



COMPACT DISC PLAYER

**CD-100X**

Service Manual

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## SPECIFICATIONS

Format	Compact disc digital audio system
Audio section	
Frequency response	5-20kHz $\pm$ 0.5dB
Total harmonic distortion	0.004%
Dynamic range	95dB
Output level	2V rms
Signal-to-noise ratio	-90dBV
Channel separation	90dB at 1kHz
Output impedance	600 ohms
Internal systems	
Optical pickup	3-beam laser
D/A conversion	16 bit linear
Filter	Seventh order passive filter
Error correction	CIRC dual error correction system
Functions	
Music search	SKIP buttons
Fast forward/reverse	FF and REV buttons
Remaining time display	REMAINING key
Program memory function	16 selections, random
Repeat	Repeat of one program Repeat of all contents
Disc loading	Motor driven, horizontal loading
General	
Power requirements	100-120V/220-240V, 50/60Hz
Power consumption	12W
Dimensions(wxhxd)	13-7/16" x 3-7/16" x 11-9/16" 341mm x 88mm x 293mm
Weight	7lbs. 5oz., 3.3kg
Accessories	Owner's manual Audio cable

# CIRCUIT OPERATIONS

## A. Laser pickup

The laser pickup used for the model CD-100X comprises six photo diodes A to F; diodes A to D, consisting actually of one single diode which is divided vertically and horizontally into four parts, for signal detection and diodes E and F for tracking servo.

Since the laser light scintillated onto the surface of compact disc is turbulently reflected by pit area and entirely reflected by no pit area, the digital signals in disc can be read out by detecting the reflected laser light.

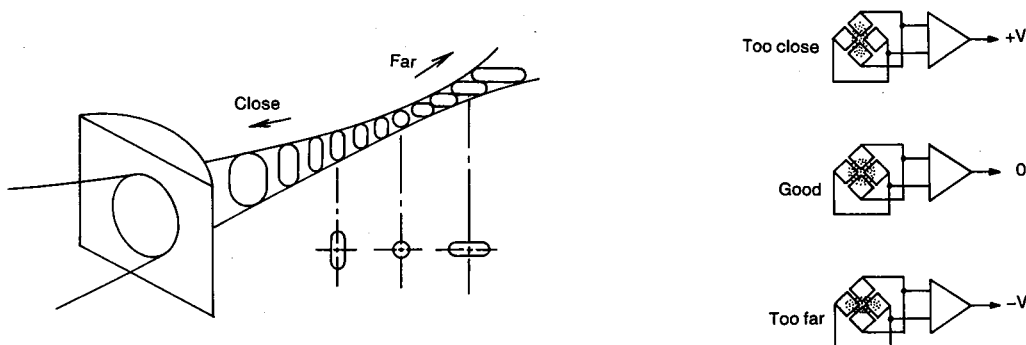
The signals detected by photo diodes A to D is sent to U101(CX20109); signals from A+C are to #5(PD1) pin and B+D to #6(PD2) of U101 to be summed and generate an EFM signal at #3(RFO) pin. The test point marked EYE TP is the check point for the EFM signal. The EFM signal input to #2(RFI) pin is shape out by the comparator in U101 to be binary signals. The reference voltage of the comparator, at #22(ASY) pin of U101, varies in accordance with the shape of CD pits. It drifts up and down to the shape of the disc pit which normally equals to be zero. The binary EFM signal is sent from #20(EFM) pin of U101 to #5(EFM) pin of U301(CX23035).

## B. Servo system

The model CD-100X utilizes five servo circuits -- the focus servo, tracking servo, sled servo, laser output servo (APC) and CLV servo -- which are controlled by U303.

### B-1 Focus control servo

The astigmatic method is employed for the focus control which utilizes the fact that routing the reflected laser light through a semi-cylindrical lens changes the shape of the beam in accordance with the distance.



The theory of the astigmatic method

Providing a foculization is made at the point which the beam becomes a true circle, an out-focus condition due to too far or too close situation can be detected since it varies the shape of the beam.

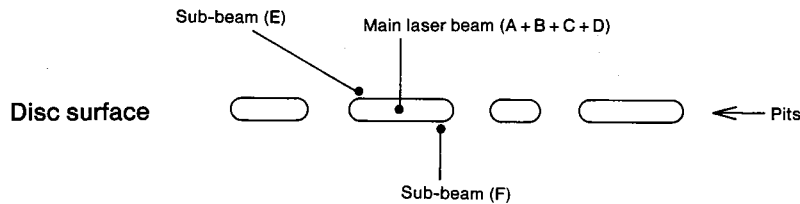
The focus servo circuit of the model CD-100X generates the difference  $(A+C)-(B+D)$  from the laser pickup output signals  $(A+C)$  and  $(B+D)$ . The foculization is perfect when this difference, the focus error signal, equals zero. U303 delivers the focus drive signal from the focus error signal which in turn applied to the tracking coil of the laser pickup to foculize. U303 sends this focus drive signal to the laser pickup from #21 pin(FEO). Q303 and Q304 amplify this signal and applies this signal

# CIRCUIT OPERATIONS

to the laser pickup.

## B-2 Tracking servo

Tracking servo is required to chase disc pit columns since CD systems do not have a guide to lead laser beam to the pit. The model CD-100X employs 3-beam tracking servo system.



The 3-beam tracking servo

Three laser beams are irradiated towards the pits in slightly offset intervals to each other as shown. Servo is achieved by the following fact that: where the main beam (indicated by point [A+B+C+D] above, is precisely on the pit, (E-F) is zero; otherwise not).

The E and F signals, input from #8(E) and #11(F) pins of U101, generate (E-F) signal inside and delivered at #17(TE) pin. RV101(E-F BALANCE) adjusts for the balance of E and F signals; RV301(RADIAL OFFSET) is for the offset adjustment; RV302(RADIAL GAIN) is for the servo gain adjustment. The TE(tracking error) signal from U101 enters into #13 pin(TE) and U303 makes tracking servo control signal according to the tracing error signal. The tracking servo control signal goes out of U303 from #27 pin (TAO) and Q307 and Q308 amplify to drive the tracking coil of the laser pickup. In searching for a track the laser pickup should be moved quickly, U304(CPU) transmits data to pins #8(DATA) to #10(CLK) of U303 which in turn delivers the pulse from pin #27(TAO) in accordance with the corresponding pulse width.

## B-3 Sled servo

The sled servo serves for dual purpose -- to gradually move back and forth the entirely of the laser pickup in accordance with the procession of disc playing; and to move it quickly for searching tracks.

The lens of the laser pickup is able to travel at a small distance to follow the pits when playing with the entire pickup stopped. As it approaches the limit of the travelable range, DC components come to be contained in the tracking servo signals. The sled servo acts to detect the DC components and maintains the lens to be in the middle of the moveable range, namely to maintain the DC component to be zero. The fraction of tracking servo signal from pin #27(TAO) of U303 through Q307 and Q308, only the DC component is extracted by R353, R354, C326, and C327 and applied to pin #25(SL+) of U303. This DC component is amplified in U303 and buffered by Q305 and Q306 and finally drives the sled motor. In regular operation, 0 to 0.4V DC is applied to rotate the sled motor every several seconds. The sled motor is energized by the plus or minus DC at pin #23(SLO) of U303 corresponding to data from the CPU during searching the tracks.

## B-4 APC(Auto Power Controller) circuit

The APC circuit is provided to maintain the constant laser output level in spite of the variation in temperature etc.

The monitor diode located in the close proximity of the lens feeds back the variation

# CIRCUIT OPERATIONS

to keep the current flowing through the diode constant. The feed back voltage from the monitor diode is compared to reference voltage by U306. Q601 amplifies its output and applies to laser emission diode to control laser output. An "high" status of pin #57(LASER) of U304 turns Q603 off and in turn Q602 on so that the output of U304 connected to ground. Therefore laser diode turns off.

## Important note for servicing

To avoid burning out the laser diode, the APC connector shall not be disconnected whichever the power is on or off.

Before removing connector CN601 for servicing, be sure to solder on the shorting terminals on the laser head to short them out. While to assemble the head, first connect the CN601 to the pc board then open the terminals on the head and turn the power on. (The terminals can be accessed without removing the bottom plate of the unit by peeling the black sealing off.)

To determine the failure of the laser head, sizing the voltage across the head can be a key. Connect a digital voltmeter across R602 and press the PLAY button. The current (I) can be calculated as:

$$I = \text{Voltage across R602} / 22 \text{ (ohm)}$$

The laser head is normal if I is obtained within 10% of the value specified on the individual head. But I shows tendency to increase when the laser pickup is used over 1000 hours.

15556
694

--- 69.4mA

## B-5 CLV (Constant Linear Velocity) servo circuit

Unlike analog records, the rotation of compact disc is 500rpm in inner area and 200rpm in outer area. The CLV servo acts to maintain the proper rotation of the motor. The reference to determine if the rotation is too fast or too slow depends upon the coincidence of the phase of the RF signal to U301 and the reference clock signal. The correct motor rotation causes a 50% duty signal delivered at pin #3(MDP) of U301; while a faster rotation causes a longer duty signal (a signal with the long "high" period of time); a slower rotation causes a shorter duty signal to be delivered. This signal is amplified by U305(1/2, 2/2), Q301, and Q302 and finally drives the spindle motor.

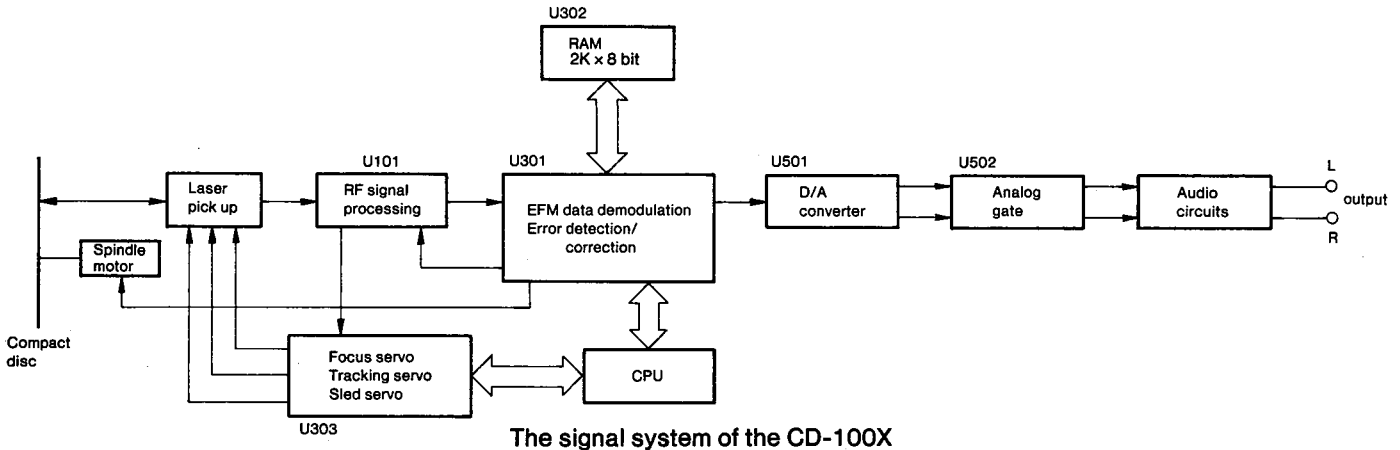
## C. Signal system

The signals detected by the laser pickup are applied to U101 -- (A+C) to #5 pin(PD1); (B+D) to #6 pin(PD2) -- and generated as EFM signal of (A+B+C+D) and output at pin #3(RFO). The EFM signal is input to pin #2 and to the comparator inside U101 which rejects DC components from the EFM signal to an asymmetrical configuration so that convert it to the binary signal.

The EFM signal then input to pin #5(EFM) of U301 which serves to the demodulation of EFM data, reproduction of bit clock, error detection/correction, data interpolation, and sub-code demodulation, etc. Since to read out the data input to pin #5(EFM) of U301, the clock should be reproduced the discrete VCO(Voltage Controlled Oscillator)

# CIRCUIT OPERATIONS

is used. The VCO clock frequency and EFM waveform are compared with each other in the phase comparator of U301 and the difference, if found, is delivered to pin #11(PDO) and filtered to be the smooth DC inside U301 finally controlling the VCO frequency determined by L301, D301 and D302. This chain of PLL (Phase Locked Loop) circuit reproduces the bit clock, 4.32MHz.



The reproduction of bit clock causes the demodulation of the EFM signal into digital data inside U301, and sending the demodulated data to store it in the RAM(U302). Should an error be found in the demodulated data, the stored data is recalled from the RAM for correction and interpolation and the correct data is sent pins #76(DA14) to #80(LRCK) of U301.

U501 is an integral type DAC(Digital-Analog Converter) which converts the clock and digital data input from pins #6(LATCH) to #10(DIN) into analog signals. This IC executes the D/A conversion on left and right channels alternatively. At the moment the integration for the D/A conversion is finished, current flows through analog switch U502 and input to U504. At next moment, Q501 or Q502 turns on and U501 resumes the D/A conversion again. Through the repetition of above process the digital data is transformed to the analog signals which in turn filtered into a smooth audio signal.

Q501 and Q502 are controlled by the CPU and switch to vary the response of the filter when the high frequency range of disc is emphasized. Q505 and Q506 are muting transistors for audio signals. At power turning on Q508 turns on and Q505 and Q506 are on, and the audio is muted. After 1 seconds since the power turning on, the level of pin #56(P-MUTE) of U304 is "high", Q507 turns off, cancelling the mute. At power turning off, Q508 base is "low" by the action of U307, Q505 and Q506R are on, muting the audio.

## D. Control system

U304 serves as the system controller for the model CD-100x. It exchanges data with the servo and signal systems to control the other stages, while controlling the functional controls and indicators. For the basing information, see page 17.

## E Power supply

The power supply circuit comprising Q803 and Q804 feeds power to analog circuit comprising U503 to U505, comparator, loading amp U307 and CLV amp U305. Q801 is the regulated supply for +8V, while Q802 is for -8V. Q805 and Q806 feeds with  $\pm 5V$  power to all ICs other than above.

# DISASSEMBLY/ASSEMBLY PROCEDURE

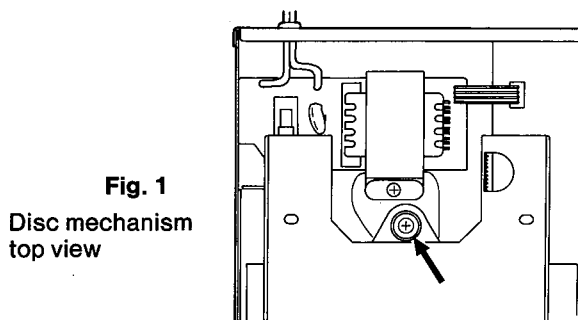
## 1. Disassembly

### A. Top cover removal

- (1) Remove four screws which fix the top cover on the chassis.
- (2) Pull the cover backward.

### B. Disc mechanism removal

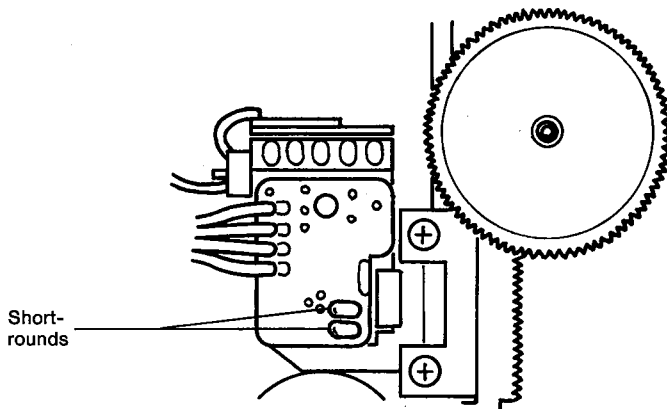
- (1) Remove the top cover.
- (2) Remove two screws on the bottom which fix the disc mechanism.
- (3) Remove a screw at the back of the disc mechanism. (fig.1)
- (4) Remove five cables from the mechanism to the main pc board.
- (6) Pull the mechanism backward gently.



## CAUTION!

After disc mechanism removal, short the short-rounds on the laser pickup to protect it from static. (fig. 2.) Use a solder iron which has little leak current (e.g. with ceramic heaters).

Do not remove the connector CN601 while shorting and opening the short-rounds!  
Do not touch the laser pickup when the short-rounds is not shorted!



The bottom of the laser pickup

Fig. 2

# DISASSEMBLY/ASSEMBLY PROCEDURE

## C. Front panel removal

- (1) Remove the top cover.
- (2) Remove four screws which fix the front panel on the chassis.
- (3) Pull the panel frontward pushing sides outside.
- (4) Remove four cables from the panel to the main pc board (CN307 - CN310). (fig. 3, 4)  
To remove cables from connectors push the top of connector while pulling a cable.  
Be sure not to add unnatural force to indicators when you assemble the front panel.

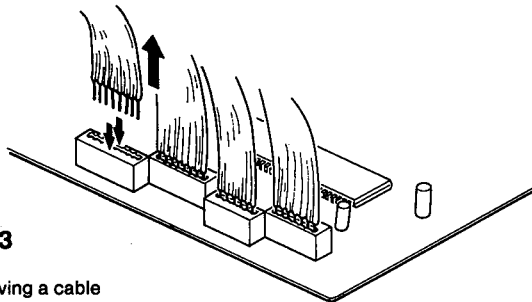


Fig. 3

Removing a cable from a connector.

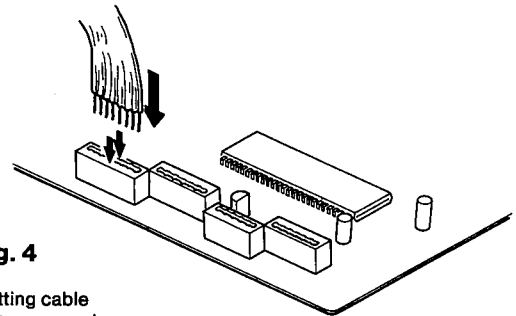


Fig. 4

Putting cable into a connector.

## D. Main pc board removal

- (1) Remove the top cover.
- (2) Remove a screw on the rear panel which fixes the OUTPUT jacks on the rear panel.
- (3) Remove two screws which fix the board on the chassis.
- (4) Remove all connectors from the board.

## E. Power supply unit removal

- (1) Remove the top cover.
- (2) Remove all the cables from this board to the main PC board.
- (3) Remove two screws which fix the power transformer on the chassis.
- (4) Remove the AC power cord from the board.

## F. Switch pc board removal

- (1) Remove the top cover.
- (2) Remove two screws which fix the board on the front panel.
- (3) Remove the board pushing six retainers outside. (fig. 5)
- (4) Remove four cables from the board to the main pc board.

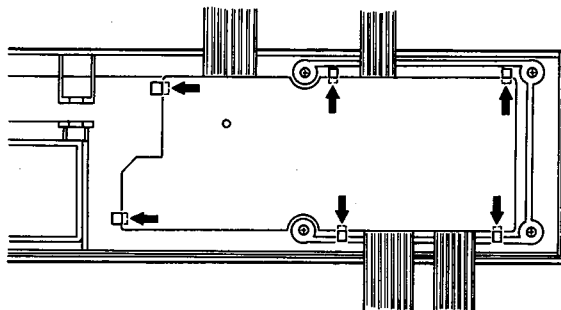


Fig. 5



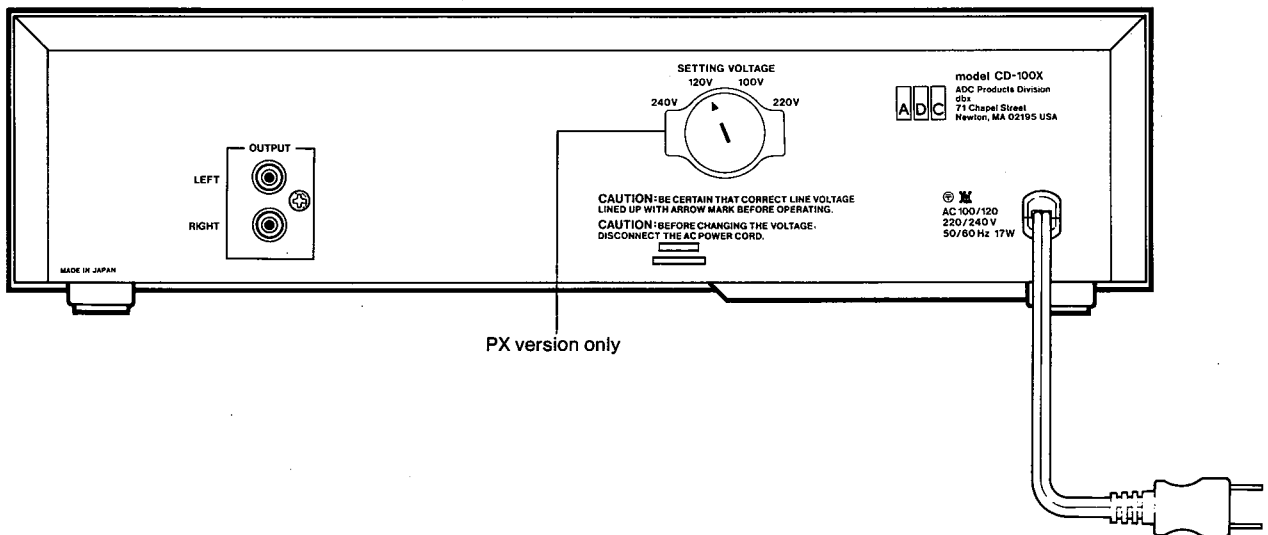
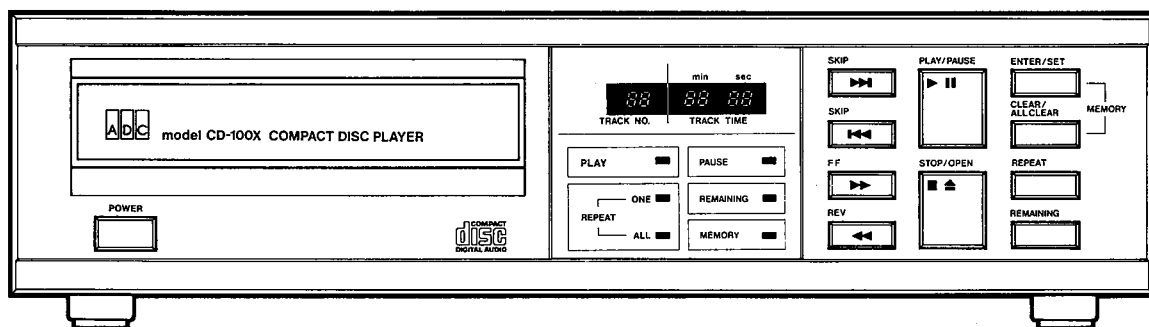
# DISASSEMBLY/ASSEMBLY PROCEDURE

## 2. Assembly

To assemble parts, make reverse manner of disassembly procedure basically. But to assemble the disc mechanism, follow the procedure below.

- (1) Connect the connector marked CN601(black) to connectors on the main PC board.
- (2) Open the short-round on the laser pickup.
- (3) Insert floating bracket at the front of the disc mechanism to the front panel.
- (4) Screw the rear of the disc mechanism on the chassis.
- (4) Connect other cables to connectors on the main pc board.

Note: It is very important to keep the order of the above procedure.



# ADJUSTMENT PROCEDURE

## Before adjustment

- Allow a minimum of 10 minutes warm-up for the test equipments and the unit under test.
- Maintain rated ac line voltage.
- Before adjustment, confirm that the regulated  $\pm 5\text{Vdc}$ ,  $\pm 8\text{Vdc}$ ,  $\pm 16\text{Vdc}$ ,  $-24\text{Vdc}$  power supplies operate correctly.

## Instruments required

- Oscilloscope
- Frequency counter
- Test disc; Sony Type 4 (YEDS-18)

### A. To introduce the test mode

The test mode is introduced by grounding the test point, marked CHECK MODE on the main pc board, during the power is off or disc tray is open (out).

### B. Tracking offset adjustment

- (1) Connect scope to test point TRACKING and to ground.
- (2) Set the unit to the check mode, see procedure A above, and turn the power on.
- (3) Without disc loaded or in standby condition, adjust RV302 for  $\pm 0\text{V}$  on scope.

### C. PLL frequency adjustment/Lock frequency check

- (1) Ground test point ASY.
- (2) Connect frequency counter to test point PLL and to ground.
- (3) Turn the power on and adjust RV303 for  $0\text{V}$  at J301(VCO).
- (4) Adjust L301 for  $4.3000\text{MHz}$  on the counter.
- (5) Disconnect test point ASY from ground.
- (6) Load with test disc YEDS-18 and press the PLAY button.
- (7) Check counter reads  $4.3218\text{MHz}$ .

### D. Focus offset adjustment.

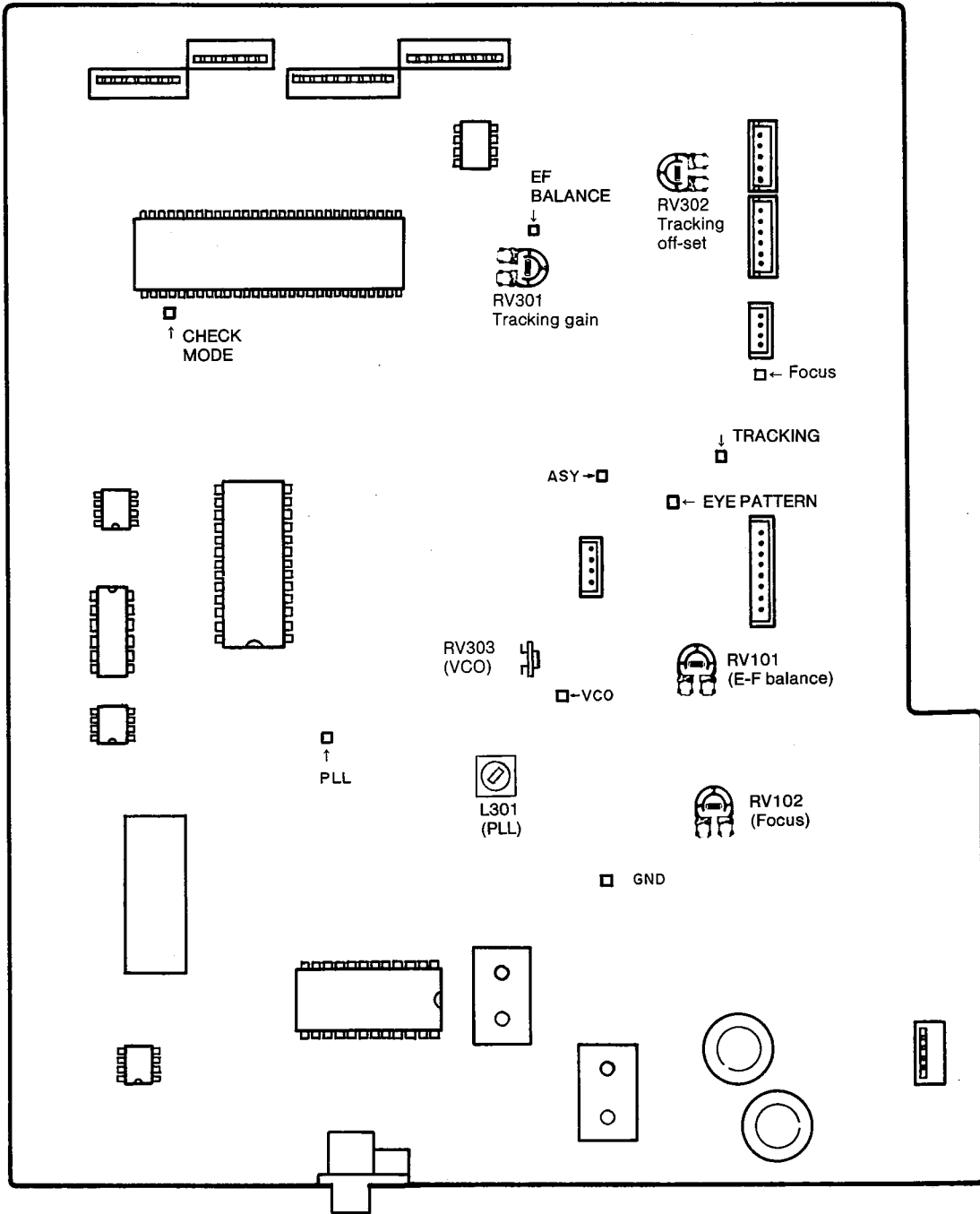
- (1) Connect scope to test point EYE PATTERN and to ground.
- (2) Load with disc YEDS-18 and press the PLAY button.
- (3) Adjust RV102 for the view on scope which follows:  
(Adjust for a clear, distinct shape of the diapers.)

### E. E-F balance adjustment

- (1) Connect scope to test point EF BALANCE and to ground.
- (2) Turn the power on.
- (3) Load with test disc YEDS-18 and press the PLAY button.
- (4) Mark the position of RV301 and turn RV301 to full clockwise.
- (5) Adjust RV101 so that the signal has the symmetrical plus swing and minus swing on scope. Enlarge the waveform for accurate adjustment.
- (6) Reset RV301 to original position.

# ADJUSTMENT POINT

## Main PC board



# TEST PROCEDURE

## A. Power turning on test

Note: Unless otherwise noted, the model CD-100X is referred to as "the unit".

- (1) Plug the power cord from the unit to specific power supply.
- (2) Depress the POWER button of the unit. No significant noise or audible hum shall be apparent.

Note: The unit maintains above condition even the tray is open (out).

## B. Loading test

- (1) Operate the STOP/OPEN button to open or close the disc tray. No mechanical noise shall be present.
- (2) The tray shall be open (out) when the STOP/OPEN button is depressed during the tray is closed (in).
- (3) The tray shall be close (in) when the STOP/OPEN button is depressed during the tray is open (out).
- (4) The unit shall be in the stop mode when the STOP/OPEN button is pressed during playback. Another pressing of the STOP/OPEN button shall open the tray (out).

## C. Lead-in test

- (1) Operate the STOP/OPEN button to open the disc tray. Put a disc in the tray.
- (2) Press the STOP/OPEN, PLAY or PAUSE button. The drawer closes and the player starts "lead-in". During "lead-in", the TRACK NO. "1" shall be indicated.
- (3) Lead-in is void if the disc loaded up-side down. In this case, the drawer opens after 12 seconds.

## D. Play test (the PLAY indicator lights up)

- (1) Press the PLAY button after placing the disc on the tray. After confirming the disc is loaded, the unit shall commence to lead-in then play.
- (2) The unit shall play the track which is assigned by the Forward SKIP/Reverse SKIP button after set to play mode. The unit operates in the same manner when the track is assigned in prior to lead-in, however, if assigned track number is greater than the number actually contained in the disc, the player plays the last track. When no lead-in data is found, the disc drawer opens after approx. 12 seconds.
- (3) The TRACK NO. indicator shows the number of the track during searching the beginning of the program then set to the counter mode after the track has been searched.
- (4) Pressing the SKIP button during playing allows to search for the beginning of the track being played and resumes playing.
- (5) The playing shall be free of intermittent sound, noises, or distortion.
- (6) Pressing the PLAY button shall cause the PLAY indicator to light up.

## E. SKIP test

- (1) The SKIP buttons allow the unit to accept up to 99 tracks before lead-in.
- (2) The SKIP button allows the unit to accept the number of tracks actually contained in the disc after lead-in.
- (3) After searching the beginning of a track, during playback, pressing the SKIP

# TEST PROCEDURE

buttons allows an immediate start of play.

- (4) Pressing the SKIP buttons during stop will not allow to start playing.
- (5) The operation of the SKIP buttons during the memory-play allows to play the tracks in the order that have been stored in the memory.
- (6) Pressing the SKIP (reverse) button during playing causes to play the beginning of the track being played, not the track located before it.

## F. FF/REV test

- (1) Pressing the FF or REV button during playing or pause allows a fast-forwarding or reverse. Since the forwarding or reverse done in the pause mode is faster 10 to 20 times than the normal play, the playing sound is not heard. This feature allows to reach the desired selection in a short time period.
- (2) Operating the FF/REV mode during the memory-play allows to fast-forward or reverse to the tracks stored in the memory.

## G. PAUSE test (the PAUSE indicator lights up)

- (1) Pressing the PAUSE button causes the PAUSE indicator to light up, stops the TRACK TIME counter, and deactivates the sound output.
- (2) In the pause mode, pressing the PLAY/PAUSE button again allows the playing to resume.

## H. STOP test

- (1) Pressing the STOP button during play allows the unit to be in standby mode.
- (2) While the unit is in operation after the lead-in, the STOP button overrides any function of the unit and stops any motion.

## I. MEMORY CLEAR test

- (1) To clear the memory, the CLEAR/ALL button shall be pressed once while the TRACK NO. indicator lights up continuously (5 seconds) and the track entered just before is erased.
- (2) Pressing the CLEAR/ALL CLEAR button twice in sequence clears all the memory contents.

## J. Memory test (the MEMORY indicator lights up)

This feature allows to play any desired track, up to 16, in any desired sequence after having them entered in the memory. The memory entry is possible in stop, play, or pause mode after lead-in.

- (1) Pressing the ENTER/SET button causes the TRACK NO. indicator to blink which shows the unit is now in the enter mode and ready to accept the memory entry. (Pressing the ENTER/SET button in the enter mode lets the blinking track number to be stored in the memory.)
- (2) The selection of the track to be stored is made on the SKIP button. Pressing the ENTER/SET button allows to memorize the track whose number is blinking in the indicator and lights up continuously for approx. five seconds until next entry (SKIP buttons) is made, then resumes blinking.
- (3) Perform above procedures to store the other track desired.

# TEST PROCEDURE

- (4) The memory can accommodate the maximum of 16 tracks stored. If the ENTER/SET button is pressed after having stored 16 tracks, the blinking of the TRACK NO. indicator will not cease.
- (5) Pressing the PLAY button allows to commence to play the memory tracks, from the track stored first, and let the MEMORY indicator to light which shows the unit is now in the memory play mode.
- (6) The SKIP buttons allow to skip over to any memory tracks, one after another, during playing. Using the all repeat mode with the SKIP buttons allows an "endless search" as follows.

E.g. When tracks 1,3, and 5 are stored in the memory in that order.

- When not using a repeat or in REPEAT ONE mode;  
The skip operation is possible between tracks 1 and 3; and tracks 3 and 5 (the forward SKIP button is inoperative on track 5. Likewise the reverse SKIP button is inoperative on track 1).
- In all repeat (REPEAT ALL) mode;  
The skip motion is possible over the loop of 1, 3, 5, 1, 3,... etc. or vice versa. (Referred to as an "endless search".)
- (7) During memory play, the FF/REV motion is operative within the track being played. If the FF/REV button is operated beyond the range of the track being played, the search is made to the next memory track when the FF/REV button is released.
  - (8) The REMAINING button is deactivated during the memory play.

To recall memory:

- (1) Playing -- Skip possible over memory tracks, then playing commences.
- (2) In pause -- Skip possible over memory tracks, then set to pause.
- (3) In stop -- Skip possible over memory tracks, then set to play if the PLAY button is pressed.

To clear memory:

- (1) Pressing the CLEAR/ALL CLEAR button while the TRACK NO. indicator lights up continuously) allows to erase the track entered just before.
- (2) Pressing the CLEAR/ ALL CLEAR button twice allows the erasure of all the memory contents and cancels the memory-entering mode (the TRACK NO. indicator lights up continuously).
- (3) Pressing the CLEAR/ ALL CLEAR button twice during memory play mode allows to cancel the memory play mode and the unit is set to the normal play, extinguishing the MEMORY indicator.

K. Repeat test (ONE/ALL indicator lights up)

- (1) Pressing the REPEAT button once, lighting the REPEAT ONE indicator, introduces the one-track repeat mode.
- (2) Pressing the REPEAT button again, lighting the REPEAT ALL indicator, introduces the all-track repeat mode.
- (3) To deactivate the repeat mode, press the REPEAT button (third time press) to extinguish the indicator.

L. Remaining indicator test

- (1) Pressing the REMAINING button lets the indicator show the remaining time and minus(-) mark for approx. two seconds after this button is released.
- (2) The remaining time indicator counts down in minus every second during playing.

# TEST PROCEDURE

(3) The REMAINING button is inoperative during the memory play.

## M. Disc simulation test

Test disc to be used:

Philips, test Disc No. 814, 125-2, 5A

(1) Interruption [Track No. 9]

No inturmittence of sound shall apparent in 600 micrometer.

Note: Intermittence of sound beyond 600 micrometer is acceptable.

(2) Black dot [Track No. 17]

No intermittenence of sound shall apparent in 500 micrometer.

(3) Finger print [Track No. 18, 19]

Simulated finger print shall not cause any intermittenence of sound.

## N. Eccentricity of disc

Test disc to be used:

Sony, Demonstration Vol. 2, processed for  $\pm 0.15$ mm eccentricity

Searching for the beginning of each track shall be made properly. No intermittenence of sound, no pickup skip, etc. shall be apparent.

## O. Shock test

Test condition:

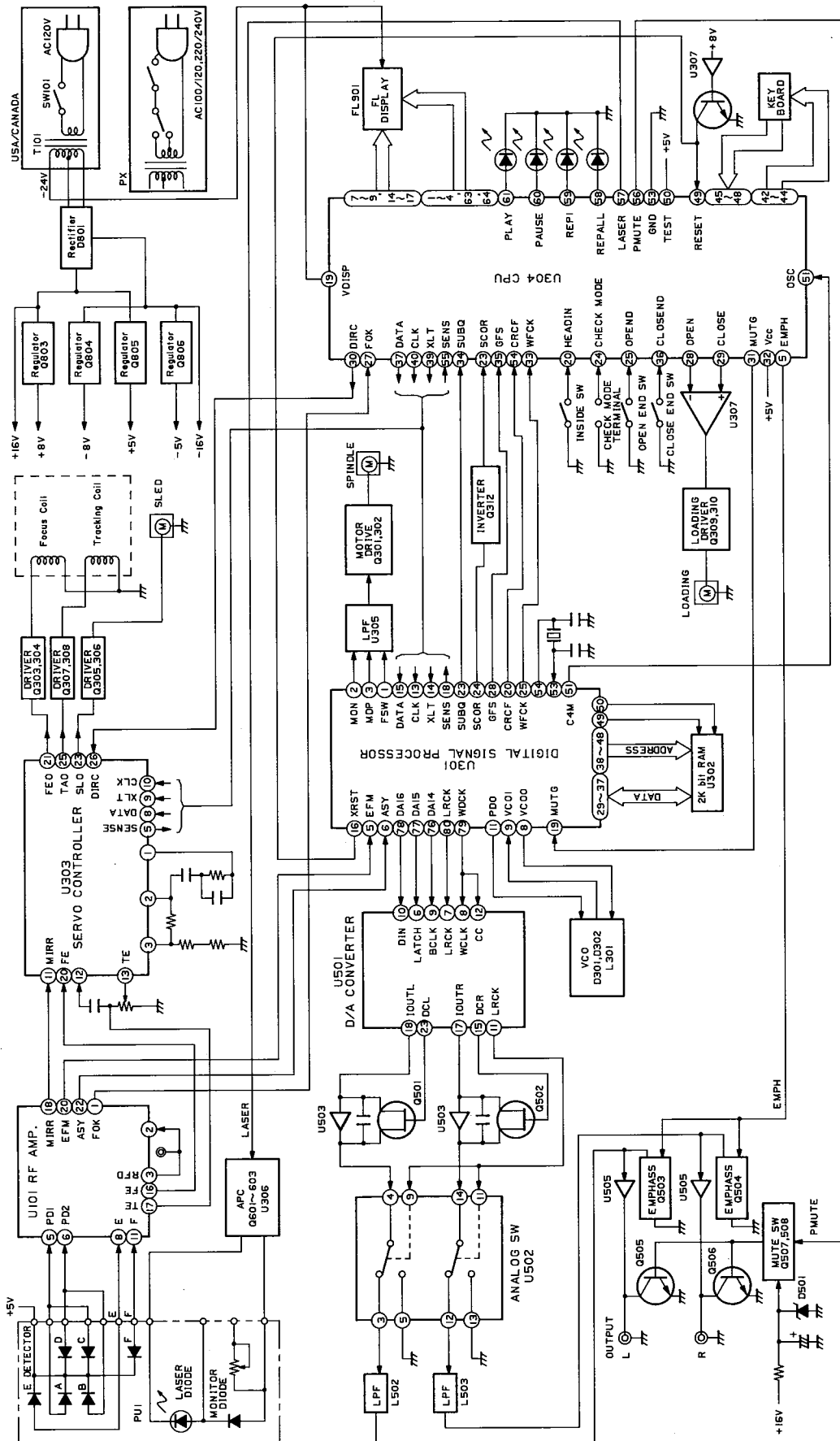
Test ball; 2cm diameter, 4g weight, to be free-dropped from the height of 20cm onto the any part of the top cover.

Test disc to be used:

Philips, Test Disc No. 814, 125-2, 5A, track No.2

No intermittenence of sound, no pickup skip, etc. shall be apparent.

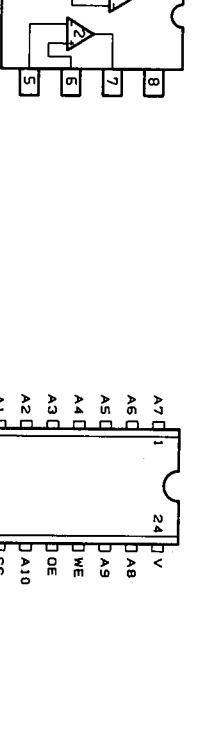
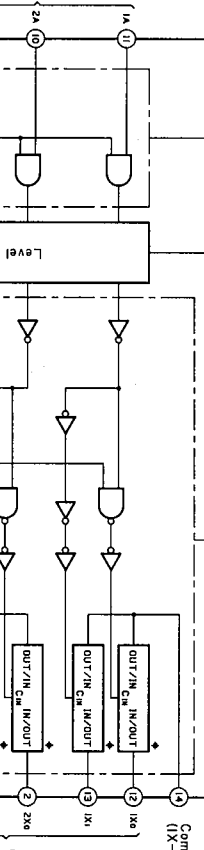
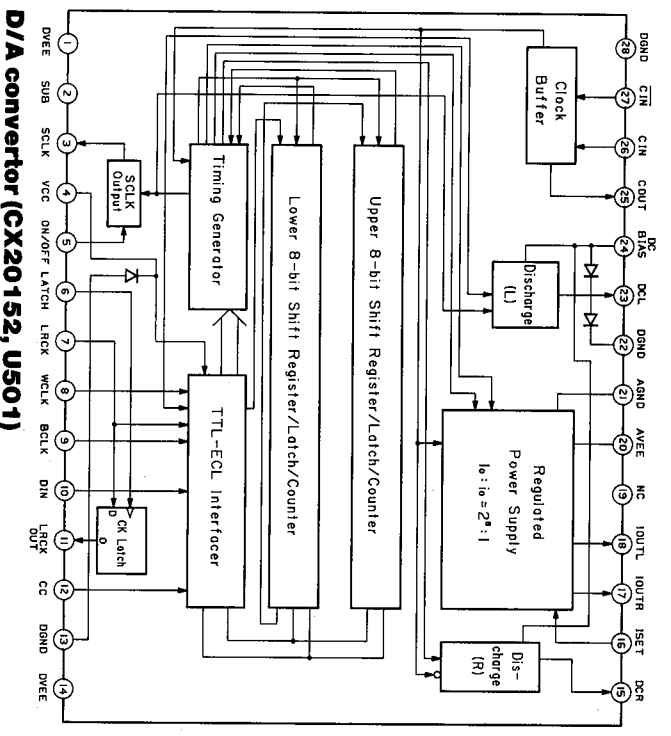
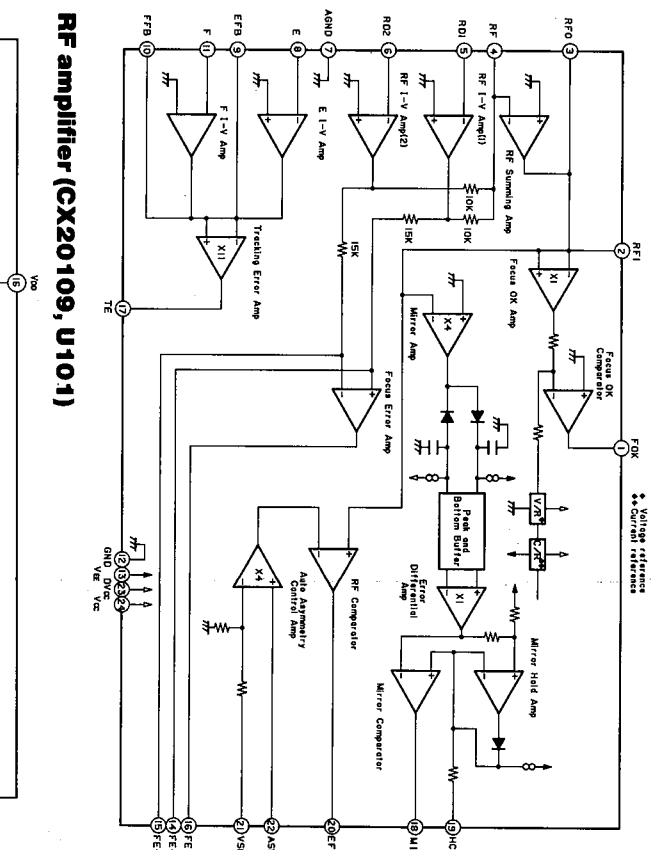
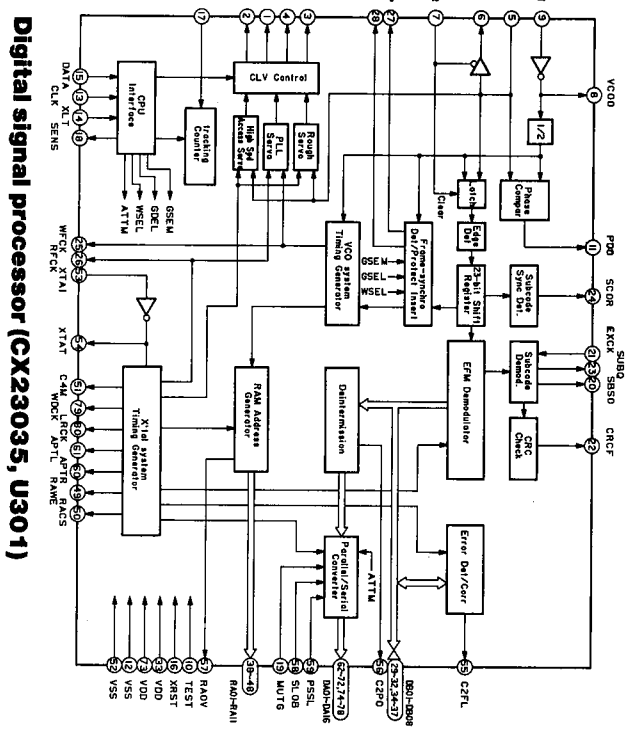
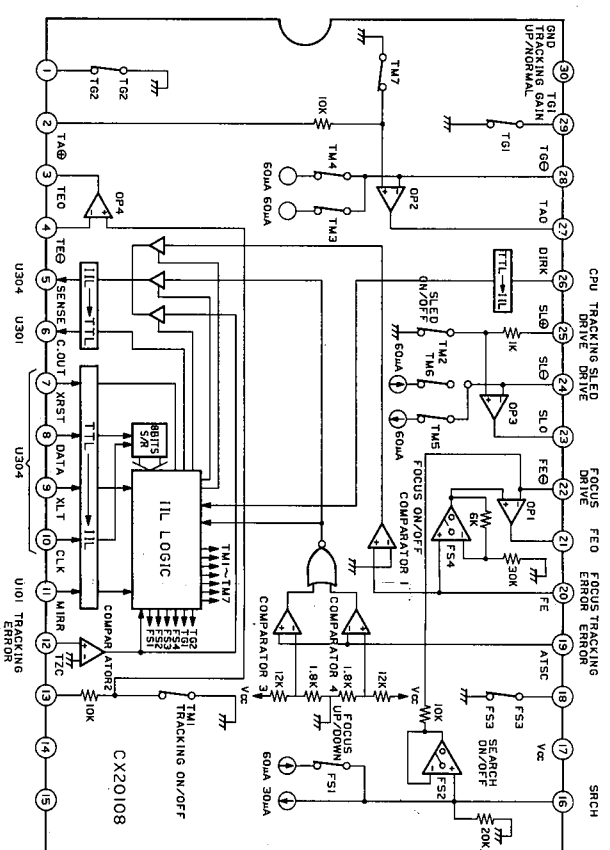
# BLOCK DIAGRAM





# IC DESCRIPTION

**CPU (U304, HMC5404C) function table**



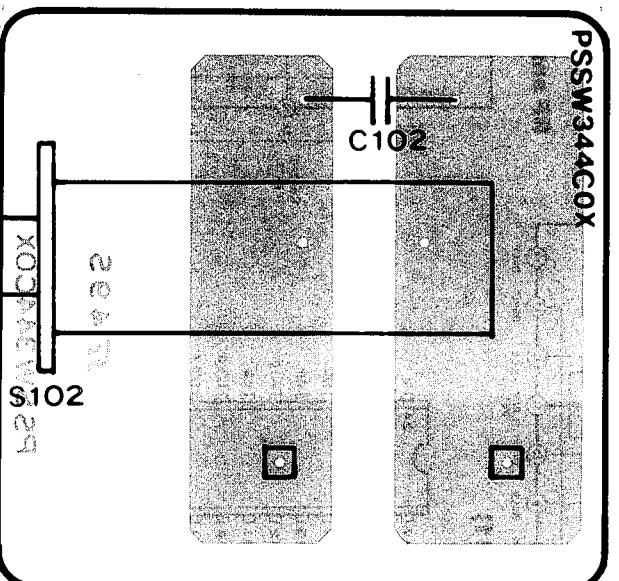
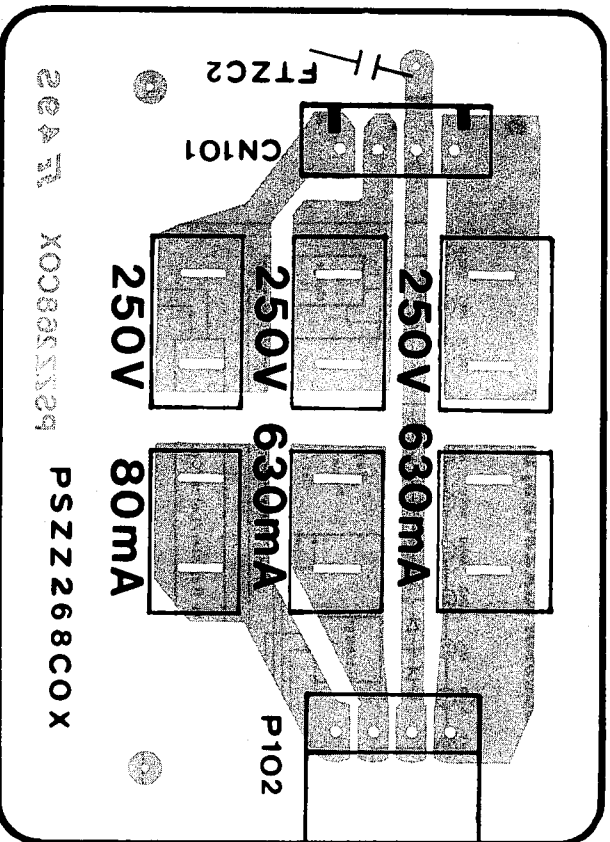
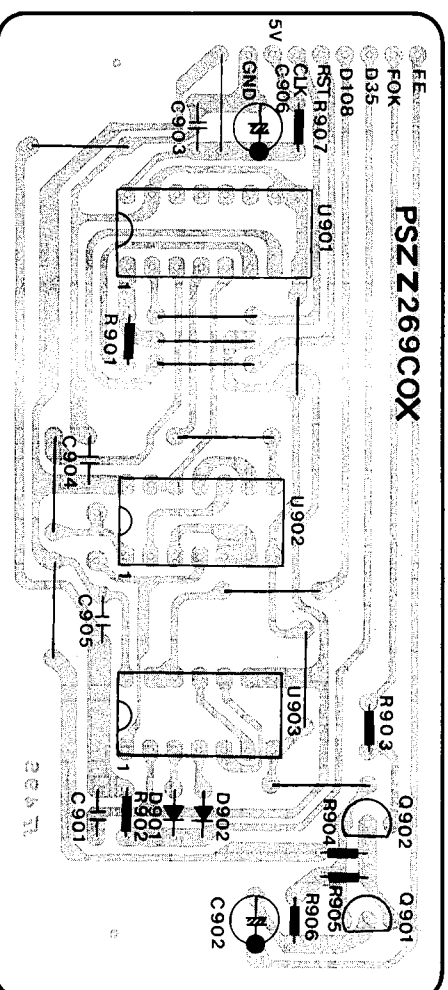
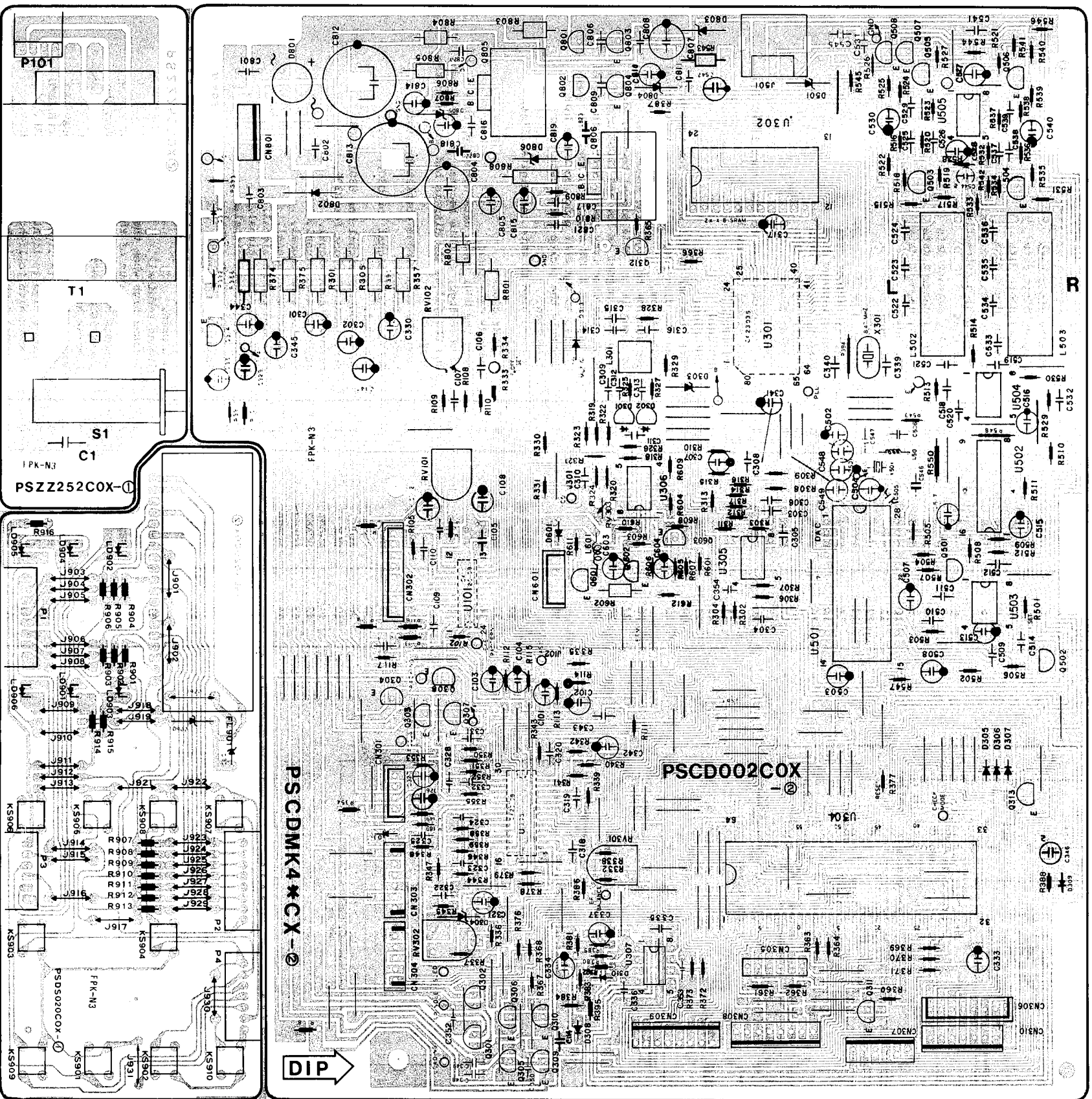
Pin No.	Signal Name	I/O	Description
1	DIG3	O	Display digit data
2	DIG4	O	Display digit data
3	DIG5	O	Display digit data
4	DIG6	O	Display digit data
5	EMPH	O	If disc data is emphasized, this signal becomes high automatically.
6	SEGL	I	Not used
7	SEGL	O	Display segment data
8	SEG2	O	Display segment data
9	SEG3	O	Display segment data
10	---	---	Not used
11	---	---	Not used
12	---	---	Not used
13	---	---	Not used
14	SEG4	O	Display segment data
15	SEG5	O	Display segment data
16	SEG6	O	Display segment data
17	SEG7	O	Display segment data
18	WFCCK	I	7.35KHz clock
19	VDISP	I	-22V If the pickup goes to the inner limit SW, this signal becomes low.
20	HEADIN	I	Not used
21	---	---	Not used
22	---	---	Not used
23	SCOR	I	75Hz clock
24	TEST	I	This terminal should be low for test mode. When the disc tray fully opens, this signal becomes low.
25	OPENEND	I	Becomes low to light the MEMORY LED.
26	MEMLEED	O	If focus is in, this signal becomes high.
27	FOK	O	When this signal is low and CLOSE signal is high, the disc tray opens. When this signal is high and CLOSE signal is low, the tray closes. In the PLAY mode, both are high.
28	OPEN	O	Controls the pickup for direct track selection.
29	CLOSE	O	Becomes high to mute the digital line.
30	DIRC	O	Becomes high to mute the digital line.
31	MUTG	O	+5V
32	VCC	I	7.35KHz clock
33	WFCCK	I	Subcode data input
34	SUBG	I	When the U301 reads data normally, this becomes high. If this becomes low for 5 sec. the CPU judges the disc is bad and opens the tray.
35	GFS	I	When the tray closes completely, this becomes low.
36	CLSEND	I	Servo control signal for U301, U303.
37	DATA	O	Not used.
38	---	---	Not used.
39	XLP	I	Servo control signal for U301, U303.
40	CLK	I	Keyboard scan signal.
41	SCAN1	O	Keyboard scan signal.
42	SCAN2	O	Keyboard scan signal.
43	SCAN3	O	Keyboard scan signal.
44	SCAN4	O	Keyboard scan signal.
45	RETR1	I	Keyboard return signal.
46	RETR2	I	Keyboard return signal.
47	RETR3	I	Keyboard return signal.
48	RETR4	I	Keyboard return signal.
49	RESET	I	Reset input signal.
50	TEST	I	Becomes high for test mode.
51	OSG1	I	CPU clock, 4.235MHz.
52	OSG2	I	Not used.
53	GND	I	Ground terminal
54	CRCF	I	Becomes high when the CRC check.
55	SENSE	I	Internal status of the U301, U308.
56	PMUTE	O	Becomes high to mute the signal when the power is on. After 3 sec. this becomes low.
57	LASER	O	Becomes high when the laser is on.
58	REPAL	O	Becomes high to light the REPEAT ONE LED.
59	REP1	O	Becomes high to light the REPEAT ONE LED.
60	PAUSE	O	Becomes high to light the PAUSE LED.
61	PLAY	O	Becomes high to light the PLAY LED.
62	REMAIN	O	Becomes high to light the REMAINING LED.
63	DIG2	O	Display digit data
64	DIG1	O	Display digit data

WIRING BOARD LAYOUT

(1-20,000)

APSCD002AH (AP111)

APSSZ269AH (AP113, 1-20,000)



APSSZ252AH (AP112)

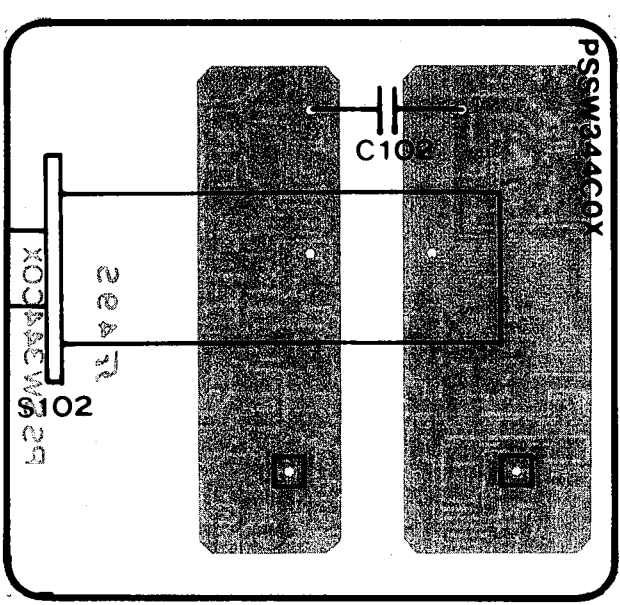
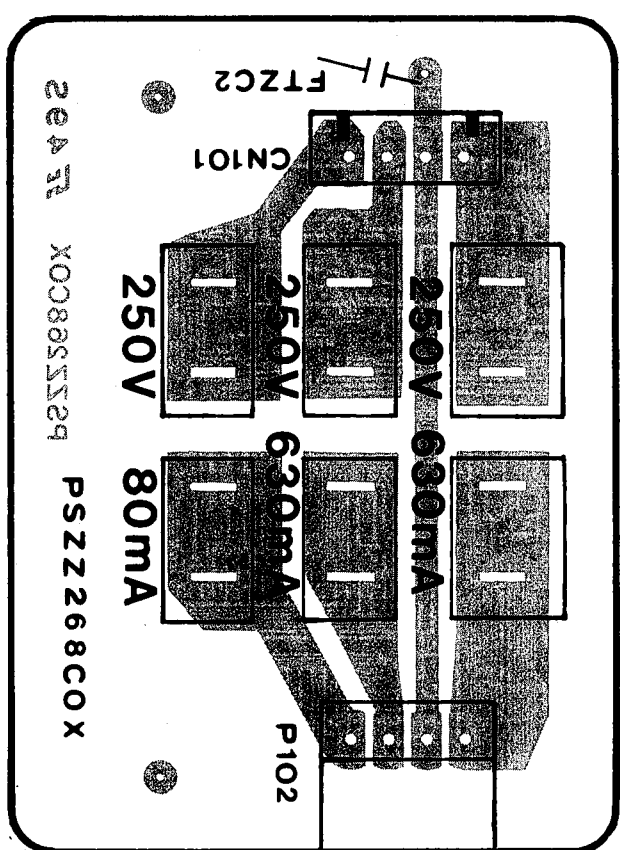
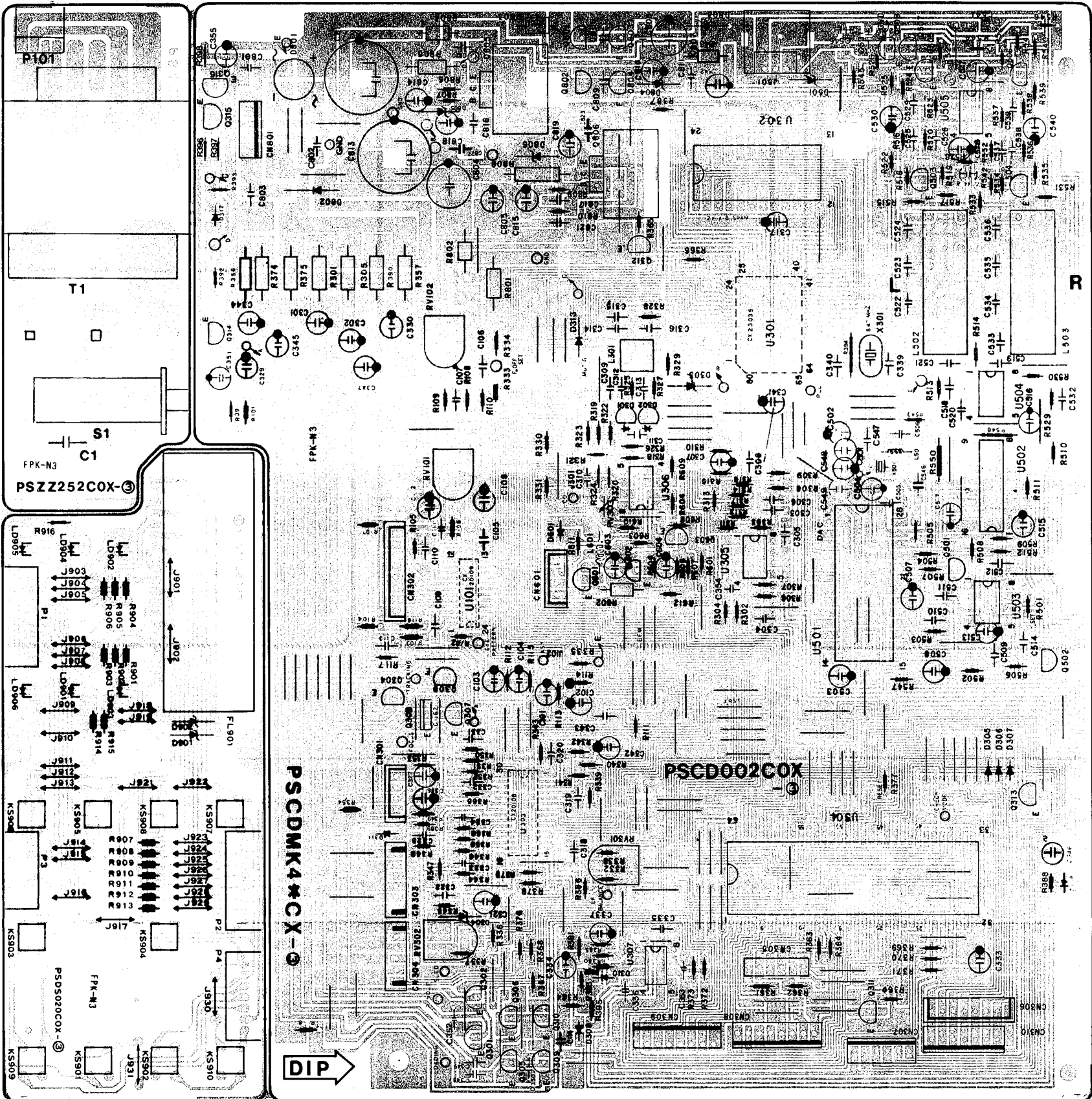
APSDS020AH (AP131)

WIRING BOARD LAYOUT

APSCD002BH (AP111)

(20,001 ~)

APSSZ268AH (PX,E) (AP114)



APSDS020AH (AP131)

APSSZ252AH (AP112)

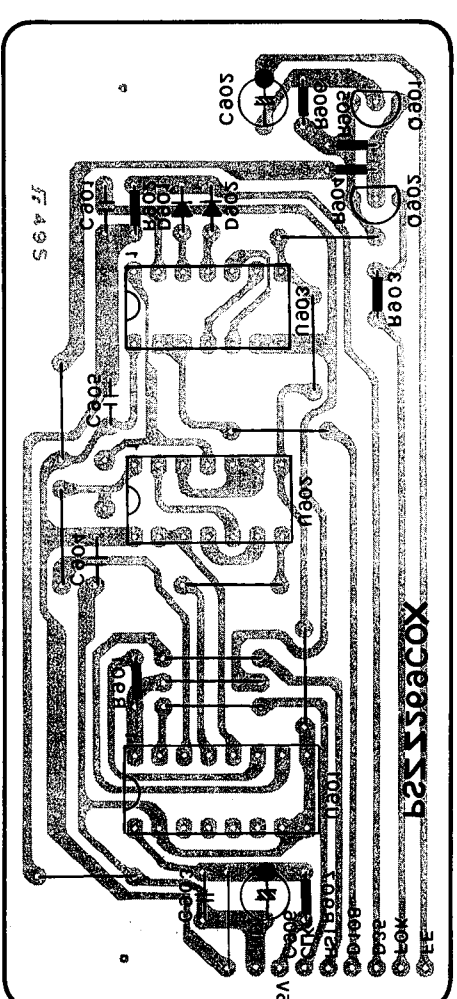
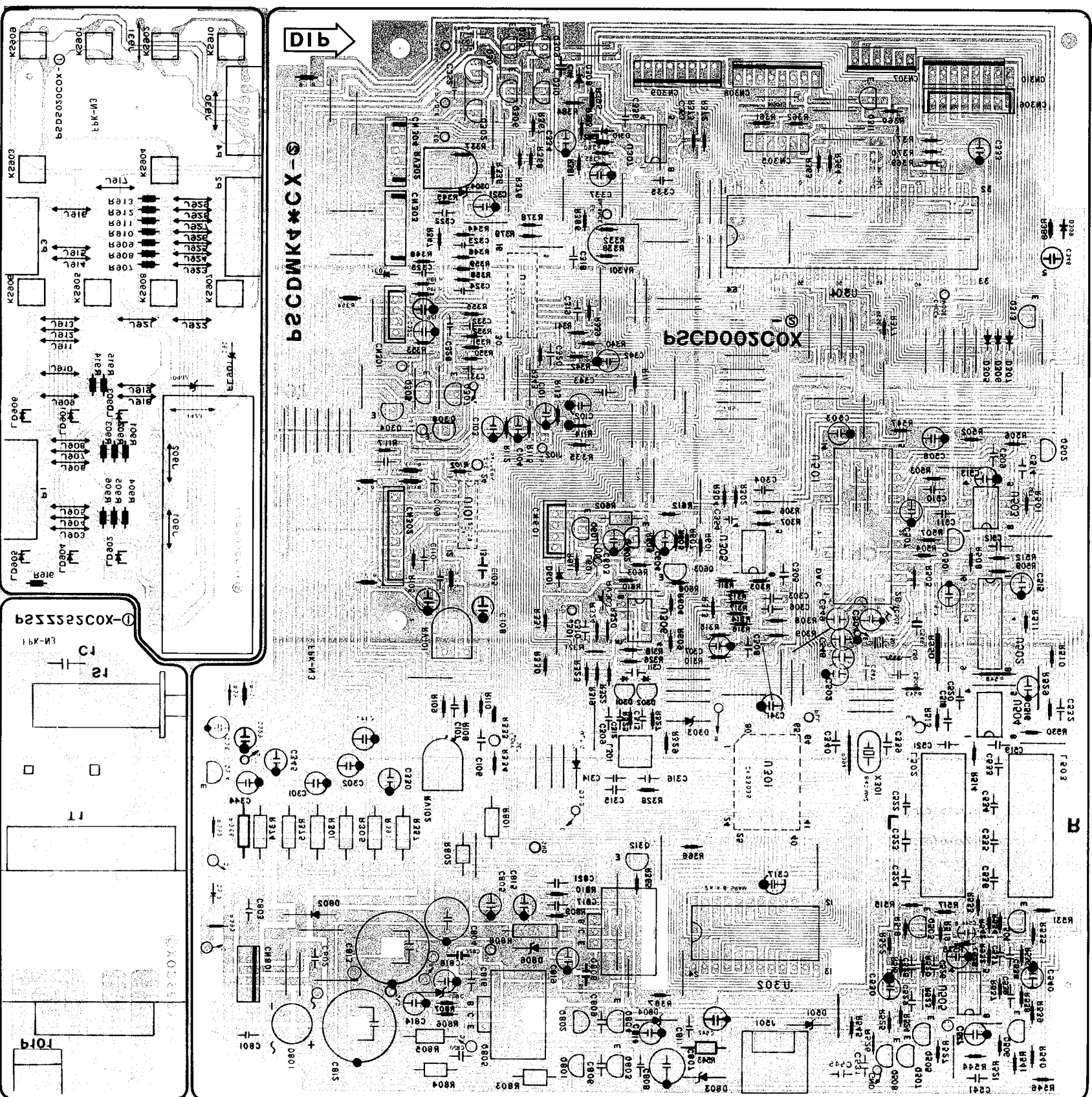


# WIRING BOARD LAYOUT

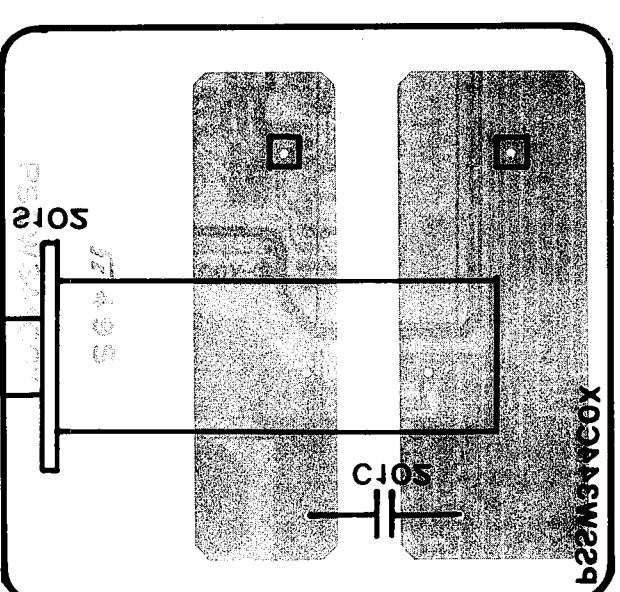
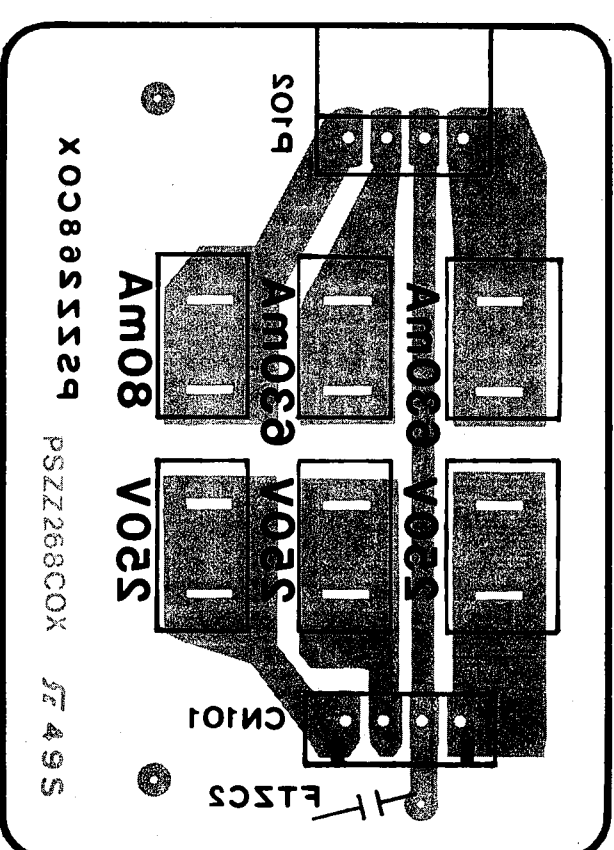
APSCD002AH (AP111)

(1-20,000)

APZZ269AH (AP113, 1-20,000)



APZZ268AH (PX,E) (AP114)

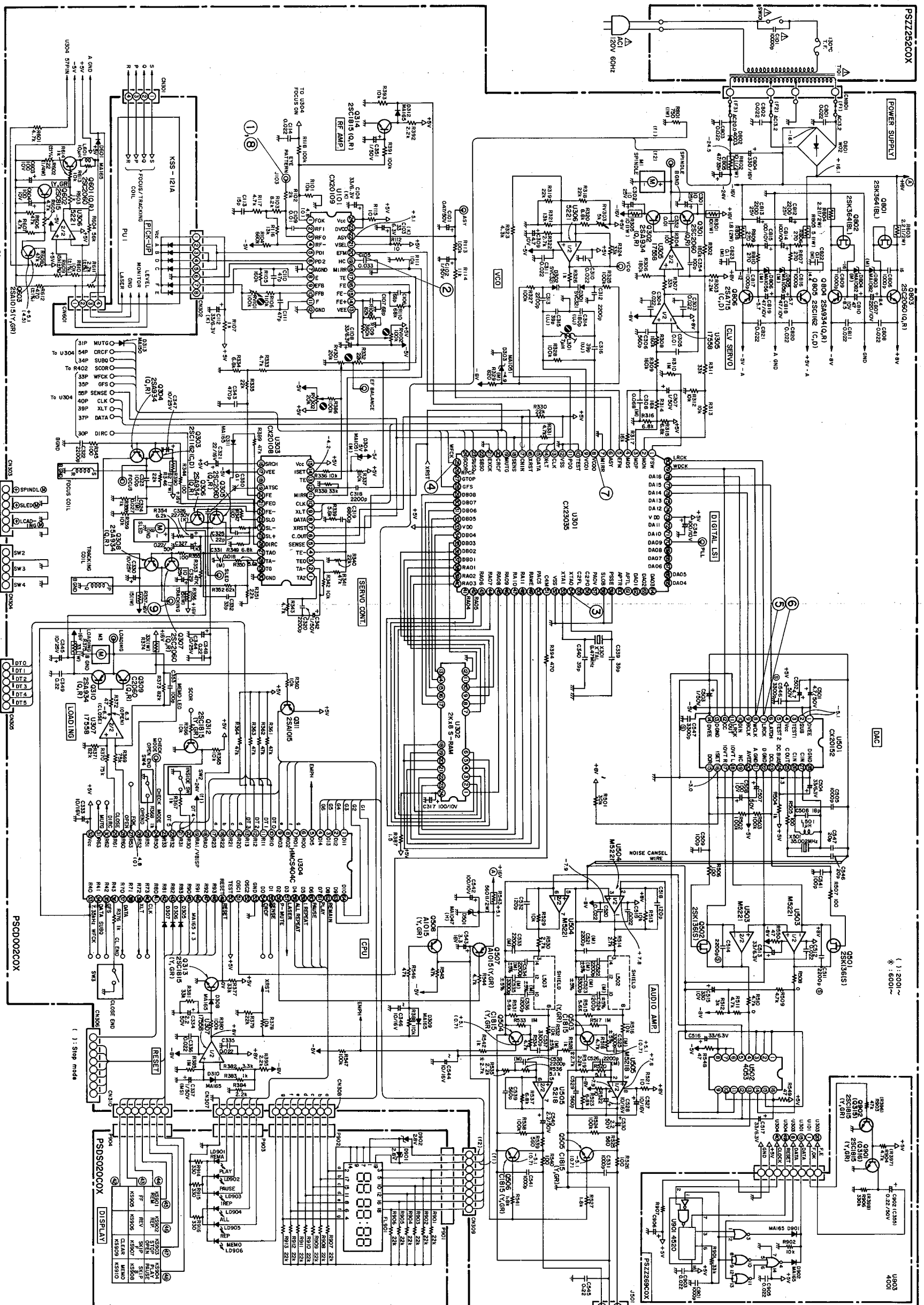


APSW344AH (AP115)

APSDS020AH (AP131)

APZZ252AH (AP112)

# SCHEMATIC DIAGRAM



## Safety precaution to service personnel

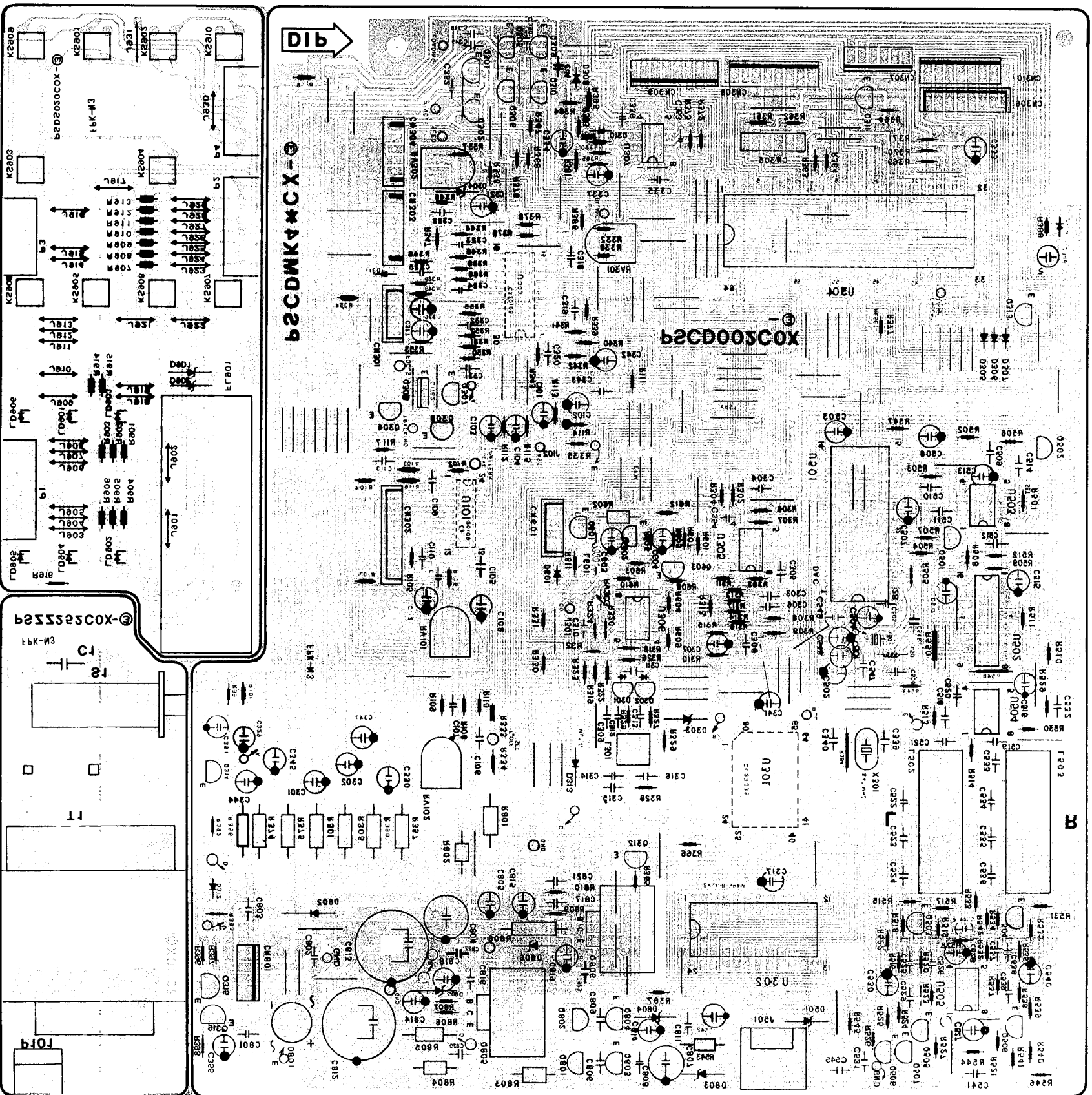
- (1) Safety requirement components in accordance with present safety regulations. These components must only be replaced by original components.
- (2) To comply with present safety regulations, be sure to make leakage current or resistance measurements before returning the appliance to customer.

## Note

All resistors are 1/4 watt unless otherwise noted.  
 Resistor values are in ohm (1K = 1000 ohm).  
 All capacitor values are in micro-farad (p = pico-farad).  
 All voltages, read from chassis, are measured with VTVM under no signal conditions unless otherwise noted.

# WIRING BOARD LAYOUT

APSCD002BH (AP111)

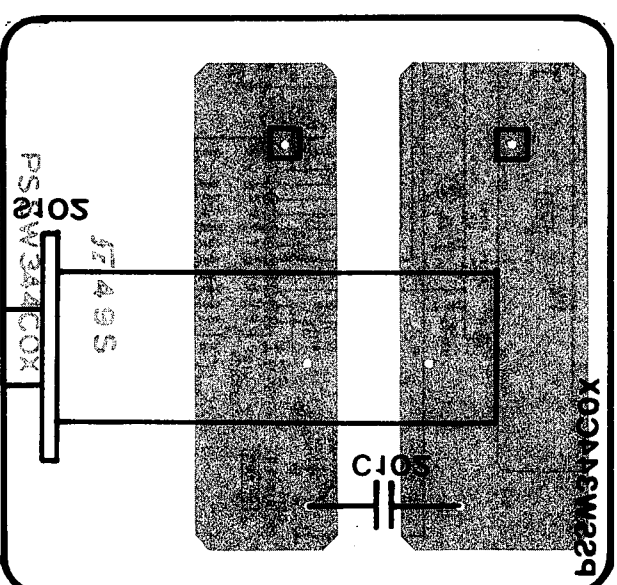
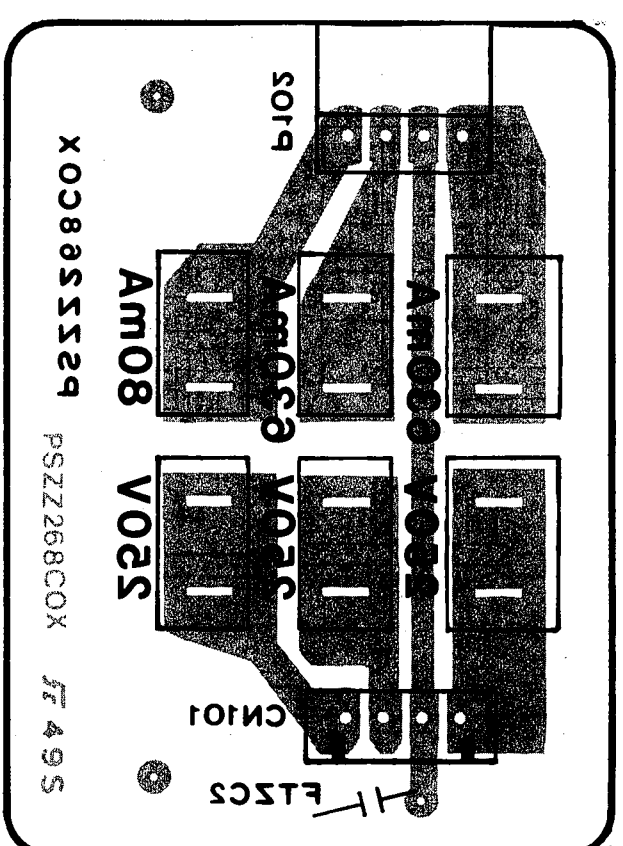


APSZ2252AH (AP112)

APSDS020AH (AP131)

(20,001 ~)

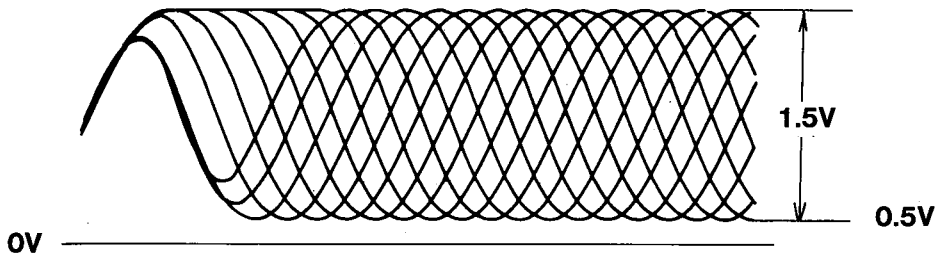
APSZ2268AH (PX,E) (AP114)



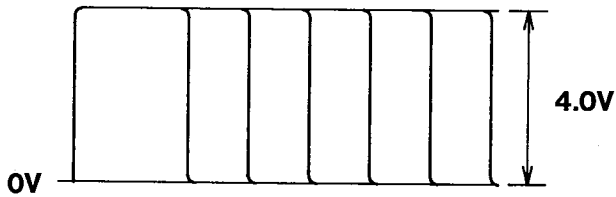
APSSW344AH (AP115)

# TEST POINTS AND WAVEFORMS

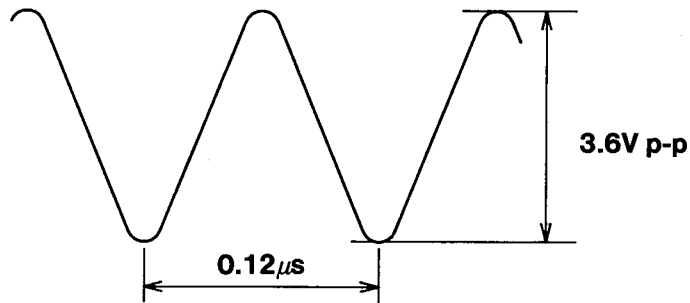
## 1. EYE PATTERN



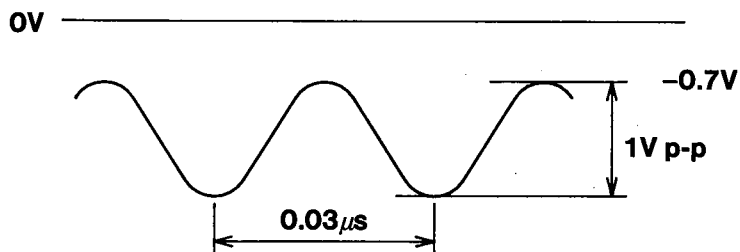
## 2. EFM



## 3. X301 (U301 54 pin)

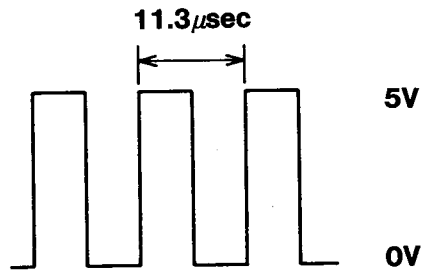


## 4. X501 (U501 25 pin)

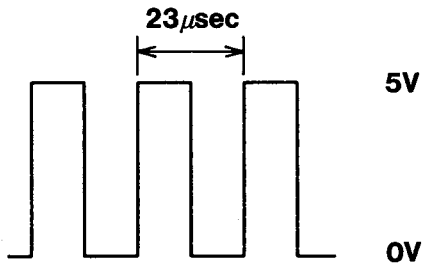


# TEST POINTS AND WAVEFORMS

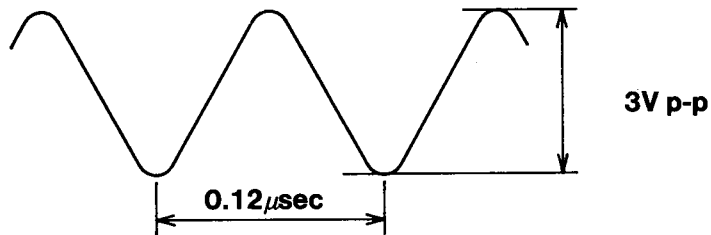
5. U501 ⑧ pin  
WCLK



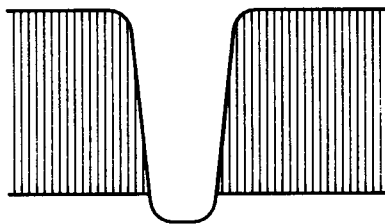
6. U501 ⑦ pin  
LRCK



7. VCOO  
U301 ⑧ pin

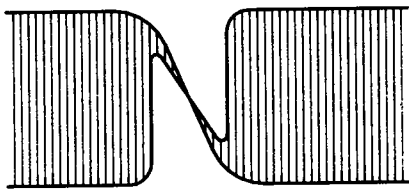


8. EYE PATTERN  
Scratched disc ①



0V

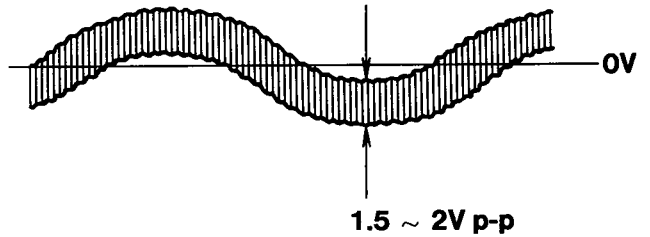
Scratched disc ②



0V

9. TRACKING

Eccentric disc

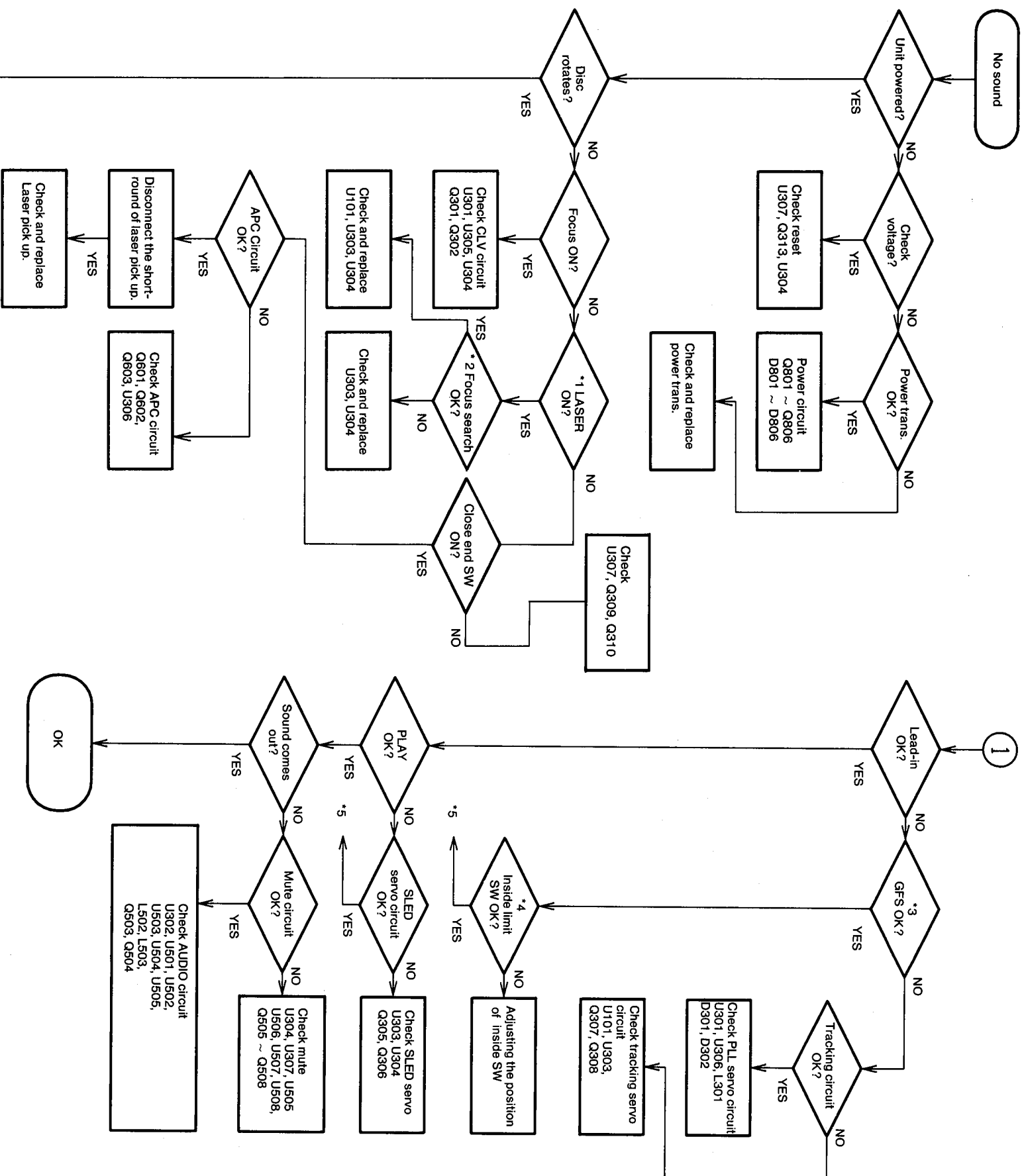


Normal disc





# QUICK TROUBLE SHOOTING



## \*1 Laser diode light check

- a. Checking light with your eyes. The object lens of the laser pickup goes up and down for four seconds when the disc tray closes with no disc. While the lens goes up and down, check that laser goes from the laser pickup.

## b. Caution

Keep your eyes from the laser pickup in 12 inches distance when checking the laser light from the laser pickup. The laser pickup is not visible from right above it. View the pickup from slant upper side.

## \*2 Focus search

After the disc tray is closed with no disc, the laser pickup goes to inside of the disc tray and the object lens goes up and down. If the player does not perform above motion, check the close end switch and inside limit switch.

## \*3 GFS signal

Judgement of frame sync. (U304, 35pin). When it is locked GFS signal is "high".

## \*4 Position of the inside limit switch

Check the position of the switch is in the disc lead-in area. Connect the test pin marked "CHECK MODE" to ground. The display shows the track time when the laser pickup is at the switch. Keep this time between -4:00 --- 5:20 (Sony test disc type 4 only) by adjusting the position of the switch.

## \*5 To find inferiority of a disc.

If a disc is inferior even if the player is normal, playback is impossible. When you judge that the disc is inferior make following tests.

### a. Scratches, dirt and pin holes

Take a careful looking at the disc. If there is dirt or finger prints wipe it off. If you do not see scratches or pin holes on the disc, check the RF signal.

### b. Eccentricity

Check the waveform of the tracking servo signal.

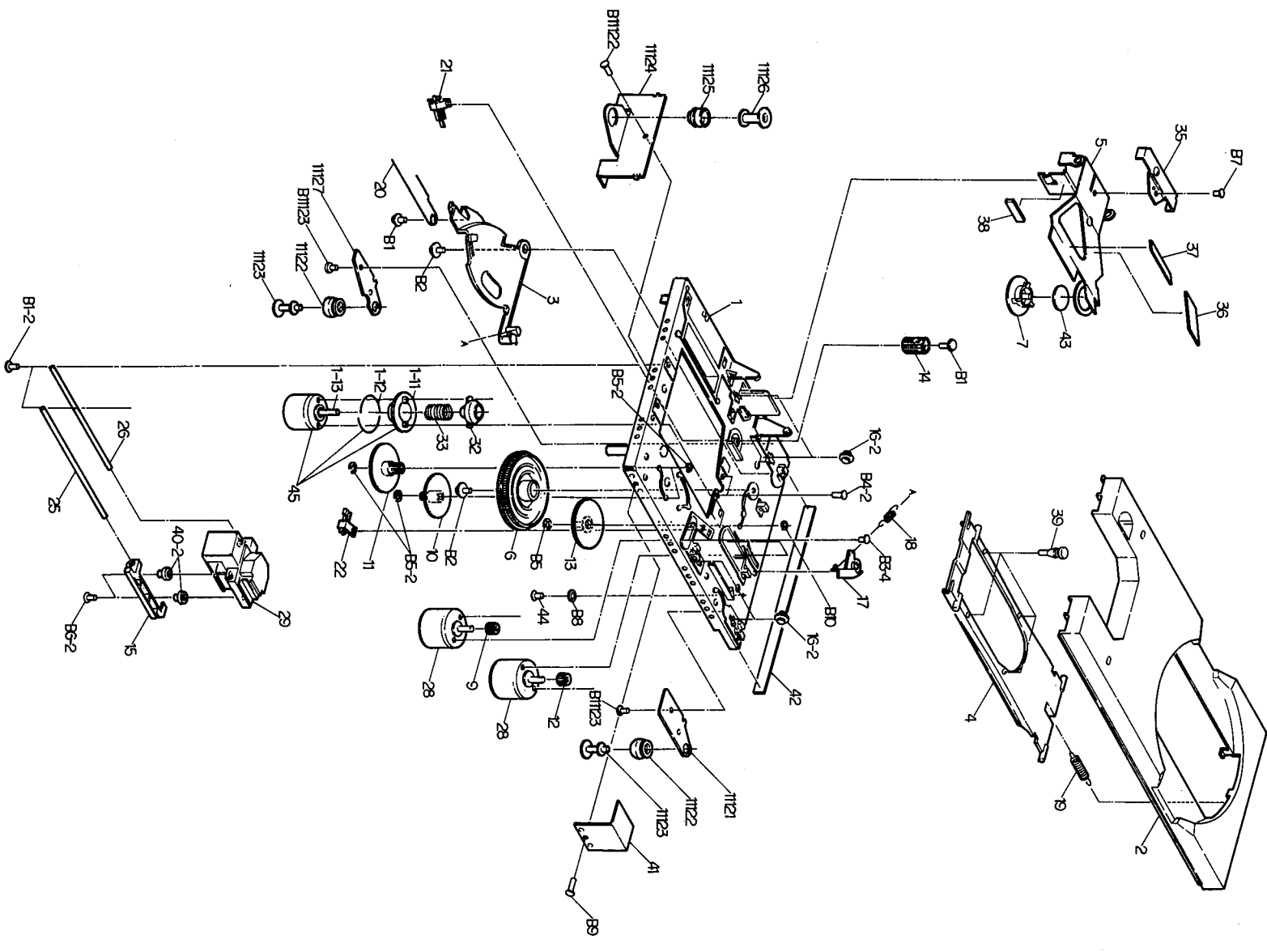
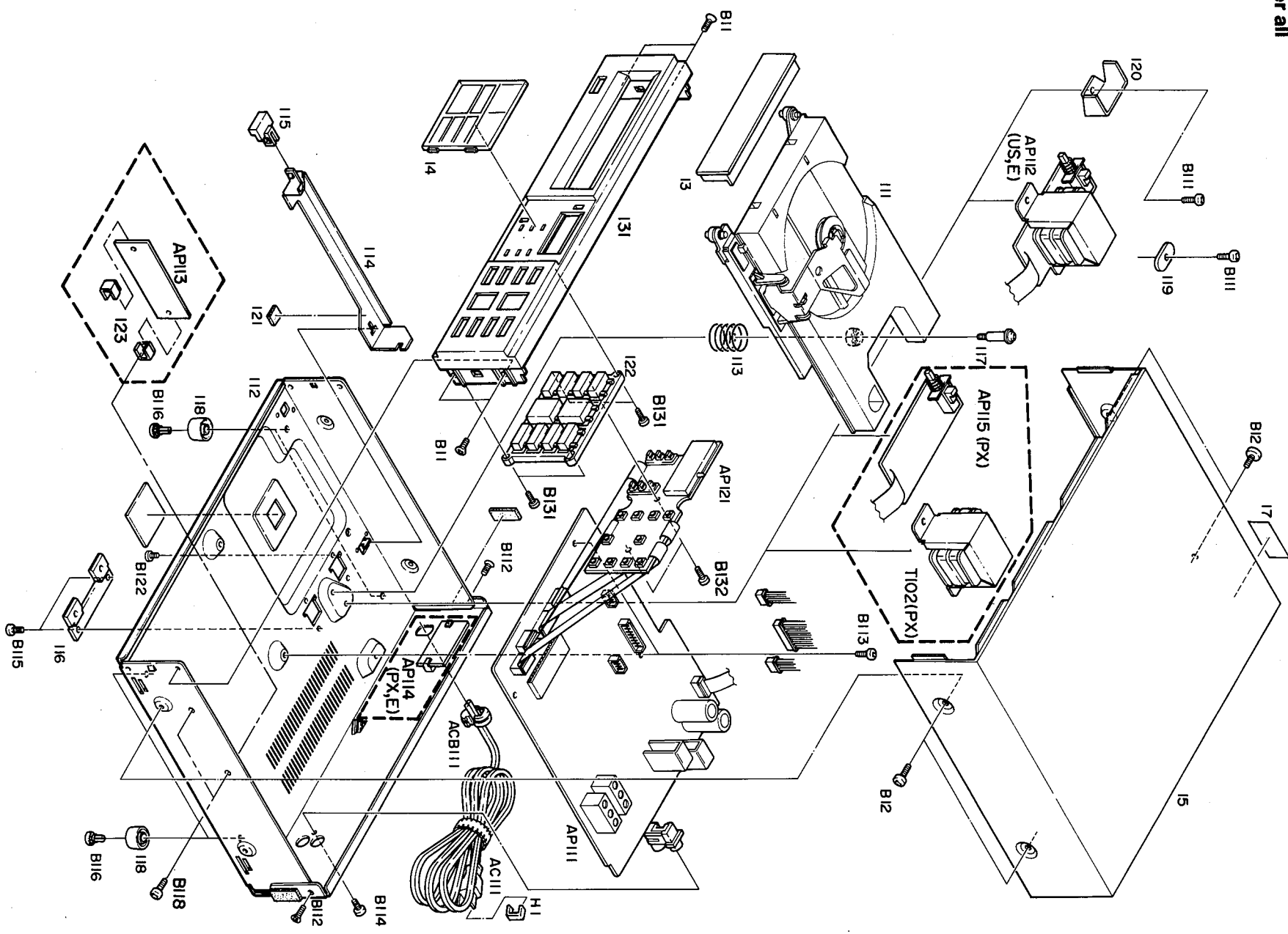
### c. Out of focus

When the disc is bent, focus is out. Check the focus tracking signal. In this case chunking operation may be incorrect. When the disc is normal, a horizontal and vertical motion of the disc is within 0.3mm. If it is over 0.3mm, check the disc table, sliding chuck and chuck arm.

# EXPLODED VIEW

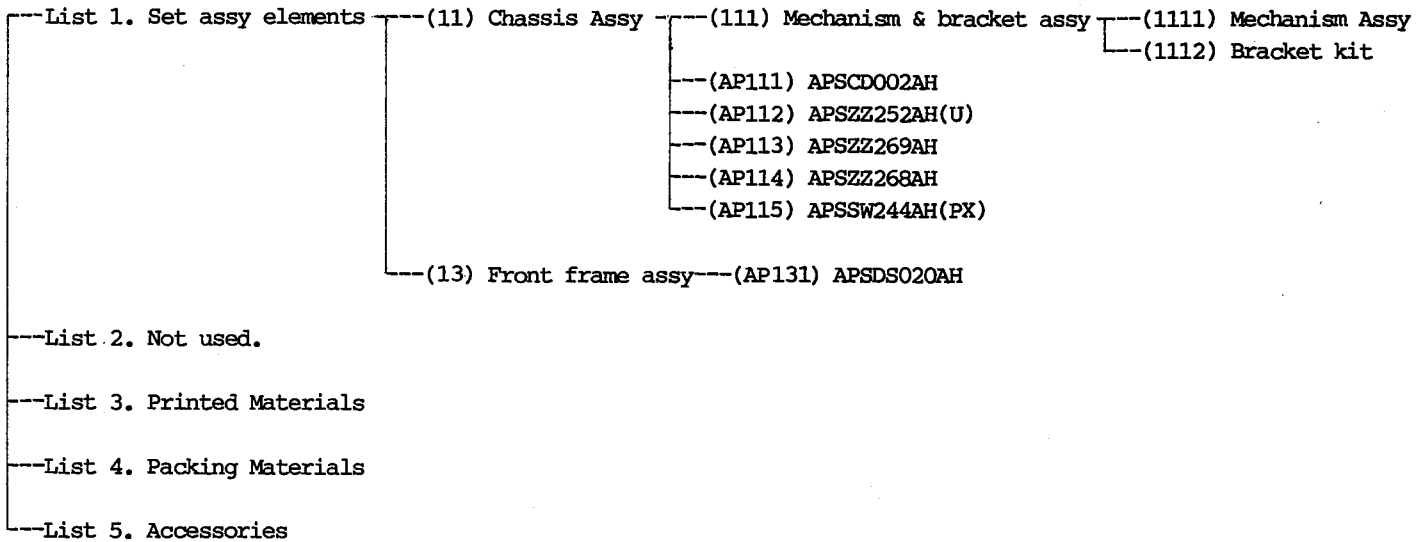
Disc mechanism

Over all



# REPLACEMENT PART LIST

## TABLE OF PART STRUCTURE



### List 1. Set assy elements

Ref.No.	MFR's Part NO.	Description	Remarks
1A	KC000449XX	Shipping caution tag	
1B	VVL646WN01	AC cord caution tag(PX)	
11	AYF1MJ**01	Chasssis assy(U,C)	
11	AYF1MPX*01	Chassis assy(PX,J)	
11	AYF1MS**01	Chassis assy(E)	
12	AYF1MJ**02	Front frame assy	
13	VE73JSK001	Lid, disc compartment	
14	VS668AK012	Plate, indicator	
15	MU886SX013	Top cover	
17	VVL521WN11	UL caution label(U)	
18	VVL611WN02	Caution label	
20	VS445VF001	Blind sheet	
B 11	BTPS3006TZ	Screw, M3x6	
B 12	BTPB4008TB	Screw, M4X8	

### 11. Chassis assy

Ref.No.	MFR's Part NO.	Description	Remarks
11A	SR0203109Z	Voltage selector(PX)	
111	AMF1MJ**01	Disc mech. assy	
112	MB886SK001	Bottom chassis(U)	
112	MB886SK003	Bottom chassis(PX)	
112	MB886SK004	Bottom chassis(E)	
113	MW271LY008	Spring	
114	MB843SL001	Joint, power SW	
115	VN220SB025	Button, power SW	
116	VK163SB004	Lock plate	
117	MT563SZ004	Shaft, trans.	

# REPLACEMENT PART LIST

Ref.No.	MFR's Part NO.	Description	Remarks
118	VM174RB001	Foot(U)	
118	VM174RB001	Foot(PX)	
119	MS317SZ006	Plate, trans.	
120	MB544SL001	Bracket, rear	
121	VS228RF006	Sponge(U)	
122	VS428RF001	Sheet	
123	MB111SZ001	Bracket, fuse PC board	
125	MZ433SL001	Power SW bracket(PX)	
AC111	ACAC029ULA	AC power cord	
ACB111	VM270NB001	Bushing, power cord	
AP111	APSCD002AH	PC board assy, main(1-20,000)	
AP111	APSCD002BH	PC board assy, main(20,001-)	
AP112	APSZZ252AH	PC board assy, power(U)	
AP113	APTZZ269AH	PC board assy, sub(1-20000)	
AP114	APSZZ268AH	PC board, power(E)	
AP115	APSSW344AH	PC board, assy, power SW	
B111	BTPB4008TZ	Screw, M4x8	
B112	BTPB3006TZ	Screw, M3x6(U)	
B112	BTPS3006TZ	Screw, M3x6(PX)	
B113	BTPB3006TZ	Screw, M3x6(U)	
B113	BTPB3006TZ	Screw, M3x6(PX)	
B114	BTPB3008PB	Screw, M3x8	
B115	BTPB3010TZ	Screw, M3x10(U)	
B115	BTPB3010TZ	Screw, M3x10	
B116	BRP4050QNB	Screw, M4x5	
B117	BSPB3012NB	Screw, M3x12(E)	
B118	BSPS3012NN	Screw, M3x12	
B119	BNHCL30NSZ	Nut (PX)	
B120	BSPB3006NZ	Screw, M3x6(PX)	
B121	BSPS3006NZ	Screw, M3x6(PX)	
B122	BTPB3006TZ	Screw, M3x6(U,E)	
C102	CKDU1039GH	Cap., 0.01(U)	
FTZC1	CKDB473ZFM	Cap., ceramic 0.047	
S102	SP01AAW03A	Power SW(U)	
T102	TPG48T004T	Power trans.(PX)	

## 111. Mechanism & bracket assy

Ref.No.	MFR's Part NO.	Description	Remarks
1111	AMCD01**01	Mechanism assy	
1112	AYF1MU**04	Bracket kit	

# REPLACEMENT PART LIST

1111. Mechanism Assy

Ref.No.	MFR's Part No.	Description	Remarks
1	AVCHASS004	Chassis assy	
1-1	MB771SL005	Chassis	
1-2	VX777DN001	Chassis outsert	
1-3	MT322LY001	Gear shaft A	
1-4	MT222LY001	Gear shaft B	
2	VB872SB012	Loading box	
3	VX662DN001	Lever, lock	
4	VU761SB001	Table, loading	
5	MX665SL002	Chuck arm	
6	VF297DN001	Cam gear	
7	VF187DN001	Chuck	
9	VM165DN002	Gear, sled(A)	
10	VM286DN002	Gear, sled(B)	
11	VM286DN003	Gear, sled(C)	
12	VM184DN001	Gear, loading(A)	
13	VM284DN001	Gear, loading(B)	
14	VM276DN002	Gear, loading(C)	
15	VZ221DN002	Gear base, pickup	
16	VF162DN001	Roller	
17	VX331DN001	Down lever	
18	MW221LY003	Spring, down lever	
19	MW331LY003	Spring, up table	
21	SF010204ZE	Limit SW, pickup	
22	SF020203ZE	Limit SW, Disc table	
25	MT730LY001	Shaft, pickup(A)	
26	MT630LY001	Shaft, pickup(B)	
28	ZNM0062101	Motor, pickup	
29	HLPSR3001S	Laser pickup	
30	ACCNV58UCA	Connector for motors	
31	ACCNV59UCA	Connector for SWs	
32	VM272KB001	Slide ring	
33	MW271LY009	Spring table	
35	MB631SB001	Chuck arm support	
36	VS327RF005	Dumper, chuck (A)	
37	VS317RF006	Dumper, chuck (B)	
38	VS217RF008	Cushion	
39	VF142RB001	Dumper, disc table	
40	MF144BD001	Collar, pickup gear	
41	ML342SL004	Bracket, box	
42	VS716XF003	Sheet, blind	
43	MD602LX001	Sheet chuck	
44	MT612BD001	Box stopper	
45	AVMOTOR005	Disc motor assy	
B 1	BTP43008PZ	Screw, M3x8	
B 2	BTP43010PZ	Screw, M3x10	
B 3	BSPB2605NZ	Screw, M2.6x5	
B 4	BSPP2005NZ	Screw, M2x5	
B 5	BWK17325KU	Slider, plastic	
B 6	BSPB2606NZ	Screw, M2.6x6	
B 7	BTTP2305AZ	Screw, M2.3x5	

# REPLACEMENT PART LIST

Ref.No.	MFR's Part No.	Description	Remarks
B 8	BWM30A08SZ	Washer	
B 9	BTPB3006TZ	Screw, M3x6	
B10	BCA1540XLD	Stop ring	

## 1112. Bracket kit

Ref.No.	MFR's Part No.	Description	Remarks
11121	MS532SL001	Bracket, front	
11122	VM176RB014	Damper, front	
11123	MT265SZ004	Shaft	
11124	MZ643SL001	Bracket, rear	
11125	VM176RB006	Damper	
11126	VT276SB001	Slide ring	
11127	MS532SL002	Bracket, front&rear	
B11121	BTPB3008PZ	Screw, M3x8	
B11122	BTPB3008TZ	Screw, M3x8	

## AP111 Main PC board assy (APSCD002AH)

Ref.No.	MFR's Part No.	Description	Remarks
	PSCD002COX	PC board, unassembled	
	MU422SD001	Shield, for LFP	
B801	BTPW3008BZ	Screw, M3x8	
C101	CEVGR47ALX	Cap., elect 0.47/50	
C102	CEVG010ALX	Cap., elect 1/25	
C103-4	CEVB330ALX	Cap., elect 33/6.3	
C105	CKFB333ZFM	Cap., ceramic 0.033	
C106-7	CKFB680KOM	Cap., ceramic 68p	
C108	CEVB330ALX	Cap., elect 33/6.3	
C109	CKFB103ZFM	Cap., ceramic 0.01	
C110-11	CCFB470KOM	Cap., ceramic 47p	
C112	CEVB330ALX	Cap., elect 33/6.3	
C113	CCFB150KOM	Cap., ceramic 15p	
C114	CKFB223ZFM	Cap., ceramic 0.022	
C301-2	CEVE100ALX	Cap., elect 10/25	
C303-4	CKFB223ZFM	Cap., ceramic 0.022	
C305	CKFB103ZFM	Cap., ceramic 0.01	
C306	CKFB561KBM	Cap., ceramic 560p	
C307	CEVG010ALX	Cap., elect 1/50	
C308	Q4B683KTH	Cap., film 0.068	
C309	CEVG4R7ALX	Cap., elect 4.7/50	
C310-11	CKFB223ZFM	Cap., ceramic 0.022	
C312-3	CKFB222KBM	Cap., ceramic 2200p	

# REPLACEMENT PART LIST

Ref.No.	MFR's Part No.	Description	Remarks
C314	CCFB181KUT	Cap., ceramic 180p	
C315-6	CCFB390KUT	Cap., ceramic 39p	
C317	CEVC101ALX	Cap., elect 100/10	
C318	CKFB222KBM	Cap., ceramic 2200p	
C319	CKFB682KBM	Cap., ceramic 6800p	
C320	CKFB222KBM	Cap., ceramic 2200p	
C321	CEVC220ALX	Cap., elect 22/10	
C322	CKFB222KBM	Cap., ceramic 2200p	
C323	CCFB101KOM	Cap., ceramic 100p	
C324	QQ4B273KTH	Cap., film 0.027	
C325	CCFB220KOM	Cap., ceramic 22p	
C326	CEVC220ALX	Cap., elect 22/10	
C327	CEVGR22ZFM	Cap., elect 0.22/50	
C329-30	CEVE100ALX	Cap., elect 10/25	
C331	QQ4B183KTH	Cap., film 0.018	
C332	CCFB330KOM	Cap., ceramic 33p	
C333	CEVD100ALX	Cap., elect 10/16	
C334	CEVG2R2ALX	Cap., elect 2.2/50	
C335-6	CKFB223ZFM	Cap., ceramic 0.022	
C337	CEVG010ZMN	Cap., elect 1/50(MS)	
C339-40	CCFB390KOM	Cap., ceramic 20p	
C341	CEVC101ALX	Cap., elect 100/10	
C342	CEVG010ALX	Cap., elect 1/50	
C343	CCFB471KOM	Cap., ceramic 470p	
C344-5	CEVE100ALX	Cap., elect 10/25	
C346	CEVD100NLX	Cap., elect 10/16(NP)	
C347	CEVE100ALX	Cap., elect 10/25	
C348-9	CKFB223ZFM	Cap., ceramic 0.022	
C350	QQ4B104KEH	Cap., ceramic 0.1	
C351	CEVG010ALX	Cap., elect 1/50	
C352	CKFB103ZFM	Cap., ceramic 0.01	
C353-4	CCFB101KOM	Cap., ceramic 100p	
C501-2	CEVG4R7ALX	Cap., elect 4.7/50	
C503	CEVG010ALX	Cap., elect 1/50	
C504	CEVB330ALX	Cap., elect 33/6.3	
C505	CKGB102KBT	Cap., ceramic 1000p	
C506	CCFB180KOM	Cap., ceramic 18p	
C507	CEVG010ALX	Cap., elect 1/50	
C508	CEVC101ALX	Cap., elect 100/10	
C509-10	CCFB101KOM	Cap., ceramic 100p	
C511	QQSC222JEB	Cap., styloflex 2200p	
C512	CKFB223ZFM	Cap., ceramic 0.022	
C513	CEVB330ALX	Cap., elect 33/6.3	
C514	QQSC222JEB	Cap., styloflex 2200p	
C515	CEVC331ALX	Cap., elect 330/10	
C516-7	CEVB330ALX	Cap., elect 33/6.3	
C518	CCFB121KOM	Cap., ceramic 120p	
C519-20	CKFB223ZFM	Cap., ceramic 0.022	
C521	QQ4B222KTH	Cap., film 2200p	
C522	QQ4B222JTH	Cap., film 2200p(±5%)	

# REPLACEMENT PART LIST

Ref.No.	MFR's Part No.	Description	Remarks
C523	QQ4B332JTH	Cap., film 3300p(±5%)	
C524	QQ4B122JTH	Cap., film 1200p(±5%)	
C525	QQ4B332JTH	Cap., film 3300p(±5%)	
C526	QQ4B222KTH	Cap., film 2200	
C526	QQ4B122KTH	Cap., film 1200p	
C527	CEVD100ALX	Cap., elect 10/16	
C528	CEVD100ALX	Cap., elect 10/16	
C529	CCFB561KOM	Cap., ceramic 560p	
C530	CEVG2R2ALX	Cap., elect 2.2/50	
C531	CKFB102KBM	Cap., ceramic 1000p	
C532	CCFB121KOM	Cap., ceramic 120p	
C533-4	QQ4B222JTH	Cap., film 2200p(±5%)	
C535	QQ4B332JTH	Cap., film 3300p(±5%)	
C536	QQ4B122JTH	Cap., film 1200p(±5%)	
C537	QQ4B332JTH	Cap., film 3300p(±5%)	
C538	QQ4B222KTH	Cap., film 2200p	
C539	CCFB561KOM	Cap., ceramic 560p	
C540	CEVG2R2ALX	Cap., elect 2.2/50	
C541	CKFB102KBM	Cap., ceramic 1000p	
C542	CEVC101ALX	Cap., elect 100/10	
C544	CEVD100NLX	Cap., elect 10/16	
C545	QQ4B224KTH	Cap., film 0.22	
C546-7	CCFB200KOM	Cap., ceramic 20p	
C548	QQSC332JEB	Cap., film 3300	
C549	QQSC332JEB	Cap., film 3300	
C603-4	CEVC101ALX	Cap., elect 100/10	
C801	CKFB223ZFM	Cap., ceramic 0.022	
C802	CKFB223ZFM	Cap., ceramic 0.022	
C803	CKFB223ZFM	Cap., ceramic 0.022	
C805	CEVF470ALX	Cap., elect 47/35	
C806	CKFB102KBM	Cap., ceramic 1000p	
C807	CEVC221ALX	Cap., elect 220/10	
C808	CKFB223ZFM	Cap., ceramic 0.022	
C809	CKFB102KBM	Cap., ceramic 1000p	
C810	CEVC470ALX	Cap., elect 47/10	
C811	CKFB223ZFM	Cap., ceramic 0.022	
C812	CEAE222UMN	Cap., elect 2200/25	
C813	CEAE222UMN	Cap., elect 2200/25	
C814-5	CEVD101ALX	Cap., elect 100/16	
C816-7	CKFB102KBM	Cap., ceramic 1000p	
C818-9	CEVC470ALX	Cap., elect 47/10	
C820-1	CKFB223ZFM	Cap., ceramic 0.022	
C822-3	QQ4B104KTH	Cap., ceramic 0.1	
CN301-2	YJF04S088Z	Connector, 4p	
CN303	YJF06S035Z	Connector, 6p	
CN304	YJF05S021Z	Connector, 5p	
CN306	YJF08S088Z	Connector, 8p	
CN307-10	YJF06S185U	Connector, 6p	
CN601	YJF04S088Z	Connector, 4p	
CN801	YJF04S185U	Connector, 4p	



# REPLACEMENT PART LIST

Ref.No.	MFR's Part No.	Description	Remarks
D301	QDCVC321CC	Vari-cap diode, SVC321SP	
D302	QDCVC321CC	Vari-cap diode, SVC321SP	
D303-4	QDZ1051M#N	Zenner diode,MA1051	
D305-12	QDSMA165#N	Diode,MA165	
D313	QDSMA150#N	Diode, MA150	
D501	QDZ1047H#N	Zenner diode,MA1047	
D601	QDSMA165#N	Diode,MA165	
D801	QDSW02XXXZ	Diode, W02RL	
D802	QDSN4003AZ	Diode, 1N4003	
D803-4	QDZ1082M#N	Zenner diode,MA1082	
D805-6	QDZ1056M#N	Zenner diode,MA1056	
D902	QDZ2R7ELBA	Zenner diode, RD2.7EL2	
HS801	MU424AD001	Heatsink	
HS802	MU424AD001	Heatsink	
J501	YJPO2S034Z	OUTPUT jack	
L301	TR07QR006S	Coil, VCO 7uH	
L502-3	FJRR20C01S	Low pass filter	
L601	LF100KE#9T	Choke coil, 10uH	
Q301	QTC2060XTX	TR., 2SC2060	
Q302	QTA1015XTT	TR., 2SA1015	
Q303	QTC1162XAB	Tr., 2SC1162	
Q304	QTA0934XTX	TR., 2SA934	
Q305	QTC2060XTX	TR., 2SC2060	
Q306	QTA0934XTX	TR., 2SA934	
Q307	QTC2060XTX	TR., 2SC2060	
Q308	QTA0934XTX	TR., 2SA934	
Q309	QTC2060XTX	TR., 2SC2060	
Q310	QTA0934XTX	TR., 2SA934	
Q311	QTA1015XTT	TR., 2SA1015	
Q312	QTC1815XTT	TR., 2SC1815	
Q313	QTC1815XTT	TR., 2SC1815	
Q314	QTC1815XTT	Tr., 2SC1815	
Q501-2	QTK0136XBN	FET, 2SK136	
Q503-6	QTC1815XTT	Tr., 2SC1815	
Q507-8	QTA1015XTT	Tr., 2SA1015	
Q601	QTC2060XTX	Tr., 2SC2060	
Q602	QTC1815XTT	Tr., 2SC1815	
Q603	QTA1015XTT	Tr., 2SA1015	
Q801-2	QTK0364XAT	FET, 2SK364	
Q803	QTC2060XTX	Tr., 2SC2060	
Q804	QTA0934XTX	Tr., 2SA934	
Q805	QTC1162XAB	Tr., 2SC1162	
Q806	QTA0715XBB	Tr., 2SA715	
R101	RD18PJ103X	Res., carbon 10k	
R102	RD18PJ202X	Res., carbon 2k	
R103	RD18PJ822X	Res., carbon 820	
R104	RD18PJ684X	Res., carbon 680k	
R105	RD18PJ164X	Res., carbon 160k	
R106	RD18PJ114X	Res., carbon 110k	
R107	RD18PJ102X	Res., carbon 1k	

# REPLACEMENT PART LIST

Ref.No.	MFR's Part No.	Description	Remarks
R108	RD18PJ823X	Res., carbon 82k	
R109	RD18PJ364X	Res., carbon 360k	
R110	RD18PJ683X	Res., carbon 68k	
R111	RD18PJ103X	Res., carbon 10k	
R112	RD18PJ100X	Res., carbon 10	
R113	RD18PJ104X	Res., carbon 100k	
R114	RD18PJ114X	Res., carbon 11k	
R115	RD18PJ100X	Res., carbon 10	
R116	RD18PJ133X	Res., carbon 13k	
R117	RD18PJ473X	Res., carbon 47k	
R118	RD18PJ104X	Res., carbon 100k	
R301	RX1ATJ100B	Res., metal-oxide 10, 1W	
R302	RD18PJ184X	Res., carbon 180k	
R303	RD18PJ225X	Res., carbon 2.2M	
R304	RD18PJ101X	Res., carbon 100	
R305	RX1ATJ100B	Res., metal-oxide 10, 1W	
R306	RD18PJ184X	Res., carbon 180k	
R307	RD18PJ333X	Res., carbon 33k	
R308-9	RD18PJ164X	Res., carbon 160k	
R310	RD18PJ105X	Res., carbon 1M	
R311	RD18PJ333X	Res., carbon 33k	
R312-3	RD18PJ103X	Res., carbon 10k	
R314	RD18PJ163X	Res., carbon 16k	
R315-6	RD18PJ682X	Res., carbon 6.8k	
R317-8	RD18PJ163X	Res., carbon 16k	
R319	RD18PJ223X	Res., carbon 22k	
R320	RD18PJ682X	Res., carbon 6.8k	
R321	RD18PJ133X	Res., carbon 13k	
R322	RD18PJ272X	Res., carbon 2.7k	
R323	RD18PJ432X	Res., carbon 4.3k	
R324	RD18PJ333X	Res., carbon 4.3k	
R325	RD18PJ104X	Res., carbon 100k	
R326	RD18PJ102X	Res., carbon 1k	
R327-8	RD18PJ104X	Res., carbon 100k	
R329	RD18PJ821X	Res., carbon 820	
R330	RD18PJ223X	Res., carbon 22k	
R331	RD18PJ472X	Res., carbon 4.7k	
R332	RD18PJ223X	Res., carbon 22k	
R333	RD18PJ472X	Res., carbon 4.7k	
R334	RD18PJ682X	Res., carbon 6.8k	
R335	RD18PJ223X	Res., carbon 22k	
R336-7	RD18PJ103X	Res., carbon 10k	
R338	RD18PJ333X	Res., carbon 33k	
R339	RD18PJ562X	Res., carbon 5.6k	
R340	RD18PJ223X	Res., carbon 22k	
R341	RD18PJ473X	Res., carbon 47k	
R342	RD18PJ103X	Res., carbon 10k	
R343	RD18PJ472X	Res., carbon 4.7k	
R344-5	RD18PJ101X	Res., carbon 100	
R346	RD18PJ223X	Res., carbon 22k	

# REPLACEMENT PART LIST

Ref.No.	MFR's Part No.	Description	Remarks
R347	RD18PJ101X	Res., carbon 100	
R348	RD18PJ913X	Res., carbon 91k	
R349	RD18PJ682X	Res., carbon 6.8k	
R350	RD18PJ562X	Res., carbon 5.6k	
R351	RD18PJ223X	Res., carbon 22k	
R352	RD18PJ623X	Res., carbon 62k	
R353	RD18PJ473X	Res., carbon 47k	
R354	RD18PJ622X	Res., carbon 6.2k	
R355	RD18PJ101X	Res., carbon 100	
R356	RG1ATJ150B	Res., metal-oxide 15, 1W	
R357	RG1ATJ150B	Res., metal-oxide 15, 1W	
R358	RD18PJ102X	Res., carbon 1k	
R359-60	RD18PJ103X	Res., carbon 10k	
R361-4	RD18PJ473X	Res., carbon 47k	
R365-6	RD18PJ103X	Res., carbon 10k	
R367-8	RD18PJ102X	Res., carbon 1k	
R369-70	RD18PJ753X	Res., carbon 75k	
R371	RD18PJ823X	Res., carbon 82k	
R372	RD18PJ470X	Res., carbon 47	
R373	RD18PJ823X	Res., carbon 82k	
R374	RG1ATJ330B	Res., metal-oxide 33, 1W	
R375	RG1ATJ330B	Res., metal-oxide 33, 1W	
R376	RD18PJ102X	Res., carbon 1k	
R377	RD18PJ333X	Res., carbon 33k	
R378	RD18PJ103X	Res., carbon 10k	
R379	RD18PJ223X	Res., carbon 22k	
R380	RD18PJ104X	Res., carbon 100k	
R381	RD18PJ333X	Res., carbon 33k	
R382	RD18PJ332X	Res., carbon 3.3k	
R383	RD18PJ102X	Res., carbon 1k	
R384	RD18PJ222X	Res., carbon 2.2k	
R385	RD18PJ105X	Res., carbon 1M	
R386	RD18PJ104X	Res., carbon 100k	
R387	RD18PJ1R5X	Res., carbon 1.5	
R388	RD18PJ114X	Res., carbon 110k	
R389	RD18PJ473X	Res., carbon 47k	
R390	RG1ATJ820B	Res., metal-oxide 82 1W	
R391	RD18PJ104X	Res., carbon 100k	
R392	RD18PJ222X	Res., carbon 2.2k	
R393	RD18PJ103X	Res., carbon 10k	
R394	RD25PJ471X	Res., carbon 470 1/4W	
R395	RD18PJ222X	Res., carbon 2.2k	
R501	RD18PJ303X	Res., carbon 30k	
R502-3	RD18PJ104X	Res., carbon 100k	
R504	RD18PJ102X	Res., carbon 1k	
R505-6	RD18PJ101X	Res., carbon 100	
R507	RD18PJ101X	Res., carbon 100	
R508-11	RD18PJ472X	Res., carbon 4.7k	
R512	RD18PJ302X	Res., carbon 3k	
R513	RD18PJ103X	Res., carbon 10k	

# REPLACEMENT PART LIST

Ref.No.	MFR's Part No.	Description	Remarks
R514	RD18PJ272X	Res., carbon 2.7k	
R515	RD18PJ562X	Res., carbon 5.6k	
R516	RD18PJ103X	Res., carbon 10k	
R517	RD18PJ105X	Res., carbon 1M	
R518	RD18PJ472X	Res., carbon 4.7k	
R519	RD18PJ272X	Res., carbon 2.7k	
R520	RD18PJ512X	Res., carbon 5.1k	
R521-2	RD18PJ100X	Res., carbon 10	
R523	RD18PJ682X	Res., carbon 6.8k	
R524	RD18PJ104X	Res., carbon 100k	
R525	RD18PJ561X	Res., carbon 560	
R526	RD18PJ101X	Res., carbon 100	
R527	RD18PJ332X	Res., carbon 3.3k]	
R528	RD18PJ102X	Res., carbon 1k	
R529	RD18PJ103X	Res., carbon 10k	
R530	RD18PJ272X	Res., carbon 2.7k	
R531	RD18PJ562X	Res., carbon 5.6k	
R532	RD18PJ103X	Res., carbon 10k	
R533	RD18PJ105X	Res., carbon 1M	
R534	RD18PJ472X	Res., carbon 4.7k	
R535	RD18PJ272X	Res., carbon 2.7k	
R536	RD18PJ512X	Res., carbon 5.1k	
R537	RD18PJ682X	Res., carbon 6.8k	
R537	RD18PJ243X	Res., carbon 24k	
R538	RD18PJ104X	Res., carbon 100k	
R539	RD18PJ561X	Res., carbon 560	
R540	RD18TJ101X	Res., carbon 100	
R541	RD18PJ332X	Res., carbon 3.3k	
R542	RD18PJ102X	Res., carbon 1k	
R543	RGHATJ561B	Res., metal-oxide 560 1/2W	
R544	RD18PJ472X	Res., carbon 4.7k	
R545	RD18PJ473X	Res., carbon 47k	
R546	RD18TJ473X	Res., carbon 47k	
R547	RD18PJ104X	Res., carbon 100k	
R548-50	RD25PJ470X	Res., carbon 47 1/4W	
R601	RD18PJ472X	Res., carbon 4.7k	
R602	RD18PF0220	Res., metal-oxide 22 (±1%)	
R603	RD18PJ102X	Res., carbon 1k	
R604	RD18PJ563X	Res., carbon 56k	
R605	RD18PJ472X	Res., carbon 4.7k	
R606	RD18PJ473X	Res., carbon 47k	
R607	RD18PJ472X	Res., carbon 4.7k	
R608	RD18PJ473X	Res., carbon 47k	
R609	RD18PF1502	Res., carbon 15k(±1%)	
R610	RD18PF1002	Res., carbon 10k(±1%)	
R611	RD18PF2201	Res., carbon 2.2k(±1%)	
R612	RD18PF4700	Res., carbon 470(±1%)	
R613	RD18PJ103X	Res., carbon 10k	
R614	RD18TJ102X	Res., carbon 1k	
R801	RG1ATJ751B	Res., metal-oxide 750,1W	

# REPLACEMENT PART LIST

Ref.No.	MFR's Part No.	Description	Remarks
R802	RXHATJ100B	Res., metal-oxide 10,1/2W	
R803	RXHATJ2R2B	Res., metal-oxide 2.2,1/2W	
R804	RXHATJ2R2B	Res., metal-oxide 2.2,1/2W	
R805	RG1ATJ150B	Res., metal-oxide 15,1/2W	
R806-7	RD18PJ271X	Res., carbon 270	
R808	RG2ATJ180B	Res., metal-oxide 18, 2W	
R809-10	RD18PJ271X	Res., carbon 270	
RV101-2	RP1NB104#1	Potentiometer,100k	
RV301-2	RP1NB203#1	Potentiometer,20k	
RV303	RPPNB50201	Potentiometer, 5k(B)	
U101	QQ020109AS	IC, CX20109	
U301	QQ023035AS	IC, CX23035	
U302	QQ005116A&	IC, HM6116LP-4	
U303	QQ020108AS	IC, CX20108	
U304	QQ000404YB	IC, HD614042 SC74(1-20000)	
U304	QQ0004043B	IC, HD614042 SD35(20001-)	
U305	QQM17558AB	IC, HA17558	
U306	QQM05221BE	IC, M5221P	
U307	QQM17558AB	IC, HA17558	
U501	QQ020152AS	IC, CX20152	
U502	QQ004053B&	IC, 4053	
U503-4	QQM05221BE	IC, M5221P	
U505	QQM05218BE	IC, M5218P	
X301	XAZ1W3001S	X'tal 8.47MHz	
X501	XAZ3A4001S	Xtal osc, 35.002MHz	

## AP112 Power PC board assy(U,E) (APSZZ252AH)

Ref.No.	MFR's Part NO.	Description	Remarks
C101	PSZZ252COX	PW board, unassembled	
P101	CKDU103PGM	Cap., ceramic 0.01	
S101	WP04158ZGT	PC joint(trans.-main PCB) (U)	
T101	SP01ZAW01W	Power switch	
T101	TPG48V007T	Power transformer(U)	
T101	TPG48S002T	Power transformer(E)	
P103	ACCNW86UCA	Connector, trans.-fuse PC board	

# REPLACEMENT PART LIST

## AP113. Sub PC board assy (APSZZ269AH) (1-20,001)

Ref.No.	MFR's Part No.	Description	Remarks
C901	PSZZ269COX	PC board, unassembled	
C902	CKFB102KBM	Cap., ceramic 1000p	
C903-5	CEVGR22ALX	Cap., elect 0.022/50	
C906	CKFB223AFM	Cap., ceramic 0.022	
CN901	CEVD100ALX	Cap., elect 10/16	
D901-2	YJF08S028Z	Connector, 8p	
Q901-2	QDSMA165#N	Diode, MA165	
R901	QTC1815XTT	Tr., 2SC1815	
R902	RD18PJ333X	Res., carbon 33k	
R903	RD18PJ103X	Res., carbon 10k	
R904	RD18PJ473X	Res., carbon 47k	
R906	RD18PJ472X	Res., carbon 4.7k	
R907	RD18PJ334X	Res., carbon 330k	
U901	RD18PJ100X	Res., carbon 10	
U903	QQ004520A&	IC, 4520	
	QQ004001A&	IC, 4001	

## AP114 Power PC board (APSZZ268AH) (PX,E)

Ref.No.	MFR's Part NO.	Description	Remarks
F01-2	YHFOP0001Z	Fuse holder	
F03	PSZZ268COX	PC board, unassembled	
FTZC2	ZFBQ63101A	Fuse, 630mA 250V	
P102	ZFBQ80001A	Fuse, 80mA 250V	
	CKDB473ZFM	Cap., ceramic 0.047	
	WPO4158ZGT	PC joint	

## AP115 Power SW PC board assy (APSSW344AH)

Ref.No.	MFR's Part No.	Description	Remarks
C102	PSSW344COX	PC board, unassembled	
S102	CKDU103PGM	Cap., ceramic 0.01	
	SPO1AAW03A	Power switch	

## 13. Front frame assy

Ref.No.	MFR's Part NO.	Description	Remarks
131	VE86JSM055	Front frame	
132	VN360SB002	Plate, button	
AP131	APSDS020AH	PW board assy	
B131	BTPP2606PZ	Screw, M2.6x6	
B132	BTPP2606PZ	Screw, M2.6x6	

# REPLACEMENT PART LIST

AP131 Keyboard PC board assy (APSDS020AH)

Ref.No.	MFR's Part No.	Description	Remarks
91	PSDS020COX	PC board, unassembled	
92	VS527RF001	Sponge shield(A)	
93	VS318RB003	Spacer, LED	
D901-2	VS318RB003	Spacer, LED	
FL901	QDZ2R7ELBA	Zener diode, 2.7-2.9V	
LD901-6	ZL9ST20ZK7	FL display tube	
P901-2	QLAR5551KR	LED, REMAINING TIME	
P903	WP08158ZGT	PC joint, (display- main PCB)	
P904	WP06158ZGT	PC joint, (display- main PCB)	
R901-13	WP07158ZGT	PC joint, (display- main PCB)	
R914-6	RD18PJ223X	Res., carbon 22k, 1/8W	
S901-2	RD18PJ331X	Res., carbon 330, 1/8W	
S903	SK0101X*3T	Switch	
S904-5	SK0101X33T	Switch	
S906	SK0101X*3T	Switch	
S907-9	SK0101X33T	Switch	
S910	SK0101X*3T	Switch	

## LIST 3. PRINTED MATERIALS

Ref.No.	MFR's Part No.	Description	Remarks
31	KTF1MU**AX	Owner's Manual	
31	KTF1ME**XX	Owner's Manual(E)	
32	KW000394AX	Warranty Card(PX)	
33	KC000437XX	Service Card	
36	KZ000148BX	Safety instruction(U)	

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## LIST 4. PACKING MATERIALS

Ref.No.	MFR's Part No.	Description	Remarks
41	KPF1MU**01	Inner Carton(U)	
41	KPF1MPX*01	Inner Carton(PX)	
42	KNF1MU**01	Partitioner(L)	
42	KPF1MPX*01	Outer Carton(PX)	
43	KNF1MU**02	Partitioner(R)	

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## LIST 5. ACCESSORIES

Ref.No.	MFR's Part No.	Description	Remarks
51	ACSP023GEA	Stereo Audio Cable	



ADC Products Division  
dbx  
71 Chapel Street  
Newton, MA 02195 USA

KDCD100XXX  
8510 GK  
Printed in Japan