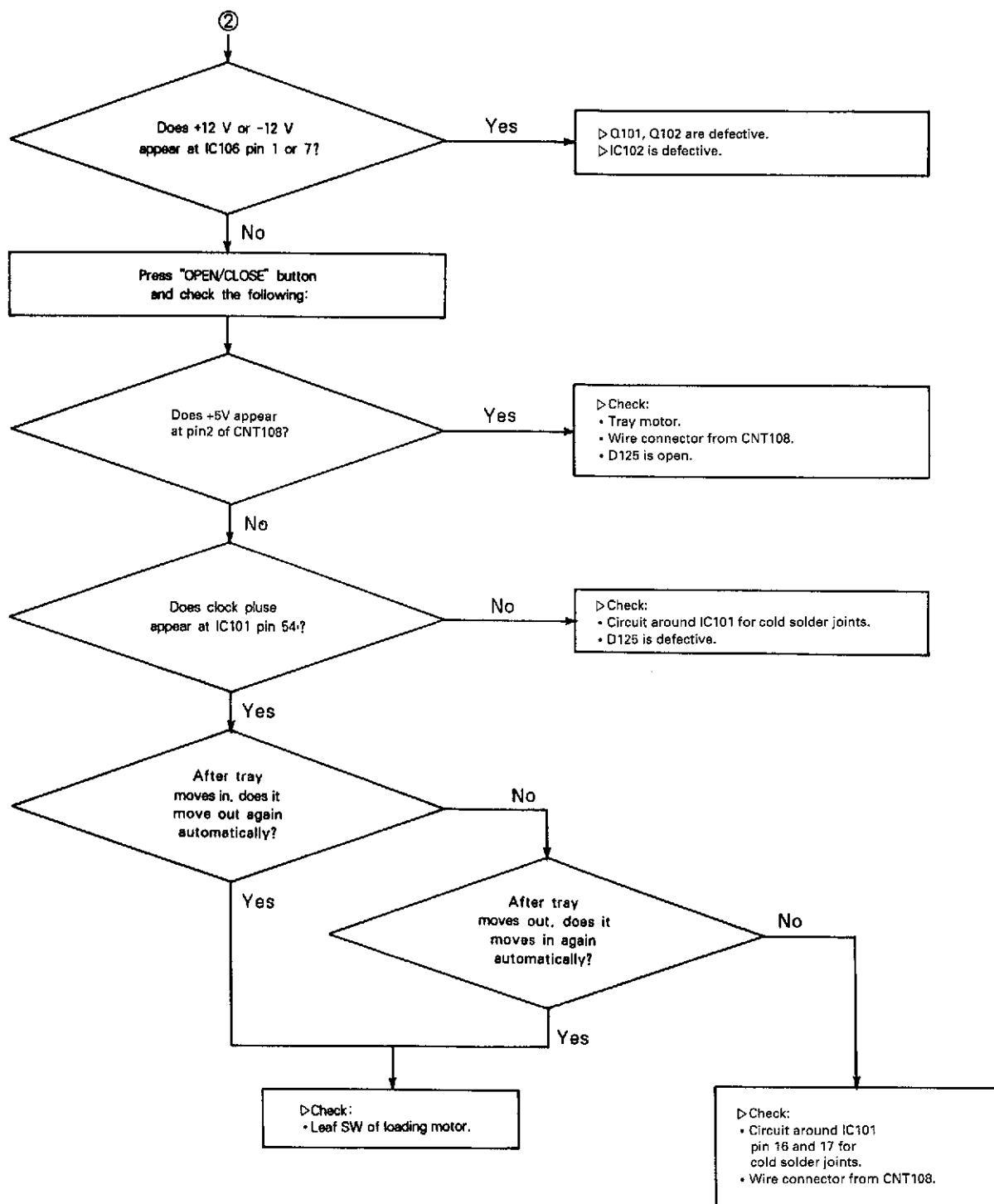
TROUBLESHOOTING



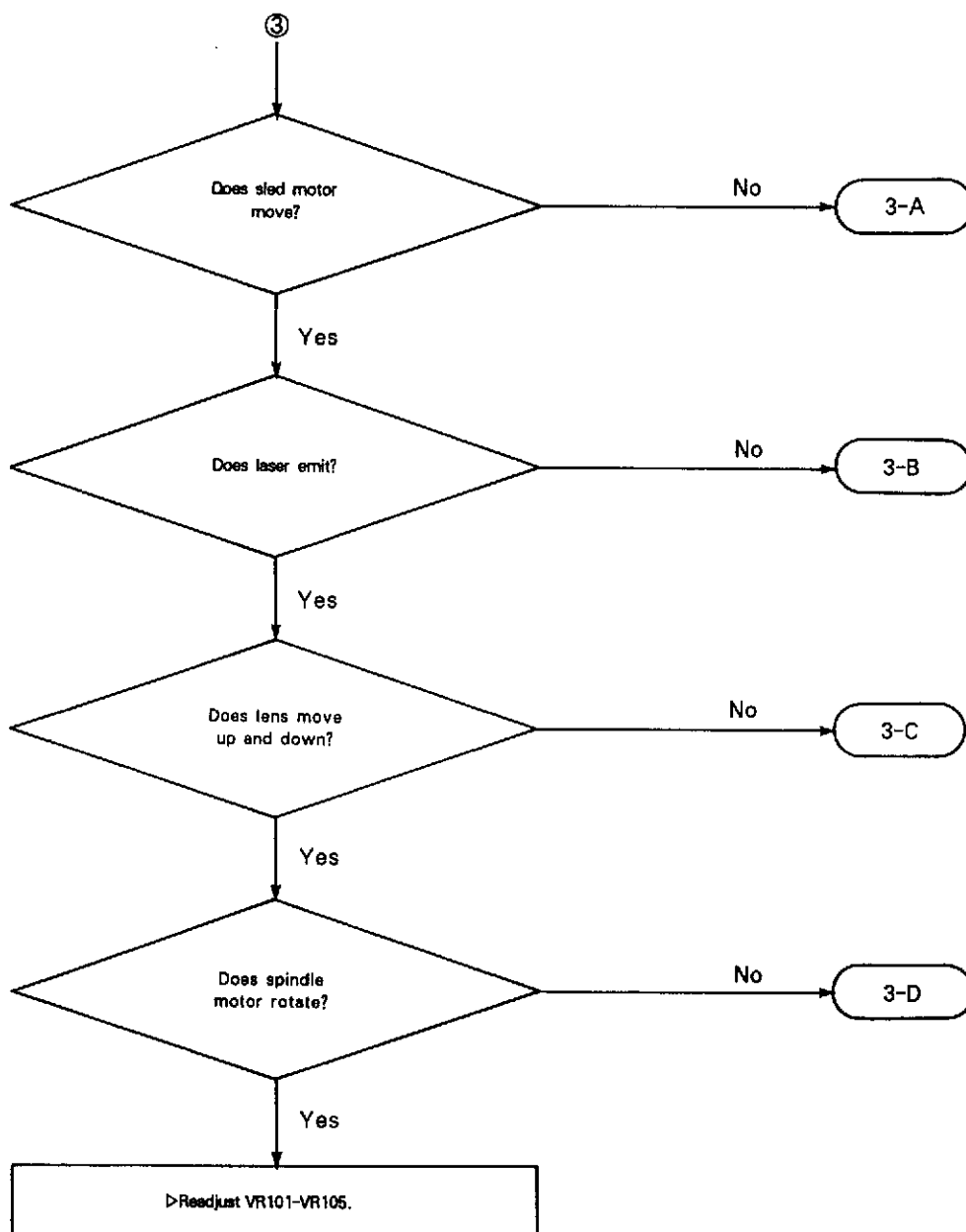
At power on. "g" and some parts are not displayed.



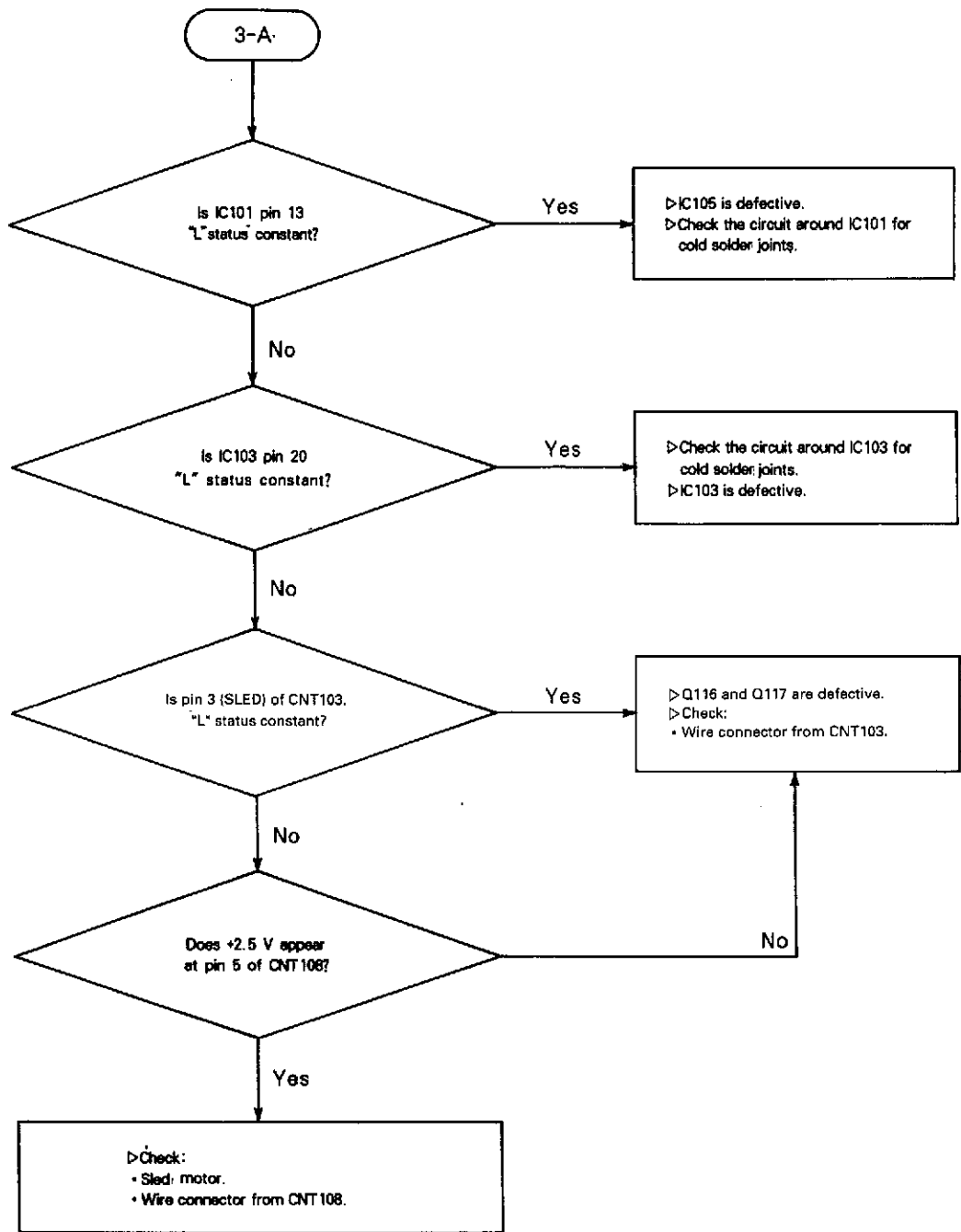
Tray cannot be opened and closed by pressing "OPEN/CLOSE" button.



"0" is displayed instead of total track number and play time.



Sled motor does not move.



Laser does not emit.

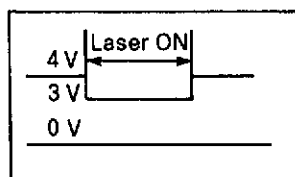
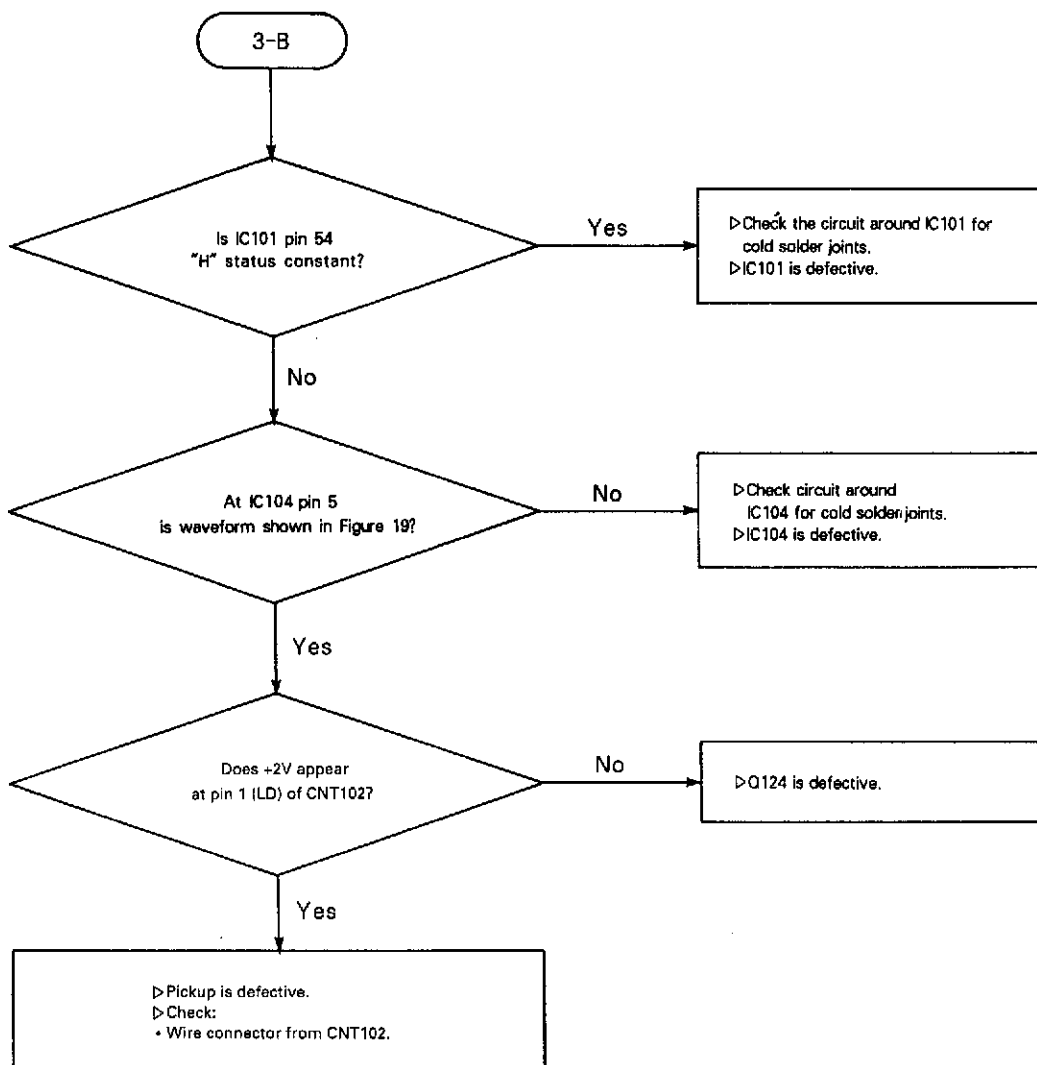
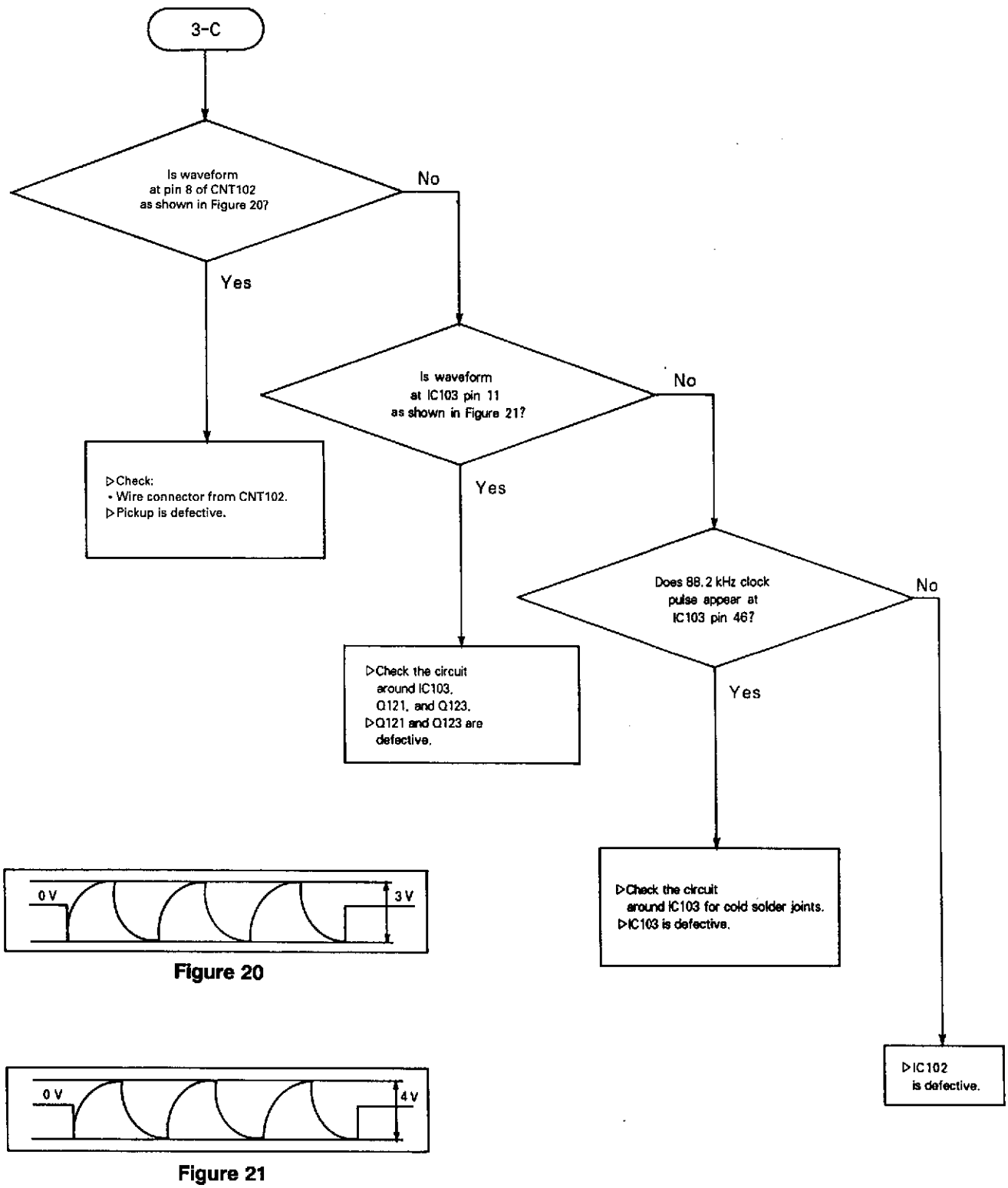


Figure 19

Object lens of pickup unit does not move up and down.



Spindle motor does not rotate.

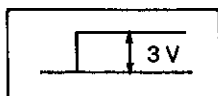
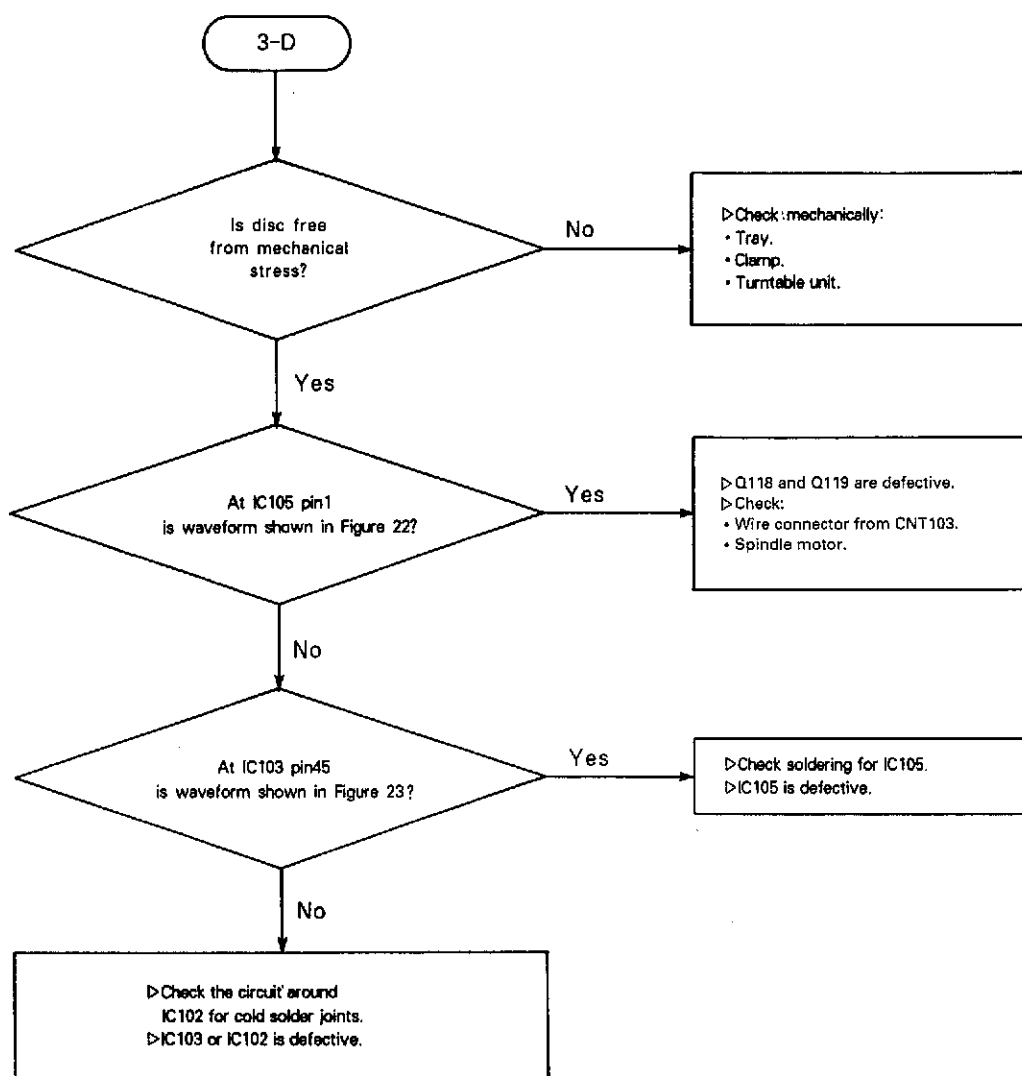


Figure 22

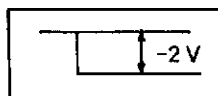
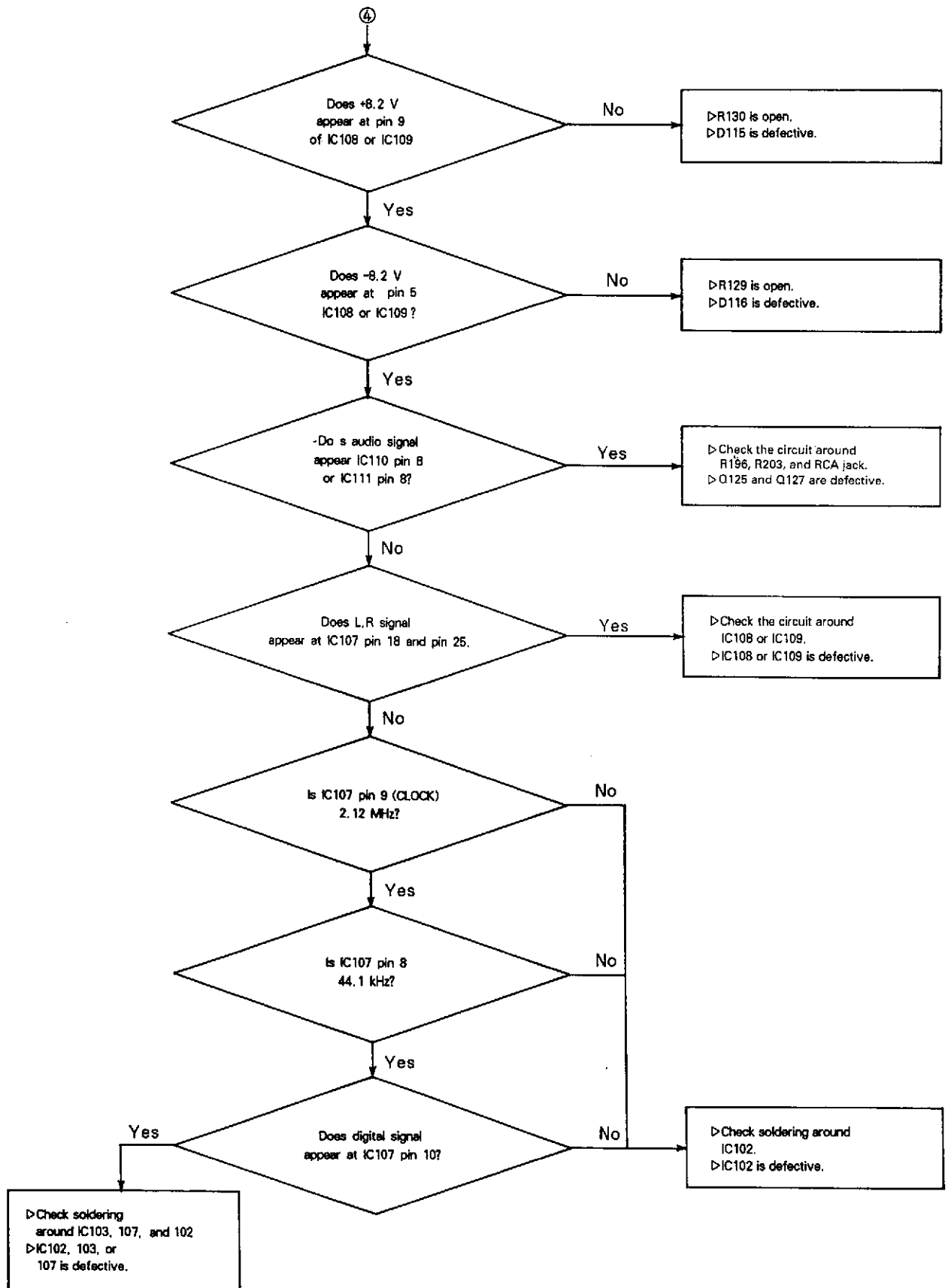


Figure 23

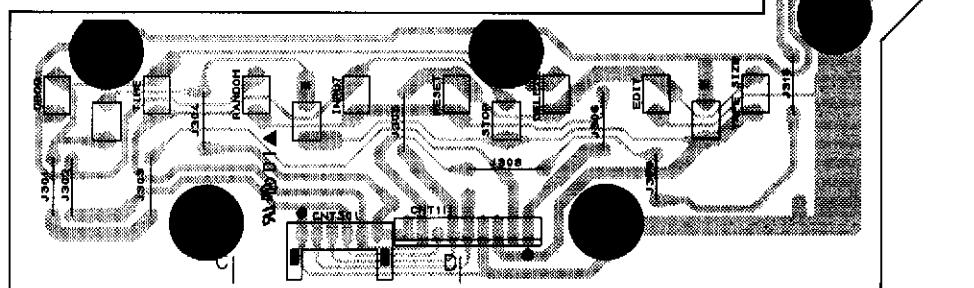
No sound signal.



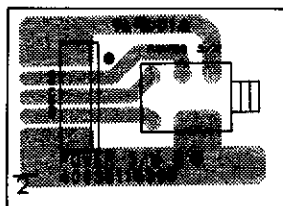
PRINTED CIRCUIT BOARDS

Model No. : FL-8400

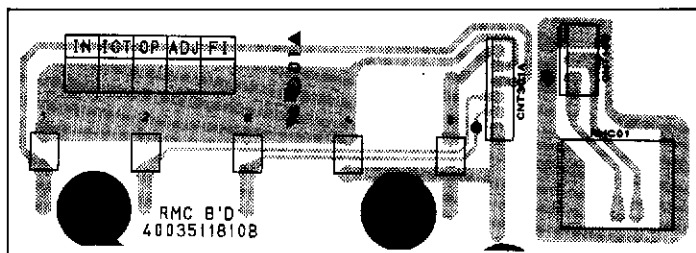
FRONT P. C. BOARD : P3



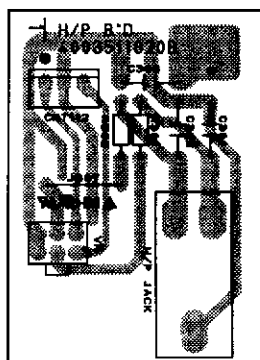
POWER S/W P. C. BOARD : P3-3



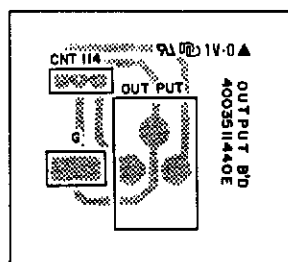
RMC P. C. BOARD : P3-1



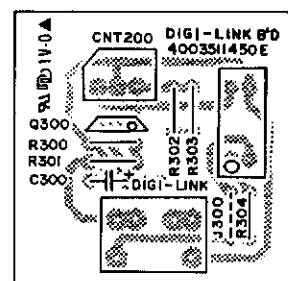
HEAD PHONE P. C. BOARD



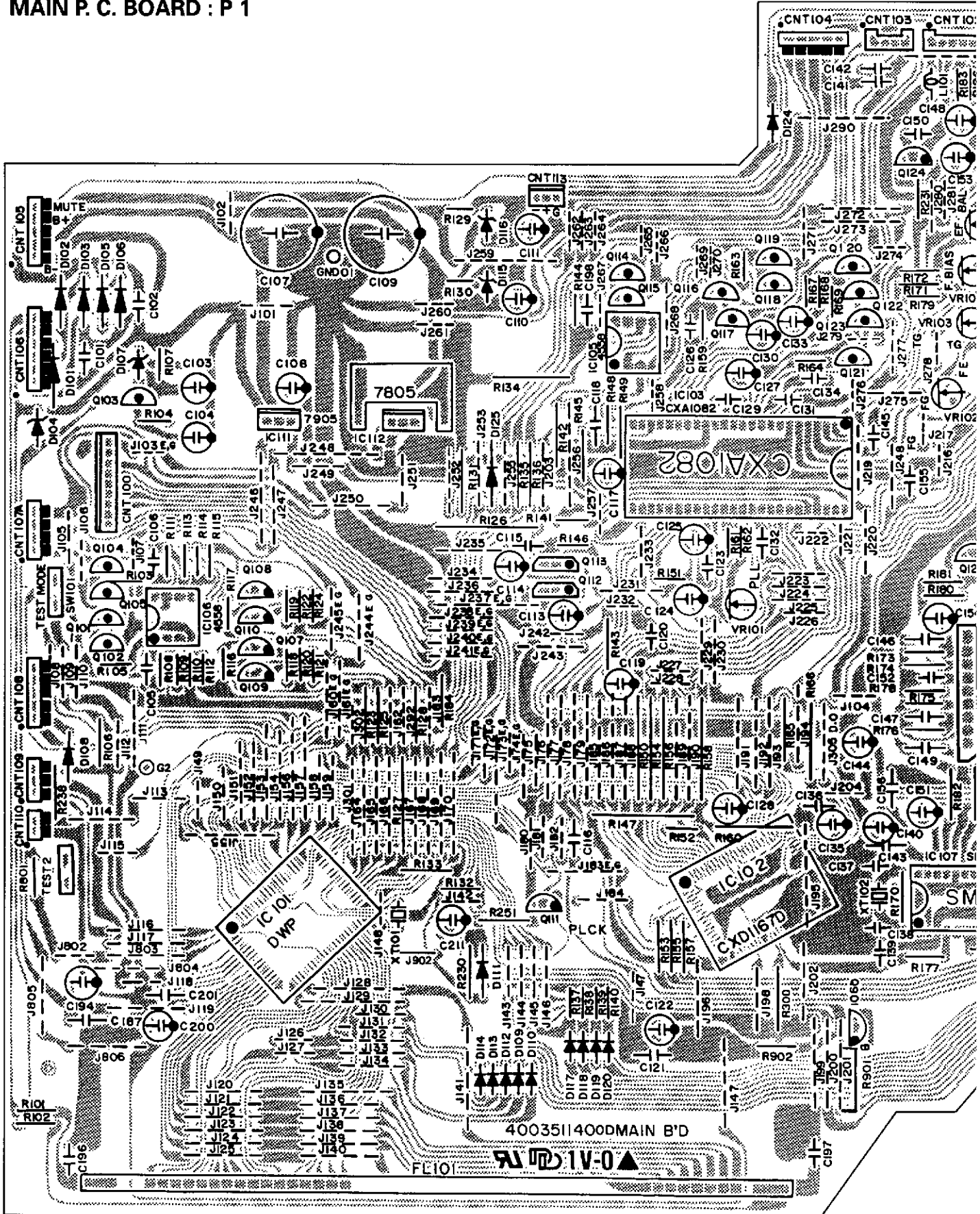
OUTPUT P. C. BOARD
P1-4

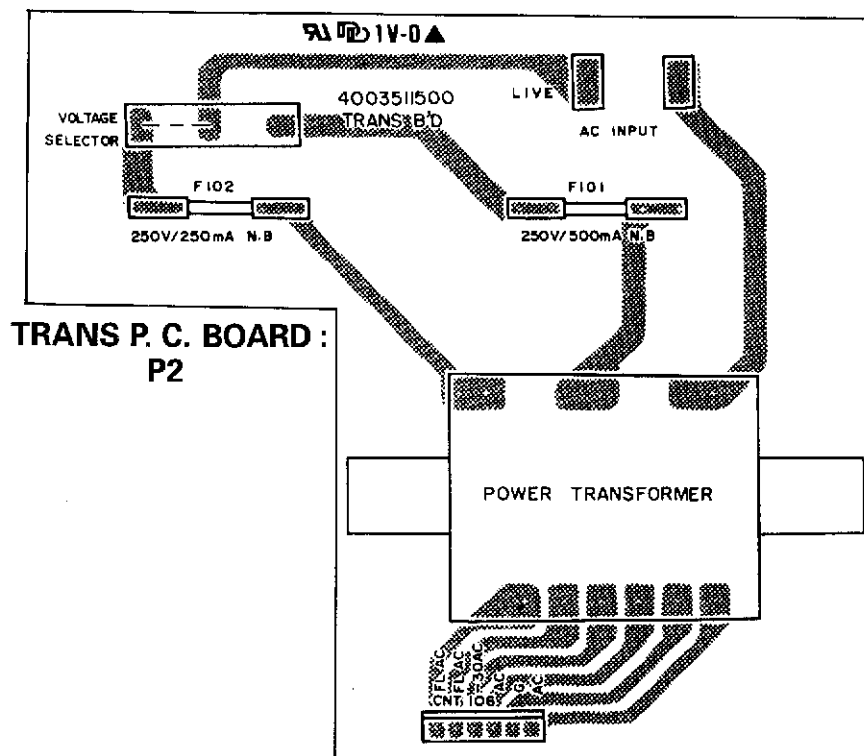
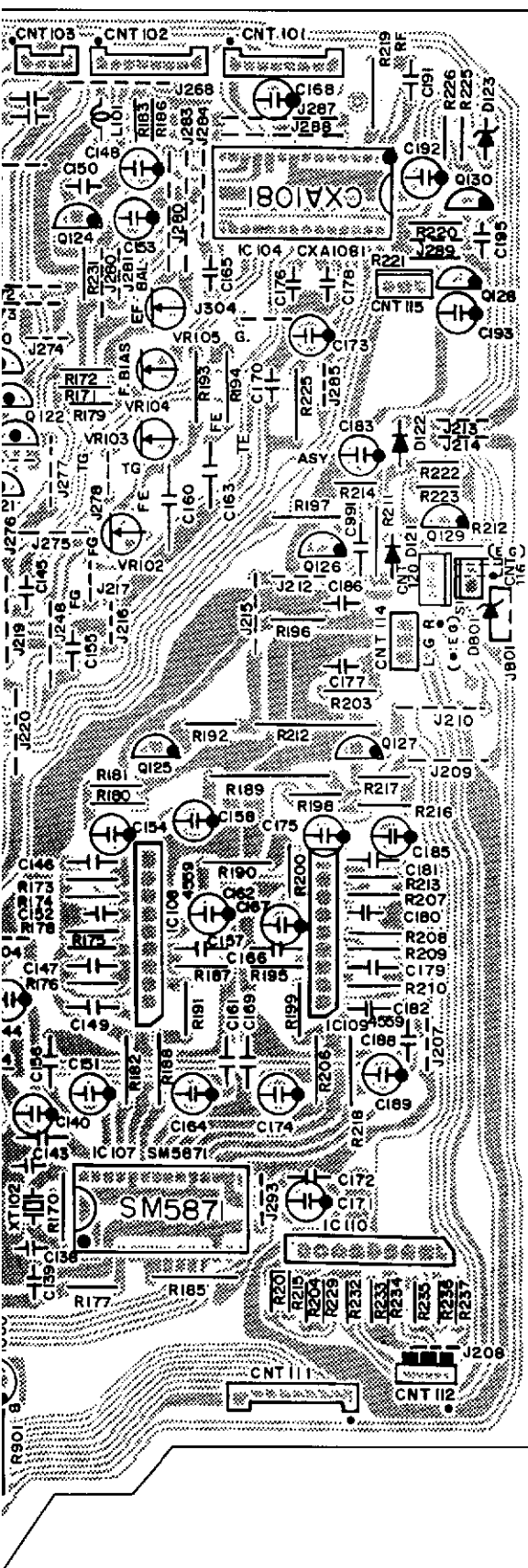


DIGI-LINK P.C.BOARD P1-5

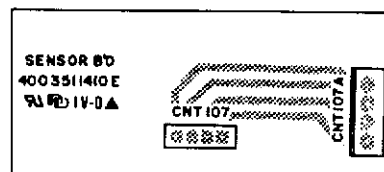


MAIN P. C. BOARD : P 1

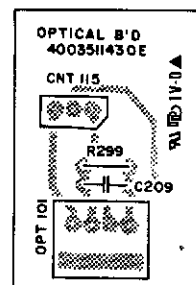


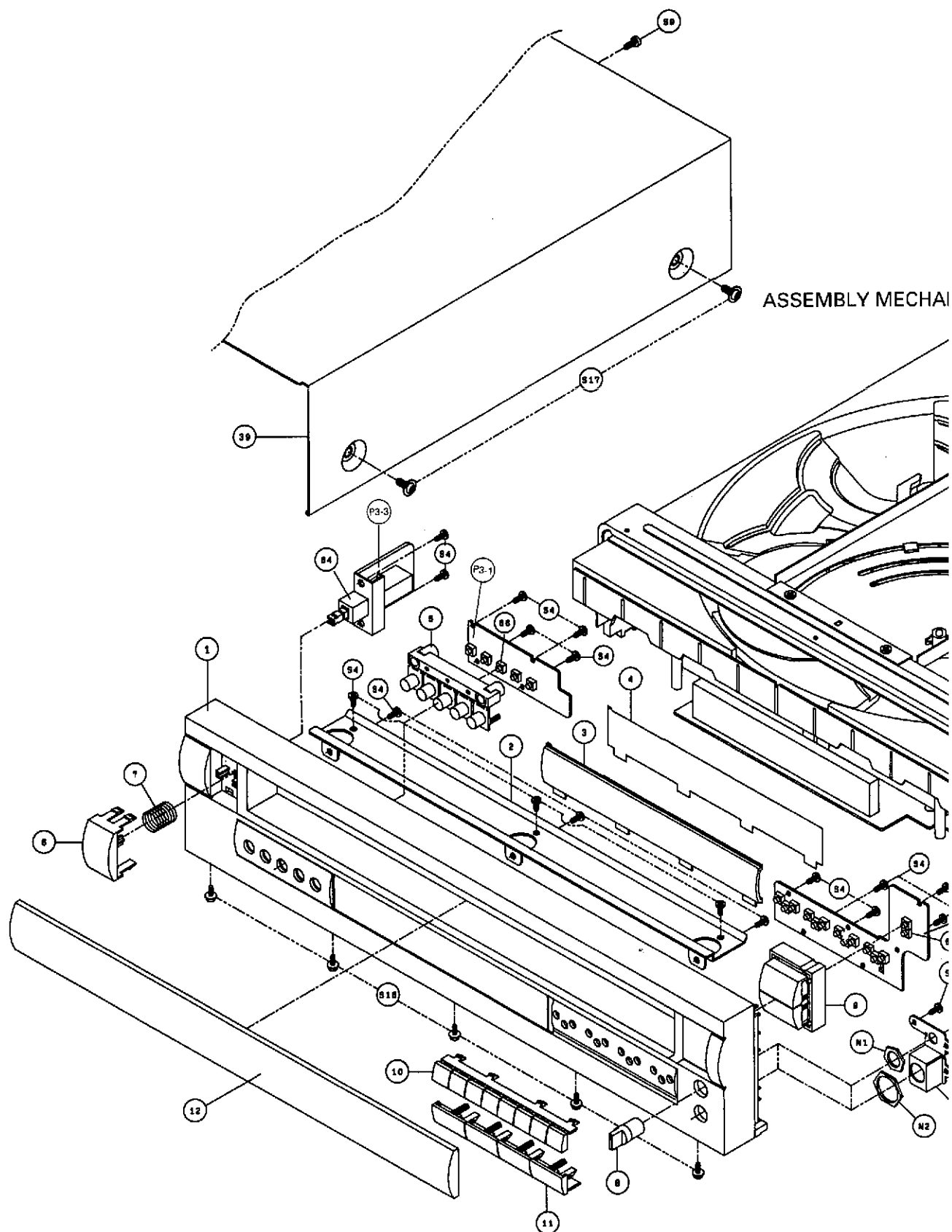


SENSOR P. C. BOARD : P1-1

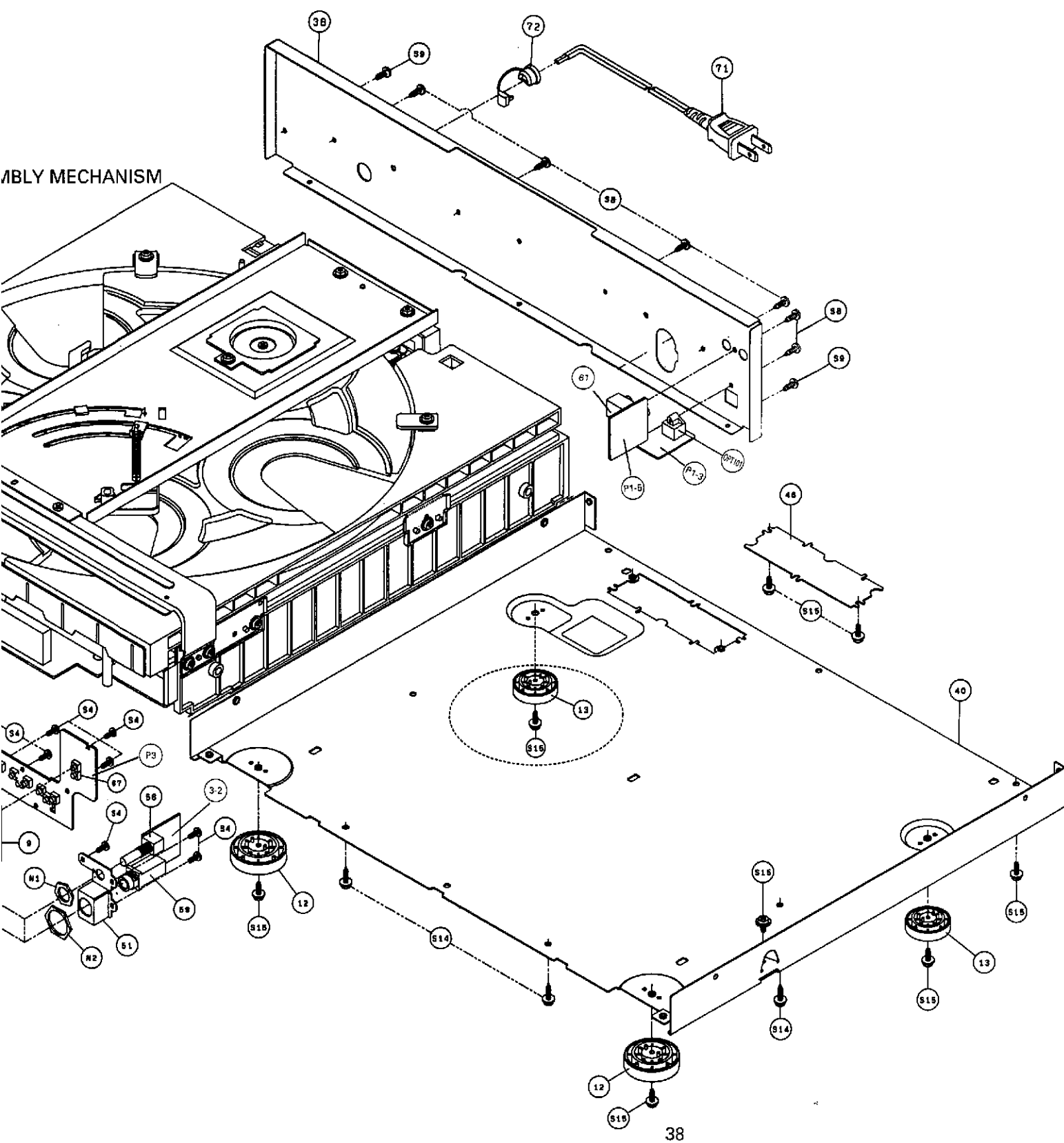


OPTICAL P. C. BOARD : P1-3

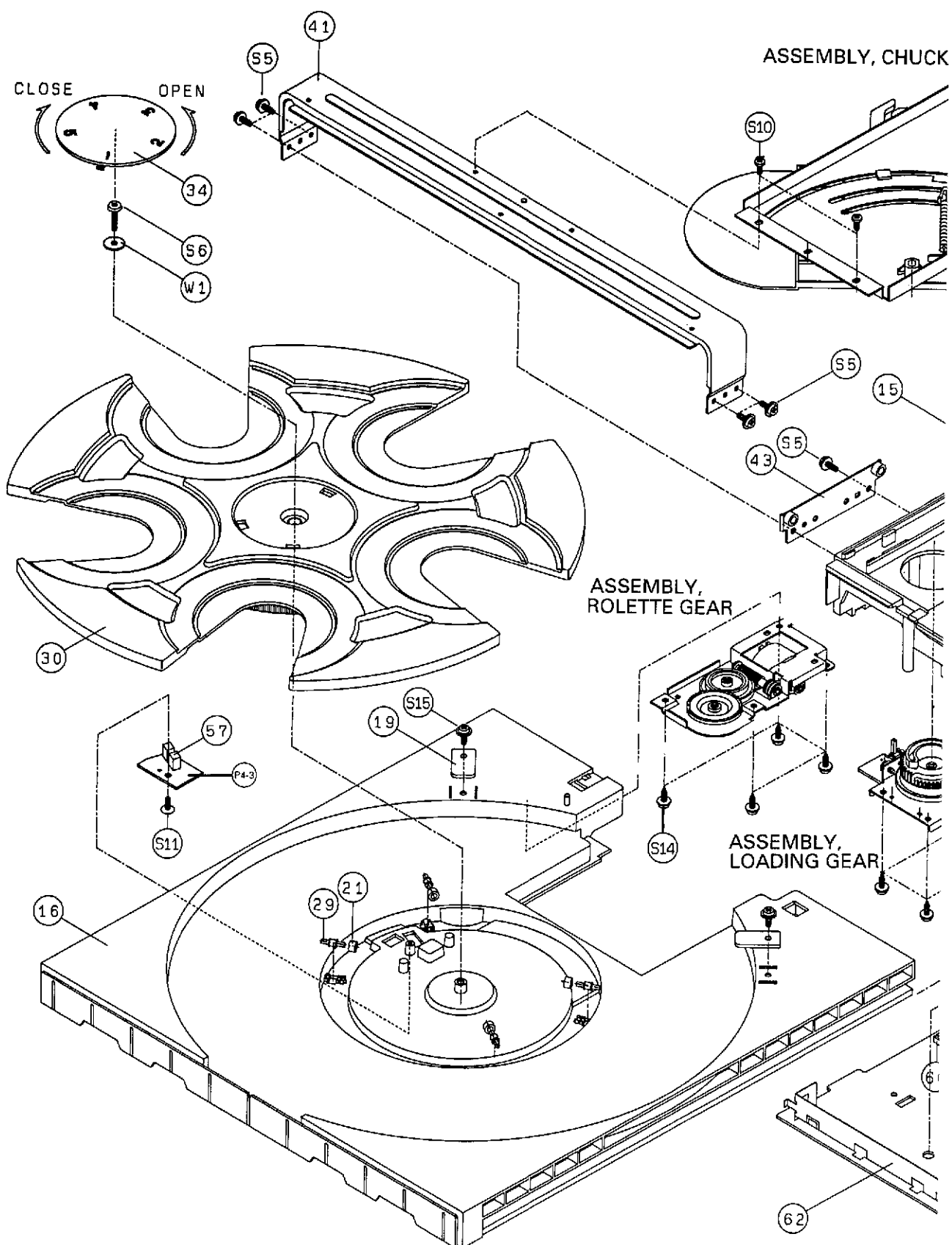


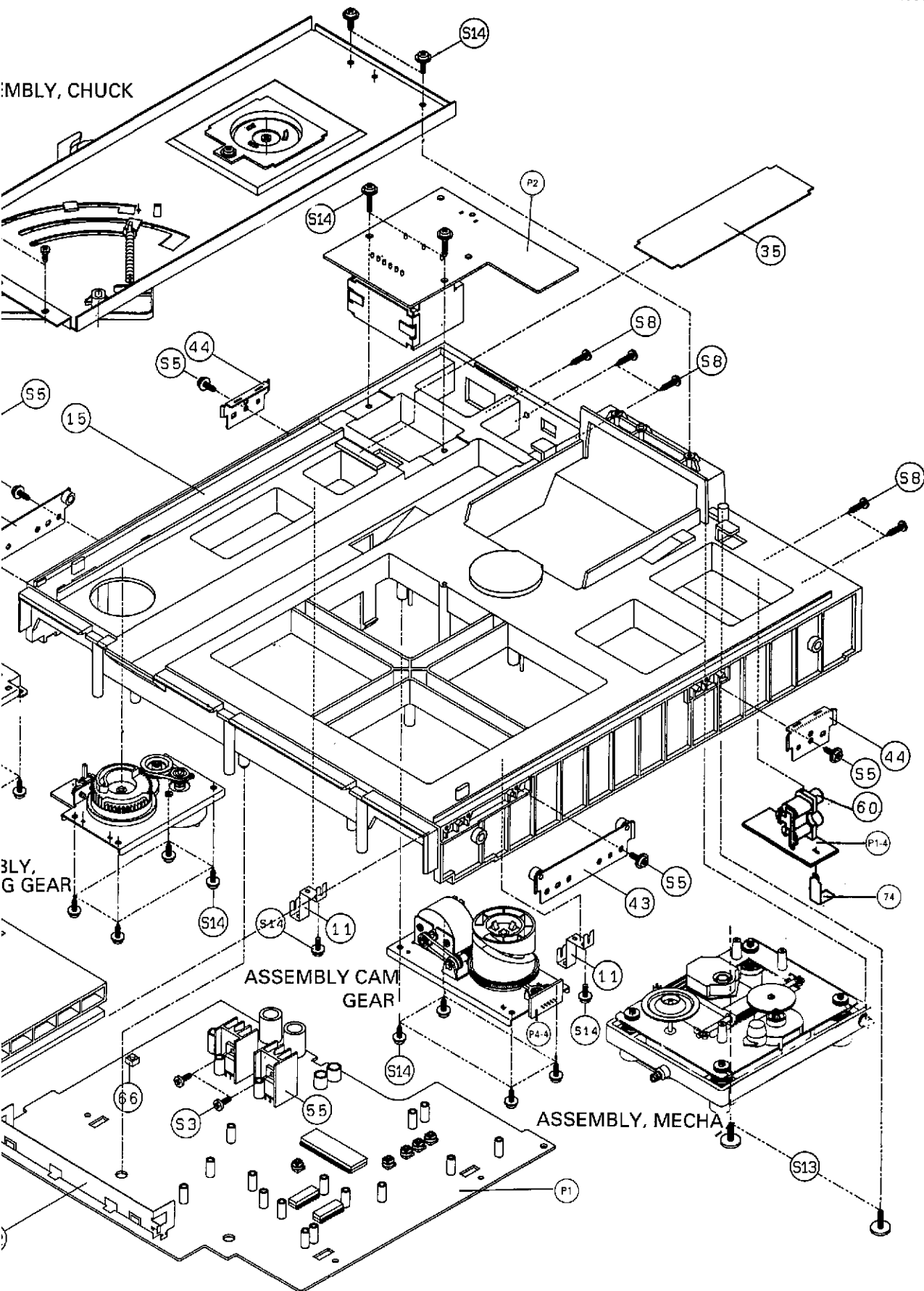
GENERAL UNIT EXPLODED VIEW**CABINET AND CHASSIS**

MBLY MECHANISM

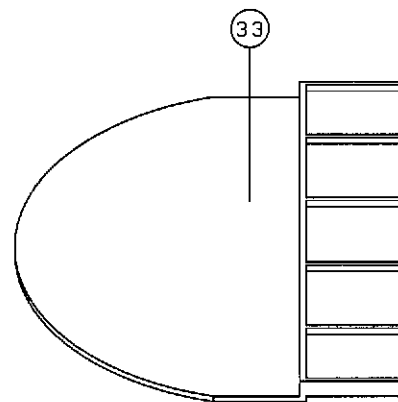
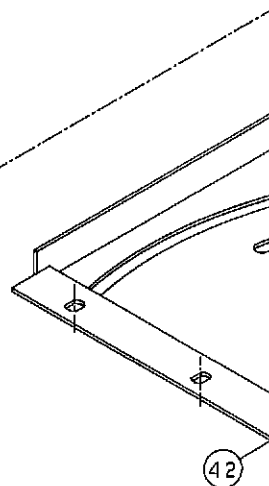
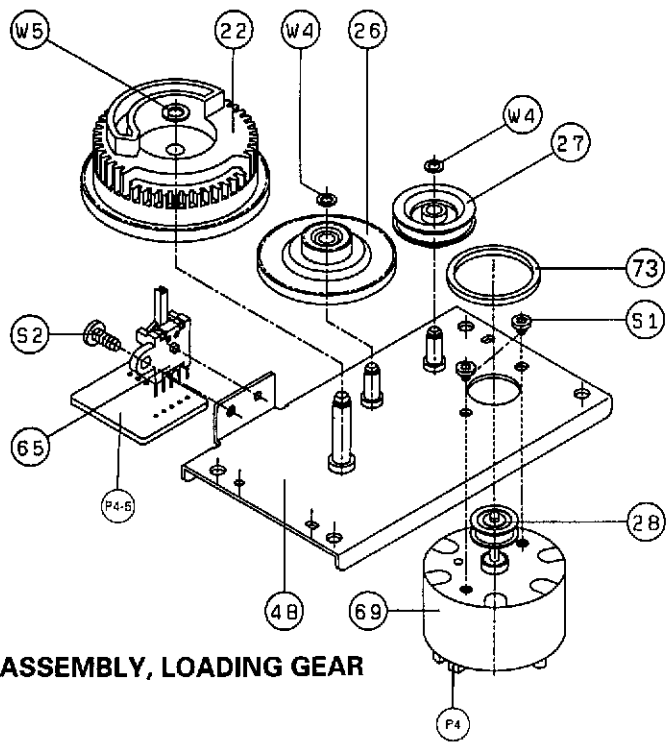
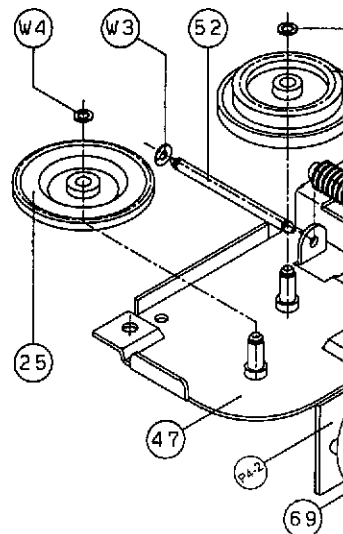
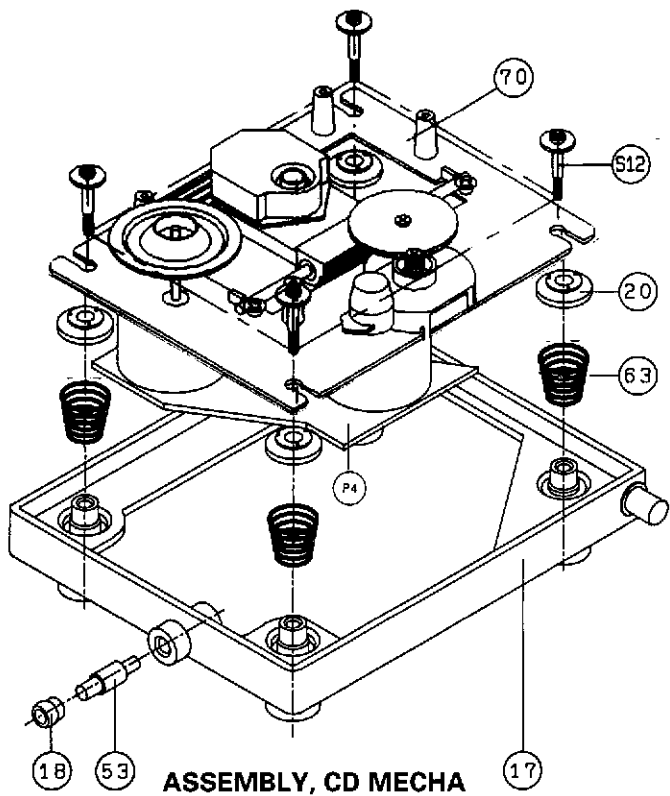


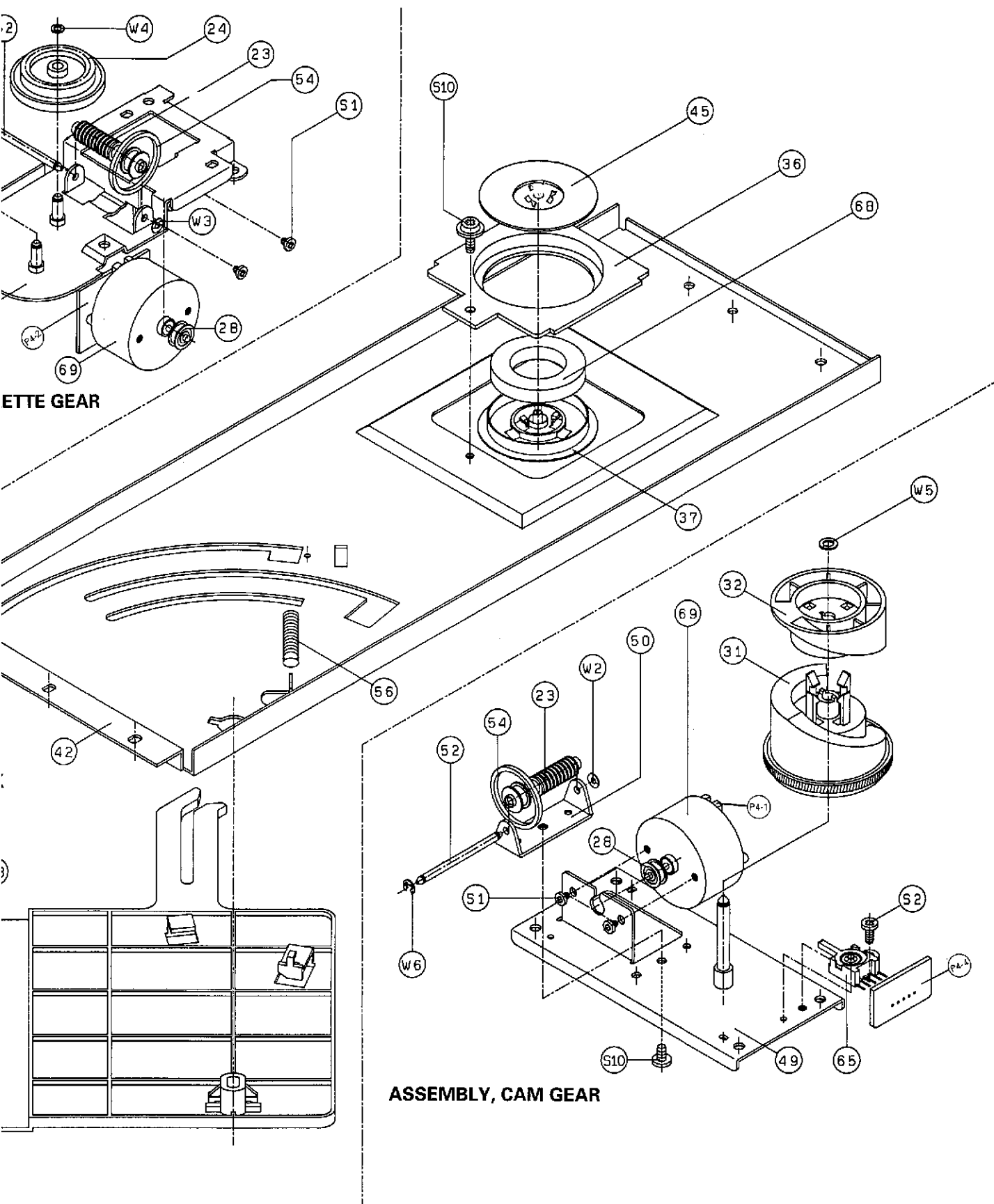
MECHANISM





MECHANISM ASSEMBLIES

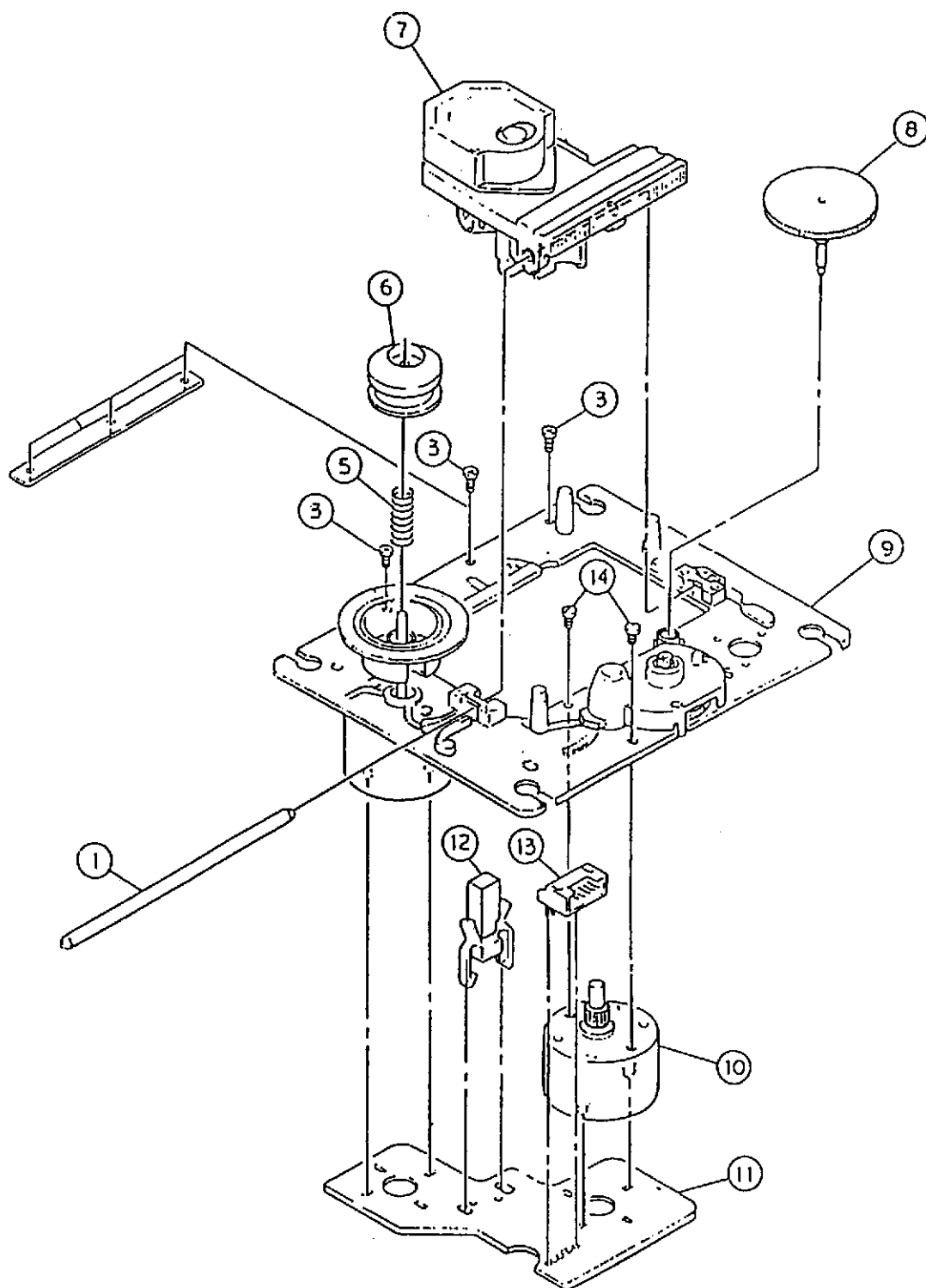




ETTE GEAR

ASSEMBLY, CAM GEAR

CD MECHANISM (KSM-2101A-AM)



Ref. No.	Part No.	Description
50	6505105610	Bracket, Worm 2
52	7005007110	Shaft, Worm
54	7165002420	Belt, 18x1.5x1.5
69	5558200310	Motor, RF-500TB-14415
S1	8009126031	Screw BM 2.6x3Y
S2	8009126061	Screw BM 2.6x6Y
S10	8119430051	Screw SAM 3x5Y
W2	8338300610	Washer, Poly, 2.1x5x0.3
W5	8338300910	Washer, Poly, 3.2x6x0.5
W6	8339020011	Washer, E-Ring Ø2
P4-1	4002517710	P.C.B Chucking
65	4638003210	SW, Lever, SSCF21028A
P4-4	4002517740	P.C.B Up/Down Leaf

	056120000008	Sub Ass'y "E", Chuck
33	8582001020	Cover, Disc
36	6043008410	Guide, Chuck
37	6063103010	Base, Magnet
42	6125000120	Chassis, Chuck
45	6023408610	Cover, Magnet
68	5125000910	Magnet, Ferrite
56	6555306110	Spring, Cover
S7	8109626051	Screw #2BT 2.6x5Y
S10	8119430051	Screw SAM 3x5Y

CD MECHANISM (KSM-2101A-AM)

Ref. No.	Part No.	Description
1	5798900002	Shaft, Slide
3/4		Not Used.
5	5798900003	Spring T/T
6	5798900004	Centering L/O
7	5798900001	Pick-up, KSS-210A (S)-RP
8	5798900005	Gear A
9	5798900006	T/T Chassis Assembly (MT)
10	5798900007	Motor Gear Assembly (MT)
11	5798900008	P.C.B Motor
12	5798900009	Switch, Leaf
13	5798900010	Wafer 4P
14	8019120031	Screw PM 2x3 ZNY

The following parts are only for European version.

Ref. No.	Part No.	Description
38	046102040521	Chassis, Back
71 △	4308001410	AC Cord, EHD-0008-266P, 2000mm, Black
72	6518000710	Stopper, Cord

PRODUCT SAFETY NOTICE

Each precaution in this manual should be followed during servicing. Components identified with the IEC symbol △ in the parts list and the safety can be of special significance. When replacing a component identified with △, use only the replacement parts designated, or parts with the same ratings of resistance, wattage or voltage that are designated in the parts list in this manual. Leakage-current or resistance measurements must be made to determine that exposed parts are acceptably insulated from the supply circuit before returning the product to the customer.

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
R147	3069104970	Carbon Film 100 kohm 1/5 W J	R223	3069153970	Carbon Film 15 kohm 1/5 W J
R148	3069474970	Carbon Film 470 kohm 1/5 W J	R225/226	3069102970	Carbon Film 1 kohm 1/5 W J
R149	3069822970	Carbon Film 8.2 kohm 1/5 W J	R227	3069104970	Carbon Film 100 kohm 1/5 W J
R150	3069203970	Carbon Film 20 kohm 1/5 W J	R229	3069183970	Carbon Film 18 kohm 1/5 W J
R151/152	3069104970	Carbon Film 100 kohm 1/5 W J	R231	3069220970	Carbon Film 22 ohm 1/5 W J
R153	3069681970	Carbon Film 680 ohm 1/5 W J	R233	3069272970	Carbon Film 2.7 kohm 1/5 W J
R154	3069102970	Carbon Film 1 kohm 1/5 W J	R234/235	3069183970	Carbon Film 18 kohm 1/5 W J
R155	3069681970	Carbon Film 680 ohm 1/5 W J	R236	3069220970	Carbon Film 22 ohm 1/5 W J
R156	3069103970	Carbon Film 10 kohm 1/5 W J	R237	3069362970	Carbon Film 3.6 kohm 1/5 W J
R157	3069681970	Carbon Film 680 ohm 1/5 W J	R238	3069473970	Carbon Film 4.7 kohm 1/5 W J
R158	3069103970	Carbon Film 10 kohm 1/5 W J	R251	3069332970	Carbon Film 3.3 kohm 1/5 W J
R159	3069124970	Carbon Film 120 kohm 1/5 W J	R299	3069822970	Carbon Film 8.2 kohm 1/5 W J
R160	3069104970	Carbon Film 100 kohm 1/5 W J	R300	3069681970	Carbon Film 680 ohm 1/5 W J
R161	3069124970	Carbon Film 120 kohm 1/5 W J			
R162	3069362970	Carbon Film 3.6 kohm 1/5 W J			
R163	3069332970	Carbon Film 3.3 kohm 1/5 W J	VR101	3248010243	Semi, 1k, PLL
R164	3069104970	Carbon Film 100 kohm 1/5 W J	VR102	3248020343	Semi, 20k, Focus Gain
R165	3069103970	Carbon Film 10 kohm 1/5 W J	VR103	3248020343	Semi, 20k, Tracking Gain
R166	3069223970	Carbon Film 22 kohm 1/5 W J	VR104	3248050343	Semi 50k, Focus Bias
R167	3069153970	Carbon Film 15 kohm 1/5 W J	VR105	3248020343	Semi 20k, EF Balance
R168/169	3069823970	Carbon Film 82 kohm 1/5 W J			
R170	3069105970	Carbon Film 1 ohm 1/5 W J			
R171	3069103970	Carbon Film 10 kohm 1/5 W J			
R172	3069223970	Carbon Film 22 kohm 1/5 W J			
R173/174	3069682970	Carbon Film 6.8 kohm 1/5 W J	D101-103	2258100135	1N4002, Rectifier
R175	3069752970	Carbon Film 7.5 kohm 1/5 W J	D104	2258599107	Zener, UZ 9.1BSC, Rectifier
R176	3069243970	Carbon Film 24 kohm 1/5 W J	D105/106	2258100135	1N4002, Rectifier
R177	3069331970	Carbon Film 330 ohm 1/5 W J	D107	2258599128	Zener, UZ 30.0BSD, Rectifier
R178	3069682970	Carbon Film 6.8 kohm 1/5 W J	D108-110	2058322101	1N4148N, Switching (=2058306101)
R179	3069103970	Carbon Film 10 kohm 1/5 W J	D112-114	2058322101	1N4148N, Switching (=2058306101)
R180	3069681970	Carbon Film 680 ohm 1/5 W J	D115/116	2258599123	Zener, UZ 8.2BSB, Rectifier
R181	3069104970	Carbon Film 100 kohm 1/5 W J	D117-122	2058322101	1N4148N, Switching (=2058306101)
R182	3069103970	Carbon Film 10 kohm 1/5 W J	D123	2258599102	Zener, UZ 4.3BSB, Rectifier
R183	3069101970	Carbon Film 100 ohm 1/5 W J	D124/125	2058322101	1N4148N, Switching (=2058306101)
R184	3069103970	Carbon Film 10 kohm 1/5 W J			
R185/186	3069102970	Carbon Film 1 kohm 1/5 W J			
R187	3069243970	Carbon Film 24 kohm 1/5 W J	Q101	2208606114	MPSA06, NPN
R188	3069103970	Carbon Film 10 kohm 1/5 W J	Q102-104	2208206113	MPSA56, PNP
R189/190	3069470970	Carbon Film 47 ohm 1/5 W J	Q105	2208606114	MPSA06, NPN
R191	3069752970	Carbon Film 7.5 kohm 1/5 W J	Q107-110	2208606104	KTC1815Y/KTC3198Y, NPN
R192	3069102970	Carbon Film 1 kohm 1/5 W J	Q111	2208606112	2SD1302S, NPN
R193/194	3069472970	Carbon Film 4.7 kohm 1/5 W J	Q112/113	2208622109	DTC144E, NPN
R195	3069243970	Carbon Film 24 kohm 1/5 W J	Q114	2208606114	MPSA06, NPN
R196	3069101970	Carbon Film 100 ohm 1/5 W J	Q115/116	2208206113	MPSA56, PNP
R197	3069102970	Carbon Film 1 kohm 1/5 W J	Q117	2208606114	MPSA06, NPN
R198	3069470970	Carbon Film 47 ohm 1/5 W J	Q118	2208206113	MPSA56, PNP
R199	3069752970	Carbon Film 7.5 kohm 1/5 W J	Q119/120	2208606114	MPSA06, NPN
R200	3069470970	Carbon Film 47 ohm 1/5 W J	Q121	2208206113	MPSA56, PNP
R201	3069220970	Carbon Film 22 ohm 1/5 W J	Q122	2208206113	MPSA56, PNP
R203	3069101970	Carbon Film 100 ohm 1/5 W J	Q123	2208606114	MPSA06, NPN
R204	3069272970	Carbon Film 2.7 kohm 1/5 W J	Q124	2208206105	KTA1015Y/KTA1266Y, PNP
R205	3069104970	Carbon Film 100 kohm 1/5 W J	Q125-128	2208606112	2SD1302S, NPN
R206	3069103970	Carbon Film 10 kohm 1/5 W J	Q129	2208206105	KTA1015Y/KTA1266Y, PNP
R207/208	3069682970	Carbon Film 6.8 kohm 1/5 W J	Q130	2208606112	2SD1302S, NPN
R209	3069752970	Carbon Film 7.5 kohm 1/5 W J			
R210	3069243970	Carbon Film 24 kohm 1/5 W J			
R211	3069103970	Carbon Film 10 kohm 1/5 W J	IC101	2138322177	DWP-311 CXP-82316-170Q, CPU
R212	3069102970	Carbon Film 1 kohm 1/5 W J	IC102	2138022110	CXD-1167Q, DSP
R213	3069682970	Carbon Film 6.8 kohm 1/5 W J	IC103	2138022112	CXA-1082BS
R214	3069104970	Carbon Film 100 kohm 1/5 W J	IC104	2138022111	CXA-1081S, R.F Amp
R215	3069362970	Carbon Film 3.6 kohm 1/5 W J	IC105/10	2168220103	NJM-4560D, OP Amp
R216	3069104970	Carbon Film 100 kohm 1/5 W J	IC107	2138099120	SM-5871AN, D/A Converter
R217	3069681970	Carbon Film 680 ohm 1/5 W J	IC108/10	2168206103	KIA-4559S/KIA-7559S, OP AmP
R218	3069103970	Carbon Film 10 kohm 1/5 W J	IC110	2168020101	NJM-4560S, OP Amp
R219	3069243970	Carbon Film 24 kohm 1/5 W J	IC111	2168602112	GL7905, Regulator
R220	3069102970	Carbon Film 1 kohm 1/5 W J	IC112	2168602105	GL7805, Regulator
R221	3069473970	Carbon Film 4.7 kohm 1/5 W J			
R222	3069183970	Carbon Film 18 kohm 1/5 W J			

Variable Resistors

Diodes

Transistors

ICs

Fluorescent

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
X-TAL					
XT101	3938124010	Resonator, 10 MHz, CST10.0MTW-TF01		054040210013	ASS'Y P.C.B POWER TRANS
XT102	3938101500	X-TAL, 16.9344 MHz			Miscellaneous
Inductor					
L101	2648610082	Coil, Fixed 10uH	F102 Δ	4255001010	Clip Fuse
Connectors					
CNT101	4428525580	Wafer 8P		4428001410	Pin Holder
CNT102	4428525580	Wafer 8P		5508205231	Fuse, NB 350 mA 250 V (UL/C)
CNT103	4428513460	Wafer 4P	TRANS Δ	2828082801	Power transformer, 120 V 60 Hz
CNT104	4428513450	Wafer 5P			Connector
CNT105	4428513450	Wafer 5P	CNT106	4358106162	Lead Ass'y 6P 160mm, to Main BD
CNT106	4428513460	Wafer 6P			054041010017 ASS'Y P.C.B FRONT
CNT107A	4428513440	Wafer 4P			Miscellaneous
CNT108	4428513450	Wafer 5P	66	4658003710	SW Tact, SKHV10910D01
CNT109	4428513430	Wafer 3P	67	4658004410	SW Tact, EVQ-PJJ-05T
CNT111	4428525590	Wafer 9P			Connectors
CNT112	4428513430	Wafer 3P			Connector
CNT114	436103263321	Lead Ass'y 3P 260 mm, to Output B'D	CNT111	4358509121	Lead Ass'y 9P 120mm to Main B'D
CNT120	436103222181	Lead Ass'y 3P 220 mm, to Output B'D	CNT301	4428525560	Wafer 6P
054041010002 ASS'Y P.C.B SENSOR A					
Connectors					
CNT107	4428515410	Wafer 4P		054041010018	ASS'Y P.C.B RMC/FUNCTION
CNT107-A	4358104164	Lead Ass'y 4P 160mm, to Main B'D	66	4658003710	SW Tact, SKHV10910D01
054041010047 P.C.B DIGI-LINK					
Miscellaneous					
61	4438007510	Jack, Multi			Connectors
Connectors					
CNT200	4428513430	Wafer 3P	CNT301A	436206303442	Lead Ass'y 6P 300mm to Front B'D
Capacitor					
C300	3479322041	Electrolytic SG	CNT109	436103223441	Lead Ass'y 3P 220mm, to Main B'D
IC					
IC300	2408000136	LTV-817			Sensor
Transistor					
Q300	2238006103	KRA107M	RMC01	2138000208	SBX1610-02, Remote Sensor
Resistors					
R300	3069473970	Carbon Film		054041010019	ASS'Y P.C.B. POWER SWITCH
R301	3069470970	Carbon Film			Miscellaneous
R302	3069392970	Carbon Film	64	4628055810	SW Push Power
R303	3069101970	Carbon Film			Connector
R304	3069271970	Carbon Film	CNT103	4358105263	Lead Ass'y 5P 260mm, to Main B'D
054041010020 ASS'Y P.C.B HEADPHONE					
Miscellaneous					
		47 kohm 1/5 W J	58	3208067210	VR, Level
		47 ohm 1/5 W J	59	4438005010	Jack, Phone, ABS, Gold
		3.9 kohm 1/5 W J			Connector
		100 ohm 1/5 W J	CNT112	4358103129	Lead Ass'y 3 P 120 mm, to Main B'D
		270 ohm 1/5 W J	G	152622101057	Wire Lug #BK100
054041010048 ASS'Y P.C.B LINE OUT					
Miscellaneous					
80	4438103010	Jack RCA 2P	C301/303	3519332935	Ceramic Tubular
74	6505139410	Bracket, Ground			0.003 uF 50 V J
Connector					
CNT114	4428513430	Wafer 3P			Resistors
Capacitor					
C400	3519472915	Ceramic Tubular	R301/302	3069560970	Carbon Film
054041010010 ASS'Y P.C.B DISC SENSOR					
Miscellaneous					
		4700 pF 16 V J	57	2408001111	SG-2, Sensor Photo
			P4-3	4002517730	P.C.B Disc Sensor

Ref. No.	Part No.	Description
Connectors		
CNT201	4358103247	Lead Ass'y 3P 200 mm, to Skip Motor B'D
Resistors		
R301	3069151970	Carbon Film 150 ohm 1/5 W J
R302	3069103970	Carbon Film 10 kohm 1/5 W J
054041010021 ASS'Y P.C.B OPTICAL		
Connector		
CNT115	4428505710	Wafer 3P
Resistor		
R228	3069822970	Carbon Film 8.2 kohm 1/5 W J
Capacitor		
C209	3519222935	Ceramic Tubular 0.022 uF 50 V J
Converter		
OPT101	2428000140	E/O PLT102, Converter, Digital Output

The following parts are only for 230V version.

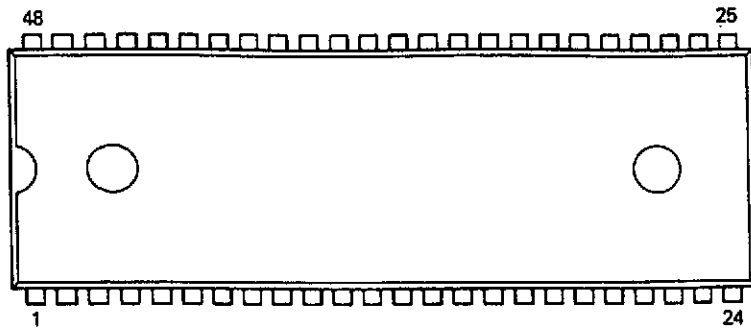
Ref. No.	Part No.	Description
054040210027 ASS'Y P.C.B POWER TRANS		
Miscellaneous		
	4255001010	Clip Fuse
	4428001410	Pin Holder
F102 Δ	5508301035	Fuse, 5T 160 mA 250 V (SEMKO)
TRANS Δ	2828009747	Power transformer, 230 V 50 Hz
Connector		
CNT106	4358106162	Lead Ass'y 6P 160mm, to Main BD

PRODUCT SAFETY NOTICE

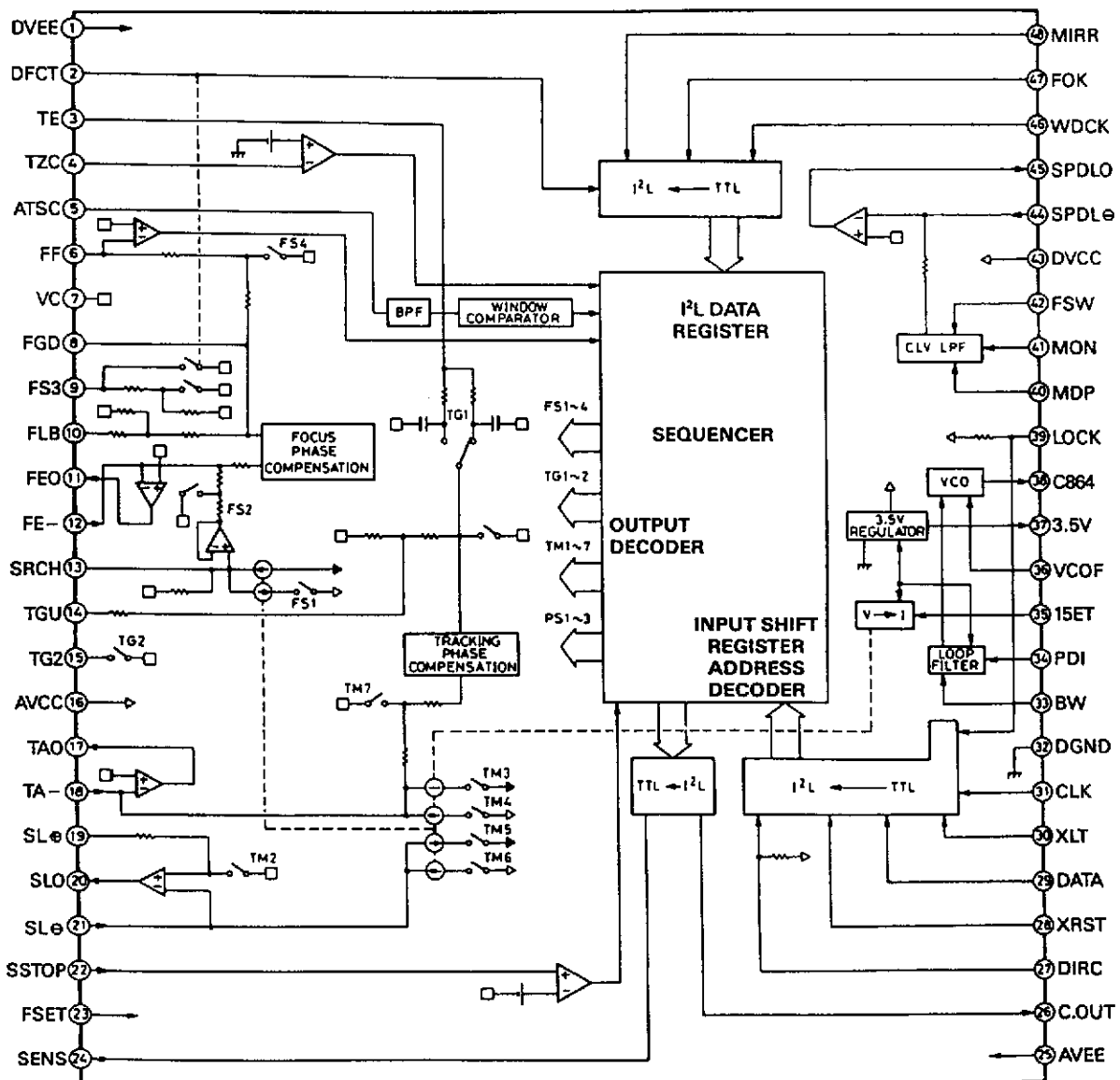
Each precaution in this manual should be followed during servicing. Components identified with the IEC symbol Δ in the parts list and the safety can be of special significance. When replacing a component identified with Δ , use only the replacement parts designated, or parts with the same ratings of resistance, wattage or voltage that are designated in the parts list in this manual. Leakage-current or resistance measurements must be made to determine that exposed parts are acceptably insulated from the supply circuit before returning the product to the customer.

IC FUNCTIONAL BLOCK DIAGRAM

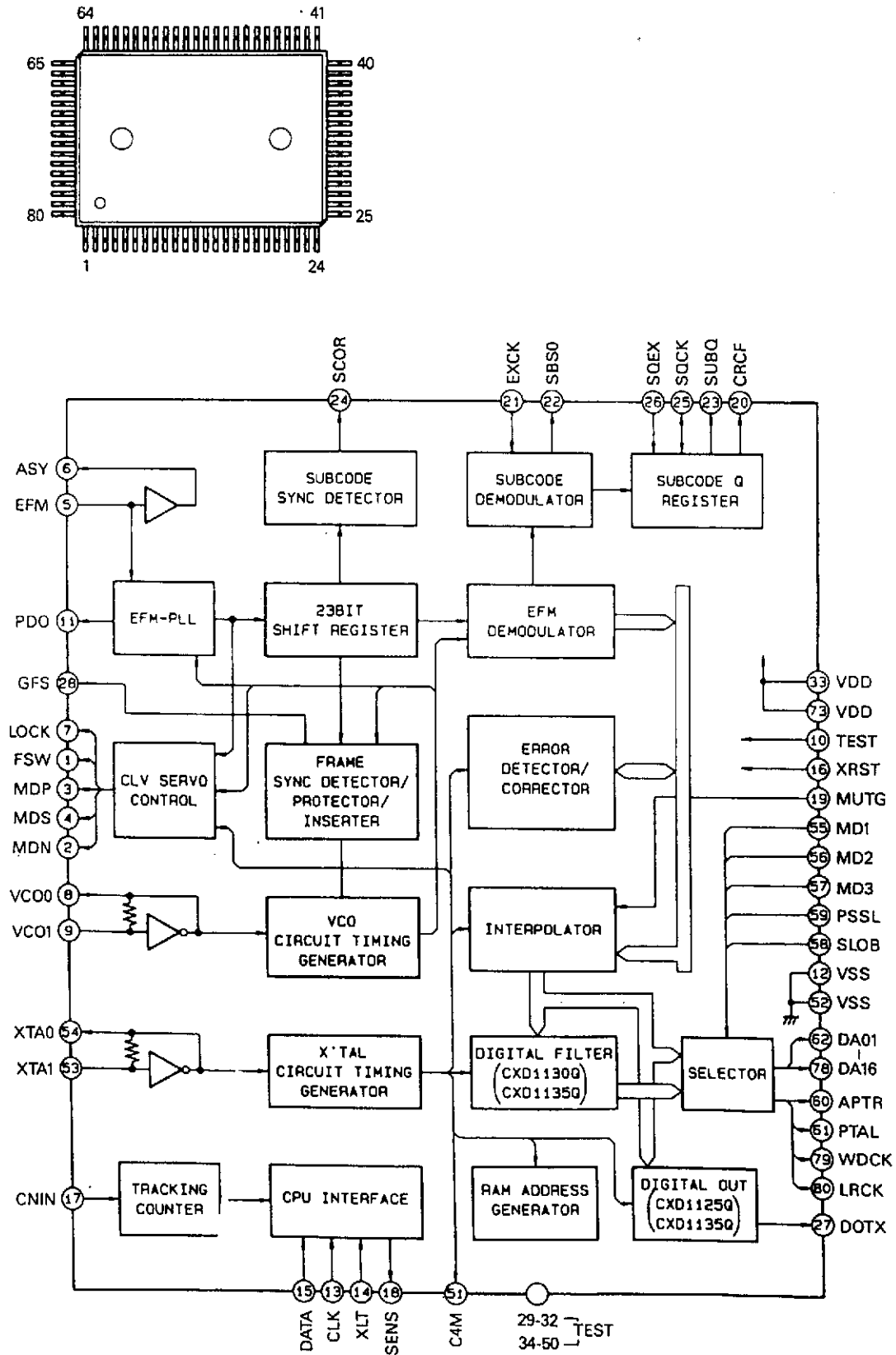
CXA1082BS : IC107



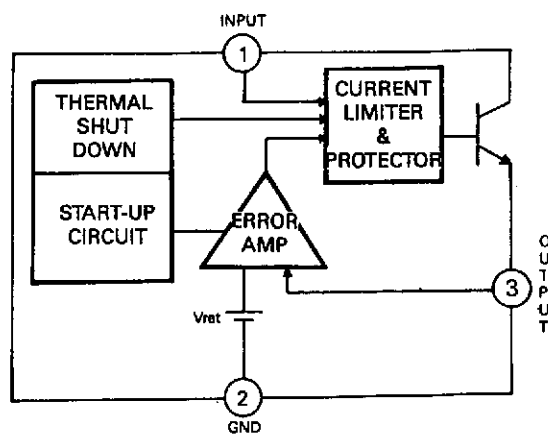
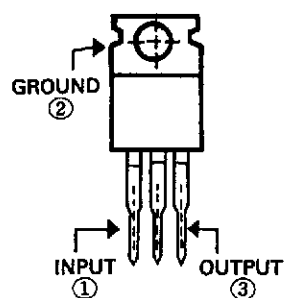
Servo Signal Processor



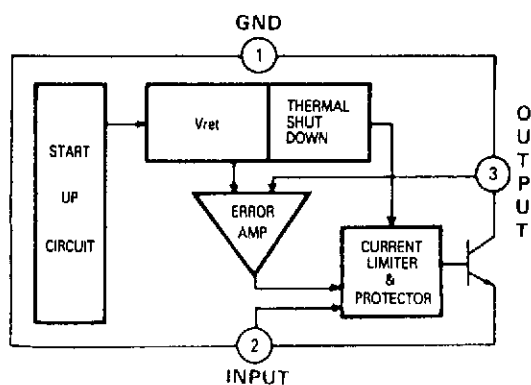
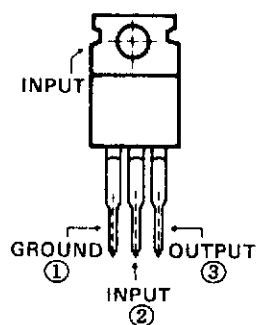
CXD1167Q : IC105 (Digital Signal Processor)



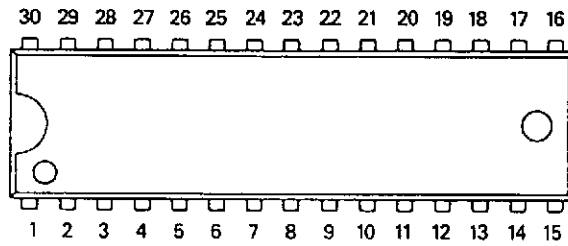
GD78XX : IC112



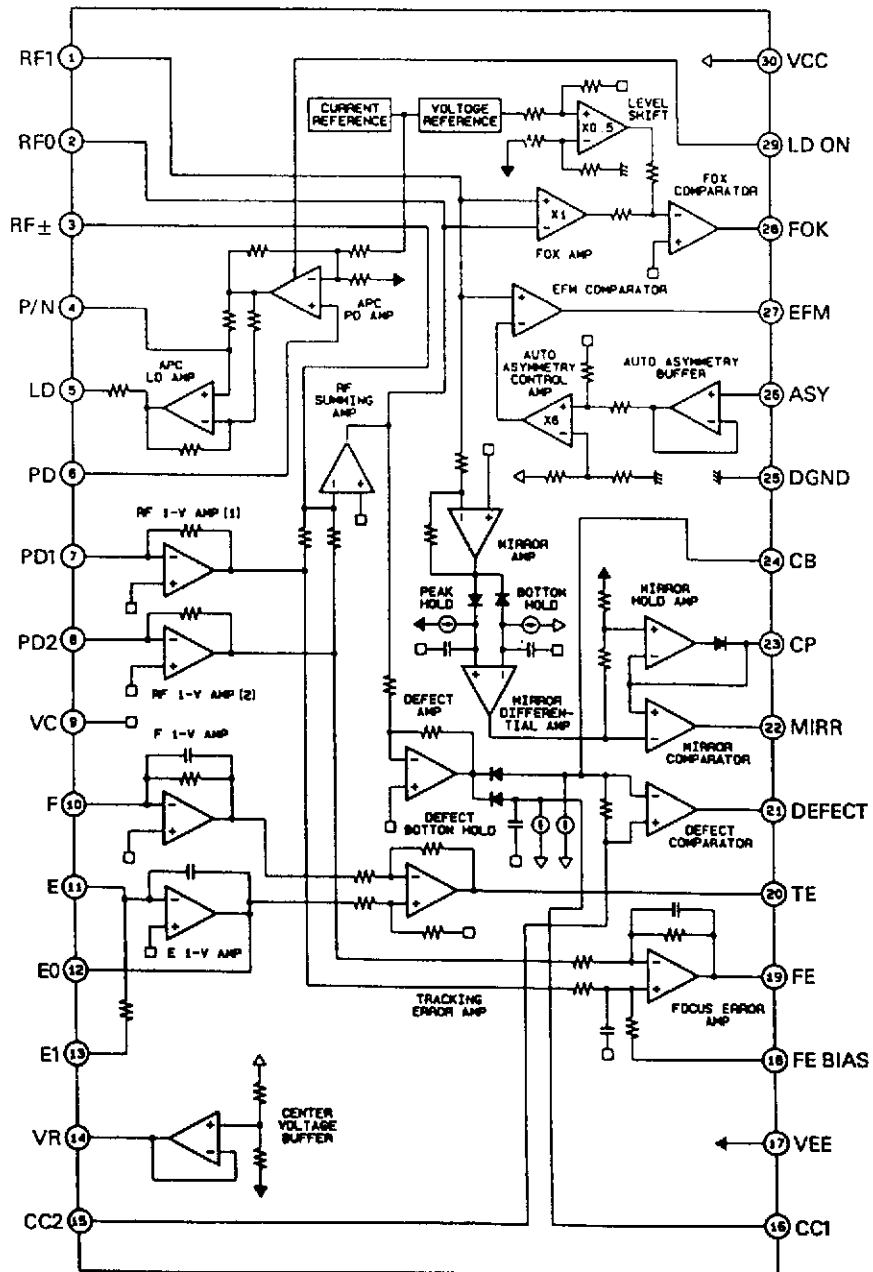
GD7915 : IC111



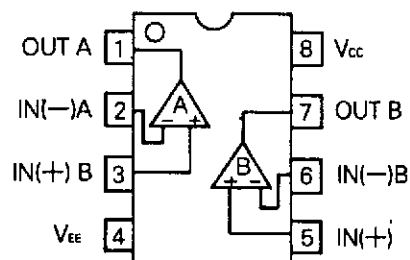
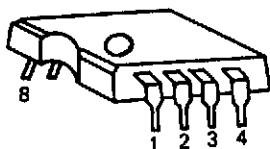
CXA1081S : IC108



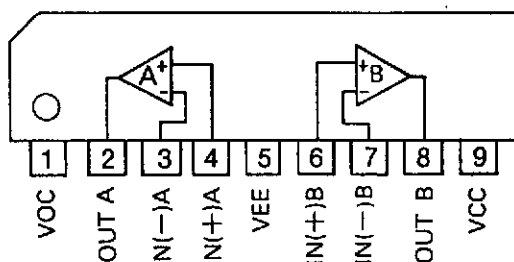
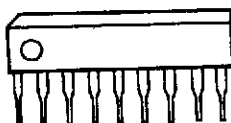
RF Amp.



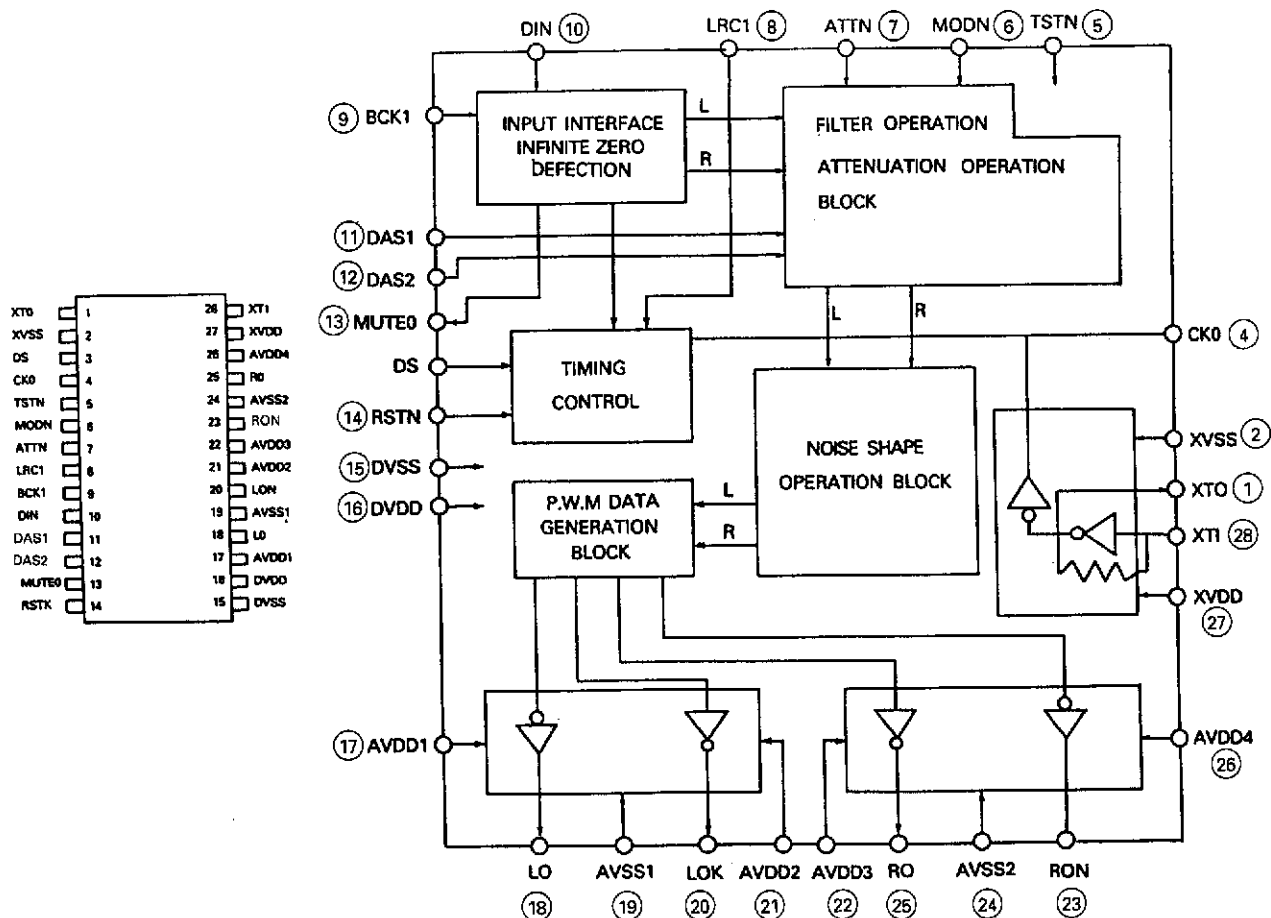
NJM4560D : IC105, IC106



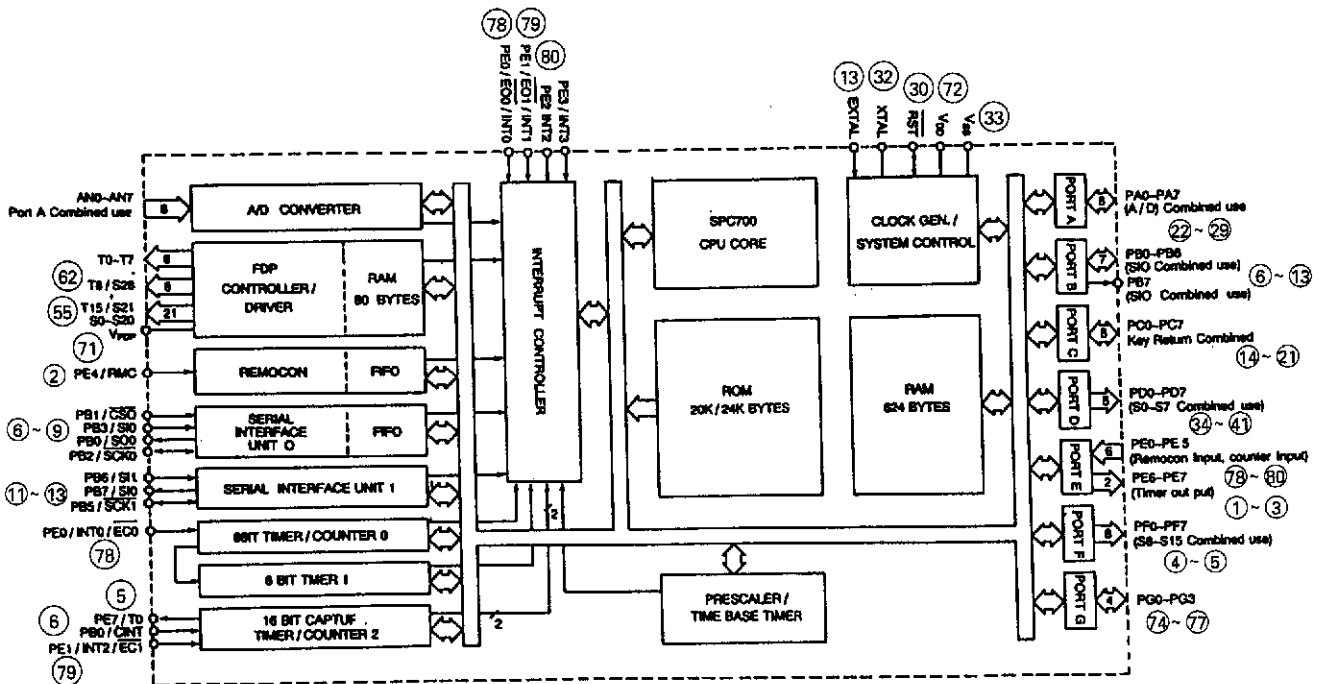
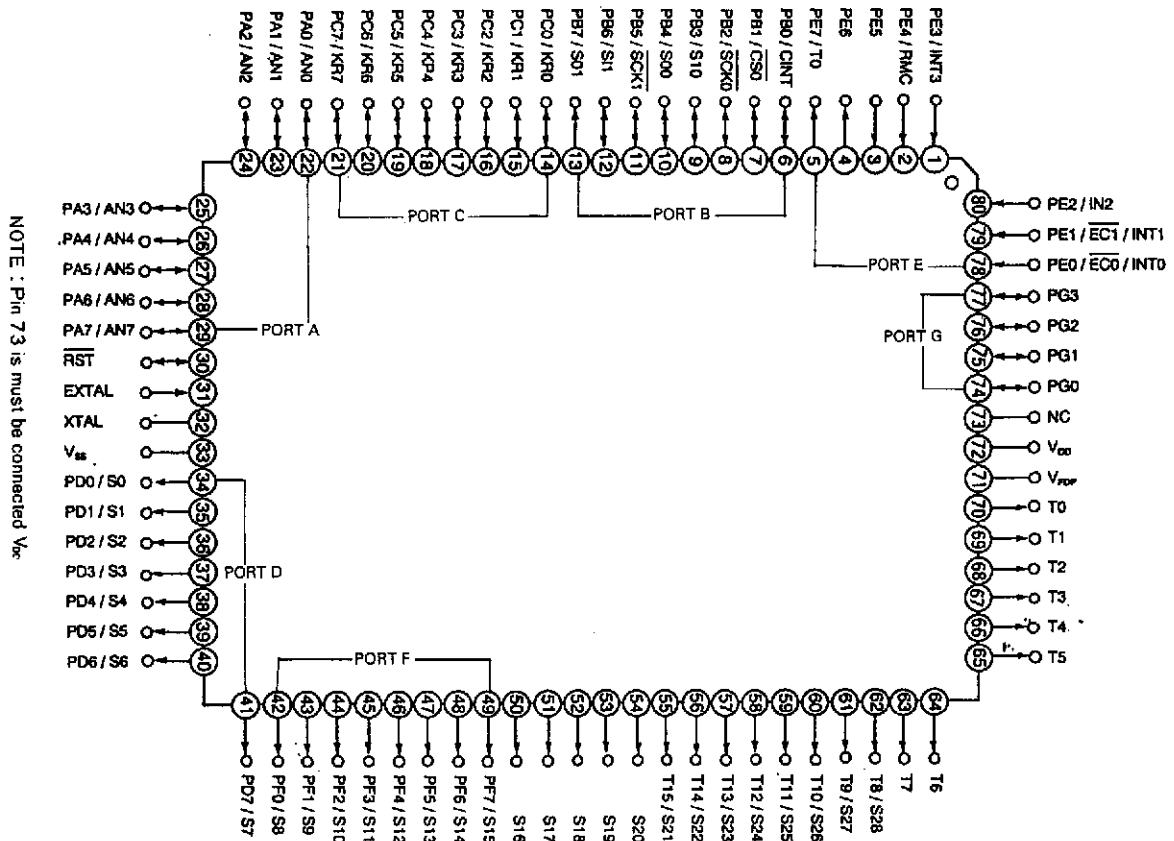
NJM4560S : IC110
KIA4559S : IC108, IC109



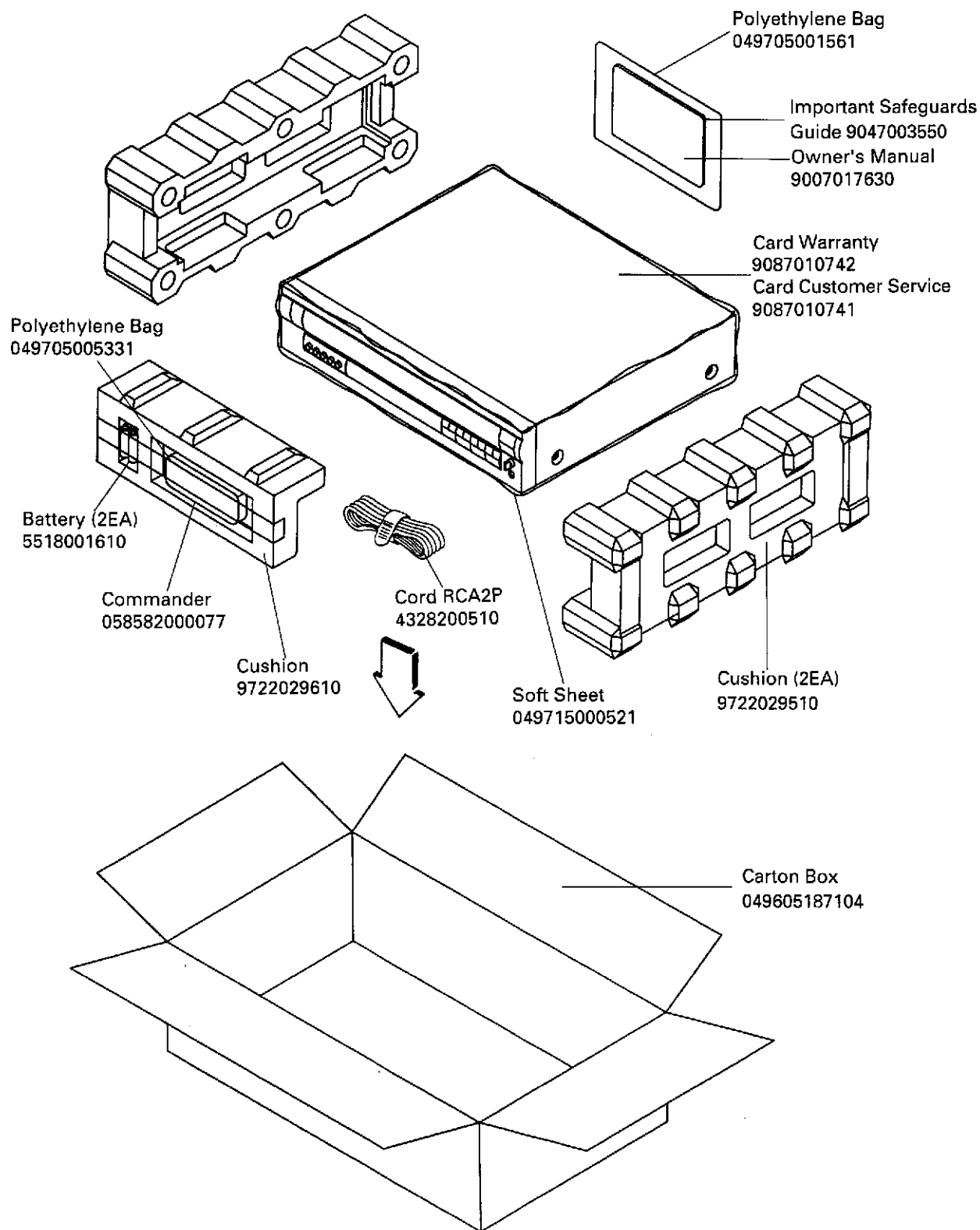
SM5871AN : IC107



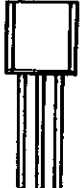
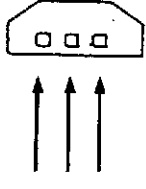
DWP 311, CXP 82316 CPU : IC102 (BLOCK DIAGRAM)

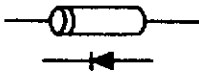
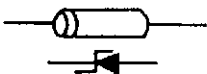


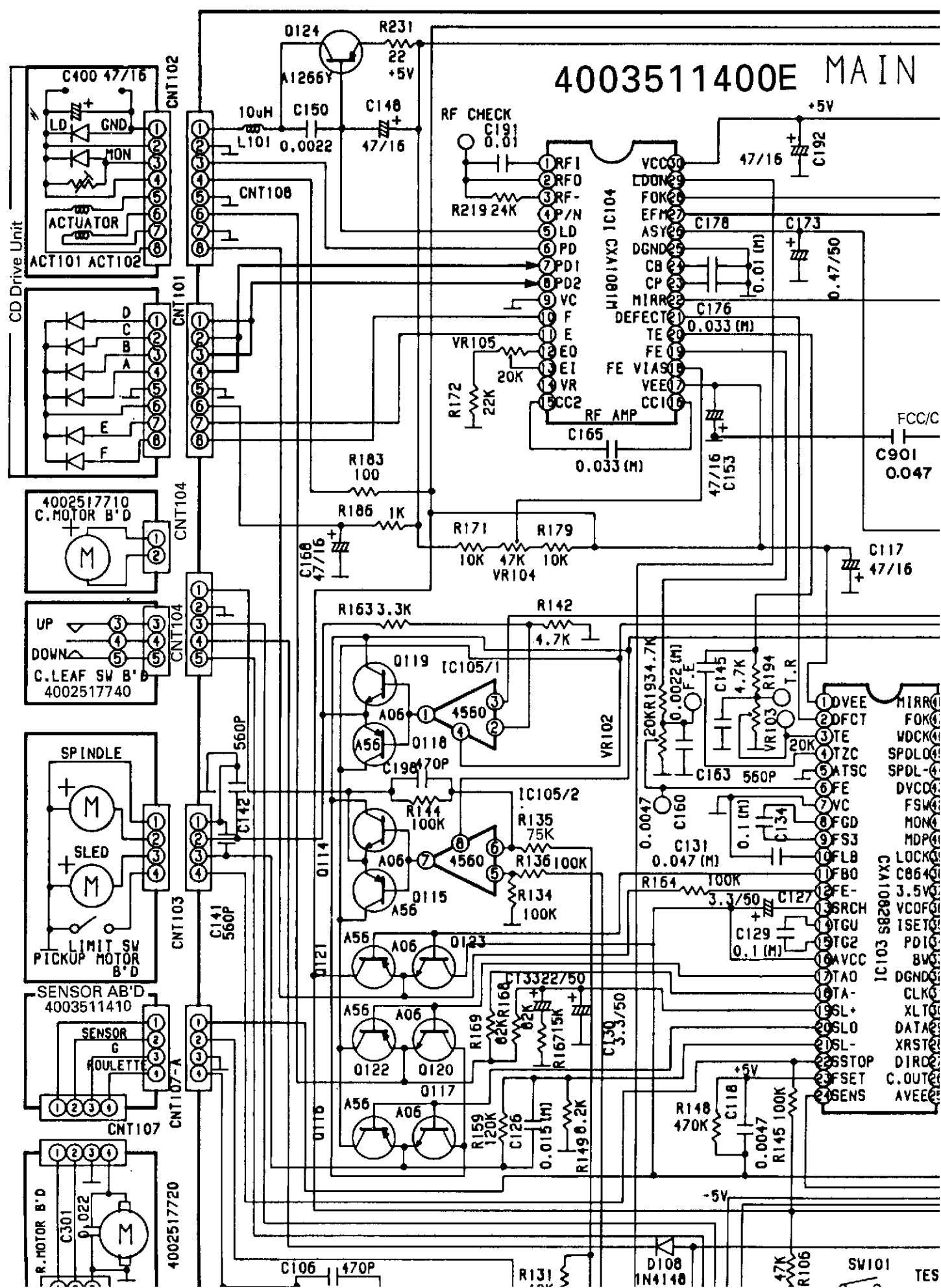
PACKAGE

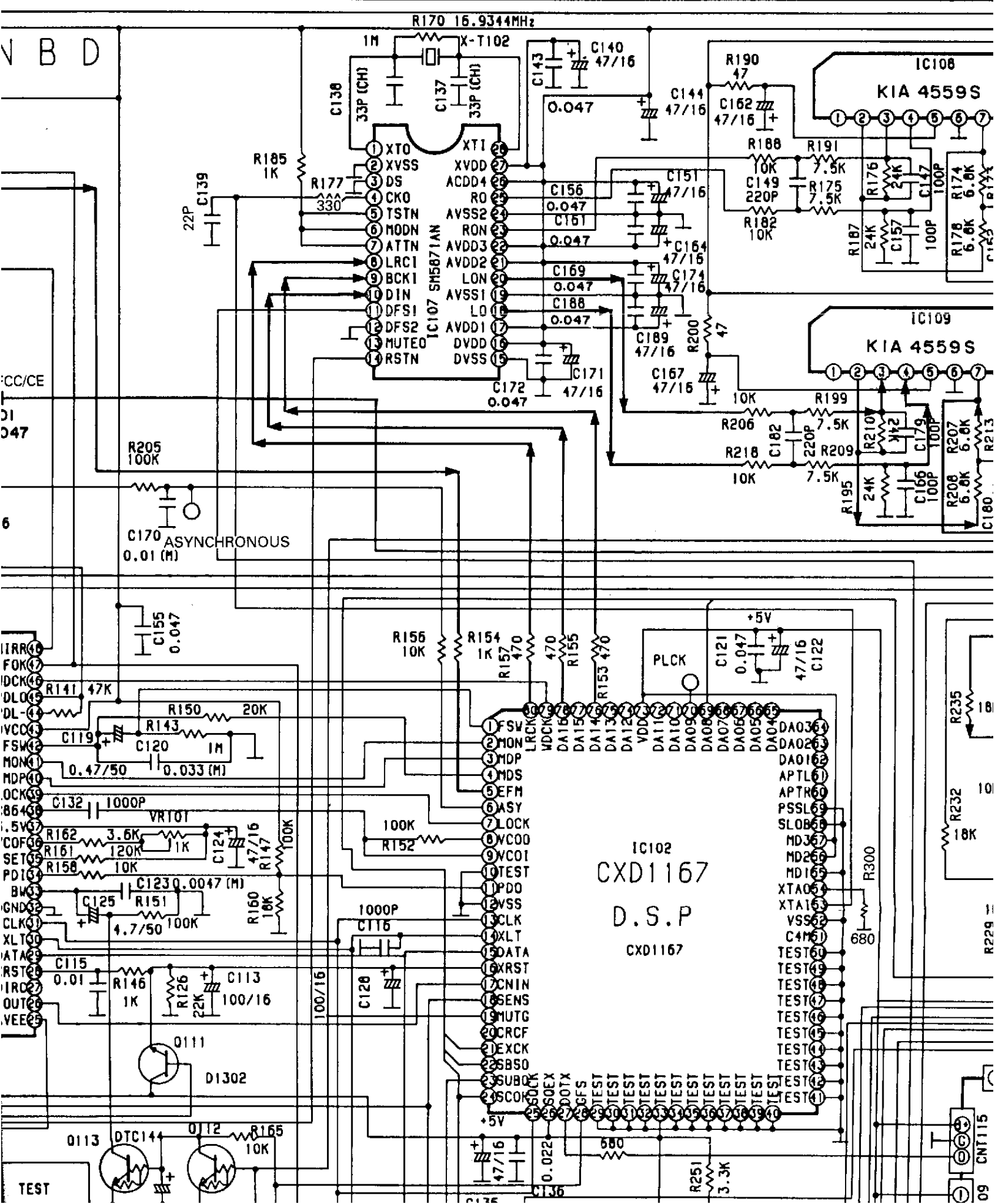


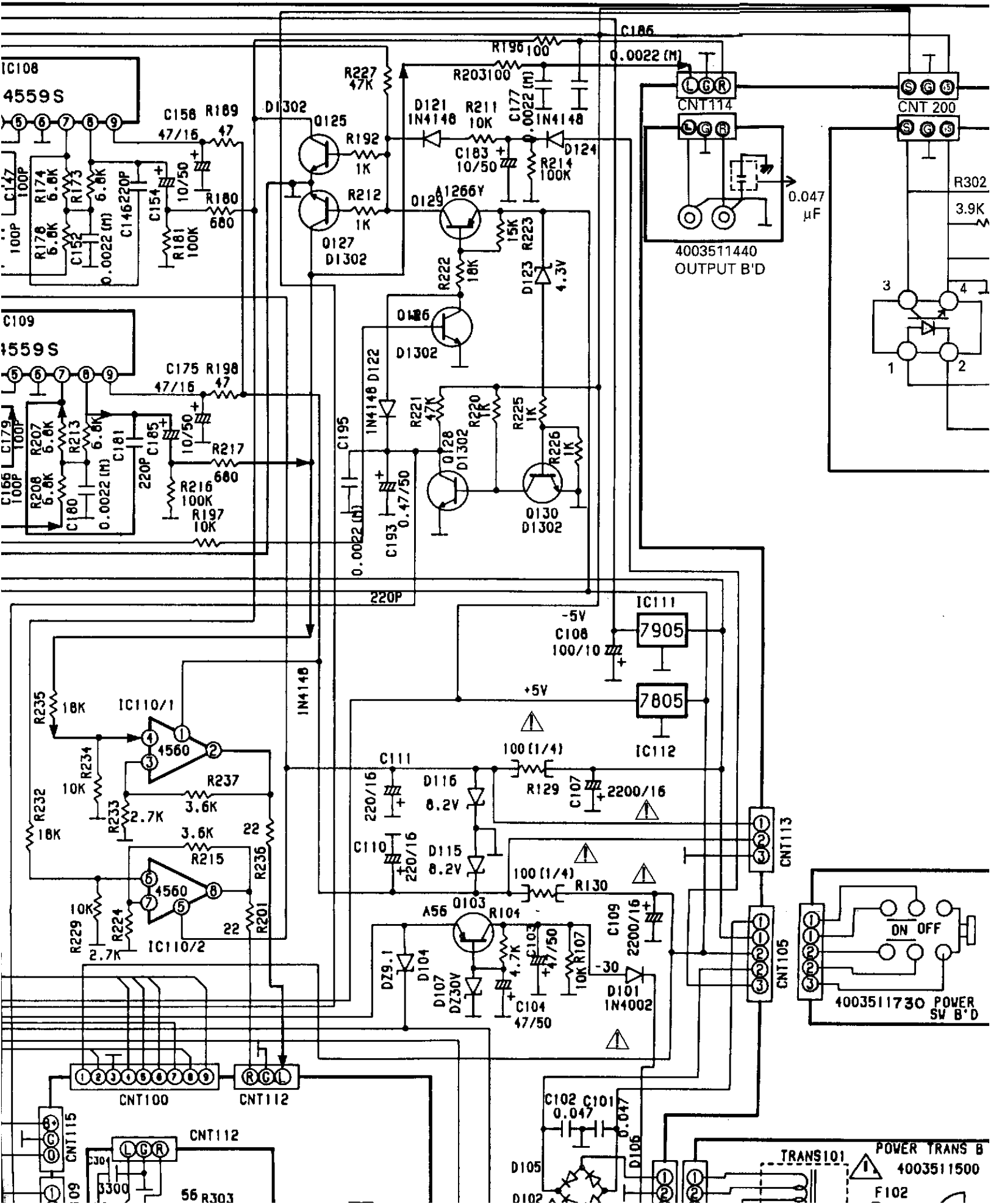
TRANSISTOR AND DIODE LEAD IDENTIFICATION

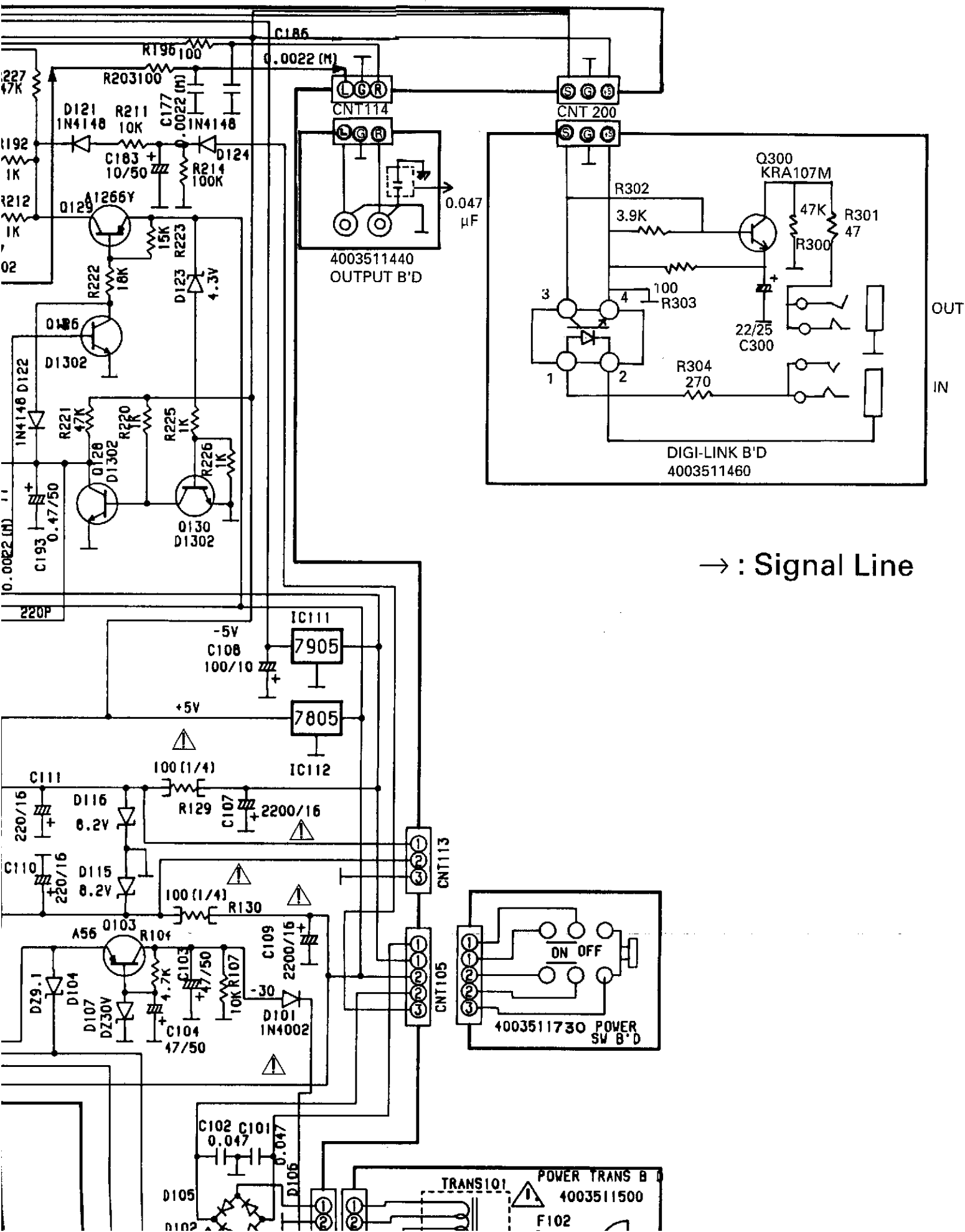
TRANSISTOR	FRONT VIEW	BOTTOM VIEW
KTC 1815Y/KTC 3198Y KTA 1015Y/KTA 1266Y KTA 1302B 2SD 1302S	 ECB	 ECB
MPSA 06 MPSA56	 EBC	 EBC
DTA 114YS/KRA 107M	 ECB	 ECB

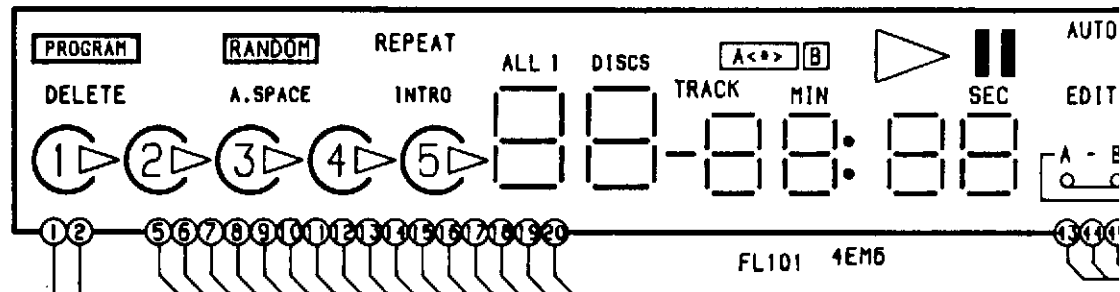
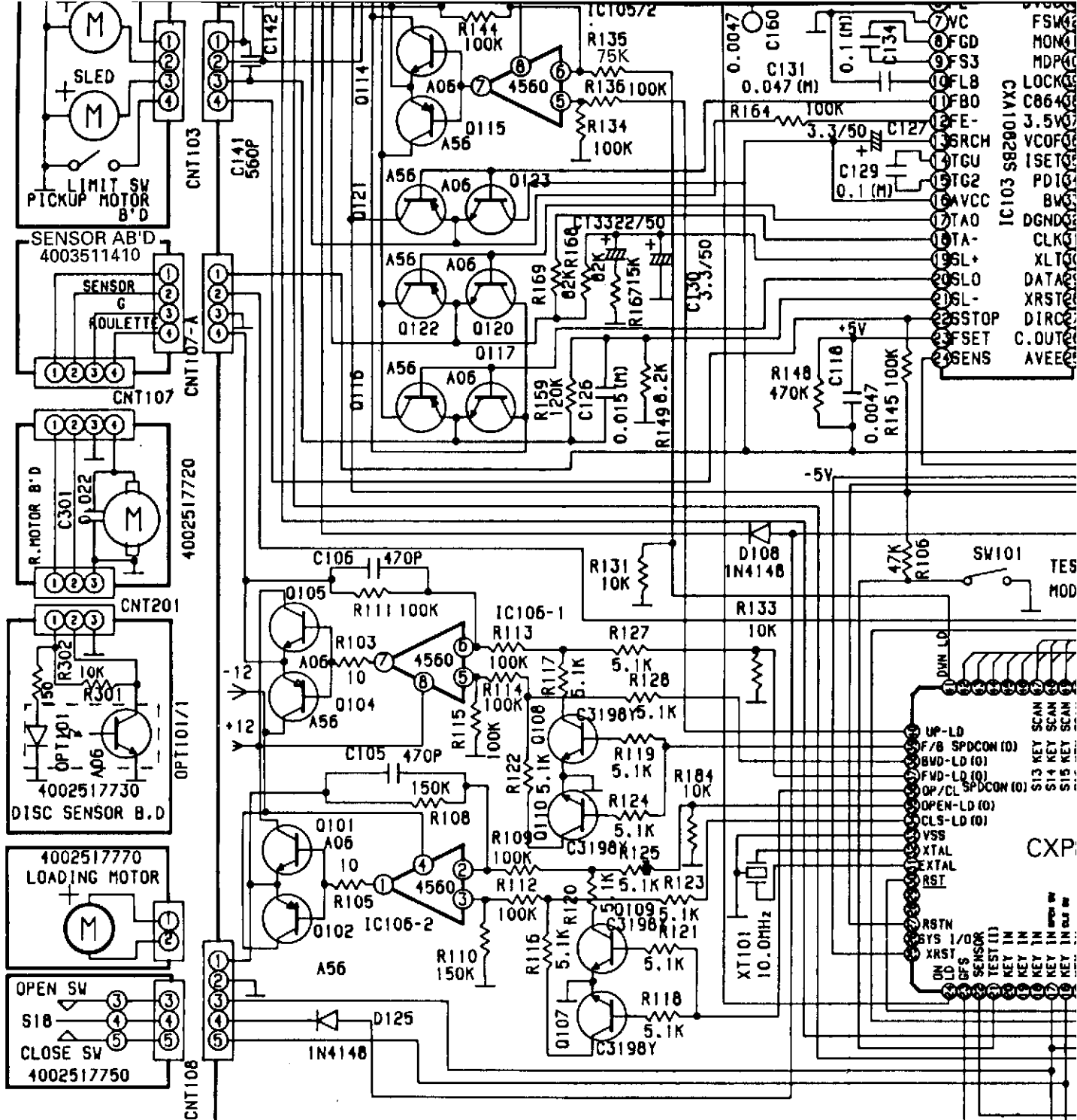
DIODE	PACKAGE VIEW
1N 4148 1N 4002	
UN XX. XBSX	
TERMINAL NAME B : BASE C : COLLECTOR E : EMITTER	

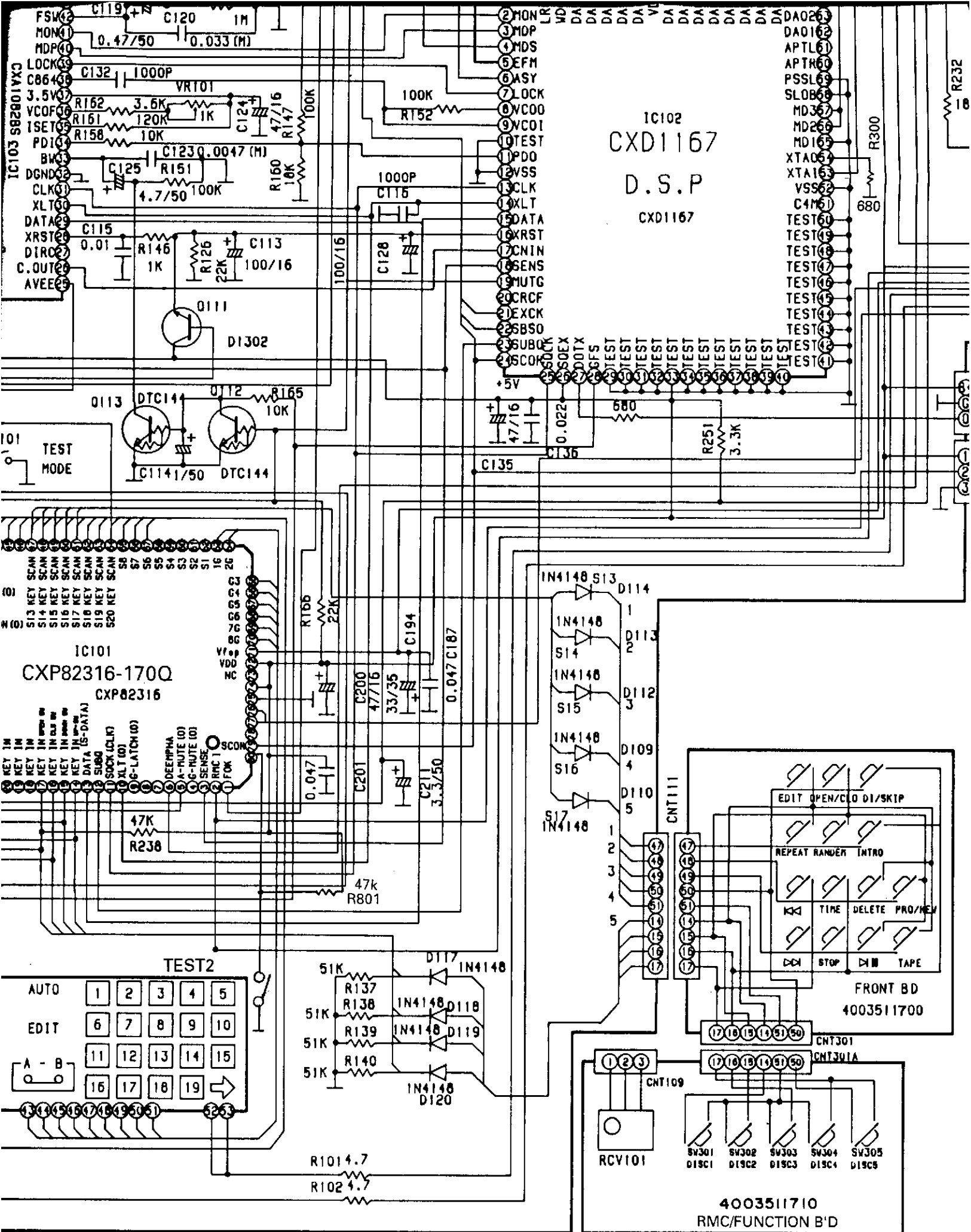


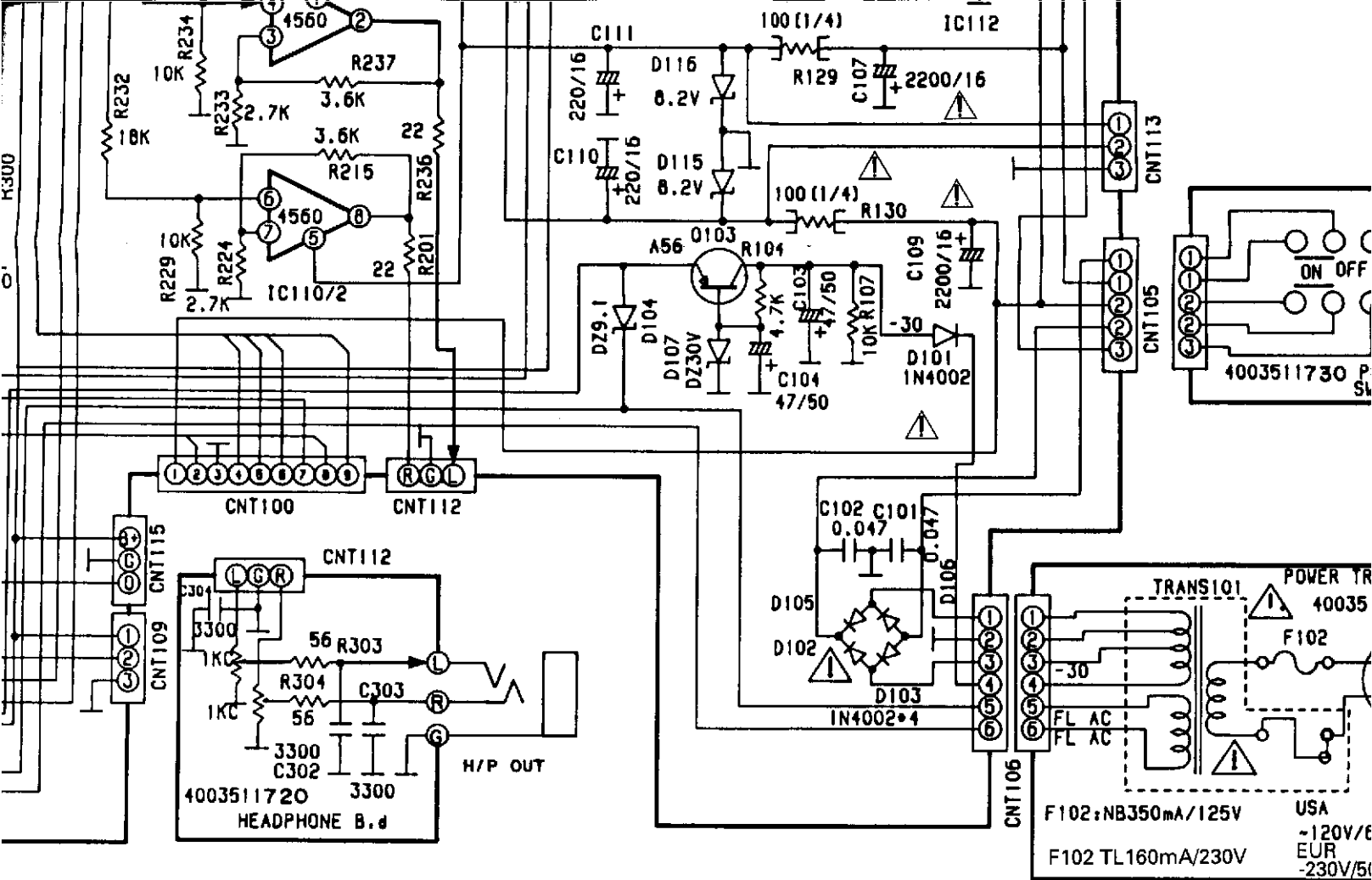












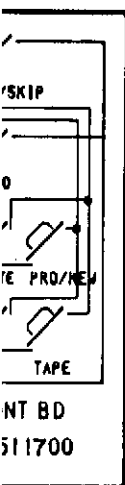
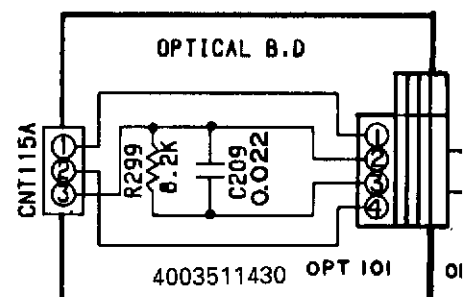
NOTES

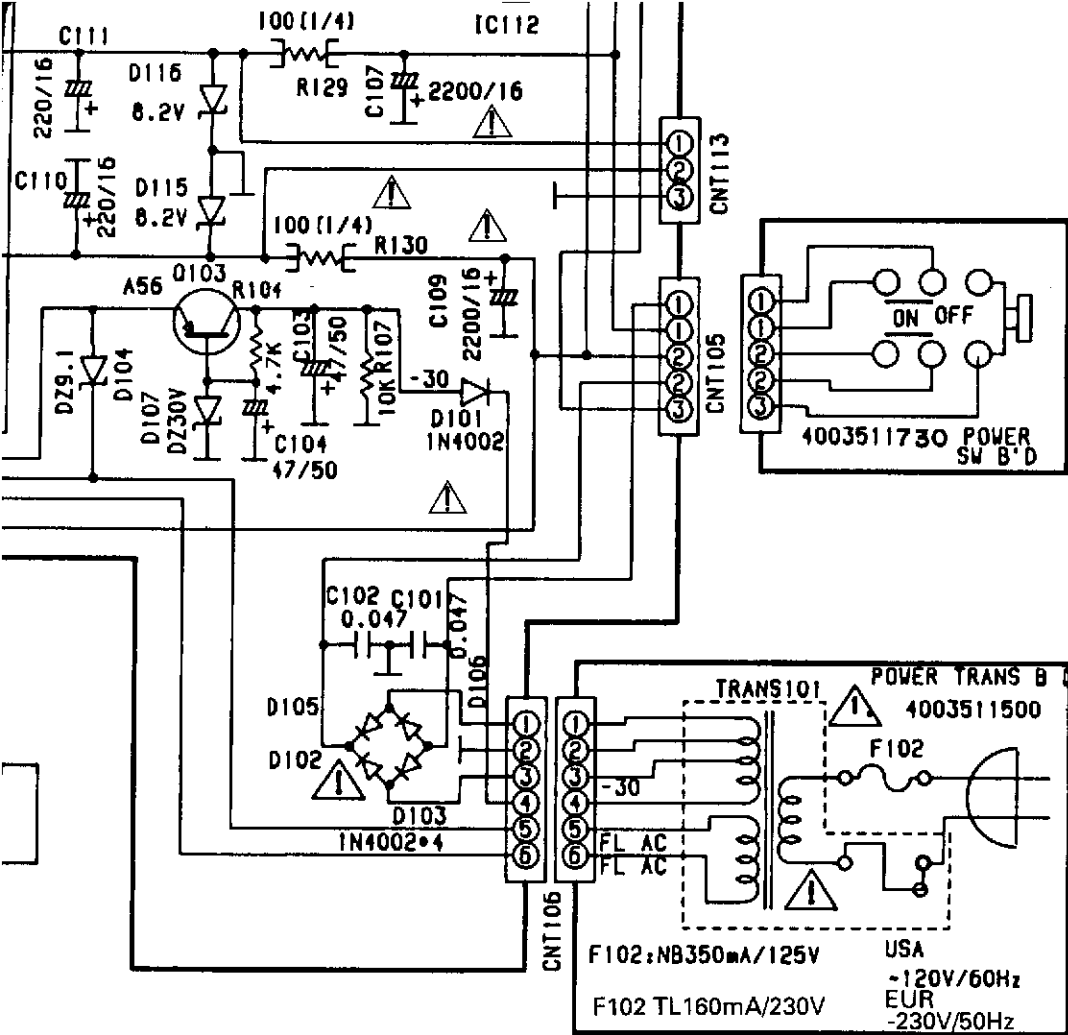
1. Resistor values are indicated in ohms unless otherwise specified
[k=1,000 M=1,000,000]
2. Capacitor values are indicated in microfarades unless otherwise specified.
[P=micro-microfarades]

CAUTION

Safety precaution to be followed during servicing

- 1) Since those parts marked with Δ are critical parts for safety use only the one described in the parts list.
- 2) Before returning the set to customer the make appropriate leakage current or resistance measurements to determine the exposed parts are properly insulated from the supply circuit.





indicated in ohms unless

M=1,000,000]

indicated in microfarades

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microfarades]

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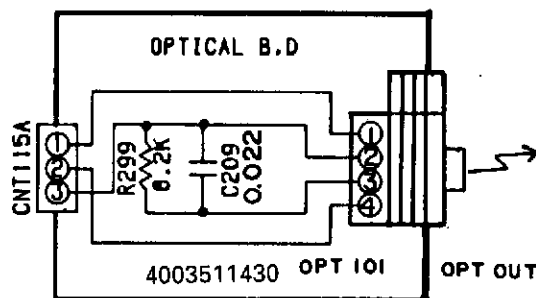
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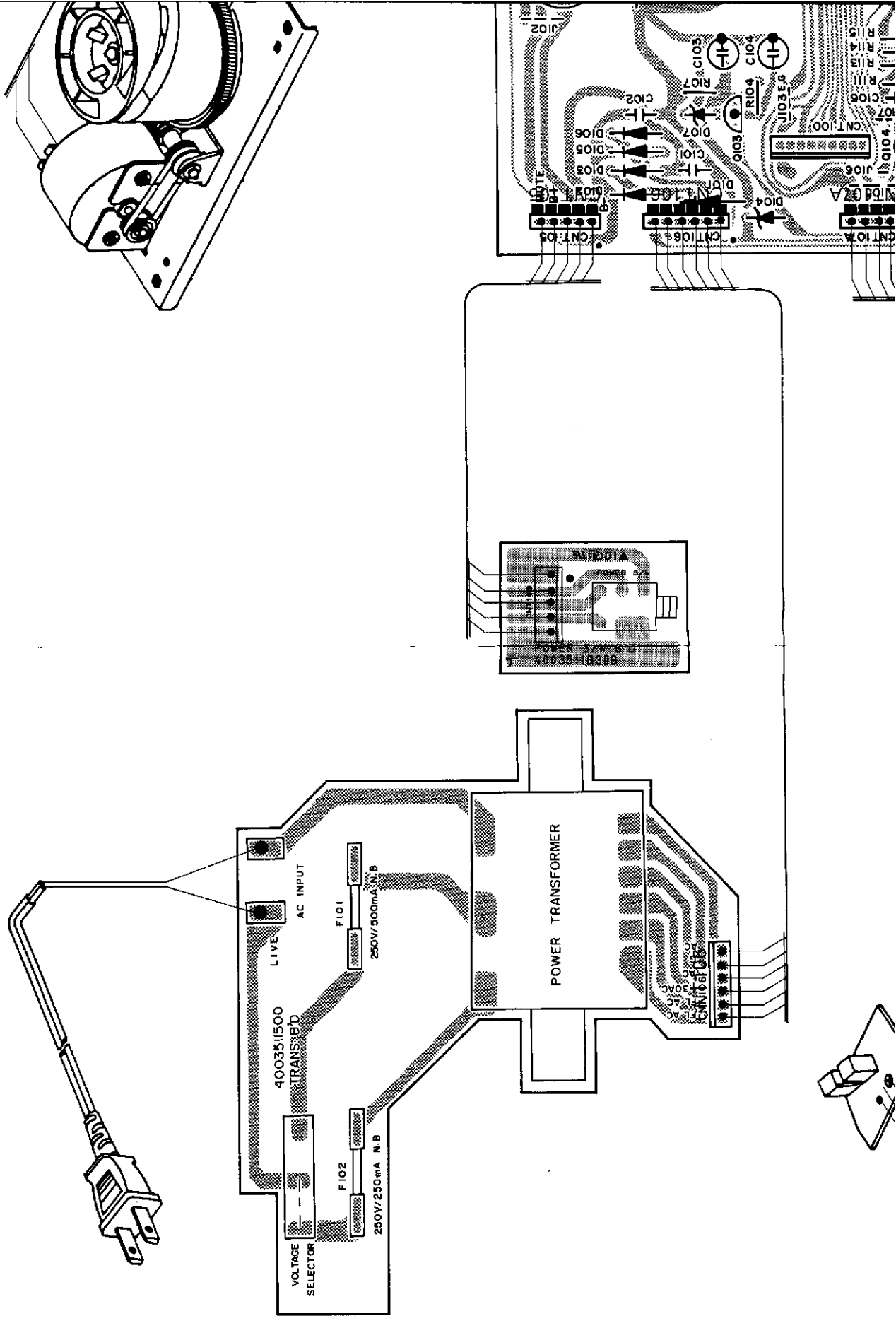
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rmine the exposed pparts

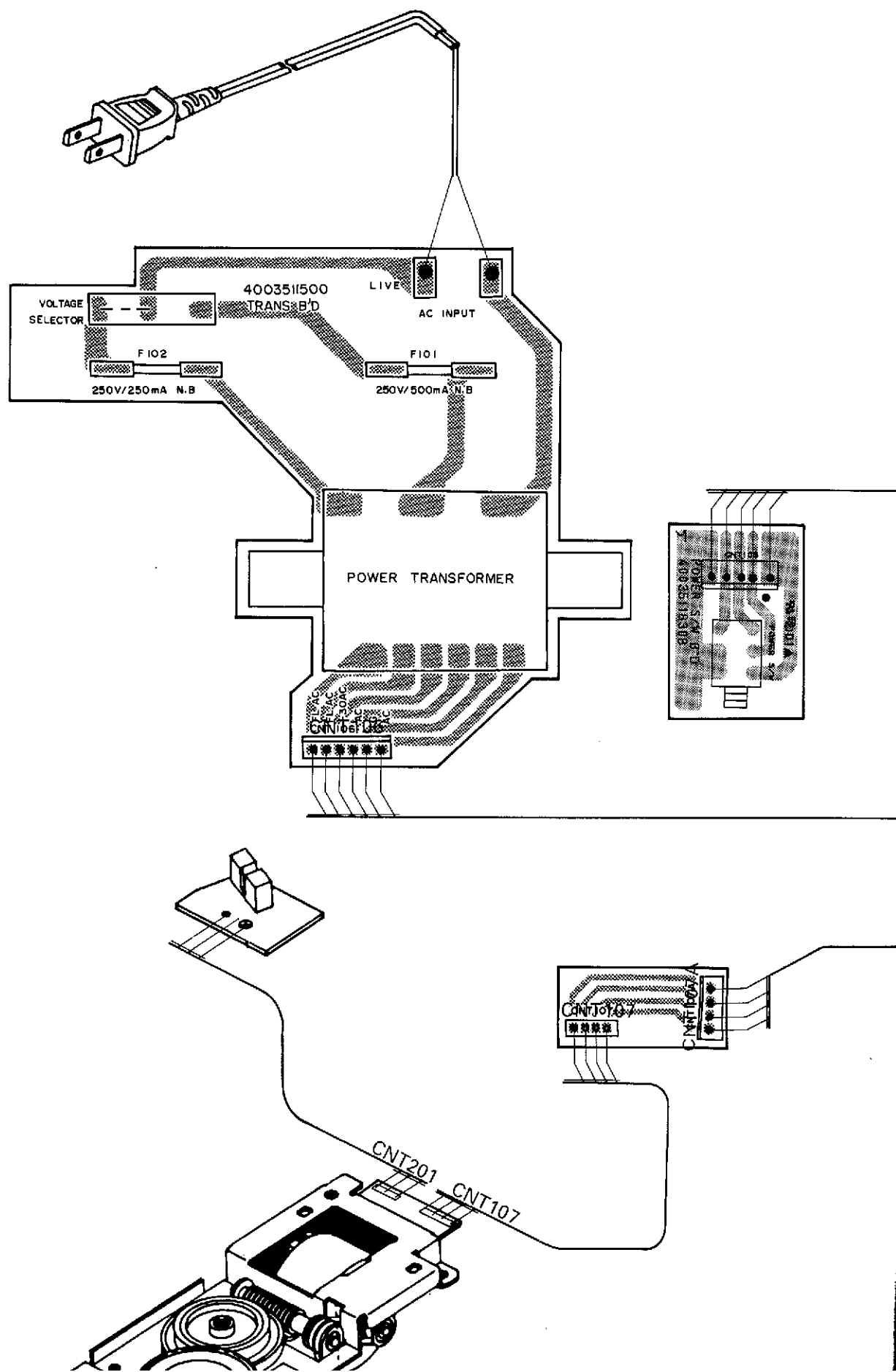
from the supply circuit.

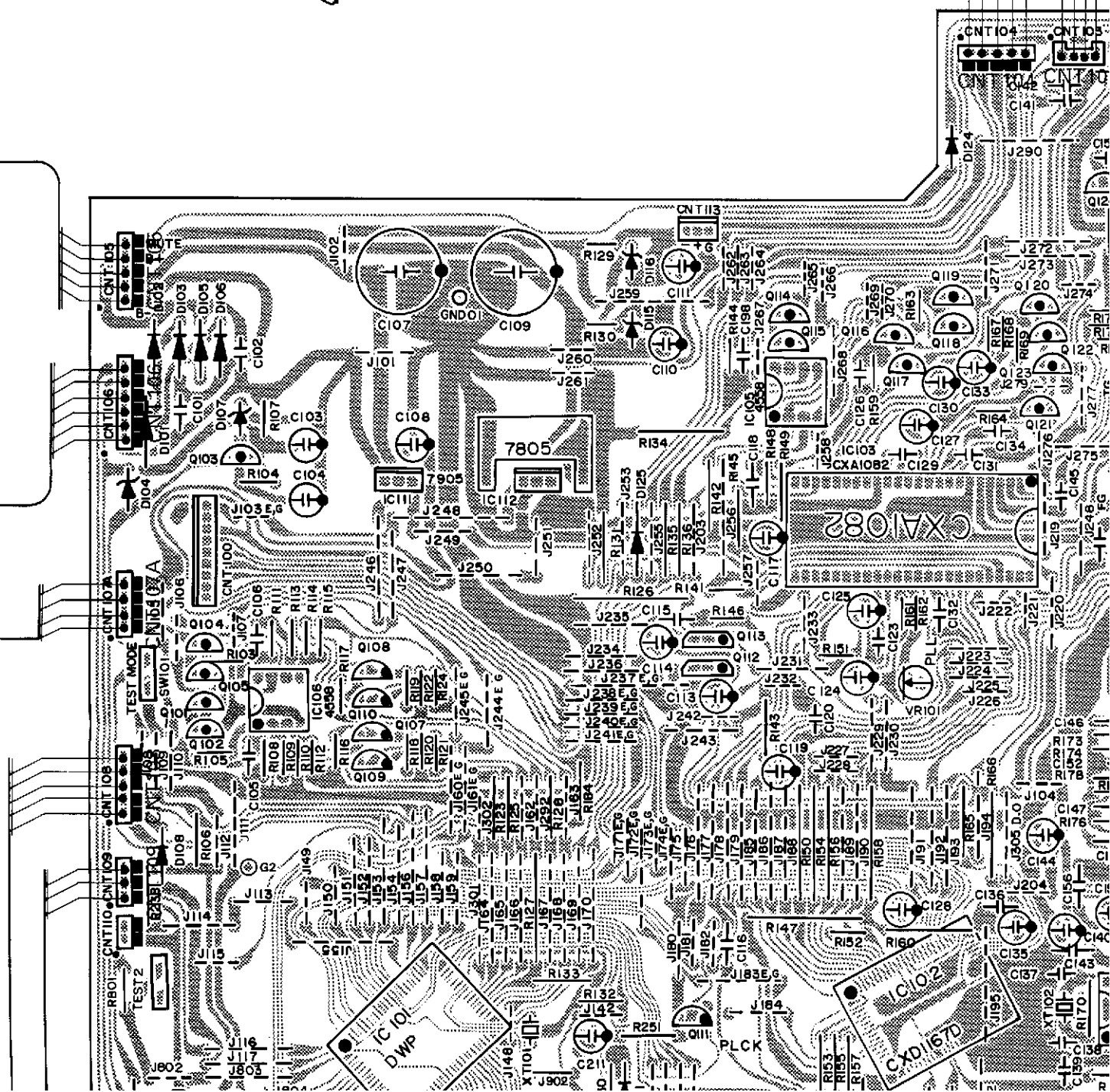
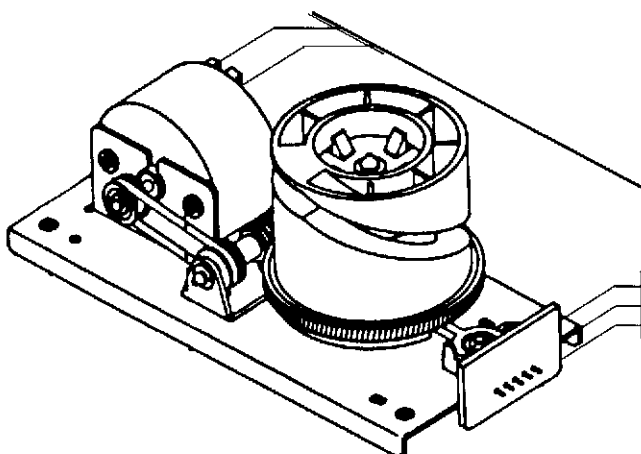


WIRING DIAGRAM

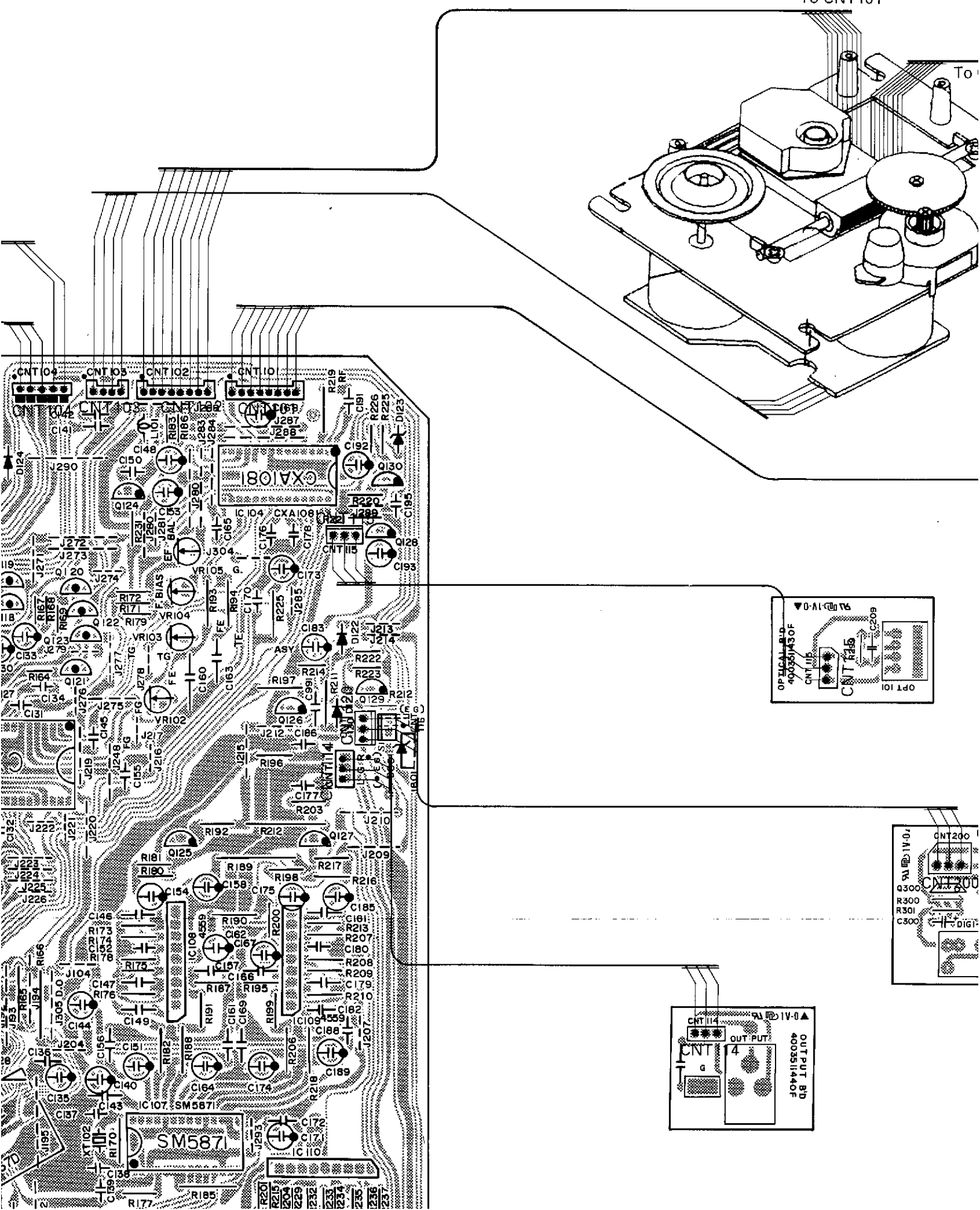


WIRING DIAGRAM

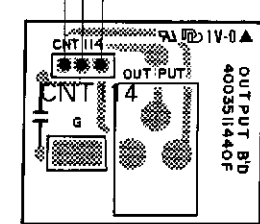
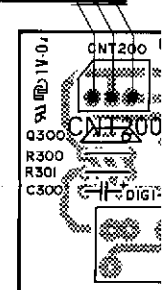
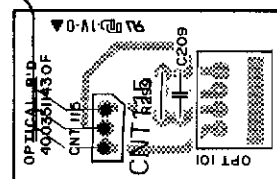


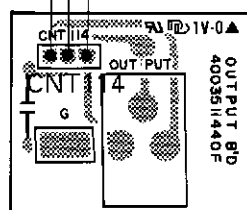
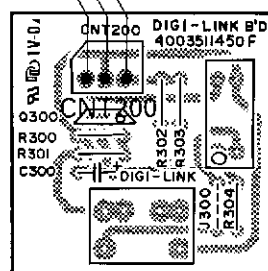
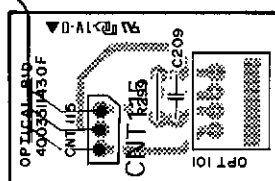
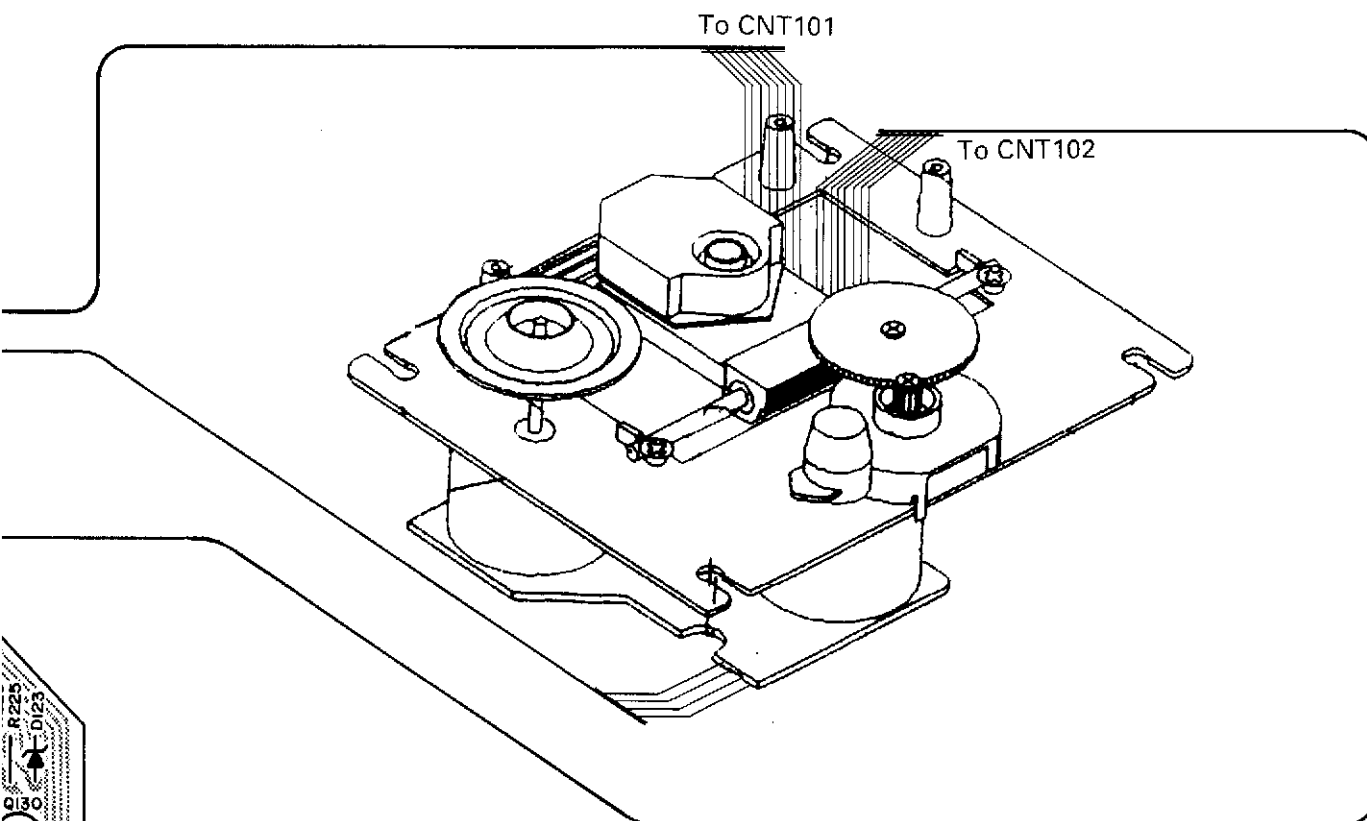


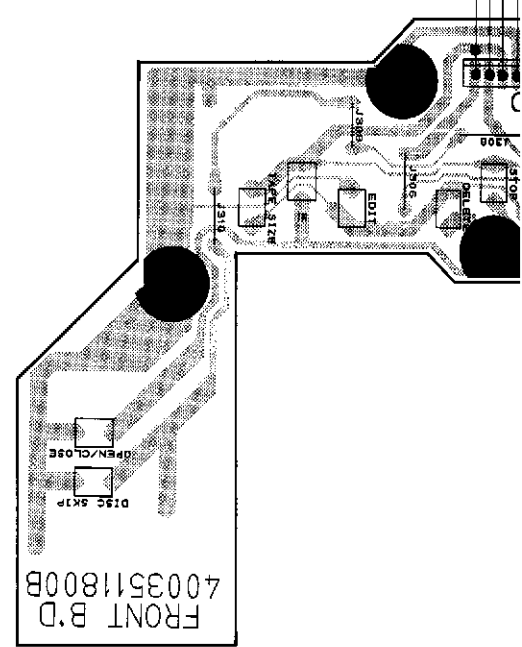
To CNT101



To







OPEN/CLOSE

019C 8K1P

