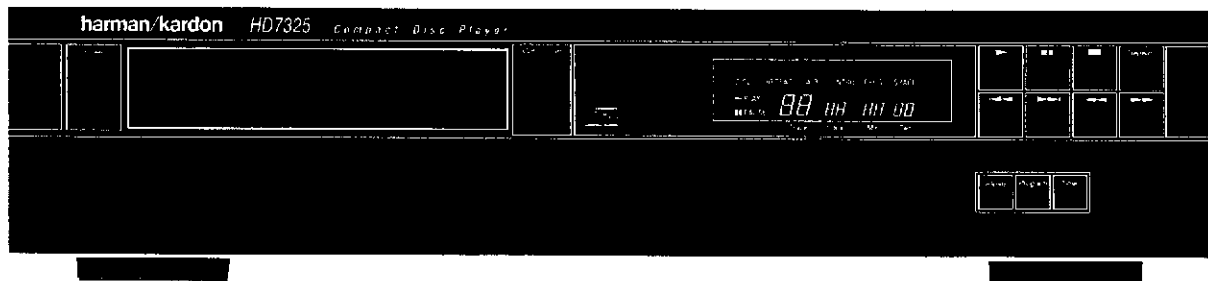


# The Harman Kardon Model HD7325/HD7225A COMPACT DISC PLAYER

Manual 192A

## Technical Manual



The following marks found in the parts list of this manual identify the models as follows:

- HD7325 **BK** : North America area model Black version  
HD7225A/HD7325 **IB** : International model Black version  
HD7225A/HD7325 **I** : International model

### CONTENTS

SPECIFICATION .....	2	IC BLOCK DIAGRAMS .....	24
SAFETY PRECAUTIONS .....	3	CD MECHANISM EXPLODED VIEW .....	27
CONTROLS AND FUNCTIONS .....	5	CD MECHANISM PARTS LIST .....	27
DISASSEMBLY PROCEDURES .....	7	GENERAL UNIT .....	28
POWER CORD REPLACEMENT .....	7	GENERAL UNIT PARTS LIST .....	29
ADJUSTMENT PROCEDURE .....	8	P.C. BOARDS .....	30
TROUBLE SHOOTING .....	10	ELECTRICAL PARTS LIST .....	31
IC TERMINAL FUNCTIONS .....	14	WIRING DIAGRAM .....	35
CIRCUIT DESCRIPTION .....	19	SCHEMATIC DIAGRAMS .....	36

**harman/kardon**

Parts and Service Office  
80 Crossways Park West, Woodbury, N.Y. 11797  
1112-0570A152 A9403 1500 Printed in Japan

**CLASS 1 LASER PRODUCT**

Product complies with DHHS rules CFR subchapter J part 1040: 10 at date of manufacture..

**DANGER**—invisible laser radiation when opened and interlock failed or defeated. Avoid direct exposure to the beam.

**CAUTION**—use of all controls, adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.



**Be Careful of the Laser Pickup**

Although you cannot see it from the outside, a laser pickup is located under the disc tray and a precision lens is built in it.

Since the laser pickup, including the lens element, is especially sensitive to dust, keep the disc tray closed when not in use. Also do not put your hand inside the unit.

**ADVARSEL:**

Usynlig laserstråling ved åbning når sikkerhedsafbrydere er ude af funktion. Undgå udsættelse for stråling.

**VAROITUS!**

Laite sisältää laseriodin, joka lähettää näkymätöntä silmille vaarallista lasersäteilyä.

**SPECIFICATION**

System : Compact Disc Digital Audio  
 D/A Converter : Linear, Pulse Width Modulated 3D Bit Stream  
 Clock Rate : 33.8688MHz, 18Bit/4Fs  
 Digital Filter  
 Signal Detection : 3-Beam Semiconductor  
 Optical Laser Pickup  
 Error Correction : CIRC System  
 Low Level Linearity : +/-1.0dB @-90dB  
 Frequency Response : 4Hz to 20kHz +0dB/-1.5dB  
 Total Harmonic Distortion (THD) : 0.006%  
 Dynamic Range : 95dB  
 Signal to Noise Ratio : 100dB

Channel Separation : 93dB  
 Line Output Level/Impedance : 2.2V@10kΩ  
 Digital Output Level/Impedance : 0.5Vp-p @75Ω  
 (Coaxial)  
 Power Supply  
 U.S.A. and Canada models : AC120V, 60Hz  
 International model : AC230/240V, 50/60Hz  
 Power Consumption : 20Watts  
 Dimensions (W x H x D) : 17-3/8" x 3-5/8" x 13"  
 442mm x 92mm x 326mm  
 Weight : 10.1lbs/4.6kg

Specifications and components subject to change without notice.  
 Overall performance will be maintained or improved.

## SAFETY PRECAUTIONS

Before returning an instrument to the customer, always make a safety check of the entire instrument, including, but not limited to, the following items:

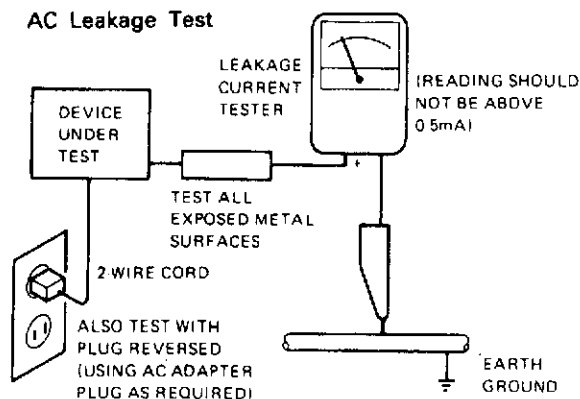
a. Be sure that no built-in protective devices are defective and/or have been defeated during servicing.

- (1) Protective shields are provided to protect both the technician and the customer. Correctly replace all missing protective shields, including any removed for servicing convenience.
- (2) When reinstalling the chassis and/or other assembly in the cabinet, be sure to put back in place all protective devices, including, but not limited to, nonmetallic control knobs, insulating fishpapers, adjustment and compartment covers/shields, and isolation resistor/capacitor networks.

**Do not operate this instrument or permit it to be operated without all protective devices correctly installed and functioning.**

b. Be sure that there are no cabinet openings through which an adult or child might be able to insert their fingers and contact a hazardous voltage. Such openings include, both are not limited to excessively wide cabinet ventilation slots, and an improperly fitted and/or incorrectly secured cabinet back over.

c. **Leakage Current Hot Check** — With the instrument completely reassembled, plug the AC line cord directly into a 120V AC outlet. (Do not use an isolation transformer during this test.) Use a leakage current tester, or a metering system that complies with American National Standards Institute (ANSI) C101.1 "Leakage Current for Appliances" and Underwriters Laboratories (UL) 1270, (34.6). With the instrument AC switch first in the ON position and then in the OFF position, measure from a known earth ground (metal waterpipe, conduit, etc.) to all exposed metal parts of the instrument (antennas, handle bracket, metal cabinet, screwheads, metallic overlays, control shafts, etc.), especially any exposed metal parts that offer an electrical return path to the chassis. Any current measured must not exceed 0.5 milliamp. Reverse the instrument power cord plug in the outlet and repeat test. **ANY MEASUREMENTS NOT WITHIN THE LIMITS SPECIFIED HEREIN INDICATE A POTENTIAL SHOCK HAZARD THAT MUST BE ELIMINATED BEFORE RETURNING THE INSTRUMENT TO THE CUSTOMER.**

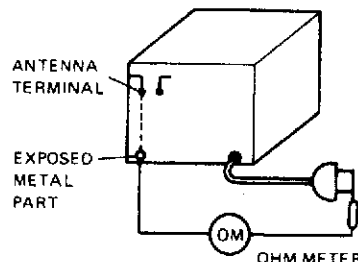


### d. Insulation Resistance Test

- (1) Unplug the power supply cord and connect a jumper wire between the two prongs of the plug.
- (2) Turn on the power switch of the instrument.
- (3) Measure the resistance with an ohmmeter between the jumpered AC plug and each **exposed metallic** cabinet part on the instrument, such as screwheads, antenna, control shafts, handle brackets, etc. The reading should be as shown below. If it is not within the limits specified, there is the possibility of a shock hazard, and the instrument must be repaired and rechecked before it is returned to the customer.

### e. Insulation Resistance Test Cold Check

- (1) Unplug the power supply cord and connect a jumper wire between the two prongs of the plug.
- (2) Turn on the power switch of the instrument.
- (3) Measure the resistance with an ohmmeter between the jumpered AC plug and each **exposed metallic** cabinet part on the instrument, such as screwheads, antenna, control shafts, handle brackets, etc. When the exposed metallic part has a return path to the chassis, the reading should be between 1 and 5.2 Megohm. When there is no return path to the chassis, the reading must be "infinite". If it is not within the limits specified, there is the possibility of a shock hazard, and the instrument must be repaired and rechecked before it is returned to the customer.



### PRODUCT SAFETY NOTICE

Some electrical and mechanical parts have special safety related characteristics which are often not evident from visual inspection, nor can the protection they give necessarily be obtained by replacing them with components rated for higher voltage, wattage, etc. Parts that have special safety characteristics are identified by shading, by (  $\Delta$  ) on schematics and parts listed. Use of a substitute replacement that does not have the same safety characteristics as the recommended replacement part might create shock, fire, and/or other hazards. Products Safety is under review continuously and new instructions are issued whenever appropriate.

### SERVICING PRECAUTIONS

**CAUTION:** Before servicing instruments covered by this manual and its supplements, read and follow the SAFETY PRECAUTIONS on this page.

**NOTE:** If unforeseen circumstances created conflict between the following servicing precautions and any of the safety precautions, **always follow the safety precautions.**

Remember: Safety First.

### General Servicing Precautions

- a. Always unplug the instrument AC power cord from the AC power source before:
  - (1) Removing or reinstalling any component, circuit board, module, or any other instrument assembly.
  - (2) Disconnecting or reconnecting any instrument electrical plug or other electrical connection.
  - (3) Connecting a test substitute in parallel with an electrolytic capacitor in the instrument.
 

**Caution:** A wrong part substitution or incorrect polarity installation of electrolytic capacitors may result in an explosion hazard.
- b. Do **not** defeat any plug/socket B+ voltage interlocks with which instruments covered by this manual might be equipped.
- c. Do **not** apply AC power to this instrument and/or any of its electrical assemblies unless all solid-state device heat sinks are correctly installed.
- d. Always connect a test instrument's ground lead to the instrument chassis ground before connecting the test instrument positive lead. Always remove the test instrument ground lead last.

**NOTE:** Refer to Safety Precautions on page 3.

- (1) The service precautions are indicated or printed on the cabinet, chassis or components. When servicing, follow the printed or indicated service precautions and service materials.
- (2) The Components used in the unit has a specified conflammability and dielectric strength. When replacing any components, use components which has the same ratings. Components marked (  $\Delta$  ) in the circuit diagram are important for safety or for the characteristics of the unit. Always replace with the appointed components.
- (3) An insulation tube or tape is sometimes used and some components are raised above the printed wiring board for safety. The internal wiring is sometimes clamped to prevent contact with heating components. Install them as they were.
- (4) After servicing, always check that the removed screws, components and wiring have been installed correctly and that the portion around the service part have not been damaged and so on. Further check the insulation between the blades of attachment plug and accessible conductive parts.

### Insulation Checking Procedure

Disconnect the attachment plug from the AC outlet and turn the power on. Connect the insulation resistance meter (500V) to the blades of the attachment plug. The insulation resistance between the each blade of the attachment plug and accessible conductive parts (Note 1) should be more than 1M-ohm.

**Note 1:** Accessible Conductive Parts including Metal panels, Output jacks, etc.

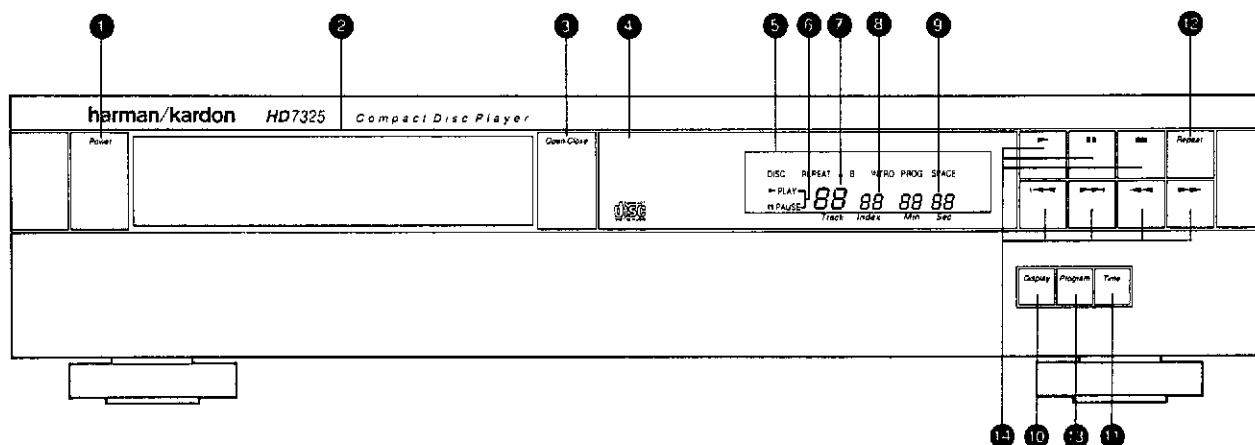
## ELECTROSTATICALLY SENSITIVE (ES) DEVICES

Some semiconductor (solid state) devices can be damaged easily by static electricity. Such components commonly are called Electrostatically Sensitive (ES) Devices. Examples of typical ES devices are integrated circuits and some fieleffect transistors and semiconductor "chip" components. The following techniques should be used to help reduce the incidence of component damage caused by static electricity.

1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging wrist strap device, which should be removed for potential shock reasons prior to applying power to the unit under test.
2. After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
3. Use only a grounded-tip soldering iron to solder or unsolder ES devices.
4. Use only an anti-static solder removal device. Some solder removal devices not classified as "anti-static" can generate electrical charges sufficient to damage ES devices.
5. Do not use freon-propelled chemicals. These can generate electrical charge sufficient to damage ES devices.
6. Do not remove a replacement ES device from its protective package until immediately before you are ready to install it. (Most replacement ES devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive material).
7. Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device will be installed.
 

**CAUTION:** Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.
8. Minimize bodily motions when handling unpackaged replacement ES devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity sufficient to damage an ES device).

## CONTROLS AND FUNCTIONS

**1 POWER switch**

The POWER switch turns the unit on and off.

**2 Compact disc drawer**

Load a disc (full-size or 3-inch/8 cm) into your compact disc player by placing it in this drawer with the label side up. Open and close the drawer using the OPEN/CLOSE button (3).

**3 OPEN/CLOSE button**

Press this button to open or close the compact disc drawer. The drawer will also close if you press the play button or push the drawer gently toward the chassis of the player; however, we recommend that you do not push the drawer.

**4 REMOTE SENSOR**

This area receives the signal from the remote control unit. Make sure this area of the front panel is kept free from dirt or other obstructions that might prevent proper reception of the infrared signal from the remote control.

**5 FUNCTION indicator**

**DISC** - This indicator lights when the disc drawer is open, and when a disc is loaded. It does not light when there is no disc.

**REPEAT** - When this indicator is lit, the unit is in REPEAT mode and will continuously repeat either the entire disc or the programmed sequence.

**A-B** - When this indicator is lit steadily, the unit is set to repeat a specified section of the disc (from A to B). When REPEAT indicator is lit, you have already programmed the starting point (point A) of a section, and the unit is waiting for you to program the ending point of the section (point B).

**INTRO** - When this indicator is lit, the unit is in INTRO SCAN mode and will play only the first 15 seconds of each selection on the disc or in the selected program.

**PROG** - When this indicator is lit, the unit is in PROGRAM mode, in which you can program a sequence of tracks in the order you'd like to hear them, then play back your programmed sequence.

**SPACE** - When this indicator is lit, the unit is in SPACE mode and will insert 4 seconds of space between tracks.

**6 PLAYBACK mode**

**PLAY** - This indicator is lit when the unit is playing a track.  
**PAUSE** - This indicator is lit when the unit is PAUSE mode (i.e., you have pressed PAUSE to temporarily stop playback).

**7 TRACK indicator**

When a disc is loaded but not playing, the TRACK indicator displays the total number of tracks on that disc. During playback, the indicator displays the number of the track currently being played. During programming, it displays the number of the track most recently selected.

**8 INDEX indicator**

Some discs that contain very long track may have those tracks subdivided into shorter sections. For example, a long classical piece may be divided into movements, each of which may have an index number. The INDEX indicator displays the number of the subdivision of a track currently being played. If the track has no subdivisions, the INDEX indicator will display a 1 during playback. During programming, the INDEX light goes out and the indicator displays the total number of tracks selected in the programmed sequence.

**9 TIME indicator**

When a disc is loaded but not playing, the TIME indicator displays the total amount of playback time on that disc. During playback, depending on the state of the TIME button (11), the indicator displays one of the following

- The time that has elapsed since the beginning of the current track.
- The time that remains on the currently selected track. The mark - (minus) will be displayed if the indicator is in this mode.
- The time that remains on either the entire disc or on the programmed selections. The mark - (minus) will be displayed if the indicator is in this mode. Note that if you have programmed more than 99 minutes in your selection, only dashes will appear in this mode.

**10 DISPLAY button**

This button turns the display on and off. When you turn the display off in PLAY mode, the entire display goes off. In PAUSE mode, most of the display goes off, but the track number is still displayed. In STOP mode, most of the display goes off, but the total number of tracks on the disc is still displayed. In some systems, turning the fluorescent display off may provide the purest possible sound quality during playback.

**11 TIME button**

During playback or programming, the button cycles through the three TIME display modes

- The time that has elapsed since the beginning of the current track.
- The time that remains on the currently selected track.
- The time that remains on either the entire disc or the programmed sequence.

**12 REPEAT button**

This button puts your compact disc player in and out of REPEAT mode. In REPEAT mode, the unit will continually play back either the entire disc or the programmed sequence of tracks. Press the button once to turn on REPEAT mode; press again to turn off REPEAT mode. When the unit is in REPEAT mode, the FUNCTION indicator (5) will display the word REPEAT.

**13 PROGRAM button**

This button puts your compact disc player in and out of PROGRAM mode. Press the button once to turn on PROGRAM mode; press again to turn it off. In PROGRAM mode, you can program a set of tracks to play in any sequence. (For instructions on programming a sequence of tracks, see the Operations section of this manual.) When the unit is in PROGRAM mode, the FUNCTION indicator (5) will display the word PROG in red.

**14 Playback controls**

**PLAY-** ► The PLAY button starts playback of a track.  
**PAUSE -** ■■ Pressing the PAUSE button temporarily stops playback. Pressing the PAUSE button again, or pressing PLAY, resumes playback at the precise point where playback left off.

**STOP-** ■ The STOP button stops playback. When you press PLAY, playback will start either at the beginning of the disc or programmed sequence, or at any track you select.

**SKIP BACK-** ◀ Pressing this button once skips back to the beginning of the present track. If you are in PLAY mode, playback will resume. Holding the button down skips backward to the beginning of each preceding track until the first track on the disc is reached.

**SKIP FORWARD-** ▶ Pressing this button once skips forward to the beginning of the next track. If you are in PLAY mode, playback will resume. Holding the button down skips forward to the beginning of each subsequent track until the last track on the disc is reached.

**SEARCH BACK-** ◀◀ Holding down this button during playback reverses rapidly through the disc. This function is similar to the "Rewind" function on a tape deck.

**SEARCH FORWARD-** ▶▶ Holding down this button during playback speeds rapidly forward through the disc. This function is similar to the "Fast forward" function on a tape deck.

**Remote control**

The remote control for the HD7325 provides the same functions found on the front panel of the compact disc player itself. In addition, the remote control provides some functions that are not found on the front panel.

The functions found on the remote control that are not found on the front panel are INTRO, A-B, CLEAR, CHECK, SPACE, and the 1-10 and +10 keys. These five functions are described below (for other functions, see the descriptions above).

**15 CLEAR button**

The CLEAR button removes tracks from your programmed sequence one by one starting with the last track entered. Each time you clear a track from the programmed sequence, that track's time is deleted from the total time displayed. This button is used only in PROGRAM mode.

**16 CHECK button**

When a disc is loaded but not playing (STOP mode), you can press the CHECK button to see the playback time of each track on the disc. Each time you press the CHECK button, the next track is displayed along with its playback time. When you have stepped sequentially through all the tracks on the disc, another press of the CHECK button displays the total playback time of the entire disc. In PROGRAM mode, the CHECK button displays the cumulative time of the tracks in the programmed sequence. That is, the first press displays the time of the first programmed track, the second press displays the cumulative playback time of the first and second tracks, and so on.

**17 A-B button**

This button puts your compact disc player in and out of A-B mode. In A-B mode, the unit will continually play back a "phrase" or section of your disc beginning at point A and ending at point B. (For instructions on repeating a section of a disc, see the Operations section of this manual.) When the unit is in A-B mode, the FUNCTION indicator (5) will display REPEAT A-B.

**18 INTRO button**

This button puts your compact disc player in and out of INTRO SCAN mode. When INTRO SCAN is on and you press PLAY, the unit plays only the first 15 seconds of each track before moving on to the next. Press the button once to turn on INTRO SCAN mode; press again to turn it off and stop the scanning. When the unit is in INTRO SCAN mode, the FUNCTION indicator (5) will display the word INTRO.

**19 SPACE button**

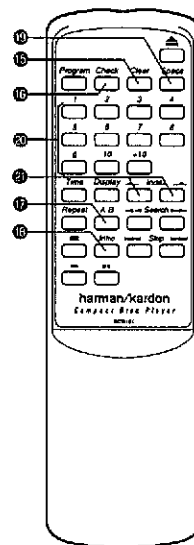
This button puts your compact disc player in and out of SPACE mode. Press the button once to turn on SPACE mode; press again to turn it off. In SPACE mode, the unit inserts 4 seconds of blank space between tracks. This is particularly useful if you are recording music from a compact disc onto a tape. Tape decks with a Music Search feature will be able to use the 4 seconds of space to correctly identify the beginning of each selection on the tape. When the unit is in SPACE mode, the FUNCTION indicator (5) will display the word SPACE.

**20 Track selection buttons**

This set of buttons (numbered 1 through 10 and +10) enables you to directly select the track you want to play. To select a track with a number higher than 10, press the +10 button, then press the button that will add up to the number of the track you want. For example, to select track 14, press +10, then press 4. If you select a track number that does not exist on your disc, the TRACK indicator will continue to display the number of the last track on the disc. When PROGRAM mode is off, pressing a track button plays the track you select. When PROGRAM mode is on, pressing a track button programs that track into your sequence.

**21 INDEX buttons**

Some discs contain long selections that may be subdivided into shorter sections (for example, operas). Just as the tracks are marked by the track number, these shorter sections may be marked by index numbers. When you have started playback of the desired track, you can use the INDEX UP and INDEX DOWN buttons to jump to a desired index selection. Each time you press an INDEX button, the INDEX indicator displays the next higher or lower index number. If you continue pressing the button until the indicated index number is higher than the actual number of index selections on the disc, playback will start from the nearest index selection.



**DISASSEMBLY PROCEDURES** (REFER TO PAGES 27 THROUGH 29 AND 35)

**[1] CABINET TOP (124) REMOVAL**

Remove 6 screws (A) and then remove the Cabinet Top (124).

**[2] FRONT PANEL ASS'Y (AA) REMOVAL**

1. Remove the Cabinet Top (124), referring to the previous step [1].
2. Disconnect the jumper lead (JL401) from connector (CN201) on the Main P.C. Board (PCB-1).
3. Open the lid of connector (CN103) on the Main P.C. Board (PCB-1), then disconnect the jumper lead (JL103).
4. Connect the power cord and turn on the power by pressing the power switch.
5. Open the Disc Tray (1) by pressing the Open/Close button.
6. With the Disc Tray (1) opened as it is, pull out the power plug.
7. Remove the Lid (130) from the both side rails on the disc tray.
8. Remove 5 screws (B) and then remove the Front Panel Ass'y (AA) with the Front P.C. Board (PCB-2).
9. Remove 9 screws (C) and then remove the Front P.C. Board (PCB-2) from the Front Panel Ass'y (AA).
10. Remove 2 screws (D) and then remove the Power Switch P.C. Board (PCB-3) from the Front Panel Ass'y (AA).

**[3] MAIN P.C. BOARD (PCB-1) REMOVAL**

1. Remove the Cabinet Top (124), referring to the previous step [1].
2. Disconnect the jumper lead (JL401) from connector (CN201) on the Main P.C. Board (PCB-1).
3. Open the lid of connector (CN103) on the Main P.C. Board (PCB-1), then disconnect the jumper lead (JL103).
4. Disconnect the connector with lead wires (LCN113, LCN114, LCN115 and LCN117) from connectors (CN113, CN114, CN115 and CN117) on the CD Player Mechanical Assembly (104).
5. Remove 14 screws (E) and then remove the Main P.C. Board (PCB-1).

**[4] CD PLAYER MECHANICAL ASSEMBLY (104) REMOVAL**

1. Remove the Cabinet Top (124), referring to the previous step [1].
2. Disconnect the connector with lead wires (LCN113, LCN114, LCN115 and LCN117) from connectors (CN113, CN114, CN115 and CN117) on the CD Player Mechanical Assembly (104).
3. Remove 4 screws (F) and then remove the CD Player Mechanical Assembly (104) backward.

**DISASSEMBLING THE CD PLAYER MECHANICAL ASSEMBLY**

**[5] DISC TRAY (1) REMOVAL**

1. Remove the Cabinet Top (124), referring to the previous step [1].
2. Connect the Power cord and turn on the power by pressing the Power switch.
3. Open the Disc Tray (1) by pressing the Open/Close button.
4. With the Disc Tray (1) opened as it is, pull out the power plug.
5. Pull out Holder with Tray.
6. Pull out the Disc Tray (1) while pulling clamps A and B outward. (Refer to Top View of page 8)

**[6] OPTICAL PICK-UP (57) REMOVAL**

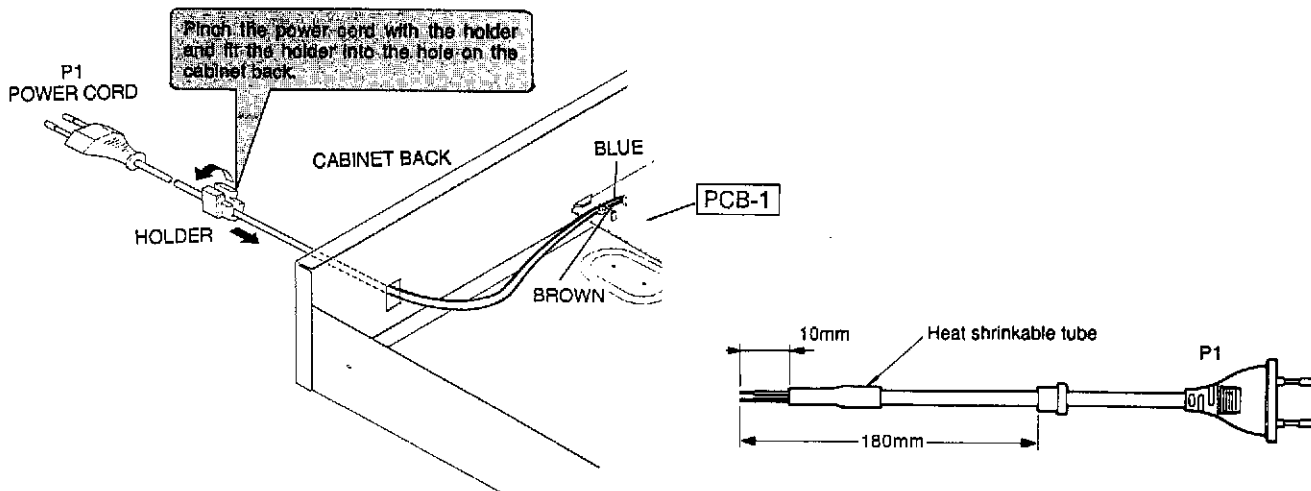
1. Remove the CD Player Mechanical Assembly (104), referring to the previous step [4].
2. Remove 4 screws (G) and then remove the Disc Motor Ass'y (59) with Pick-up, Slide Motor and etc.
3. Remove the Gear (58).
4. Remove the Shaft (51) and then remove the Pick-up (57).

**[7] SLIDE MOTOR (57) REMOVAL**

1. Remove the CD Player Mechanical Ass'y (104), referring to the previous step [4].
2. Unsolder the terminal of Disc and Slide Motors, then remove the Motor P.C. Board (61).
3. Remove 2 screws (H) and then remove the Slide Motor (60).

**POWER CORD REPLACEMENT (FOR SERVICE ENGINEERS OTHER THAN NORTH AMERICA)**

In order to prevent fire or shock hazard when replacing the power cord, follow the procedure below to replace the part with the standard supply parts.



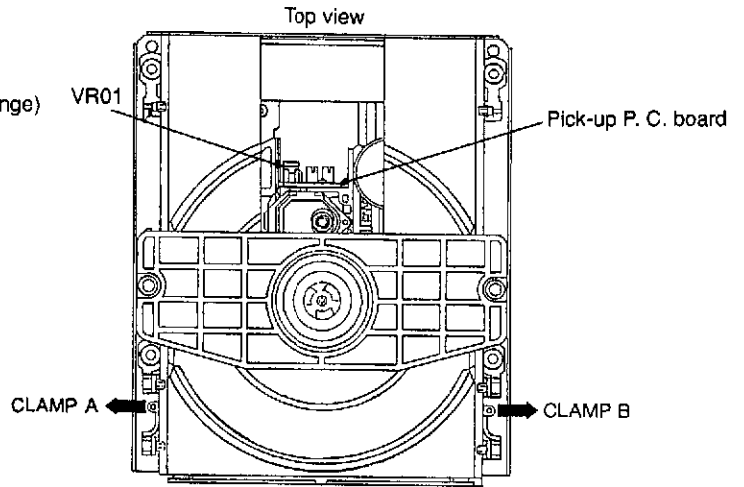
## ADJUSTMENT PROCEDURE

### 1. Instruments required

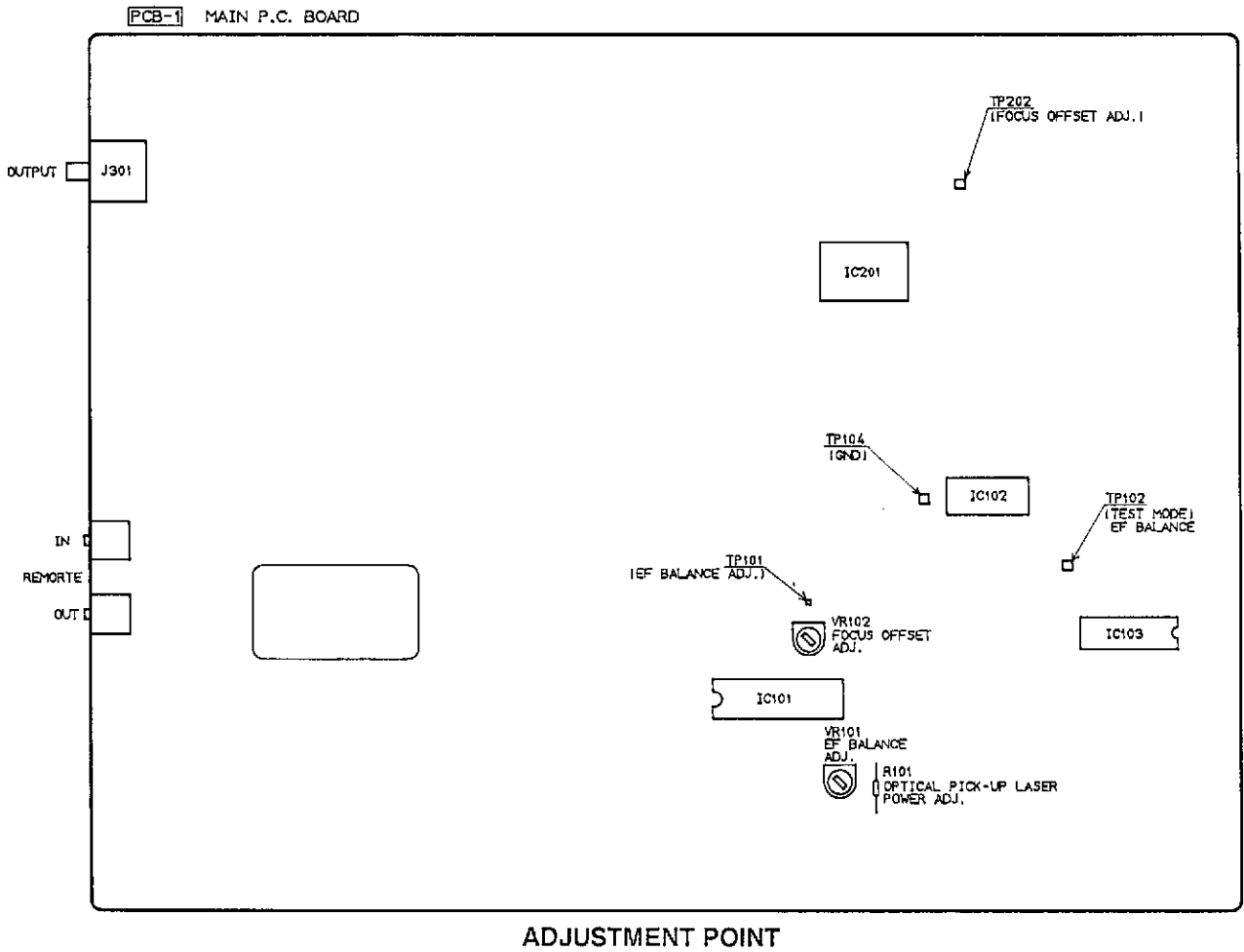
- DC voltmeter
- Oscilloscope (3 or more modes, 100 MHz, input select DC range)
- Jitter meter
- Test disc: EIAJ CD-1

### 2. Adjustment points

2-1 Adjusting screw layout for CD player mechanical assembly.



2-2 VR and test point layout for main P.C. board.





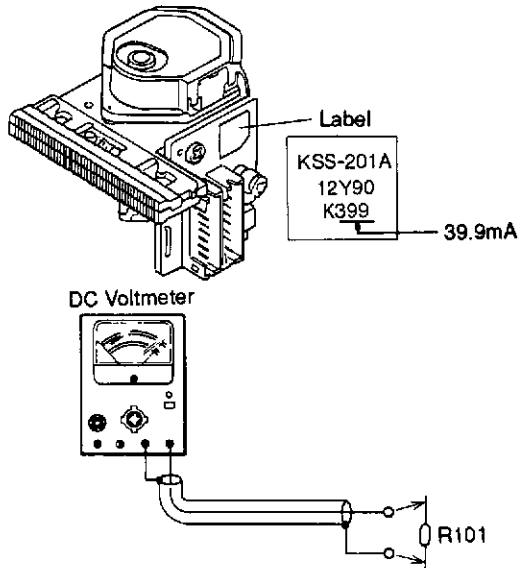
### 3. Optical Pick-up Laser Power Adjustment

The specified value for adjustment varies with the type of the pick-up in use. Obtain the voltage value according to the following procedure.

- Read the current value on the label of the pick-up P.C.board.
- Using the amperage of the current and the following equation, calculate the voltage value.

When the current is 39.9mA:  
 $V=0.0399A \times 22=0.8778V$

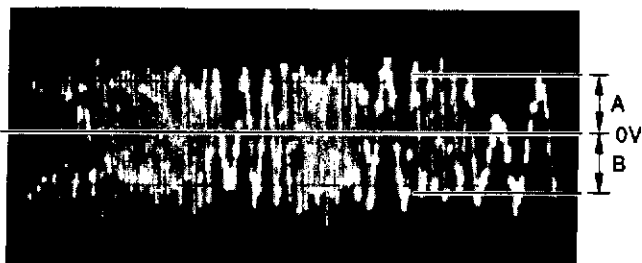
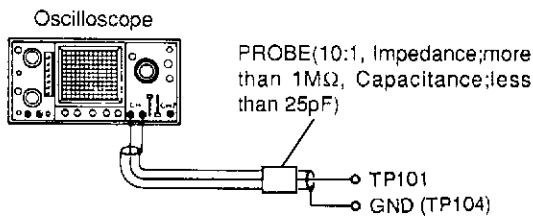
- Connect the DC voltmeter to both ends of R101.
- Insert EIAJ CD-1 test disc and place the unit in the Play mode.
- Adjust VR01 in the pick-up P.C.board to the voltage obtained in step (b) above.



### 4. EF Balance Adjustment

- Connect the oscilloscope (0.5V/div, 5 msec./div, DC mode) to TP101 and GND (TP104). Short-circuit TP102 and GND.
- Insert EIAJ CD-1 test disc and place the unit in the Play mode.
- Adjust VR101 so that the amplitude above and below the zero DC line becomes equal. (Amplitude A = Amplitude B)

NOTE: Instead of using the DC input of an oscilloscope, you may also use a DC null voltmeter for this alignment.

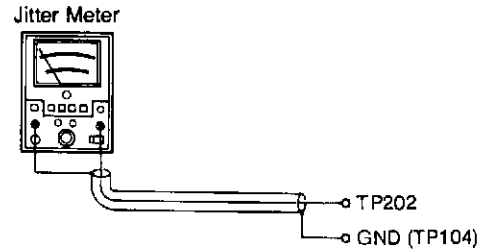


A=B

(approx. 1.5Vp-p)

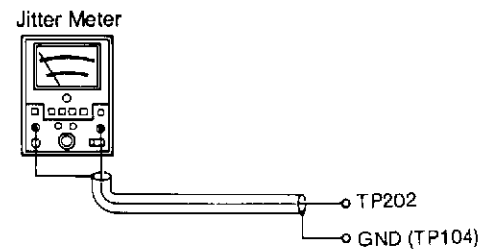
### 5. Focus Offset Adjustment

- Connect the Jitter meter to TP202 and GND (TP104).
- Insert EIAJ CD-1 test disc and place the unit in the play mode.
- Adjust VR102 until the jitter for optimum sensitivity.



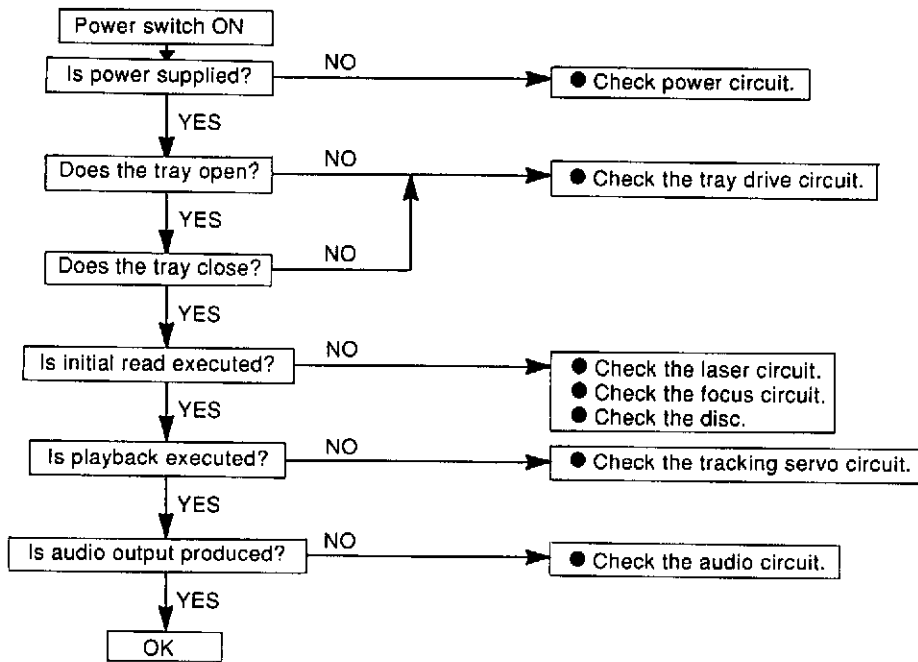
### 6. Jitter inclination Confirmation

- Connect the Jitter meter (sigma range) to TP202 and GND (TP104).
- Insert EIAJ CD-1 test disc and place the unit in the Play mode.
- Confirm the jitter meter reading is less than 30ns.

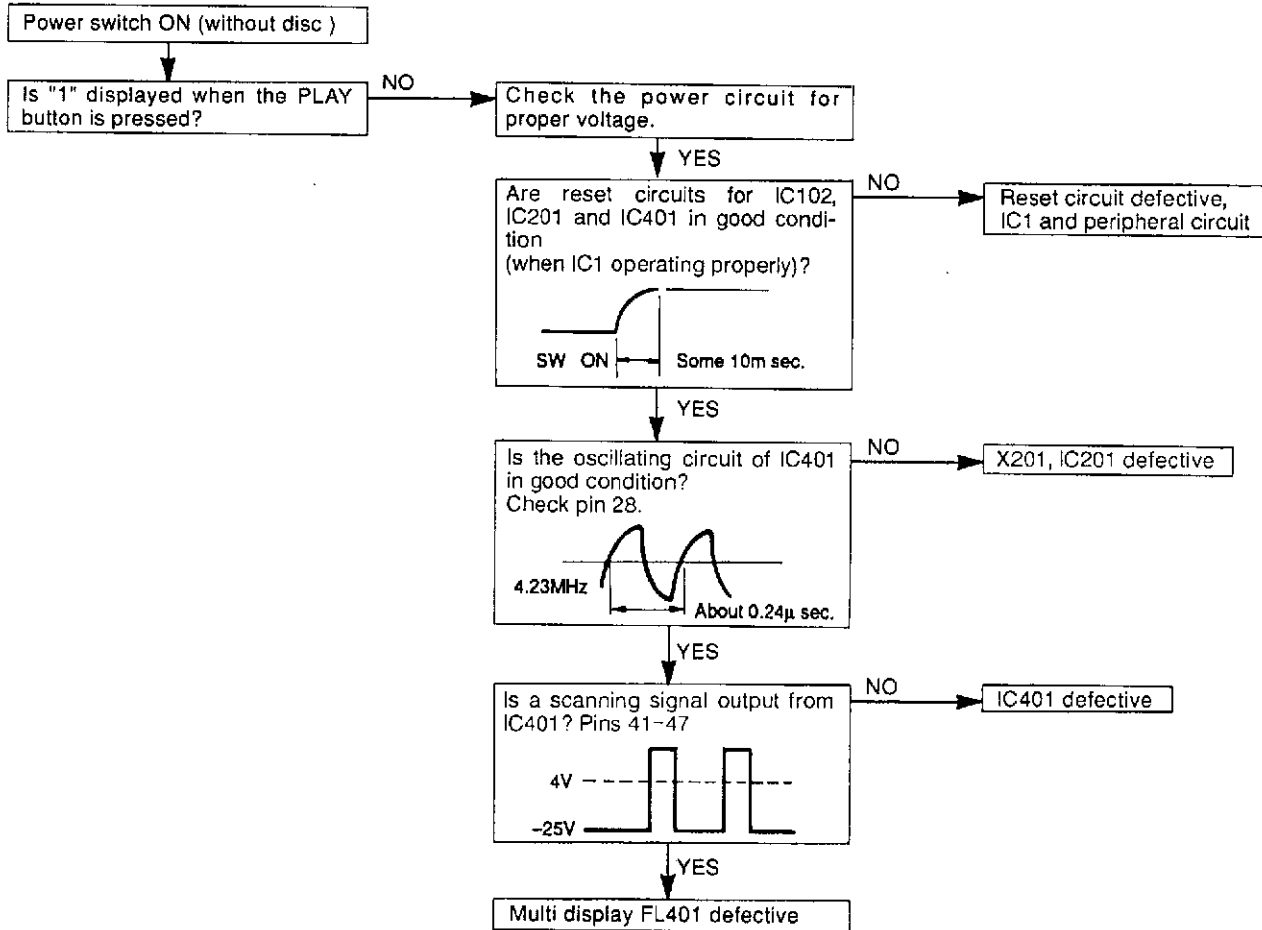


## TROUBLE SHOOTING

When a trouble has occurred, first check the pick-up lens for dirt and each connector for tight and secure connection. If the problem persists after checking both of these items, use the following check procedures.

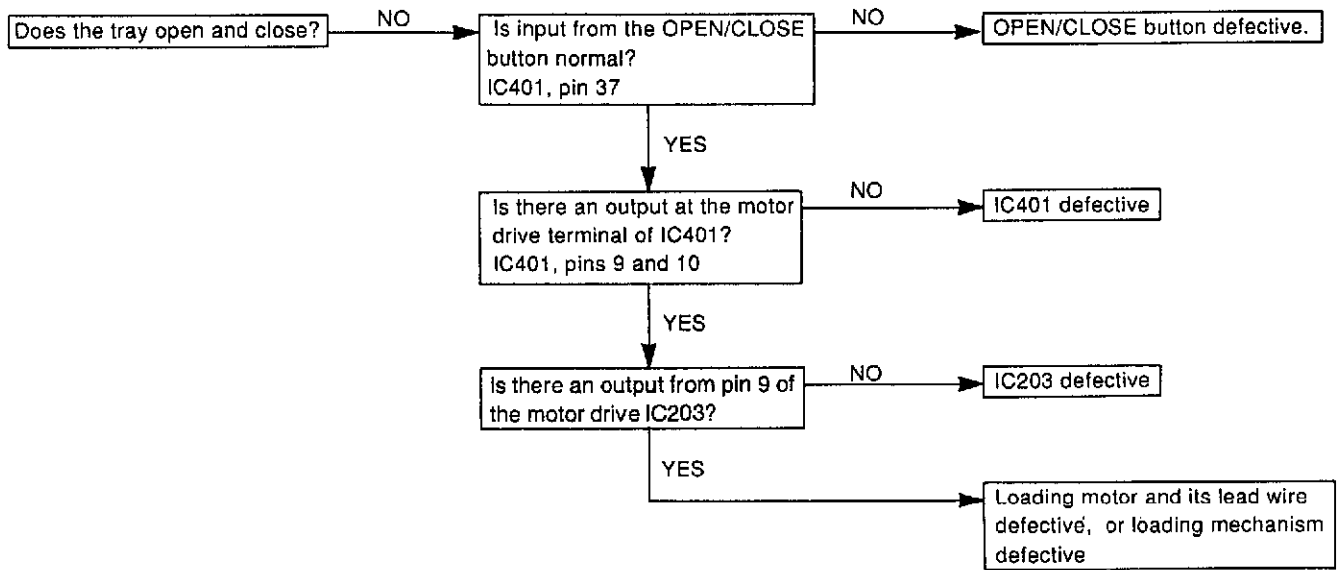


(1) When Multi Display fails to light properly.



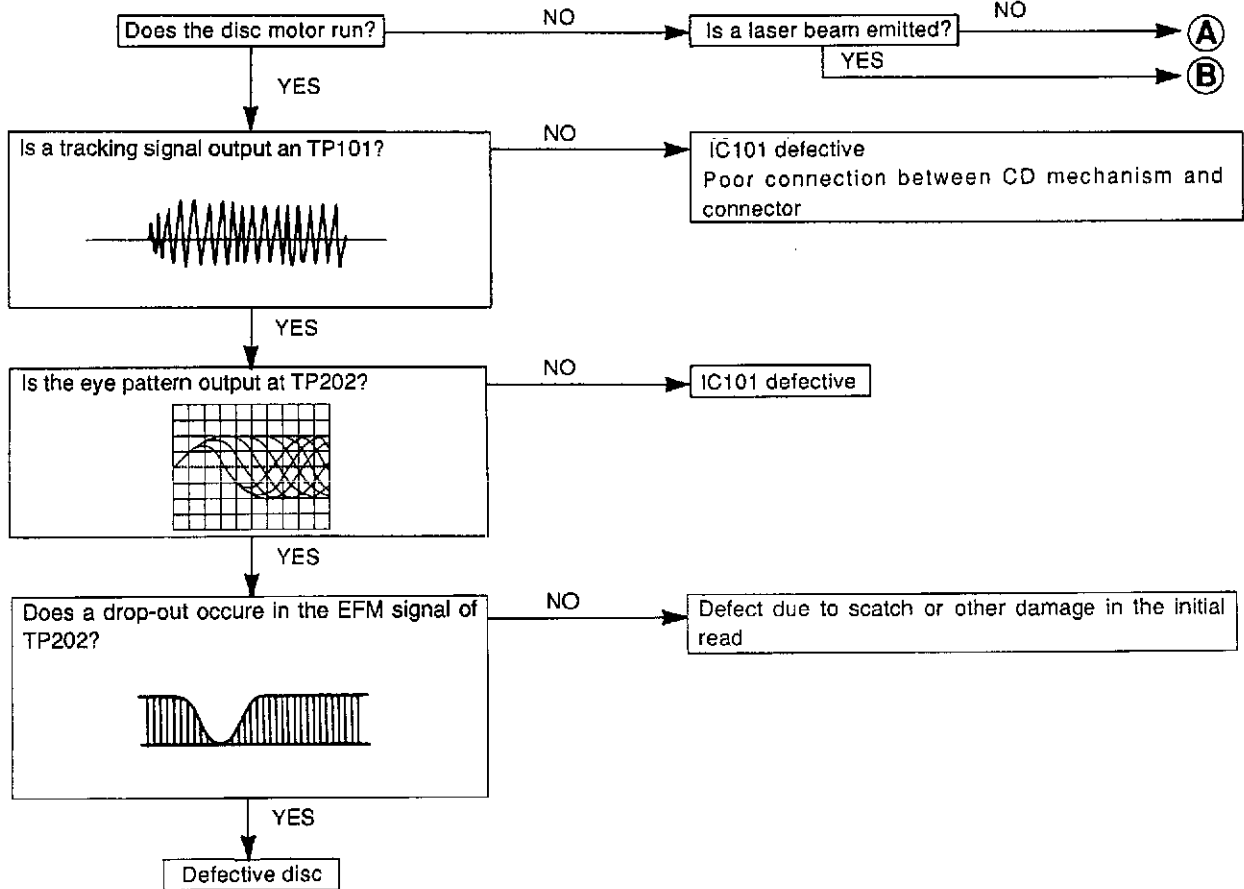
When a problem occurs, first check the pick-up lens for dirt and each connector for tight and secure connection. If the problem persists after checking both of these items, use the following check procedures.

**(2) When the tray fails to operate properly.**

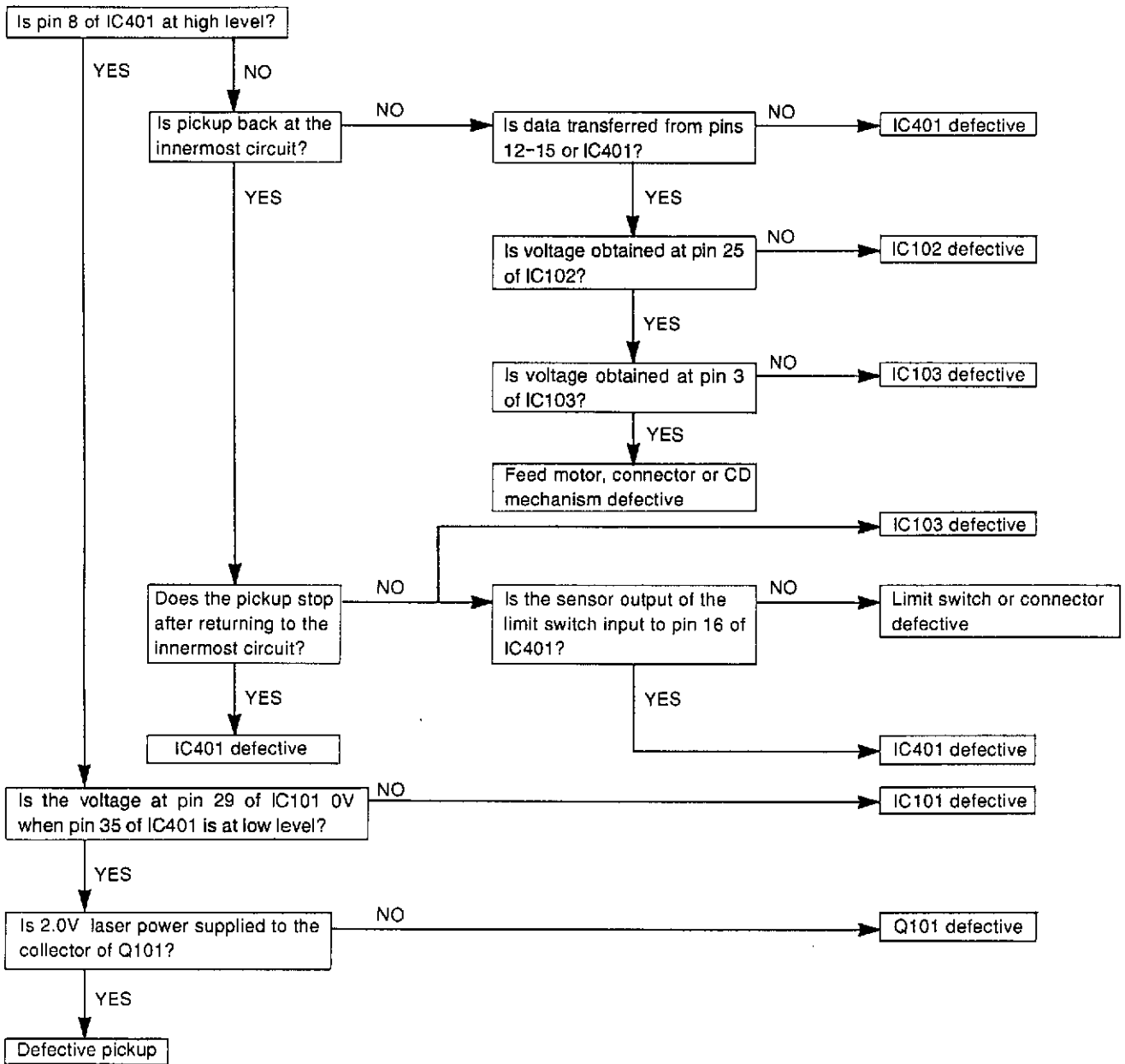


**(3) When Initial read cannot be executed.**

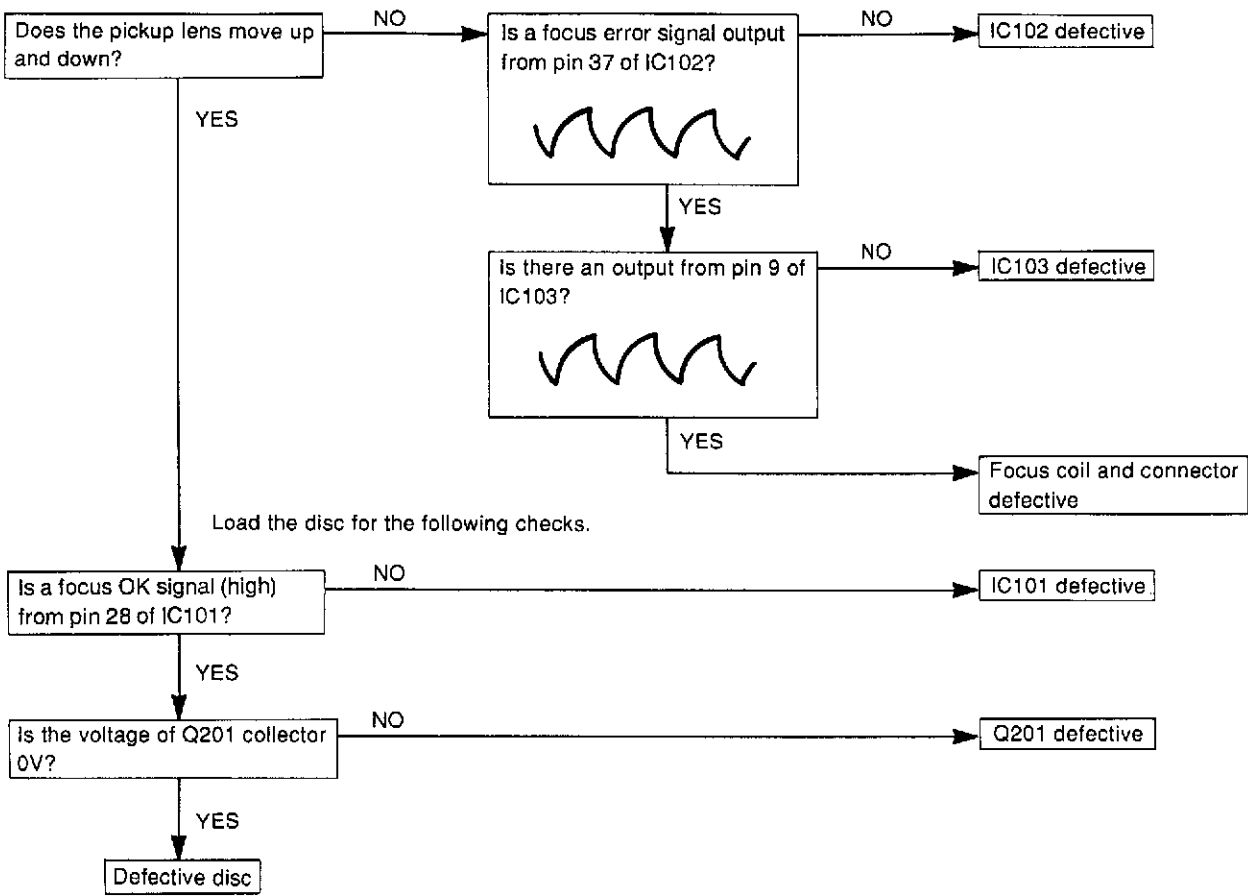
The following checks can be done without a disc loaded.



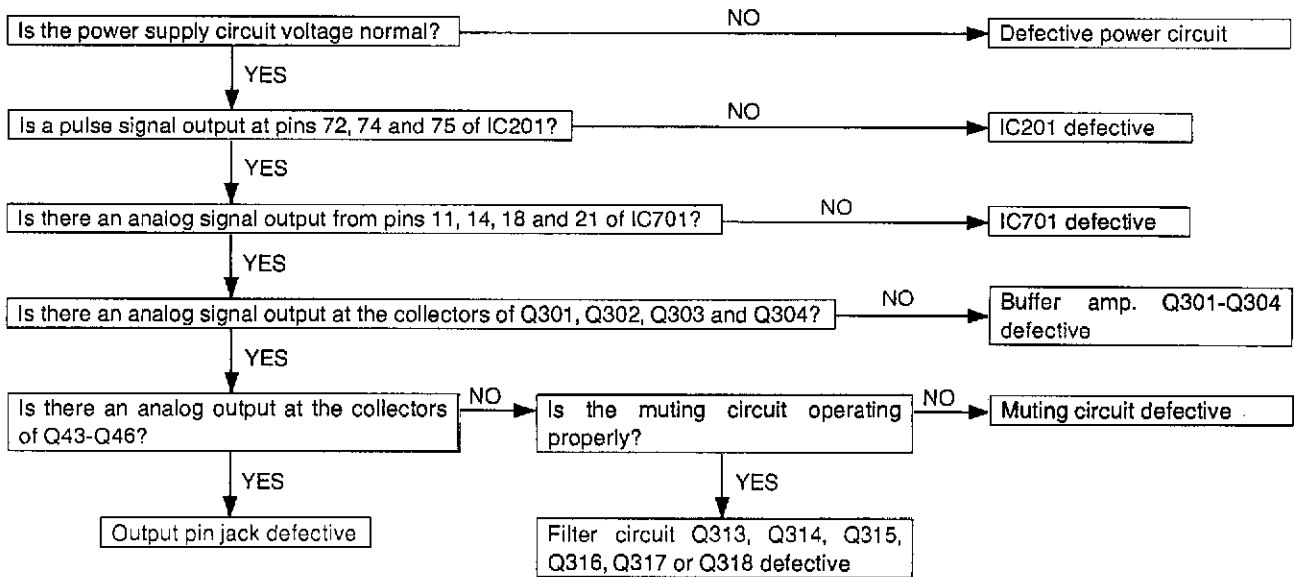
**A** When laser beam is not emitted.



**B** When laser beam is emitted.



**When there is no audio output**



IC TERMINAL FUNCTIONS

IC NUMBER	TERMINAL NUMBER	PORT NAME	TERMINAL CODE	I/O	OUTLINE OF FUNCTIONS
IC101	1	RFI		I	RF summing amp. input terminal.
	2	RFO		O	RF summing amp. output terminal.
	3	RF-		I	RF summing amp. return input terminal.
	4	P/N		I	Laser diode P/N select terminal.
	5	LD		O	APC LD amp. output terminal.
	6	PD		I	APC PD amp. input terminal.
	7	PD1		I	RF I-V amp. (1) invert input terminal.
	8	PD2		I	RF I-V amp. (2) invert input terminal.
	9	VC		-	GND terminal.
	10	F		I	F I-V amp. invert input terminal.
	11	E		I	E I-V amp. invert input terminal.
	12	EO		O	E I-V amp. output terminal.
	13	EI		I	E I-V amp. return input terminal.
	14	VR		O	DC voltage output terminal.
	15	CC2		I	DEFECT signal input terminal.
	16	CC1		O	DEFECT signal output terminal.
	17	V <sub>EE</sub>		-	Negative power terminal.
	18	FE BIAS		I	Focus error amp. bias terminal.
	19	FE		O	Focus error amp. output terminal.
	20	TE		O	Tracking error amp. output terminal.
	21	DEFECT		O	DEFECT comparator output terminal.
	22	MIRR		O	MIRR comparator output terminal.
	23	CP		I	MIRR hold capacitor connect terminal.
	24	CB		I	DEFECT hold capacitor connect terminal.
	25	DGND		-	GND terminal.
	26	ASY		I	Auto asymmetry control input terminal.
	27	EFM		O	EFM comparator output terminal.
	28	FOK		O	Focus OK comparator output terminal.
	29	LD ON		I	Laser diode on/off select terminal.
	30	V <sub>CC</sub>		-	Positive power terminal.
IC102	1	ALPC SW OUT	ALPC output	O	Auto laser power control output terminal.
	2	ALPC SW IN	ALPC input	I	Auto laser power control input terminal.
	3	TE IN	Pre amp. input	I	Tracking error signal input terminal.
	4	TC IN	Pre amp. input	I	Track cross signal input terminal.
	5	MR	Pre amp. input	I	Mirror detected signal input terminal.
	6	Jump Flag	Mi-com I/O	O	Outputs "H" under jump function.
	8	HF OK IN	Pre amp. input	I	HF OK signal input terminal.
	9	HFD	Mi-com I/O	O	"1" indicates that MR input is "1" and track servo loop is off (TS OFF, JF, JR).
	10	DATA OUT	Mi-com I/O	O	Inner condition output changed by command modes.
	11	JP1	Mi-com I/O	I	1 track jump control signal. Usually "H".
	12	MSD	Mi-com I/O	I	Serial data input terminal (LSB first, 8-bit data).
	13	MLA	Mi-com I/O	I	Latch signal of serial data from mi-com to servo IC.
	14	MCK	Mi-com I/O	I	Clock signal of serial data from mi-com to servo IC. Receives data on leading edge.
	15	ACL <sub>R</sub>	Mi-com I/O	I	All clear input. (Clear inner registers and flip-flops by "L" signal.)
	18	Bias	Power supply	O	V <sub>CC</sub> /2 bias power supply output when single-pole power supply is used.
	19	COM	Power supply	I	Common terminal. Connect to GND when double-pole power supply is used and to BIAS when single-pole power supply is used.
	20	GND	Power supply	I	GND terminal.
	21	V <sub>EE</sub>	Power supply	I	Negative power terminal. Connect to GND when single-pole power supply is used.
	22	C-FSR	Focus servo	-	Connect capacitor which determines time constant of focus search waveform.
	23	I-Ref	Power supply	I	Terminal for connecting resistor for setting current value of reference current source.
	24	V <sub>CC</sub>	Power supply	I	Positive power terminal.
	25	SS OUT	Slide servo	O	Operation amplifier SS output.
	26	SS <sub>⊖</sub>	Slide servo	I	Operation amplifier SS reverse input.
	27	SS <sub>⊕</sub>	Slide servo	I	Operation amplifier SS non-reverse input.
	28	TS OUT	Track servo	O	Operation amplifier TA output.
	29	TS <sub>⊖</sub>	Track servo	I	Operation amplifier TA reverse input.
	30	TG2	Track servo	-	Track gain select switch TG2 output. Set to open or common level.
	31	TS <sub>⊕</sub>	Track servo	I	Operation amplifier TA non-reverse input.
	32	TG1	Track servo	-	Track gain select switch TG1 output. Set to open or common level.
	33	TE OUT	Track servo	O	Operation amplifier TE output.
	34	TE <sub>⊖</sub>	Track servo	I	Operation amplifier TE reverse input.

IC	TERMINAL NUMBER	FUNCTION	TERMINAL CODE	I/O	OUTLINE OF FUNCTIONS
IC102	35	FSR IN	Focus servo	I	Focus search voltage level detector input.
	36	FG	Focus servo	-	Focus gain select switch FG output. Set to open or common level.
	37	FS OUT	Focus servo	O	Operation amplifier FA output.
	38	FSE	Focus servo	I	Operation amplifier FA reverse input.
	39	FSE	Focus servo	I	Operation amplifier FA non-reverse input.
IC103	1	+VIN1		I	Positive input terminal 1 for amp. 1.
	2	-VIN1		I	Negative input terminal 1 for amp. 1.
	3	OUT1		O	Output terminal 1.
	4	OUT2		O	Output terminal 2.
	5	-VIN2		I	Negative input terminal 2 for amp. 2.
	6	+VIN2		I	Positive input terminal 2 for amp. 2.
	7	+VIN3		I	Positive input terminal 3 for amp. 3.
	8	-VIN3		I	Negative input terminal 3 for amp. 3.
	9	OUT3		O	Output terminal 3.
	10	NC		-	
	11	NC		-	
	12	Vcc		-	Positive power supply.
IC201	1	EMP		O	Emphasis code output. Emphasis = "1"
	2	PWM1		O	Disc motor drive PWM output 1. -
	3	PWM2		O	Disc motor drive PWM output 2. +
	4	DOTX		O	Digital output.
	5	ACRCY		I	Channel status clock input.
	6	TEST1		I	Test mode select input.
	7	DOBSEL		I	Output data bit select.
	8	DASEL1		I	D/A converter interface select input 1.
	9	DASEL2		I	D/A converter interface select input 2.
	10	DASEL3		I	D/A converter interface select input 3.
	11	DASEL4		I	D/A converter interface select input 4.
	12	MSD		I	Microcomputer interface serial data input.
	13	MCK		I	Microcomputer interface shift clock input.
	14	MLA		I	Microcomputer interface data latch clock input.
	15	ACLR		I	Microcomputer interface register clear input.
	16	HFD		I	Play signal absence signal input.
	17	HF		I	Play signal input.
	18	IREF		I	Detection/PLL circuit reference current input.
	19	TLC		O	Slice level control output.
	20	LPF		I/O	PLL loop filter connection terminal.
	21	LOCK/DRD		O	Synchronous/low disc rotate status output.
	22	SYCLK		O	Frame synchronous status output.
	23	V <sub>DD2</sub>		I	5V power supply used for Detection/PLL circuit analog area only.
	24	DRD		O	Low disc rotate status output.
	25	EFFK		O	EFM frame clock output.
	26	SCINT		O	Subcode Q interrupted signal output.
	27	SQRO		O	Subcode Q register output.
	28	SQRCK		I	Subcode Q register data shift clock input.
	29	SCOR		O	Subcode synchronous signal output.
	30	CRCF		O	Subcode Q CRC check result output.
	31	SCCK		I	Shift clock input for serial subcode data output.
	32	V <sub>SS2</sub>		I	GND terminal.
	33	SCOE2		I	Subcode parallel output channel P to S enable input.
	34	SCOE1		I	Subcode parallel output channel T to W enable input.
	35	SBCW		O	Subcode channel W output.
	36	SBCV		O	Subcode channel V output.
	37	SBCU		O	Subcode channel U output.
	38	SBCT		O	Subcode channel T output.
	39	SBCS		O	Subcode channel S output.
	40	SBCR		O	Subcode channel R output.
	41	SBCQ		O	Subcode channel Q output.
	42	SBCP		O	Subcode channel P output.
	43	RA <sub>S</sub>	RT1	O	Row address strobe signal output.
	44	TEST2	TEST2	I	Test mode select input.
	45	ROB2	RT2	I/O	External memory data I/O 2.
	46	NC		-	
	47	RT3		I/O	External memory data I/O 1.
	48	RT4		I/O	External memory data I/O 4.

IC NUMBER	TERMINAL NUMBER	PORT NAME	TERMINAL CODE	I/O	OUTLINE OF FUNCTIONS
IC201	49	RT5		O	Column address strobe signal output.
	50	RT6		I/O	External memory data I/O 3.
	51	RT7		O	Write enable signal output.
	52	RT8		I	External memory address output 7.
	53	RT9		O	External memory address output 1.
	54	RT10		O	External memory address output 2.
	55	RT11		O	External memory address output 3.
	56	NC		-	
	57	RT12		O	External memory address output 4.
	58	RT13		O	External memory address output 5.
	59	RT14		O	External memory address output 6.
	60	RT15		O	External memory address output 0.
	61	EST2		O	Error status 2.
	62	EST1		O	Error status 1.
	63	V <sub>DD</sub> 1		I	5V power supply.
	64	DOFK		O	OSC frame clock output.
	65	F <sub>SCK</sub>		O	Clock output. 44.1kHz
	66	C846		O	Clock output. 8.4672MHz
	67	C423		O	Clock output. 4.2336MHz
	68	CKSEL		I	1/2 divider input.
	69	DFSEL		O	1/2 divider output.
	70	XI		I	Crystal oscillator input.
	71	XO		O	Crystal oscillator output.
	72	DO1		O	D/A converter serial data output.
	73	V <sub>SS</sub> 1		I	GND terminal.
	74	DSCK		O	D/A converter data shift clock output.
	75	LRCK		O	D/A converter left/right clock output.
	76	DO2		O	Dual D/A converter serial data output.
	77	WDCK		O	D/A converter word clock.
	78	DLRCK		O	D/A converter left/right clock output.
79	APTL		O	D/A converter deglitch clock L.	
80	APTR		O	D/A converter deglitch clock R.	
IC203	1	VSENCE1			
	2	OUT1		O	Output terminal 1.
	3	-VIN1		I	Negative input 1.
	4	+VIN1		I	Positive input 1.
	5	V <sub>EE</sub>			Negative power supply.
	6	+VIN2		I	Positive input 2.
	7	-VIN2		I	Negative input 2.
	8	OUT2		O	Output terminal 2.
	9	VSENCE2			
	10	V <sub>CC</sub>			Positive power supply.
IC401	1	V <sub>CC</sub>			Positive power supply.
	2	P6 <sub>5</sub>		I/O	
	3	P6 <sub>4</sub>		I/O	
	4	P6 <sub>3</sub>		I/O	
	5	P6 <sub>2</sub>		I/O	
	6	P6 <sub>1</sub>		I/O	
	7	P6 <sub>0</sub>		I/O	
	8	P2 <sub>7</sub>	I/O port	I/O	Disc tray open direction driving output.
	9	P2 <sub>6</sub>	I/O port	I/O	Disc tray close direction driving output.
	10	P2 <sub>5</sub>	I/O port	I/O	
	11	P2 <sub>4</sub>	I/O port	I/O	Serial data output.
	12	P2 <sub>3</sub>	I/O port	I/O	Serial data output.
	13	P2 <sub>2</sub>	I/O port	I/O	Data latch clock output.
	14	P2 <sub>1</sub>	I/O port	I/O	
	15	P2 <sub>0</sub>	I/O port	I/O	
16	P3 <sub>7</sub>	OUT PORT	O	Display output i.	
17	P3 <sub>6</sub>	OUT PORT	O	Display output g.	
18	P3 <sub>5</sub>	OUT PORT	O	Display output f.	
19	P3 <sub>4</sub>	OUT PORT	O	Display output e.	
20	P3 <sub>3</sub>	OUT PORT	O	Display output d.	
21	P3 <sub>2</sub>	OUT PORT	O	Display output c.	
22	P3 <sub>1</sub>	OUT PORT	O	Display output b.	
23	P3 <sub>0</sub>	OUT PORT	O	Display output a.	



		IO	I/O	DETAILS OF FUNCTIONS
IC401	24	P5 <sub>3</sub>		
	25	P5 <sub>2</sub>		
	26	CNV <sub>SS</sub>		Usually connected to V <sub>SS</sub> .
	27	RESET		I Reset input.
	28	XIN	CLOCK IN	I Clock input.
	29	XOUT	CLOCK OUT	O Clock output.
	30	XCIN	CLOCK IN	I Serial data input.
	31	XCOU	CLOCK OUT	O Clock output.
	32	V <sub>SS</sub>		Power supply.
	33	∅		O Timing output.
	34	P5 <sub>7</sub>		
	35	P5 <sub>6</sub>		
	36	P5 <sub>5</sub>		
	37	P5 <sub>4</sub>		
	38	VP		I Pull down voltage input.
	39	P5 <sub>1</sub>		
	40	P5 <sub>0</sub>		
	41	P1 <sub>7</sub>	OUT PORT	O Laser diode control output.
	42	P1 <sub>6</sub>	OUT PORT	O Display output 7.
	43	P1 <sub>5</sub>	OUT PORT	O Display output 6.
	44	P1 <sub>4</sub>	OUT PORT	O Display output 5.
	45	P1 <sub>3</sub>	OUT PORT	O Display output 4.
	46	P1 <sub>2</sub>	OUT PORT	O Display output 3.
	47	P1 <sub>1</sub>	OUT PORT	O Display output 2.
	48	P1 <sub>0</sub>	OUT PORT	O Display output 1.
	49	P0 <sub>7</sub>	I/O port	I/O Serial data input.
	50	P0 <sub>6</sub>	I/O port	I/O Frame synchronous state output.
	51	P0 <sub>5</sub>	I/O port	I/O Low disc rotate state output.
	52	P0 <sub>4</sub>	I/O port	I/O Sub-code synchronous signal output.
	53	P0 <sub>3</sub>	I/O port	I/O Sub-code Q check.
	54	P0 <sub>2</sub>	I/O port	I/O Sub-code channel Q output.
	55	P0 <sub>1</sub>	I/O port	I/O Interrupt input.
	56	P0 <sub>0</sub>	I/O port	I/O
	57	P4 <sub>7</sub>		
58	P4 <sub>6</sub>			
59	P4 <sub>5</sub>			
60	P4 <sub>4</sub>			
61	P4 <sub>3</sub>			
62	P4 <sub>2</sub>			
63	P4 <sub>1</sub>			
64	P4 <sub>0</sub>			
IC701	1	MLD	I	Mi-com command of load input terminal. Low level = load
	2	RSTB		Reset terminal. Low level = active
	3	IE		I Low level = LSI format. High level = I2S format.
	4	TP1		O Digital filter test output terminal 1.
	5	TP2		O Digital filter test output terminal 2.
	6	TEST1		I Digital filter test signal input terminal 1. Nominal = Low level
	7	TEST2		I Digital filter test signal input terminal 2. Nominal = Low level
	8	NC		
	9	NC		
	10	AVDD4		Analog power supply terminal 4. (+5V)
	11	OUTL(-)		O L ch. negative PWM output terminal.
	12	AVSS4		Analog ground terminal 4.
	13	AVSS3		Analog ground terminal 3.
	14	OUTL(+)		O L ch. positive PWM output terminal.
	15	AVDD3		Analog power supply terminal 3. (+5V)
	16	NC		
	17	AVDD2		Analog power supply terminal 2. (+5V)
	18	OUTR(+)		O R ch. positive PWM output terminal.
	19	AVSS2		Analog ground terminal 2.
	20	AVSS1		Analog ground terminal 1.
	21	OUTR(-)		O R ch. negative PWM output terminal.
	22	AVDD1		Analog power supply terminal 1. (+5V)
	23	DVDD1		Digital power supply terminal 1 for oscillator. (+5V)
	24	DVSS1		Digital ground terminal 1 for oscillator.

IC NUMBER	TERMINAL NUMBER	POP/ NAME	TERMINAL CODE	I/O	OUTLINE OF FUNCTIONS
IC701	25	X2			Crystal oscillator.
	26	X1			Crystal oscillator (external clock input terminal).
	27	NC			
	28	DVDD2			Digital power supply terminal 2. (+5V)
	29	DVSS2			Digital ground terminal 2.
	30	NSUB			Connect to the D-VDD terminal.
	31	ZFLGB		O	Zero signal detect output terminal.
	32	192FS		O	Clock output 9.216MHz
	33	LRPOL			Polarity (L ch. and R ch.) select terminal. L level = R H level = L
	34	LRCLK		I	LRCLK input terminal.
	35	BCLK		I	Serial input bit clock.
	36	SRDATA		I	Serial data input terminal.
	37	DVSS3			Digital ground terminal 3.
	38	DVDD			Digital power supply terminal. (+5V)
	39	384FS		O	Clock output. 18.432MHz
40	PD			Power down terminal. High level = active	
41	MDATA		I	Mi-com command data input terminal.	
42	MCLK		I	Clock input terminal for mi-com command.	
IC801	1	1Y		O	Output terminal 1.
	2	1A		I	Input terminal 1.
	3	1B		I	Input terminal 1.
	4	2Y		O	Output terminal 2.
	5	2A		I	Input terminal 2.
	6	2B		I	Input terminal 2.
	7	GND			Ground terminal.
	8	3A		I	Input terminal 3.
	9	3B		I	Input terminal 3.
	10	3Y		O	Output terminal 3.
	11	4A		I	Input terminal 4.
	12	4B		I	Input terminal 4.
	13	4Y		O	Output terminal 4.
	14	Vcc			Power supply terminal.

## CIRCUIT DESCRIPTION

### 1. APC CIRCUIT

A semiconductor laser is used as the light source for the optical pickup. As the output from the semiconductor laser changes radically with changes in temperature, 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 IC101 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.

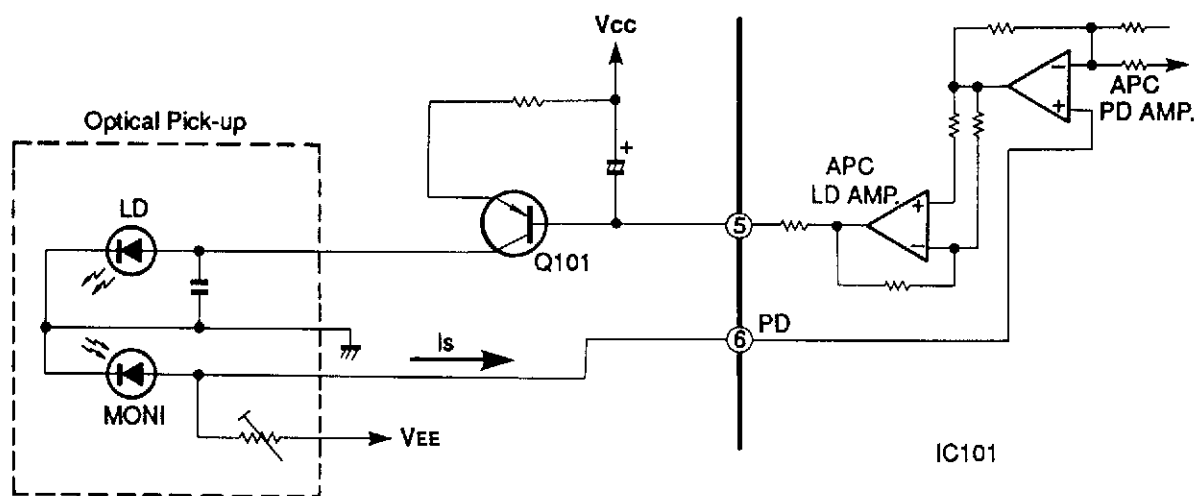


Fig. 1

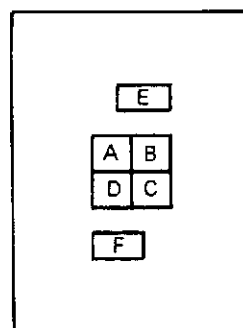
### 2. FOCUS SERVO

#### 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 IC101 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 IC101 and converted to voltage by RF I-V amplifiers (1) and (2) included in IC101.

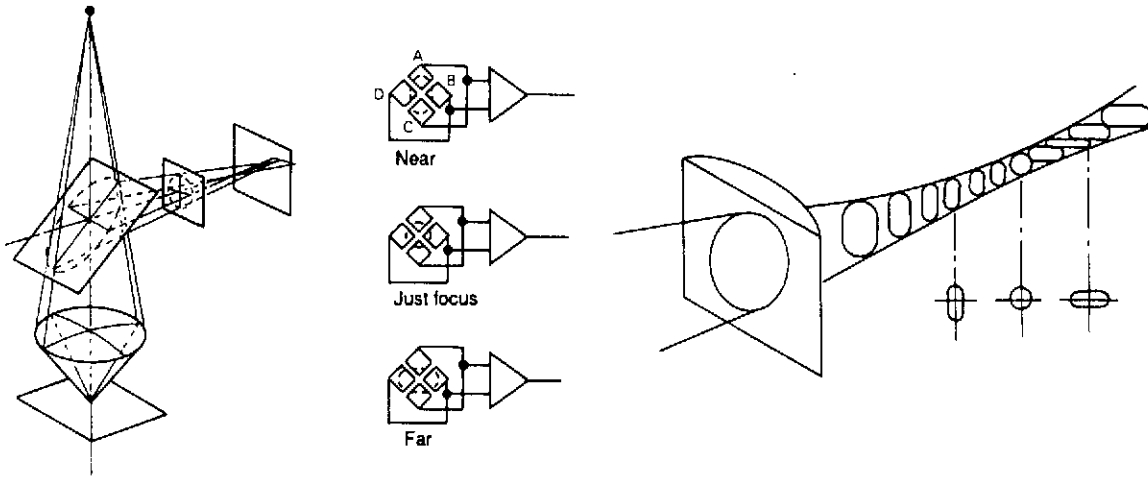


Fig.3

**2-3. Focus servo control operation**

The focus error signal, after begin 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 just 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 IC101 passes through IC102, in from pin 39 and out from pin 37, and IC103, in from pin 7 out from pin 9 as shown in Fig. 4. It is amplified in each IC and fed to the focus coil which then drives the objective lens of the pickup.

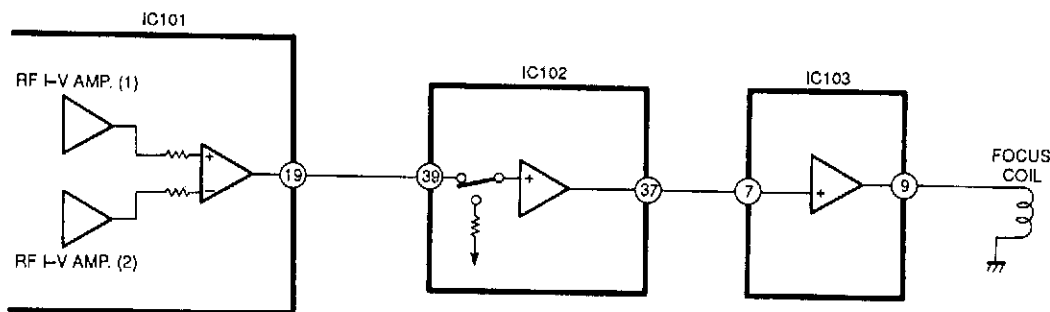


Fig. 4

### 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.

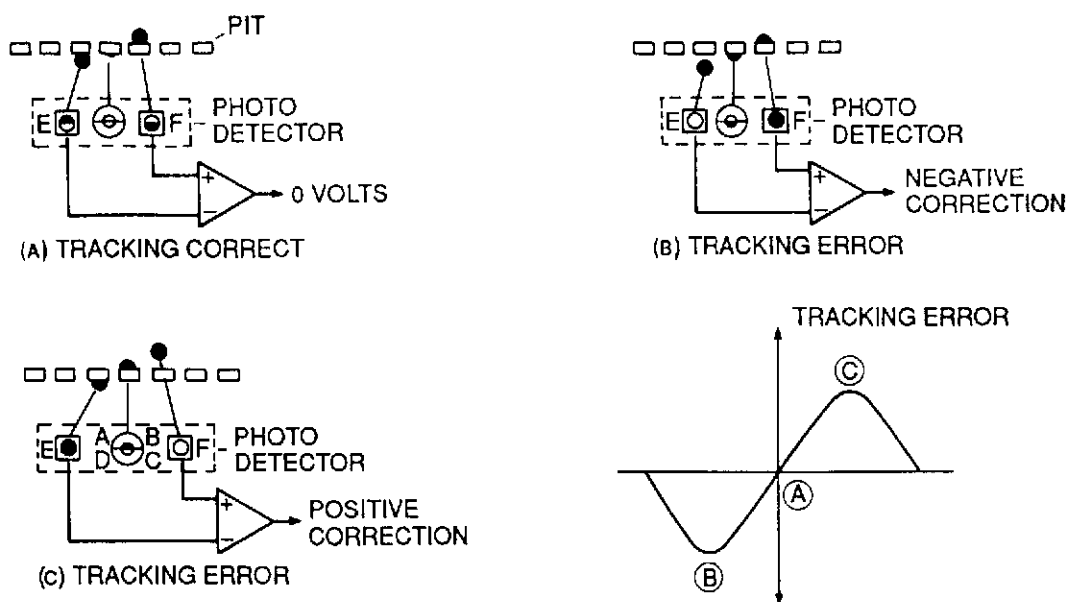


Fig. 5

### 2-5. Tracking servo control operation

When a tracking error signal is detected by photodiodes E and F, it is fed to pins 11 and 10 of IC101 respectively as shown in Fig. 6. In IC101, the signal is converted into voltage by the E I-V AMP. and F I-V AMP., transmitted to the tracking error amplifier and output through pin 20. While it passes through IC102, in from pin 3 and out from pin 28, and IC103, in from pin 6 and out from 4, it is amplified in each IC and sent to the tracking coil to adjust pickup so that the amount of track shift is reduced as closely to none as possible.

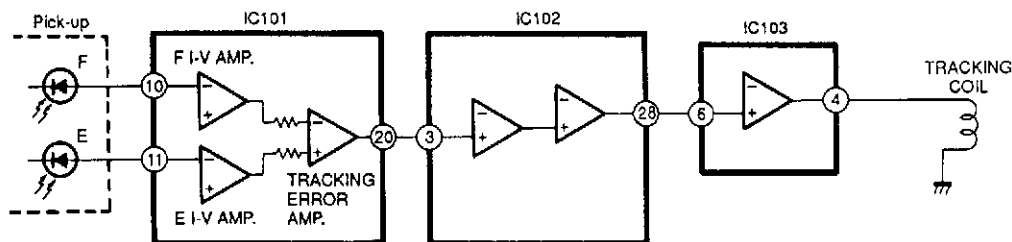
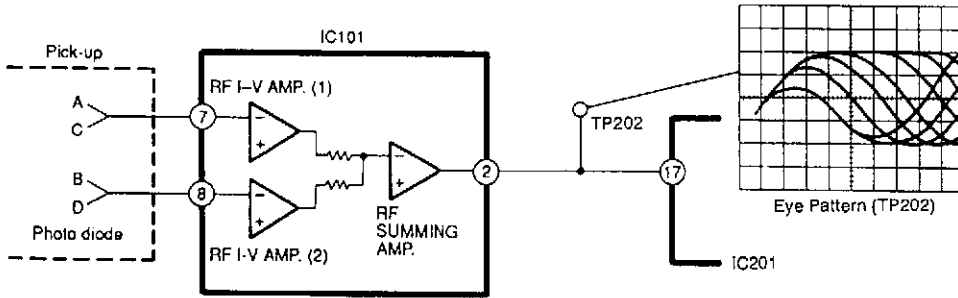


Fig. 6

**3. REGENERATIVE CIRCUIT**

**3-1. RF circuit**

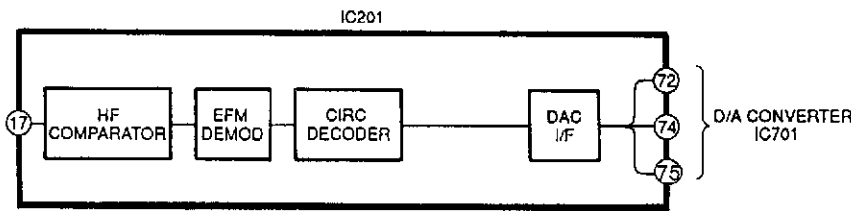
The currents from photodiodes (a, b, c and d) are fed to IC101 through pins 7 and 8 and converted to voltage by RF I-V amplifiers (1) and (2) respectively there, added by the RF summing amplifier and output from pin 2 as a signal. As it is sent to pin 17 of IC201, it can be checked at the test point (TP202) provided on its way by means of the eye pattern check.



**Fig. 7**

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

EFM demodulation, error correction and serial/parallel conversion are performed by the internal circuitry of IC201. The eye-pattern signals from pin 2 of IC101 are sent to pin 17 of IC201, 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 18-bit digital signals from pins 72, 74 and 75 of IC201 and fed to the D/A converter of IC701.



**Fig. 8**

**4. 1-BIT D/A CONVERTER**

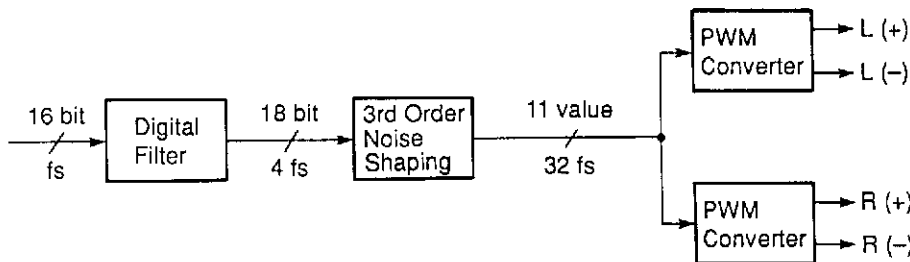
Conventionally, high-precision D/A conversion was mainly carried out using resistor ladder systems. There was, however, one main drawback with these systems, which was that zero cross distortion was likely to be generated. To achieve production of a high-precision D/A converter with a minimum amount of zero cross distortion, it would be necessary to carry out complicated and bothersome processes such as laser trimming processing. In addition, use of such D/A converter would require a sampling-and-hold circuits (or de-glitcher circuit) and an intricate analog filter with special characteristics when mounting it.

To solve these difficulties, we used a 1-bit D/A converter with 3rd order noise shaping technology (IC701: MN6474AM).

**4-1. Features and Configuration of MN6474AM**

- |          |   |   |
|----------|---|---|
| Features | 1. No zero cross distortion                     | 4. 2 channels (left and right) built in |
|          | 2. No non linear distortion                     | 5. 4DAC configuration possible          |
|          | 3. Built-in 4 times oversampling digital filter | 6. Single 5V power supply operation     |

The block diagram is shown in Fig. 9. The MN6474AM is configured of a digital filter, a 3rd order noise shaping circuit, and a PWM.



**Fig. 9**

4-2. Configuration of MN6474AM

Fig. 10 shows the configuration of the MN6474AM. 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, however, oversampling is carried out first at  $4f_s$  in the first digital filter, and following that, a 0 order hold takes place in the 3rd order noise shaping circuit. This enables conversion of the  $4f_s$  signal to a  $32f_s$  signal.

The digital filter, using  $384f_s$  as clock signals, and the noise shaping section, uses  $64f_s$ , carry out time division processing on the data for the left and right channels. The PWM section, using  $768f_s$  as a clock signal, carries out signal processing for the left and right channels independently.

In the noise shaping section, the 19-bit  $32f_s$  signal is converted to 11 values and pulse width modulation (PWM) is carried out on these signals in the PWM section. D/A conversion is carried out in this way. Following are the descriptions of the various blocks.

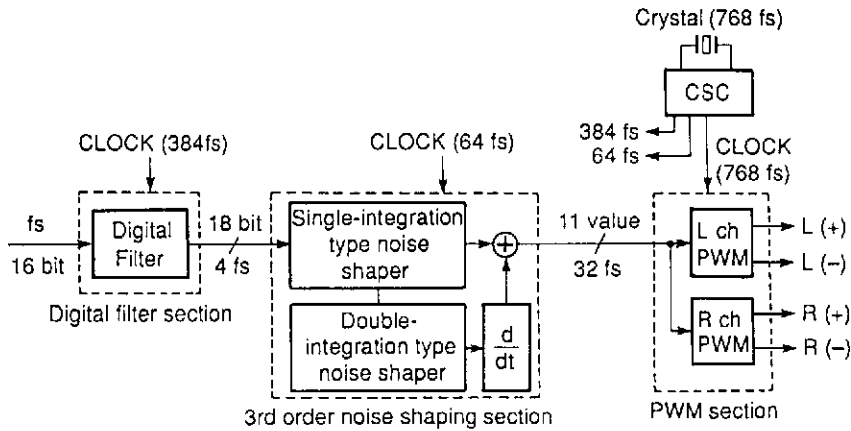
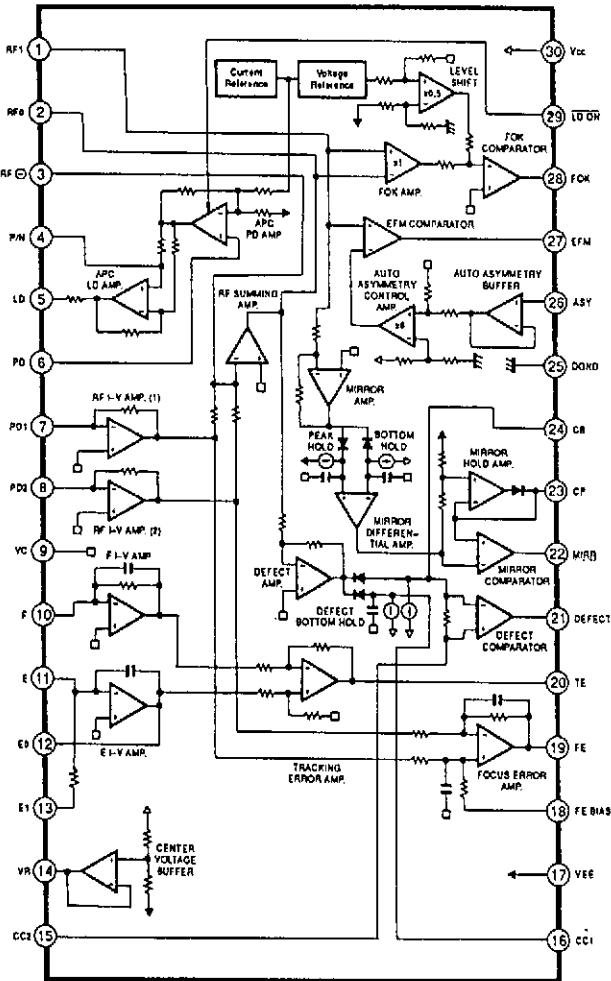


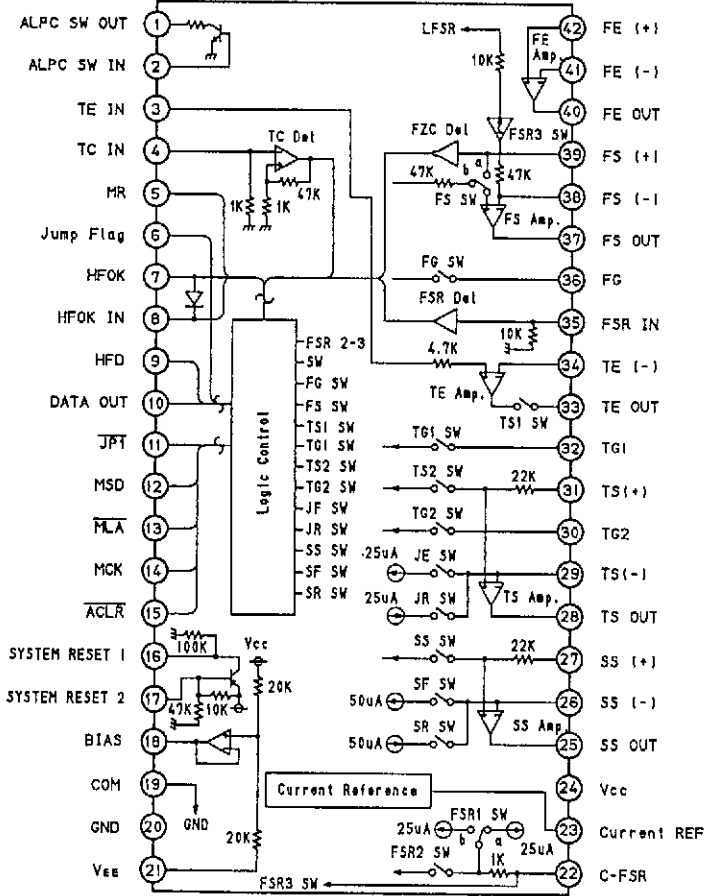
Fig. 10

IC BLOCK DIAGRAMS

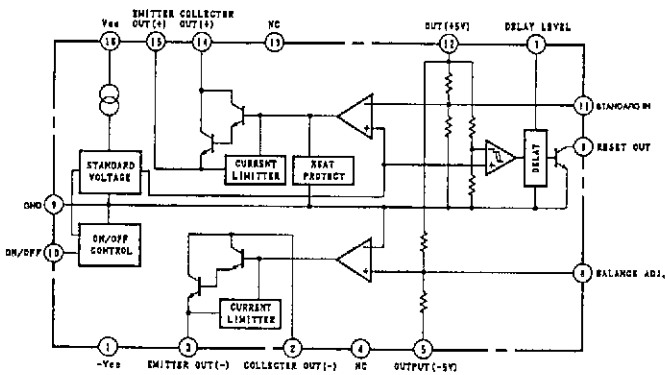
IC101 : CXA1081S  
RF Amp.



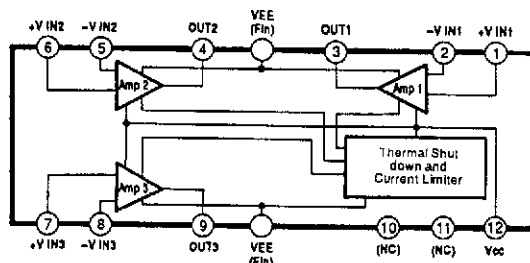
IC102  
M51594AFP  
Optical Pick-up Servo Control



IC1 :  
M5290P  
Voltage Regulator

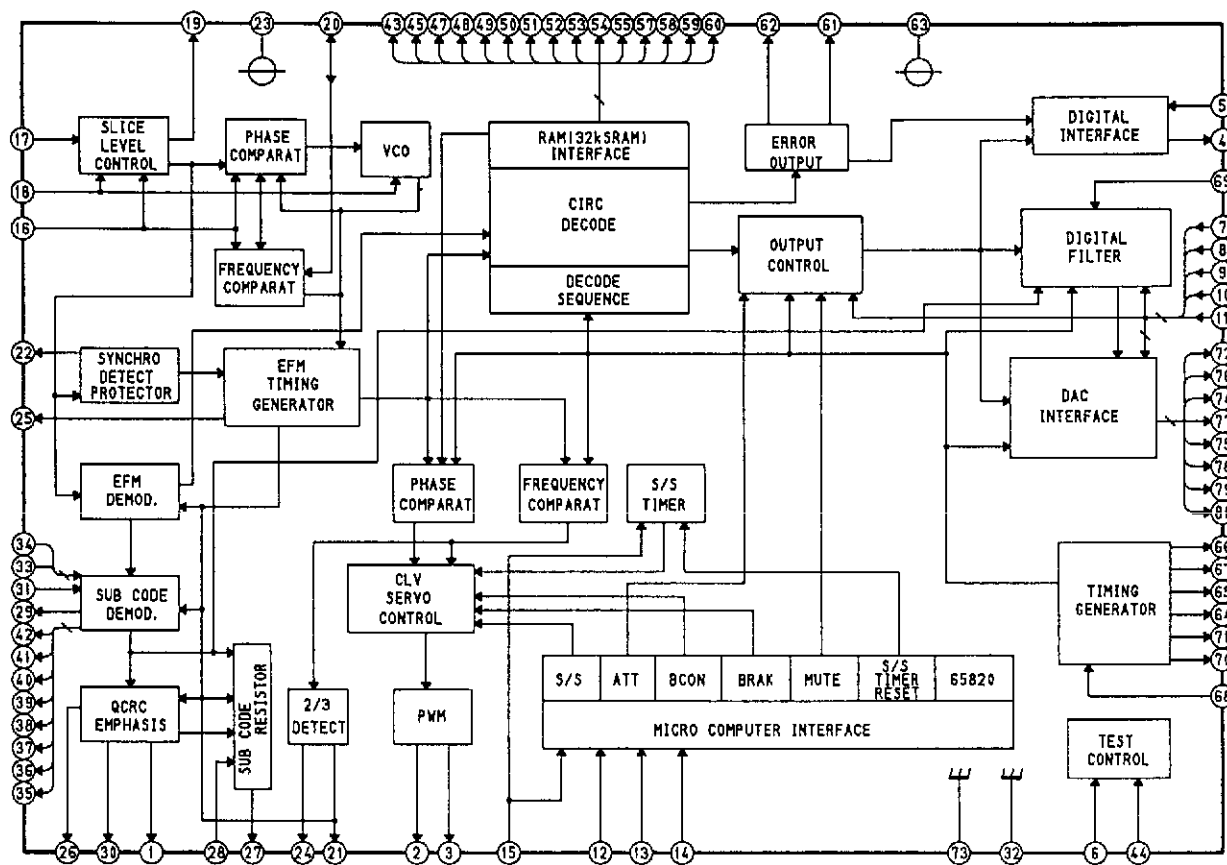


IC103 : LA6520  
3 channel Power OP-Amp.

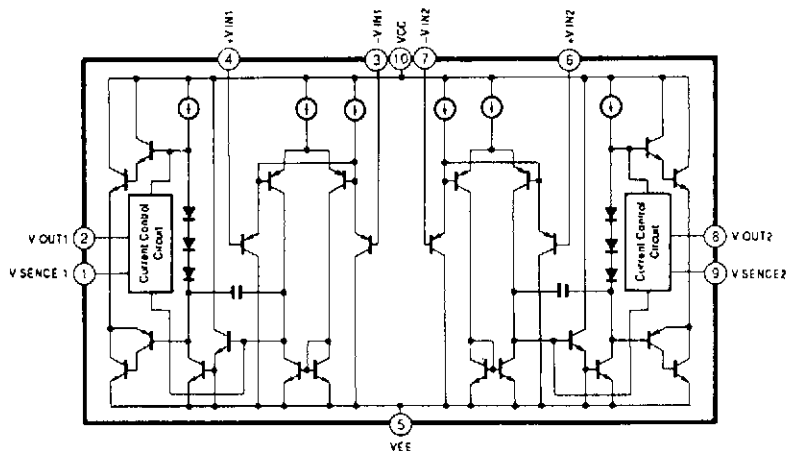




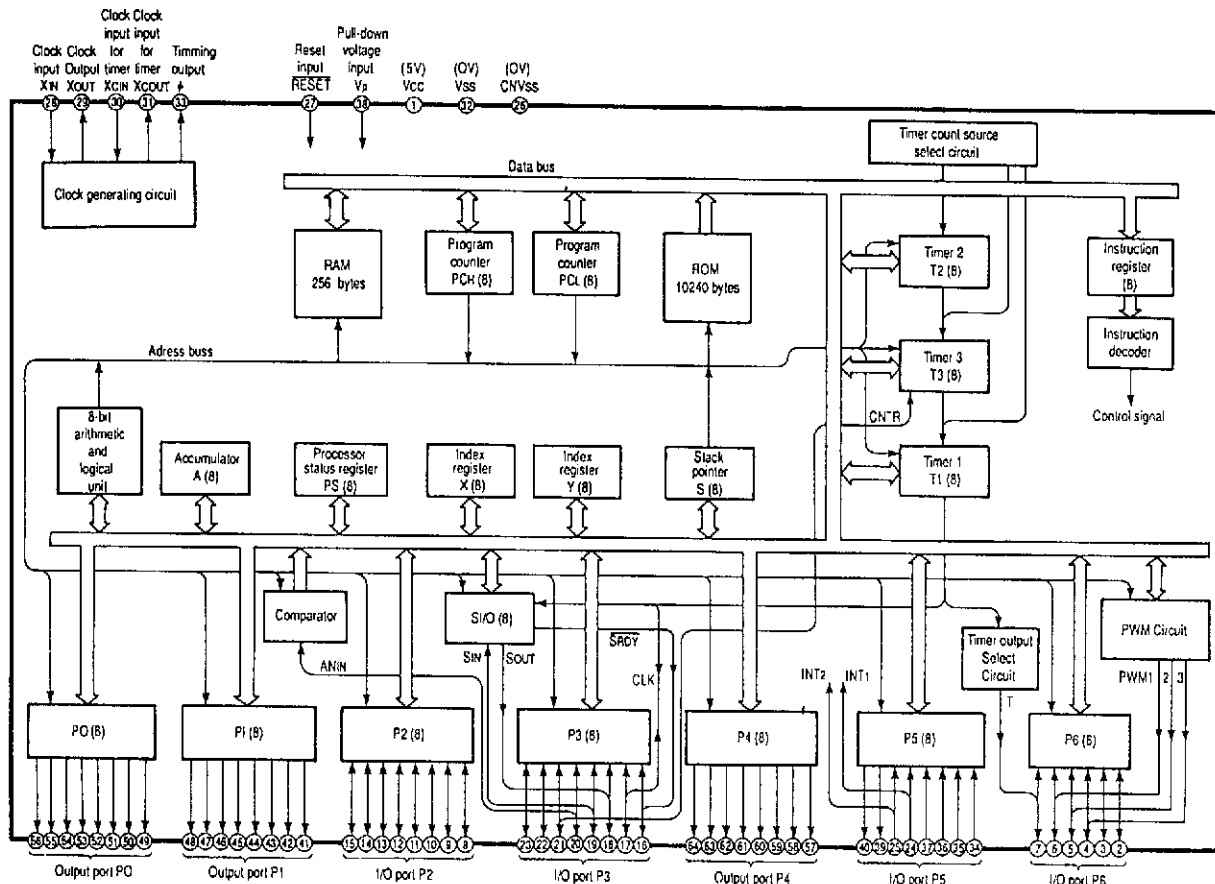
IC201 : M65820FP  
Digital Signal Processor



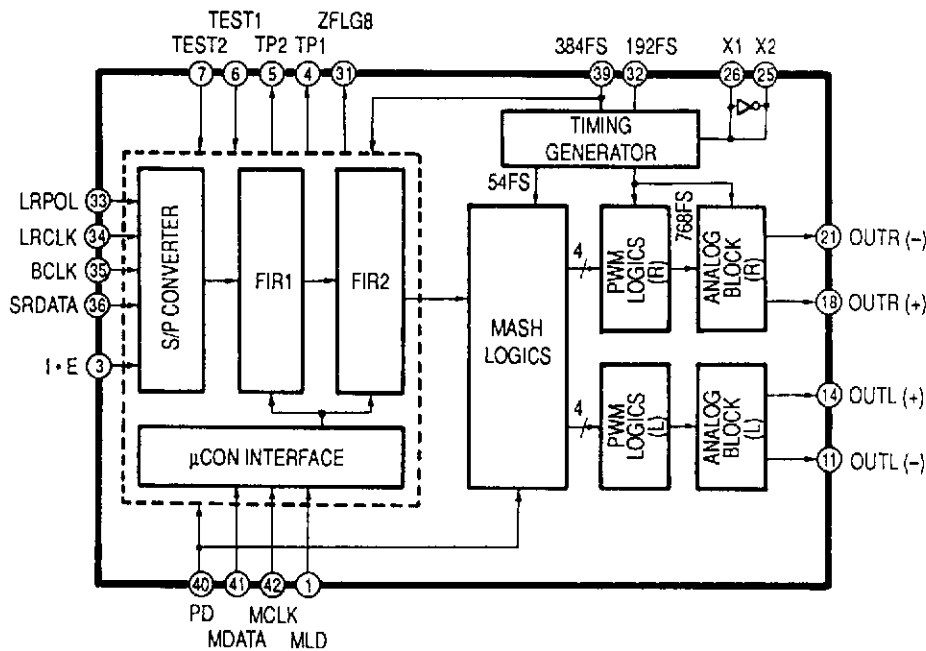
IC203 : LA6515  
2 channel Power OP-Amp.



IC401 : M50957-243  
Microcomputer



IC701 : MN6474AM  
D/A Converter



A

B

C

D

E

# CD MECHANISM EXPLODED VIEW

1

2

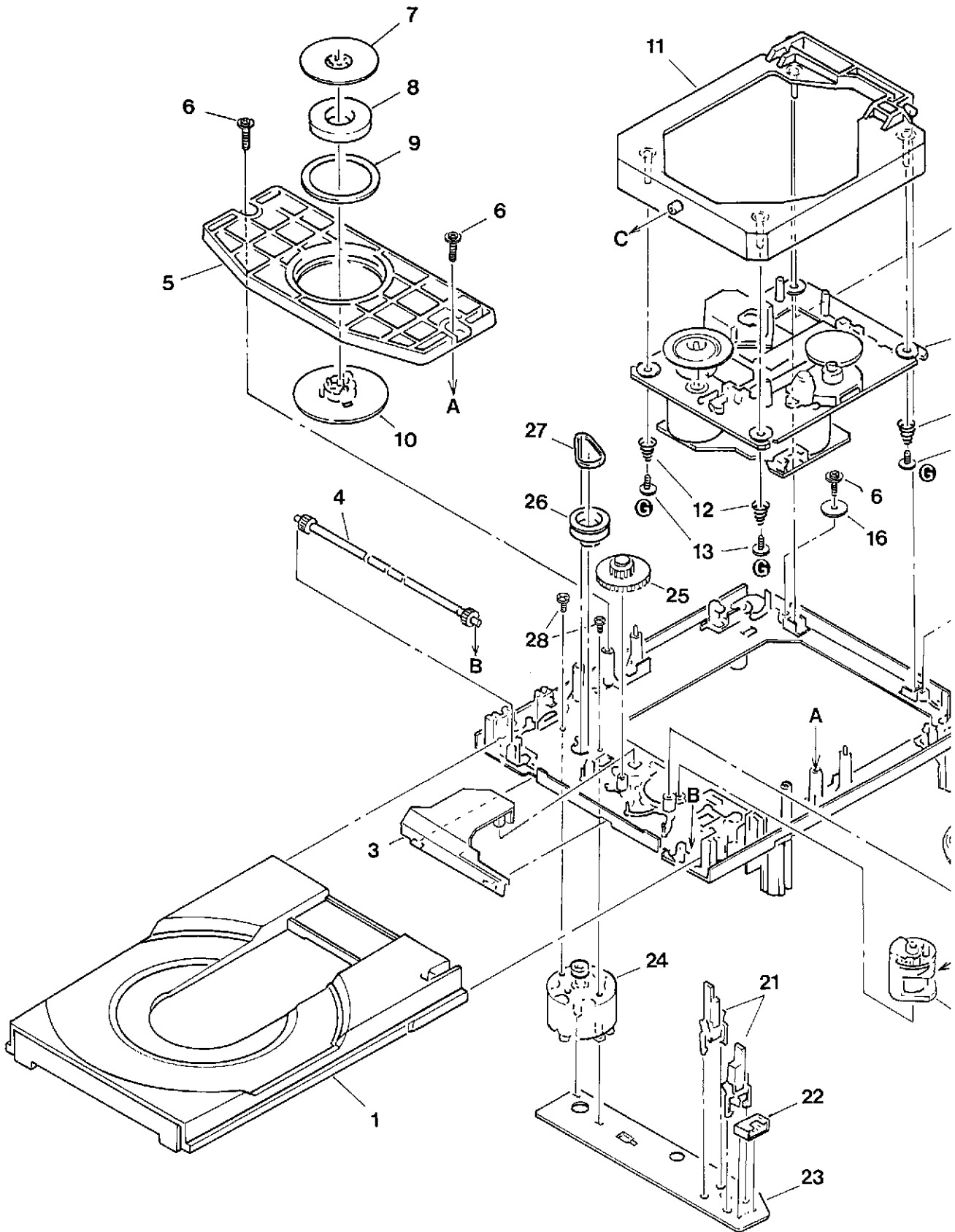
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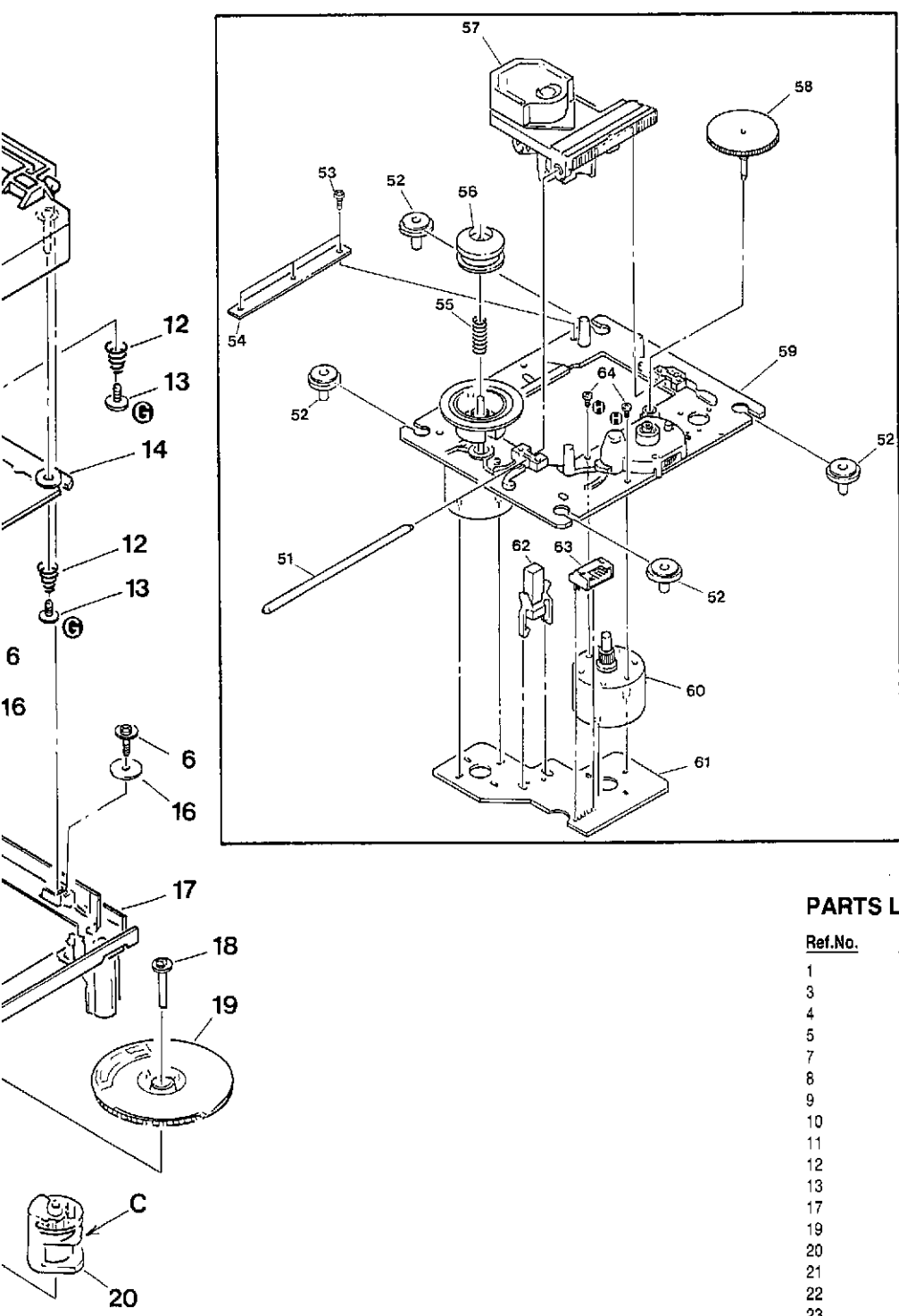
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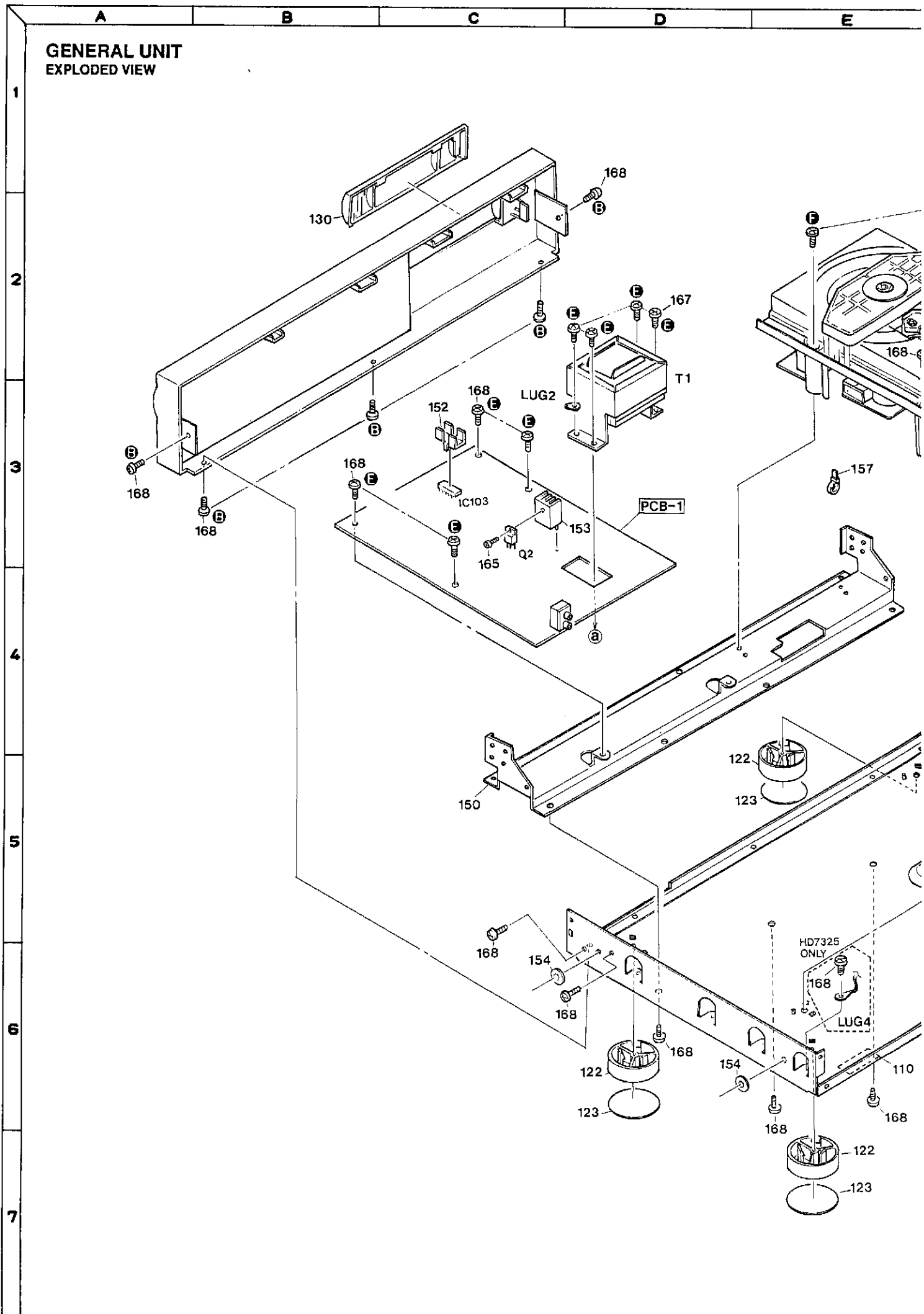


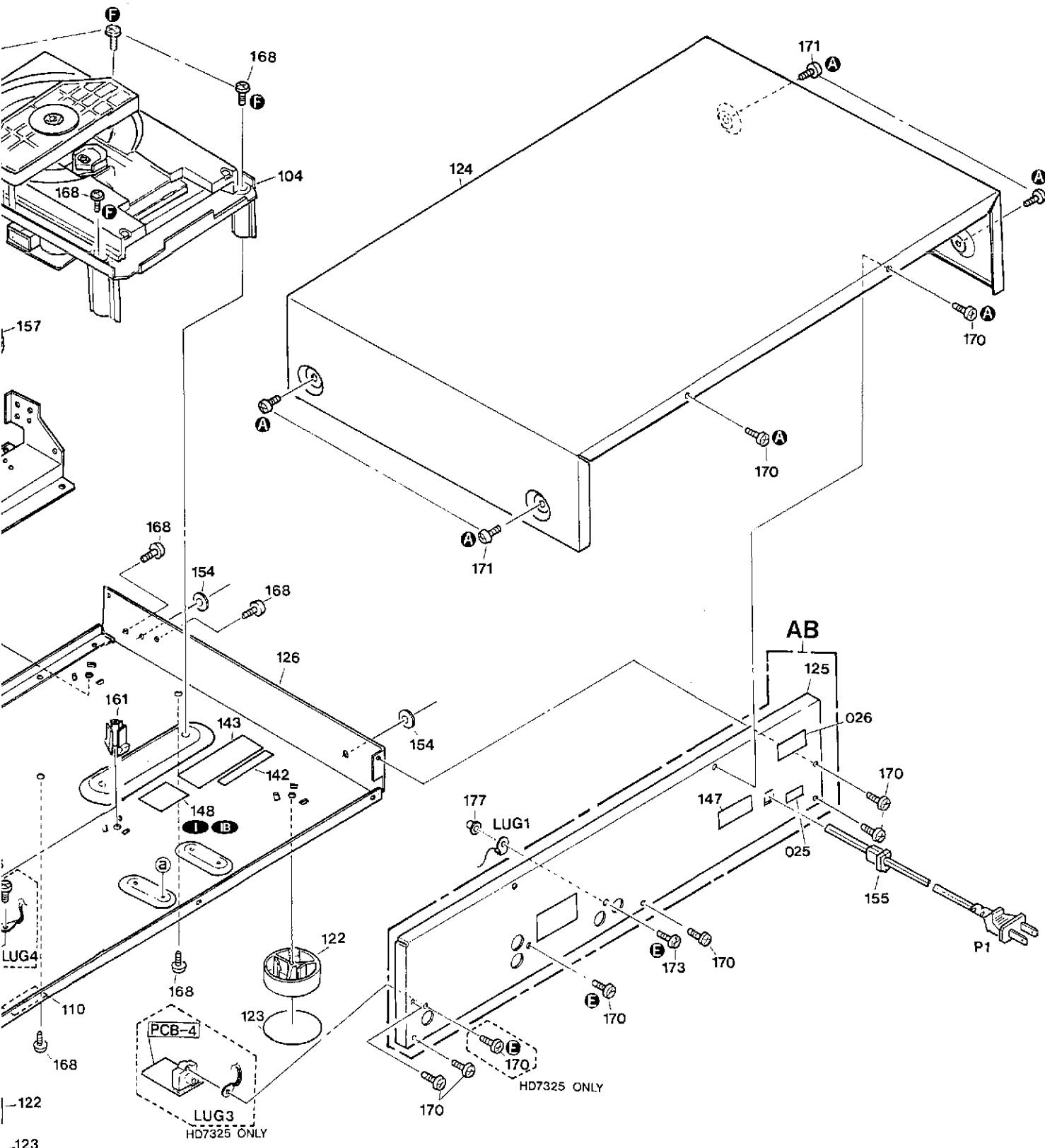
E F G H I J



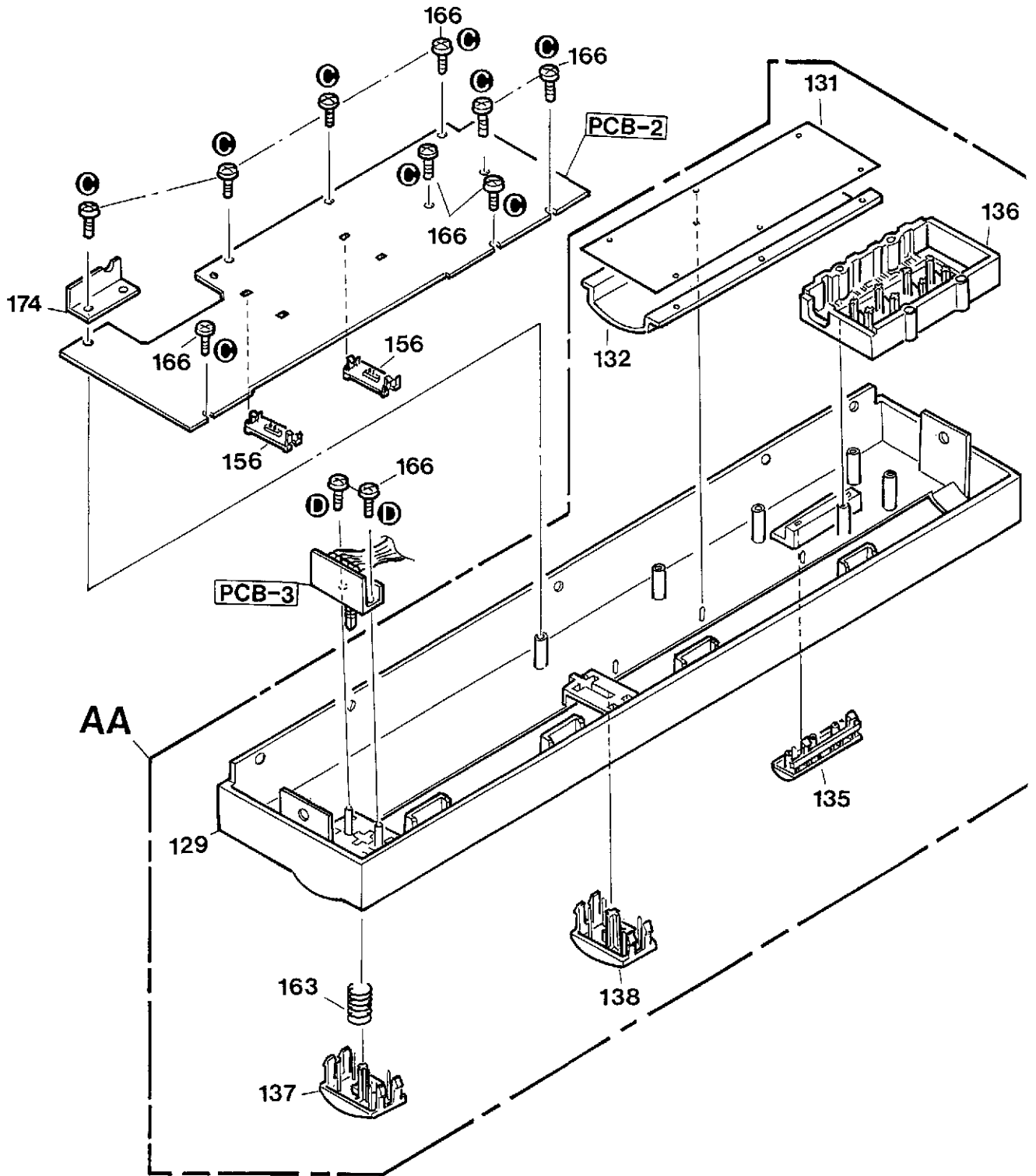
**PARTS LIST**

Ref.No.	Part No.	Description
1	2-625-550-02	TRAY (G)
3	2-625-544-01	COVER (G), GEAR
4	2-625-535-01	GEAR (G), TRAY
5	2-625-546-01	PLATE (G), CHUCKING
7	2-625-537-01	YOKE (S), CHUCKING
8	1-452-493-21	MAGNET
9	2-625-541-02	DAMPER (S)
10	2-625-548-01	PULLEY (G), CHUCKING
11	X-2625-227-1	CHASSIS ASS'Y (G), SUB
12	2-625-539-01	SPRING (S) (X4)
13	2-625-730-01	WASHER BASED SCREW (X4)
17	2-625-552-06	CHASSIS (G), OUTSERT MAIN
19	2-625-547-01	GEAR (G), DRIVE
20	2-625-545-04	CAM (G), CONTROL
21	1-572-086-11	SWITCH, LEAF (X2)
22	1-564-721-11	PIN, CONNECTOR 5P
23	1-640-523-11	PC BOARD, LOADING
24	X-2625-117-1	MOTOR ASS'Y, LOADING
25	2-625-534-02	GEAR (G), MIDWAY
26	2-625-536-02	PULLEY (G), LOADING
27	3-653-387-00	BELT, LM
51	4-917-565-01	SHAFT (S), SLED
52	2-625-538-01	INSULATOR (S) (X4)
53	2-641-386-01	SCREW (2x5mm), TAPPING (S) (X3)
55	2-625-191-01	SPRING (S), COMPRESSION
56	2-625-477-01	RING (LO) (S), CENTER
57	8-848-127-11	PICK UP KSS-210A (S) (RP)
58	2-625-188-02	GEAR (A) (S)
59	X-2625-133-1	CHASSIS ASS'Y (MB), TT
60	X-2625-132-1	GEAR ASS'Y (MB), MOTOR
61	1-639-676-12	PC BOARD, MOTOR (6P) (S)
62	1-572-085-11	SWITCH, LEAF
63	1-564-722-11	PIN, CONNECTOR 6P



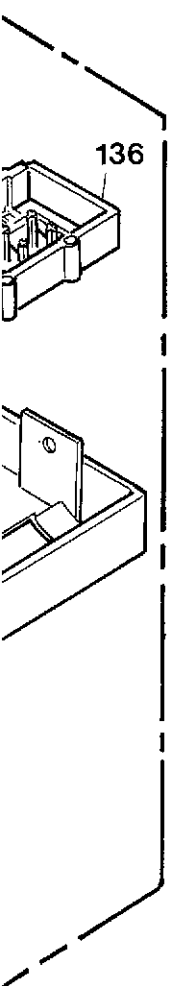


**GENERAL UNIT  
EXPLODED VIEW**



**GENERAL UNIT PARTS LIST**

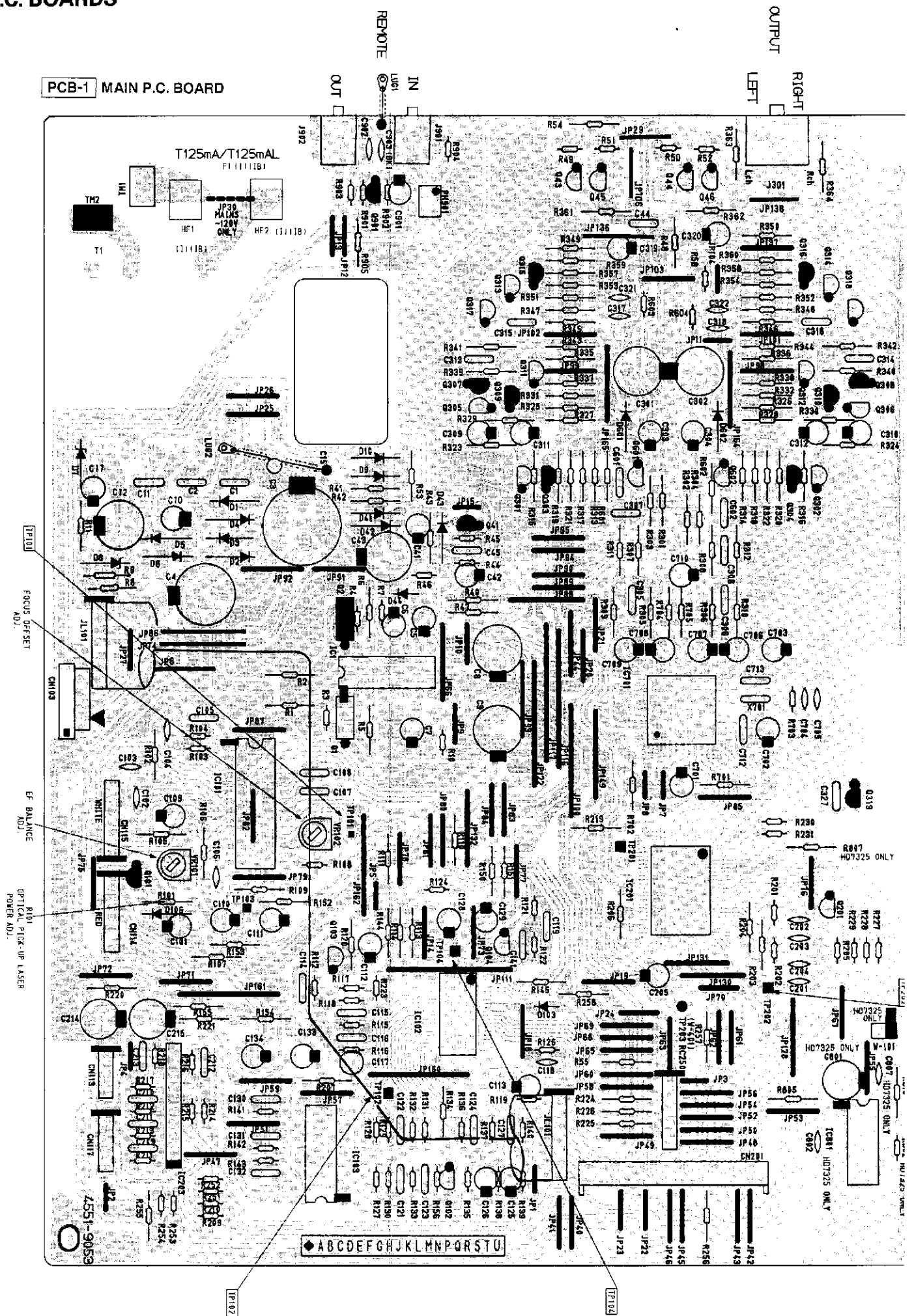
Ref.No.	Part No.	Description	Ref.No.	Part No.	Description
AA	A442-HD7325A	FRONT PANEL ASSEMBLY (Model:HD7325) BK IB	150	2219-8394	METAL FITTG, CD MECHA
AA	A442-HD7325B	FRONT PANEL ASSEMBLY (Model:HD7325) I	152	2222-7264	HEAT SINK, IC103
AA	A442-HD7226A	FRONT PANEL ASSEMBLY (Model:HD7225A) IB	153	2222-7217	HEAT SINK, Q2
AA	A442-HD7226B	FRONT PANEL ASSEMBLY (Model:HD7225A) I	154	2111-1389	FELT, CABINET BUTTOM (X4)
AB	A424-HD7325B	CABINET BACK ASSEMBLY (Model:HD7325) BK	155	2240-364	HOLDER, AC CORD
AB	A424-HD7325A	CABINET BACK ASSEMBLY (Model:HD7325) IB I	156	2240-7370	HOLDER, FL401 (X2)
025	1341-**568	NAME PLATE, PRODUCTION DATE (Model:HD7325) BK	157	2240-R0101	HOLDER, WIRING (X2)
026	1756-CSA	LABEL, CSA LABEL (Model:HD7325) BK	161	2360-7022	SPECIAL BOSS, MAIN PCB (X2)
104	3119-02301	CD MECHA ASSEMBLY	163	2651-2101732	SPRING, POWER BUTTON
110	1117-78	SERIAL LABEL, CABINET BUTTOM	165	2327-R0130082	SCREW,BND+ (3X8 mm)
122	1319-04302	LEG (X4)	166	2347-R0126082	SCREW,BND T+ (2.6X8 mm) (X11)
123	1319-04601	LEG, RUBBER (X4)	167	2347-R0130062	SCREW,BND T+ (3X6 mm) (X4)
124	1414-17001	CABINET, TOP COVER	168	2347-R0130082	SCREW,BND T+ (3X8 mm) (X22) (Model:HD7325)
125	1424-36401	CABINET BACK, REAR (Model:HD7325) BK	168	2347-R0130082	SCREW,BND T+ (3X8 mm) (X21) (Model:HD7225A)
125	1424-36402	CABINET BACK, REAR (Model:HD7325) IB I	170	2347-R0130084	SCREW,BND T+ (3X8 mm) (X9) (Model:HD7325)
125	1424-36405	CABINET BACK, REAR (Model:HD7225A) IB I	170	2347-R0130084	SCREW,BND T+ (3X8 mm) (X8) (Model:HD7225A)
126	1424-36301	CABINET BACK, BOTTOM	171	2347-R0140064	SCREW,BND T+ (4X6 mm) (X4)
129	1442-28502	FRONT PANEL (Model:HD7325) BK IB	173	2327-R0130064	SCREW,BND+ (3X6 mm)
129	1442-28506	FRONT PANEL (Model:HD7225A) IB	174	2216-7187	SHIELD PLATE, FRONT PCB EARTH
129	1442-28501	FRONT PANEL (Model:HD7325) I	177	2440-7016	SPECIAL NUT
129	1442-28505	FRONT PANEL (Model:HD7225A) I			
130	1452-10002	LID, CD MECHA (Model:HD7325) BK IB (Model:HD7225A) B			
130	1452-10001	LID, CD MECHA (Model:HD7325/7225A) I			
131	1511-19810	PANEL, FL FILTER			
132	1532-17507	WINDOW, FRONT			
135	1662-68202	PUSH BUTTON, DISPLAY/PROGRAM/TIME (Model:HD7325) BK IB (Model:HD7225A) IB			
135	1662-68201	PUSH BUTTON, DISPLAY/PROGRAM/TIME (Model:HD7325/7225A) I			
136	1662-52404	PUSH BUTTON, PLAY/PAUSE/STOP/ REPEAT/SKIP(F,R)/SEARCH(F,R) (Model:HD7325) BK IB (Model:HD7225A) IB			
136	1662-52403	PUSH BUTTON, PLAY/PAUSE/STOP/ REPEAT/SKIP(F,R)/SEARCH(F,R) (Model:HD7325/7225A) I			
137	1662-52001	PUSH BUTTON, POWER (Model:HD7325) BK IB (Model:HD7225A) IB			
137	1662-52003	PUSH BUTTON, POWER (Model:HD7325/7225A) I			
138	1662-52002	PUSH BUTTON, OPEN/CLOSE (Model:HD7325) BK IB (Model:HD7225A) IB			
138	1662-52004	PUSH BUTTON, OPEN/CLOSE (Model:HD7325/7225A) I			
142	1756-03305	LABEL, LASER CAUTION, CD MECHA			
143	1756-09602	LABEL, LASER CAUTION, CD MECHA (Model:HD7325) BK			
143	1756-12101	LABEL, LASER CAUTION, CD MECHA (Model:HD7325/7225A) IB I			
147	1756-11801	LABEL, LASER PRODUCT, REAR			
148	1756-11802	LABEL, LASER CAUTION, CD MECHA (Model:HD7325/7225A) IB I			





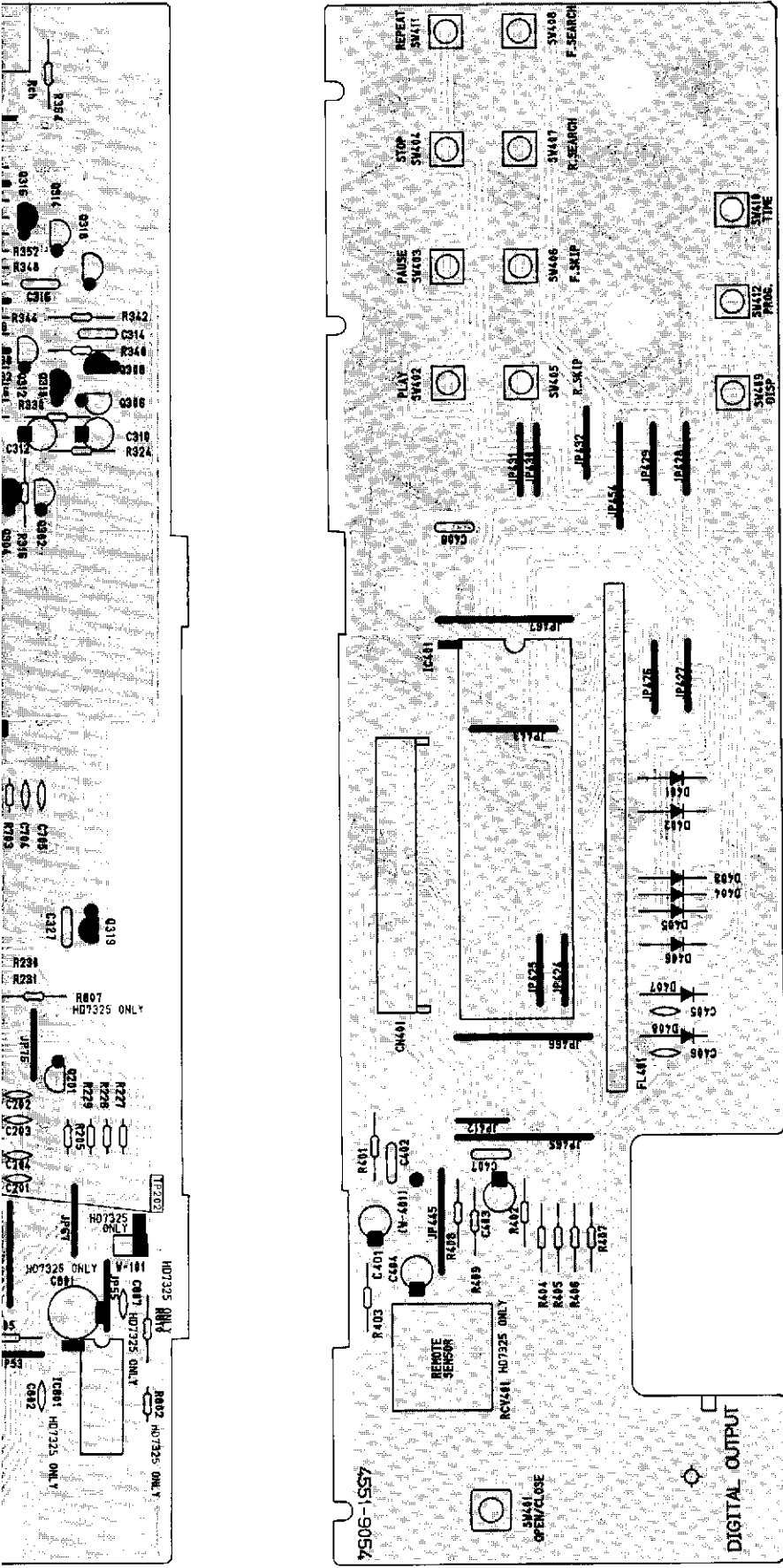
# P.C. BOARDS

PCB-1 MAIN P.C. BOARD

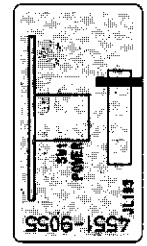


RIGHT

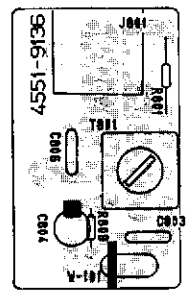
**PCB-2 FRONT P.C. BOARD**



**PCB-3 POWER SWITCH P.C. BOARD**



**PCB-4 DIGITAL OUTPUT P.C. BOARD**  
(Model: HD7325 only)



**ELECTRICAL PARTS LIST**

Ser. No. Ref. No. Part No.

Description

Ser. No. Ref. No. Part No.

Description

**PCB-1 MAIN P.C. BOARD**

**CAPACITORS**

511	C1	5354-104593	CAP,MYL .1U
511	C2	5354-104593	CAP,MYL .1U
520	C3	5345-478C0962	CAP,MINI ELE 4700U/16V
519	C4	5345-228C0962	CAP,MINI ELE 2200U/16V
514	C5	5345-106F0962	CAP,MINI ELE 10U/50V
514	C6	5345-106F0962	CAP,MINI ELE 10U/50V
513	C7	5345-225F0962	CAP,MINI ELE 22U/50V
518	C8	5345-477B0962	CAP,MINI ELE 470U/10V
518	C9	5345-477B0962	CAP,MINI ELE 470U/10V
515	C10	5345-226F0962	CAP,MINI ELE 22U/50V
511	C11	5354-104593	CAP,MYL .1U
517	C12	5345-227E0962	CAP,MINI ELE 220U/35V
510	C15	5354-152J1HM	CAP,MYL 1500P
516	C17	5345-107B0962	CAP,MINI ELE 100U/10V
754	C41	5345-226D0962	CAP,MINI ELE 22U/25V
753	C42	5345-106F0962	CAP,MINI ELE 10U/50V
755	C43	5345-108B0962	CAP,MINI ELE 1000U/10V
756	C44	5354-224593	CAP,MYL .22U
770	C45	5354-104J1HM	CAP,MYL .1U
550	C101	5345-107B0962	CAP,MINI ELE 100U/10V
569	C102	5361-330JCH	CAP,CER 33P
569	C103	5361-330JCH	CAP,CER 33P
570	C104	5361-100DCH	CAP,CER 10P
555	C105	5354-332J1HM	CAP,MYL 3300P
560	C106	5354-333J1HM	CAP,MYL .033U
560	C107	5354-333J1HM	CAP,MYL .033U
557	C108	5354-103J1HM	CAP,MYL .01U
549	C109	5345-476D0962	CAP,MINI ELE 47U/25V
549	C110	5345-476D0962	CAP,MINI ELE 47U/25V
549	C111	5345-476D0962	CAP,MINI ELE 47U/25V
546	C112	5345-474F0962	CAP,MINI ELE .47U/50V
548	C113	5345-226D0962	CAP,MINI ELE 22U/25V
562	C114	5354-823J1HM	CAP,MYL .082U
574	C115	5361-681KB	CAP,CER 680P
565	C116	5354-274593	CAP,MYL .27U
544	C117	5342-105F0951	CAP,ELE BP 1U/50V
563	C118	5354-104J1HM	CAP,MYL .1U
556	C119	5354-472J1HM	CAP,MYL 4700P
559	C121	5354-183J1HM	CAP,MYL .018U
564	C122	5354-184593	CAP,MYL .18U
558	C123	5354-123J1HM	CAP,MYL .012U
572	C124	5361-391KB	CAP,CER 390P
549	C125	5345-476D0962	CAP,MINI ELE 47U/25V
546	C126	5345-474F0962	CAP,MINI ELE .47U/50V
561	C127	5354-563J1HM	CAP,MYL .056U
549	C128	5345-476D0962	CAP,MINI ELE 47U/25V
549	C129	5345-476D0962	CAP,MINI ELE 47U/25V
563	C130	5354-104J1HM	CAP,MYL .1U
563	C131	5354-104J1HM	CAP,MYL .1U
563	C132	5354-104J1HM	CAP,MYL .1U
551	C133	5345-107D0962	CAP,MINI ELE 100U/25V
551	C134	5345-107D0962	CAP,MINI ELE 100U/25V
554	C141	5354-102J1HM	CAP,MYL 1000P
662	C201	5354-222J1HM	CAP,MYL 2200P
628	C202	5354-223J1HM	CAP,MYL .022U
632	C203	5361-471KB	CAP,CER 470P
629	C204	5354-154593	CAP,MYL .15U
625	C205	5345-476B0951	CAP,MINI ELE 47U/10V
573	C209	5361-471KB	CAP,CER 470P
573	C210	5361-471KB	CAP,CER 470P
563	C211	5354-104J1HM	CAP,MYL .1U
571	C212	5361-220JCH	CAP,CER 22P
563	C213	5354-104J1HM	CAP,MYL .1U
551	C214	5345-107D0962	CAP,MINI ELE 100U/25V
551	C215	5345-107D0962	CAP,MINI ELE 100U/25V
695	C301	5345-338B0962	CAP,MINI ELE 3300U/10V
695	C302	5345-338B0962	CAP,MINI ELE 3300U/10V
694	C303	5345-227B0962	CAP,MINI ELE 220U/10V
694	C304	5345-227B0962	CAP,MINI ELE 220U/10V

698	C305	5359-8205851	CAP,PPP 82P
698	C306	5359-8205851	CAP,PPP 82P
697	C307	5359-3905851	CAP,PPP 39P
697	C308	5359-3905851	CAP,PPP 39P
692	C309	5345-336C0962	CAP,MINI ELE 33U/16V
692	C310	5345-336C0962	CAP,MINI ELE 33U/16V
691	C311	5345-106F0962	CAP,MINI ELE 10U/50V
691	C312	5345-106F0962	CAP,MINI ELE 10U/50V
696	C313	5353-100534	CAP,MCA 10P (Model:HD7325)
696	C313	5353-100933	CAP,MCA 10P (Model:HD7225A)
696	C314	5353-100534	CAP,MCA 10P (Model:HD7325)
696	C314	5353-100933	CAP,MCA 10P (Model:HD7225A)
703	C315	5359-S010J562	CAP,PPP 5600P
703	C316	5359-S010J562	CAP,PPP 5600P
702	C317	5359-S010J152	CAP,PPP 1500P
702	C318	5359-S010J152	CAP,PPP 1500P
693	C319	5345-476B0951	CAP,MINI ELE 47U/10V
693	C320	5345-476B0951	CAP,MINI ELE 47U/10V
702	C321	5359-S010J152	CAP,PPP 1500P
702	C322	5359-S010J152	CAP,PPP 1500P
706	C327	5354-104J1HM	CAP,MYL .1U
701	C601	5359-S010J122	CAP,PPP 1200P
701	C602	5359-S010J122	CAP,PPP 1200P
657	C701	5345-227B0962	CAP,MINI ELE 220U/10V
655	C702	5345-106F0962	CAP,MINI ELE 10U/50V
655	C703	5345-106F0962	CAP,MINI ELE 10U/50V
660	C704	5361-050DCH	CAP,CER 5P
660	C705	5361-050DCH	CAP,CER 5P
658	C706	5345-476B0951	CAP,MINI ELE 47U/10V
658	C707	5345-476B0951	CAP,MINI ELE 47U/10V
658	C708	5345-476B0951	CAP,MINI ELE 47U/10V
658	C709	5345-476B0951	CAP,MINI ELE 47U/10V
656	C710	5345-107B0962	CAP,MINI ELE 100U/10V
663	C712	5354-473J1HM	CAP,MYL .047U
663	C713	5354-473J1HM	CAP,MYL .047U
808	C801	5345-476B0962	CAP,MINI ELE 47U/10V (Model:HD7325)
812A	C802	5361-331KB	CAP,CER 330P (Model:HD7325) <b>BK</b>
812	C802	5361-101KB	CAP,CER 100P (Model:HD7325/7225A) <b>B I</b>
816	C807	5359-3905851	CAP,PPP 39P (Model:HD7325)
777	C901	5345-226D0962	CAP,MINI ELE 22U/25V
780	C902	5361-470KSL	CAP,CER 47P
041A	C903	5361-221KB	CAP,CER 220P (Model:HD7325) <b>BK</b>

**RESISTORS**

522	△ R1	5102-4R74713	RES,FUSE 4.7
522	△ R2	5102-4R74713	RES,FUSE 4.7
528	R3	5232-471J16P	RES,CBN 1/6P 470
528	R4	5232-471J16P	RES,CBN 1/6P 470
523	△ R5	5102-1015116	RES,FUSE 100
523	△ R6	5102-1015116	RES,FUSE 100
529	R7	5232-153J16P	RES,CBN 1/6P 15K
524	R8	5134-121J25P	RES,CBN 1/4P 120
526	R9	5134-223J25P	RES,CBN 1/4P 22K
525	R10	5232-152J16P	RES,CBN 1/6P 1.5K
527	R11	5134-331J25P	RES,CBN 1/4P 330
759	R40	5134-222J25P	RES,CBN 1/4P 2.2K
763	R41	5135-271J50P	RES,CBN 1/2P 270
758	R42	5134-682J25P	RES,CBN 1/4P 6.8K
761	R43	5134-224J25P	RES,CBN 1/4P 220K
768	R44	5232-473J16P	RES,CBN 1/6P 47K
768	R45	5232-473J16P	RES,CBN 1/6P 47K
765	R46	5232-101J16P	RES,CBN 1/6P 100
767	R47	5134-103J25P	RES,CBN 1/4P 10K
760	R48	5134-154J25P	RES,CBN 1/4P 150K
766	R49	5232-103J16P	RES,CBN 1/6P 10K
766	R50	5232-103J16P	RES,CBN 1/6P 10K
766	R51	5232-103J16P	RES,CBN 1/6P 10K
766	R52	5232-103J16P	RES,CBN 1/6P 10K
763	R53	5135-271J50P	RES,CBN 1/2P 270
757	R54	5134-102J25P	RES,CBN 1/4P 1K
762	R55	5134-103J25P	RES,CBN 1/4P 10K

Ser. No.	Ref. No.	Part No.	Description	Ser. No.	Ref. No.	Part No.	Description
733	R58	5232-154J16P	RES,CBN 1/6P 150K	641	R227	5232-222J16P	RES,CBN 1/6P 2.2K
585	R101	5134-220J25P	RES,CBN 1/4P 22	641	R228	5232-222J16P	RES,CBN 1/6P 2.2K
588	R102	5134-222J25P	RES,CBN 1/4P 2.2K	641	R229	5232-222J16P	RES,CBN 1/6P 2.2K
604	R103	5232-163J16P	RES,CBN 1/6P 16K	644	R230	5232-103J16P	RES,CBN 1/6P 10K
601	R104	5232-82J16P	RES,CBN 1/6P 8.2K	644	R231	5232-103J16P	RES,CBN 1/6P 10K
591	R105	5134-223J25P	RES,CBN 1/4P 22K	602	R251	5232-103J16P	RES,CBN 1/6P 10K
587	R106	5134-102J25P	RES,CBN 1/4P 1K	602	R252	5232-103J16P	RES,CBN 1/6P 10K
586	R107	5134-221J25P	RES,CBN 1/4P 220	602	R253	5232-103J16P	RES,CBN 1/6P 10K
605	R108	5232-183J16P	RES,CBN 1/6P 18K	602	R254	5232-103J16P	RES,CBN 1/6P 10K
590	R109	5134-183J25P	RES,CBN 1/4P 18K	589	R255	5134-103J25P	RES,CBN 1/4P 10K
587	R110	5134-102J25P	RES,CBN 1/4P 1K	587	R256	5134-102J25P	RES,CBN 1/4P 1K
589	R111	5134-103J25P	RES,CBN 1/4P 10K	637	R257	5134-472J25P	RES,CBN 1/4P 4.7K
611	R112	5232-104J16P	RES,CBN 1/6P 100K	589	R258	5134-103J25P	RES,CBN 1/4P 10K
590	R113	5134-183J25P	RES,CBN 1/4P 18K	711	△ R301	5102-1004713	RES,FUSE 10
591	R114	5134-223J25P	RES,CBN 1/4P 22K	711	△ R302	5102-1004713	RES,FUSE 10
610	R115	5232-683J16P	RES,CBN 1/6P 68K	711	△ R303	5102-1004713	RES,FUSE 10
603	R116	5232-153J16P	RES,CBN 1/6P 15K	711	△ R304	5102-1004713	RES,FUSE 10
600	R117	5232-682J16P	RES,CBN 1/6P 6.8K	723	R305	5134-103J25P	RES,CBN 1/4P 10K
596	R118	5232-221J16P	RES,CBN 1/6P 220	723	R306	5134-103J25P	RES,CBN 1/4P 10K
609	R119	5232-473J16P	RES,CBN 1/6P 47K	723	R307	5134-103J25P	RES,CBN 1/4P 10K
589	R120	5134-103J25P	RES,CBN 1/4P 10K	723	R308	5134-103J25P	RES,CBN 1/4P 10K
602	R121	5232-103J16P	RES,CBN 1/6P 10K	723	R309	5134-103J25P	RES,CBN 1/4P 10K
607	R122	5232-273J16P	RES,CBN 1/6P 27K	723	R310	5134-103J25P	RES,CBN 1/4P 10K
602	R124	5232-103J16P	RES,CBN 1/6P 10K	723	R311	5134-103J25P	RES,CBN 1/4P 10K
611	R126	5232-104J16P	RES,CBN 1/6P 100K	723	R312	5134-103J25P	RES,CBN 1/4P 10K
611	R127	5232-104J16P	RES,CBN 1/6P 100K	726	R313	5134-473J25P	RES,CBN 1/4P 47K
602	R128	5232-103J16P	RES,CBN 1/6P 10K	726	R314	5134-473J25P	RES,CBN 1/4P 47K
602	R129	5232-103J16P	RES,CBN 1/6P 10K	721	R315	5134-222J25P	RES,CBN 1/4P 2.2K
612	R130	5232-224J16P	RES,CBN 1/6P 220K	721	R316	5134-222J25P	RES,CBN 1/4P 2.2K
611	R131	5232-104J16P	RES,CBN 1/6P 100K	726	R317	5134-473J25P	RES,CBN 1/4P 47K
599	R132	5232-562J16P	RES,CBN 1/6P 5.6K	726	R318	5134-473J25P	RES,CBN 1/4P 47K
597	R133	5232-102J16P	RES,CBN 1/6P 1K	719	R319	5134-102J25P	RES,CBN 1/4P 1K
592	R134	5134-563J25P	RES,CBN 1/4P 56K	719	R320	5134-102J25P	RES,CBN 1/4P 1K
603	R135	5232-153J16P	RES,CBN 1/6P 15K	719	R321	5134-102J25P	RES,CBN 1/4P 1K
603	R136	5232-153J16P	RES,CBN 1/6P 15K	719	R322	5134-102J25P	RES,CBN 1/4P 1K
608	R137	5232-393J16P	RES,CBN 1/6P 39K	722	R323	5134-562J25P	RES,CBN 1/4P 5.6K
606	R138	5232-223J16P	RES,CBN 1/6P 22K	722	R324	5134-562J25P	RES,CBN 1/4P 5.6K
598	R139	5232-332J16P	RES,CBN 1/6P 3.3K	727	R325	5134-913J25P	RES,CBN 1/4P 91K
607	R140	5232-273J16P	RES,CBN 1/6P 27K	727	R326	5134-913J25P	RES,CBN 1/4P 91K
595	R141	5232-100J16P	RES,CBN 1/6P 10	729	R327	5134-184J25P	RES,CBN 1/4P 180K
595	R142	5232-100J16P	RES,CBN 1/6P 10	729	R328	5134-184J25P	RES,CBN 1/4P 180K
595	R143	5232-100J16P	RES,CBN 1/6P 10	716	R329	5134-101J25P	RES,CBN 1/4P 100
593	R144	5134-474J25P	RES,CBN 1/4P 470K	716	R330	5134-101J25P	RES,CBN 1/4P 100
592	R145	5134-563J25P	RES,CBN 1/4P 56K	718	R331	5134-561J25P	RES,CBN 1/4P 560
581	R150	5135-220J50P	RES,CBN 1/2P 22	718	R332	5134-561J25P	RES,CBN 1/4P 560
581	R151	5135-220J50P	RES,CBN 1/2P 22	714	R335	5134-2R2J25P	RES,CBN 1/4P 2.2
580	R152	5134-2R2J25P	RES,CBN 1/4P 2.2	714	R336	5134-2R2J25P	RES,CBN 1/4P 2.2
580	R153	5134-2R2J25P	RES,CBN 1/4P 2.2	720	R337	5134-182J25P	RES,CBN 1/4P 1.8K
582	△ R154	5102-4R75116	RES,FUSE 4.7	720	R338	5134-182J25P	RES,CBN 1/4P 1.8K
582	△ R155	5102-4R75116	RES,FUSE 4.7	723	R339	5134-103J25P	RES,CBN 1/4P 10K
615	R156	5232-105J16P	RES,CBN 1/6P 1M	723	R340	5134-103J25P	RES,CBN 1/4P 10K
642	R201	5232-333J16P	RES,CBN 1/6P 33K	717	R341	5134-471J25P	RES,CBN 1/4P 470
641	R202	5232-222J16P	RES,CBN 1/6P 2.2K	717	R342	5134-471J25P	RES,CBN 1/4P 470
639	R203	5134-104J25P	RES,CBN 1/4P 100K	718	R343	5134-561J25P	RES,CBN 1/4P 560
638	R204	5134-103J25P	RES,CBN 1/4P 10K	718	R344	5134-561J25P	RES,CBN 1/4P 560
643	R205	5232-104J16P	RES,CBN 1/6P 100K	719	R345	5134-102J25P	RES,CBN 1/4P 1K
634	R206	5135-330J50P	RES,CBN 1/2P 33	719	R346	5134-102J25P	RES,CBN 1/4P 1K
591	R207	5134-223J25P	RES,CBN 1/4P 22K	719	R347	5134-102J25P	RES,CBN 1/4P 1K
611	R209	5232-104J16P	RES,CBN 1/6P 100K	719	R348	5134-102J25P	RES,CBN 1/4P 1K
611	R210	5232-104J16P	RES,CBN 1/6P 100K	716	R349	5134-101J25P	RES,CBN 1/4P 100
613	R211	5232-104J16P	RES,CBN 1/6P 100K	716	R350	5134-101J25P	RES,CBN 1/4P 100
613	R212	5232-104J16P	RES,CBN 1/6P 100K	716	R351	5134-101J25P	RES,CBN 1/4P 100
595	R213	5232-100J16P	RES,CBN 1/6P 10	716	R352	5134-101J25P	RES,CBN 1/4P 100
611	R214	5232-104J16P	RES,CBN 1/6P 100K	725	R353	5134-183J25P	RES,CBN 1/4P 18K
611	R215	5232-104J16P	RES,CBN 1/6P 100K	725	R354	5134-183J25P	RES,CBN 1/4P 18K
610	R216	5232-683J16P	RES,CBN 1/6P 68K	717	R357	5134-471J25P	RES,CBN 1/4P 470
610	R217	5232-683J16P	RES,CBN 1/6P 68K	717	R358	5134-471J25P	RES,CBN 1/4P 470
595	R218	5232-100J16P	RES,CBN 1/6P 10	714	R359	5134-2R2J25P	RES,CBN 1/4P 2.2
636	R219	5134-152J25P	RES,CBN 1/4P 1.5K	714	R360	5134-2R2J25P	RES,CBN 1/4P 2.2
582	△ R220	5102-4R75116	RES,FUSE 4.7	715	R361	5134-470J25P	RES,CBN 1/4P 47
582	△ R221	5102-4R75116	RES,FUSE 4.7	715	R362	5134-470J25P	RES,CBN 1/4P 47
614	R223	5232-474J16P	RES,CBN 1/6P 470K	728	R363	5134-104J25P	RES,CBN 1/4P 100K
588	R224	5134-222J25P	RES,CBN 1/4P 2.2K	728	R364	5134-104J25P	RES,CBN 1/4P 100K
588	R225	5134-222J25P	RES,CBN 1/4P 2.2K	724	R601	5134-123J25P	RES,CBN 1/4P 12K
588	R226	5134-222J25P	RES,CBN 1/4P 2.2K	724	R602	5134-123J25P	RES,CBN 1/4P 12K

Ser. No.	Ref. No.	Part No.	Description
730	R603	5232-105J16P	RES,CBN 1/6P 1M
730	R604	5232-105J16P	RES,CBN 1/6P 1M
669	R701	5134-102J25P	RES,CBN 1/4P 1K
666	R702	5135-220J50P	RES,CBN 1/2P 22
672	R703	5232-472J16P	RES,CBN 1/6P 4.7K
668	R704	5134-101J25P	RES,CBN 1/4P 100
668	R705	5134-101J25P	RES,CBN 1/4P 100
824	R802	5232-221J16P	RES,CBN 1/6P 220 (Model:HD7325)
819	R805	5134-101J25P	RES,CBN 1/4P 100 (Model:HD7325)
821	R807	5134-331J25P	RES,CBN 1/4P 330 (Model:HD7325)
820	R810	5134-221J25P	RES,CBN 1/4P 220 (Model:HD7325)
785	R901	5232-392J16P	RES,CBN 1/6P 3.9K
786	R902	5232-473J16P	RES,CBN 1/6P 47K
783	R903	5232-470J16P	RES,CBN 1/6P 47
784	R904	5232-331J16P	RES,CBN 1/6P 330
787	R905	5134-220J25P	RES,CBN 1/4P 22

**INTEGRATED CIRCUITS**

501	△ IC1	5653-M5290P	IC,LINEAR
531	IC101	5653-CXA1081S	IC,LINEAR
534	IC102	5654-M51594FP	IC,DIGITAL
533	IC103	5653-LA6520	IC,LINEAR
621	IC201	5654-M65820FP	IC,DIGITAL
532	IC203	5653-LA6515	IC,LINEAR
651	IC701	5654-MN6474AM	IC,DIGITAL
801	IC801	5654-H74H02P	IC,DIGITAL (Model:HD7325)

**TRANSISTORS**

504	△ Q1	5614-2012	XISTOR,NPN A
503	△ Q2	5612-1375	XISTOR,PNP A
741	Q41	5611-1015(GR)	XISTOR,PNP R
745	Q43	5613-2878(B)	XISTOR,NPN R
745	Q44	5613-2878(B)	XISTOR,NPN R
745	Q45	5613-2878(B)	XISTOR,NPN R
745	Q46	5613-2878(B)	XISTOR,NPN R
536	Q101	5612-647(C)	XISTOR,PNP A
537	Q102	5613-1815(GR)	XISTOR,NPN R
537	Q103	5613-1815(GR)	XISTOR,NPN R
537	Q104	5613-1815(GR)	XISTOR,NPN R
623	Q201	5613-1815(GR)	XISTOR,NPN R
684	Q301	5613-1815L(GR)	XISTOR,NPN R
684	Q302	5613-1815L(GR)	XISTOR,NPN R
681	Q303	5611-950(Y)	XISTOR,PNP R
681	Q304	5611-950(Y)	XISTOR,PNP R
684	Q305	5613-1815L(GR)	XISTOR,NPN R
684	Q306	5613-1815L(GR)	XISTOR,NPN R
682	Q307	5611-1015L(GR)	XISTOR,PNP R
682	Q308	5611-1015L(GR)	XISTOR,PNP R
681	Q309	5611-950(Y)	XISTOR,PNP R
681	Q310	5611-950(Y)	XISTOR,PNP R
684	Q311	5613-1815L(GR)	XISTOR,NPN R
684	Q312	5613-1815L(GR)	XISTOR,NPN R
684	Q313	5613-1815L(GR)	XISTOR,NPN R
684	Q314	5613-1815L(GR)	XISTOR,NPN R
681	Q315	5611-950(Y)	XISTOR,PNP R
681	Q316	5611-950(Y)	XISTOR,PNP R
686	Q317	5616-SK246GR2	FET,N-CH
686	Q318	5616-SK246GR2	FET,N-CH
683	Q319	5611-A114ES	XISTOR,PNP R
686	Q601	5616-SK246GR2	FET,N-CH
686	Q602	5616-SK246GR2	FET,N-CH
771	Q901	5611-A143ES	XISTOR,PNP R

**DIODES**

506	△ D1	5632-S5566B	DIODE,RECT
506	△ D2	5632-S5566B	DIODE,RECT
506	△ D3	5632-S5566B	DIODE,RECT
506	△ D4	5632-S5566B	DIODE,RECT
506	△ D5	5632-S5566B	DIODE,RECT
506	△ D6	5632-S5566B	DIODE,RECT
508	△ D7	5635-HZ582	DIODE,ZENER
507	D8	5635-HZ27-2	DIODE,ZENER
506	△ D9	5632-S5566B	DIODE,RECT
506	△ D10	5632-S5566B	DIODE,RECT
749	D41	5636-1S2473	DIODE,SWITCH

Ser. No.	Ref. No.	Part No.	Description
751	△ D42	5635-HZ7B2L	DIODE,ZENER
749	D43	5636-1S2473	DIODE,SWITCH
748	D44	5636-1SS133	DIODE,SWITCH
541	D103	5636-1SS133	DIODE,SWITCH
540	D106	5636-1S2473	DIODE,SWITCH
689	D601	5636-1S2473	DIODE,SWITCH
689	D602	5636-1S2473	DIODE,SWITCH

**TRANSFORMERS**

861A	△ T1	5584-T1701	XFORMER,POWER (Model:HD7325)
861	△ T1	5584-T1702	XFORMER,POWER (Model:HD7325/7225A)

**CONTROLS**

578	VR101	5101-22301934	RES,SEMI FIX 22K
577	VR102	5101-50201934	RES,SEMI FIX 5K

**MISCELLANEOUS**

882	CN103	4443-040185	CONNECTOR, 4 PIN
876	CN201	4443-05501029	CONNECTOR, 29 PIN
868	△ F1	5732-01601121	FUSE, T125mA/T125mA 250V
867	△ HF1	4472-04901	FUSE HOLDER, F1
867	△ HF2	4472-04901	FUSE HOLDER, F1
872	△ J301	4489-04003002	MLT PIN JACK, OUTPUT LEFT/RIGHT
874	J901	4451-00184	1P PIN JACK, REMOTE IN
874	J902	4451-00184	1P PIN JACK, REMOTE OUT
891	JL101	4242-R0107181	JUMPER LEAD
892	JL103	4242-R0504451	JUMPER LEAD
884	LCN113	4163-S5305121	CONNECTOR W/W
886	LCN114	4163-01526008	CONNECTOR W/W
887	LCN115	4163-01527008	CONNECTOR W/W
885	LCN117	4163-S5306800	CONNECTOR W/W
896	LUG1	4211-4	LUG, W-1
896	LUG2	4211-4	LUG, C15
774	PH901	5624-PC817	PHOTO COUPLR
646	RC250	5212-S0305103	R COMPOSITE, 10K X5
865	△ TM1	4214-245	TERMINAL, AC CORD
865	△ TM2	4214-245	TERMINAL, AC CORD
866	TP101	4214-132	TERMINAL, TEST PIN
866	TP102	4214-132	TERMINAL, TEST PIN
866	TP104	4214-132	TERMINAL, TEST PIN
866	TP201	4214-132	TERMINAL, TEST PIN
866	TP202	4214-132	TERMINAL, TEST PIN
866	TP203	4214-132	TERMINAL, TEST PIN
889	W101	4141-00158291	1C SHIELD WIRE (Model:HD7325)
888	W401	4163-0122020	CONNECTOR W/W
653	X701	5691-S0901343	XTAL,QSC, 33.8688MHz
158		2240-Z021	HOLDER, W-101 (Model:HD7325)

**PCB-2 FRONT P.C. BOARD**

**CAPACITORS**

833	C401	5345-106F0962	CAP,MINI ELE 10U/50V
835	C402	5354-104J1HM	CAP,MYL .1U
833	C403	5345-106F0962	CAP,MINI ELE 10U/50V
850	C404	5345-107B0962	CAP,MINI ELE 100U/10V
837	C405	5361-471KB	CAP,CER 470P
837	C406	5361-471KB	CAP,CER 470P
835	C407	5354-104J1HM	CAP,MYL .1U
835	C408	5354-104J1HM	CAP,MYL .1U

**RESISTORS**

858	R401	5135-220J50P	RES,CBN 1/2P 22
854	R402	5134-102J25P	RES,CBN 1/4P 1K
852	R403	5134-100J25P	RES,CBN 1/4P 10
855	R404	5134-103J25P	RES,CBN 1/4P 10K
855	R405	5134-103J25P	RES,CBN 1/4P 10K
855	R406	5134-103J25P	RES,CBN 1/4P 10K
855	R407	5134-103J25P	RES,CBN 1/4P 10K
856	R408	5134-220J25P	RES,CBN 1/4P 22
853	R409	5134-221J25P	RES,CBN 1/4P 220

Ser. No.	Ref. No.	Part No.	Description
<b>INTEGRATED CIRCUIT</b>			
831	IC401	5654-M957-243	IC,DIGITAL
<b>DIODES</b>			
848	D401	5636-1S2473	DIODE,SWITCH
848	D402	5636-1S2473	DIODE,SWITCH
848	D403	5636-1S2473	DIODE,SWITCH
848	D404	5636-1S2473	DIODE,SWITCH
848	D405	5636-1S2473	DIODE,SWITCH
848	D406	5636-1S2473	DIODE,SWITCH
848	D407	5636-1S2473	DIODE,SWITCH
848	D408	5636-1S2473	DIODE,SWITCH

<b>MISCELLANEOUS</b>			
877	CN401	4443-05401029	CONNECTOR, 29 PIN
841	FL401	5722-062	TUBE DISPLAY
843	RCV401	6143-00802	RECEIVER UNIT (Model:HD7325)
845	SW401	4437-01201	SWITCH,PU-TC, OPEN/CLOSE
845	SW402	4437-01201	SWITCH,PU-TC, PLAY
845	SW403	4437-01201	SWITCH,PU-TC, PAUSE
845	SW404	4437-01201	SWITCH,PU-TC, STOP
845	SW405	4437-01201	SWITCH,PU-TC, R.SKIP
845	SW406	4437-01201	SWITCH,PU-TC, F.SKIP
845	SW407	4437-01201	SWITCH,PU-TC, R.SERACH
845	SW408	4437-01201	SWITCH,PU-TC, F.SERACH
846	SW409	4437-01202	SWITCH,PU-TC, DISPLAY
846	SW410	4437-01202	SWITCH,PU-TC, TIME
845	SW411	4437-01201	SWITCH,PU-TC, REPEAT
846	SW412	4437-01202	SWITCH,PU-TC, PROGRAM

**PCB-3 POWER SWITCH P.C. BOARD**

<b>MISCELLANEOUS</b>			
870	△ SW1	4431-S2202102	PUSH SWITCH, POWER

**PCB-4 DIGITAL OUTPUT P.C. BOARD (Model:HD7325)**

<b>CAPACITORS</b>			
811	C803	5361-560JCH	CAP,CER 56P (Model:HD7325)
807	C804	5345-336C0962	CAP,MINI ELE 33U/16V (Model:HD7325)
814	C806	5354-104J1HM	CAP,MYL .1U (Model:HD7325)
<b>RESISTORS</b>			
818	R801	5134-750J25P	RES,CBN 1/4P 75 (Model:HD7325)
823	R809	5232-101J16P	RES,CBN 1/6P 100 (Model:HD7325)
<b>MISCELLANEOUS</b>			
873	△ J801	4481-00501	1P PIN JACK, DIGITAL OUT (Model:HD7325)
895	LUG3	4211-4	LUG, W-3 (X2) (Model:HD7325)
895	LUG4	4211-4	LUG, W-3 (X2) (Model:HD7325)
160		2240-Z042	HOLDER, JL103 (Model:HD7325)
<b>COIL</b>			
804	T801	5933-S0801	COIL CASE,10 (Model:HD7325)

**CHASSIS MISCELLANEOUS**

<b>MISCELLANEOUS</b>			
893	△ JL401	4242-S0329161	JUMPER LEAD
863A	△ P1	4161-03601202	CORD W/PLUG, AC CORD (Model:HD7325) <b>BK</b>
863	△ P1	4161-03701220	CORD W/PLUG, AC CORD (Model:HD7325/7225A) <b>IB I</b>

**PACKING PARTS LIST**

Ser. No.	Ref. No.	Part No.	Description
021A		1119-05301	ATTACH SHEET, UL SAFETY (Model:HD7325) <b>BK</b>
022A		1113-02501	OWNER CARD, REPLY CARD (Model:HD7325) <b>BK</b>
023A		1119-04502	ATTACH SHEET, SERVICE SHOP GUIDE (Model:HD7325) <b>BK</b>
024A		1116-03802	GUARANTY CARD, WARRANTY (Model:HD7325) <b>BK</b>
030B		1756-23601	LABEL, CHAMPAGNE <b>I</b>
105A		1111-1200M152	OWNER GUIDE, IB (Model:HD7325) <b>BK</b>
105		1111-1430M152	OWNER GUIDE, IB (Model:HD7325) <b>IB I</b>
105		1111-1430M152	OWNER GUIDE, IB (Model:HD7225A) <b>IB I</b>
114		1221-31802	CARTON BOX (Model:HD7325)
114		1221-31805	CARTON BOX (Model:HD7225A)
115		1222-7394	CUSHION, R
116		1222-7393	CUSHION, L
117		1223-R0420055	SOFT SHEET, FRONT
118		1223-00207018	SOFT SHEET, CD LID
119		1241-R0160601	POLYETHY BAG, SET
120		1241-R0123351	POLYETHY BAG, IB
145		1756-03108	LABEL, (I) LABEL, CARTON BOX (X2) <b>IB I</b>
864		4161-04602102	CORD W/PLUG, RCA CORD
900		6142-07802	REMOTE CONTROL ASSY (Model:HD7325)
901		1135-00301	ACCESSORY BAT (Model:HD7325)

**ABBREVIATIONS IN PARTS LIST**

**CAPACITORS**

CAP, MINI ELE	: Electrolytic
CAP, CER	: Ceramic
CAP, PPP	: Polypropylene
CAP, MYL	: Mylar
CAP, MCA	: Mica
CAP, MINI BP	: Bipolar
CAP, ELE BP	: Electrolytic Bipolar
470U	: 470µF
6800P	: 6800pF
.047U	: 0.047µF

**RESISTORS**

RES, CBN 1/6P	: Carbon 1/6W
RES, FUSE	: Fuse
RES, CEM 5P	: Cement 5W
RES, MTL 1P	: Metal 1W
2.2K	: 2.2kΩ
220	: 220Ω

**TRANSISTORS**

XISTOR	: Transistor
FET	: Field Effect Transistor

**CONTROLS**

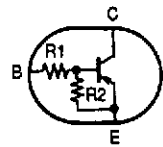
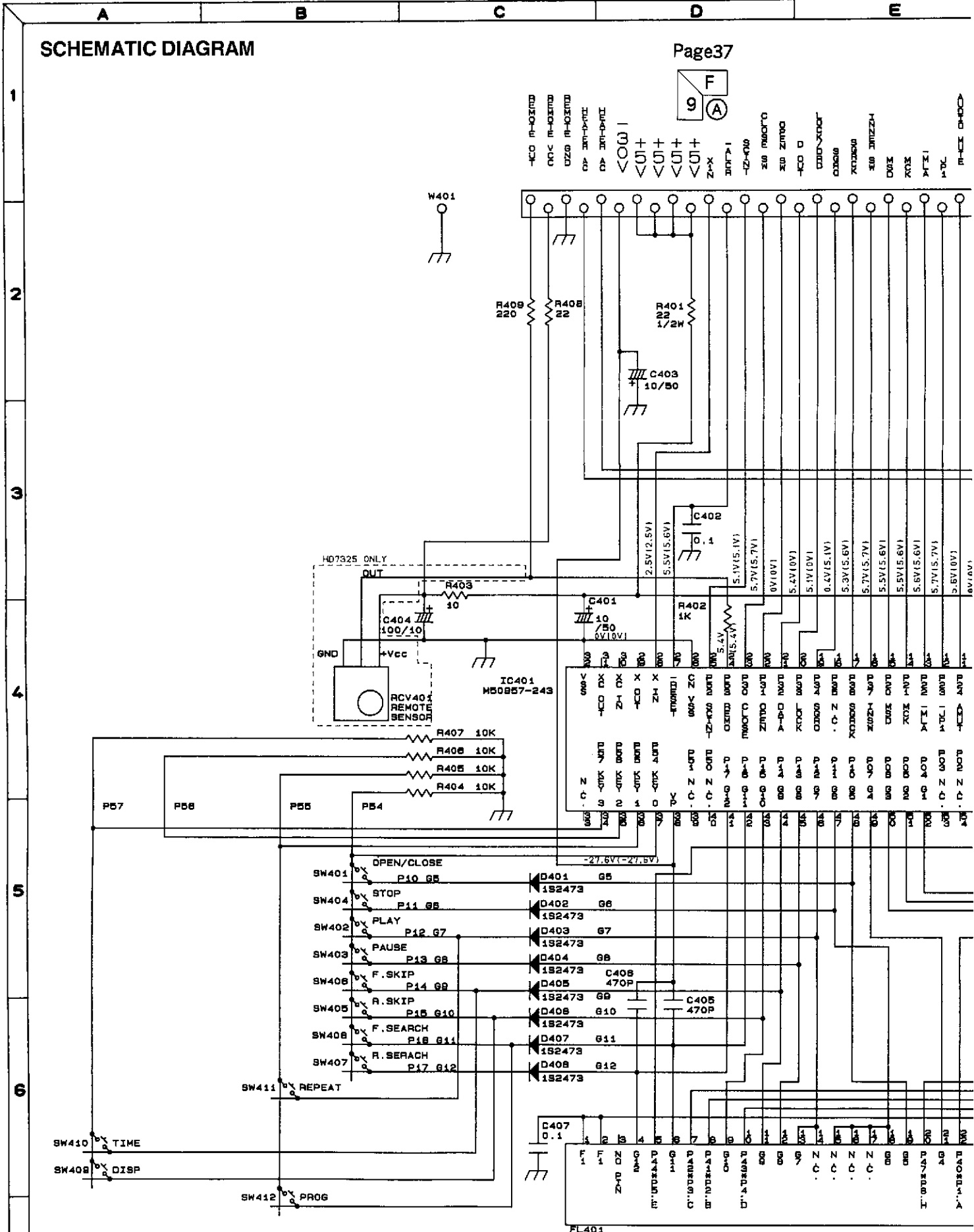
RES, SEMI FIX	: Semi-fixed Resistor
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**NOTE**



SAFETY RELATED COMPONENT. USE ONLY EXACT REPLACEMENT PART AS SPECIFIED.

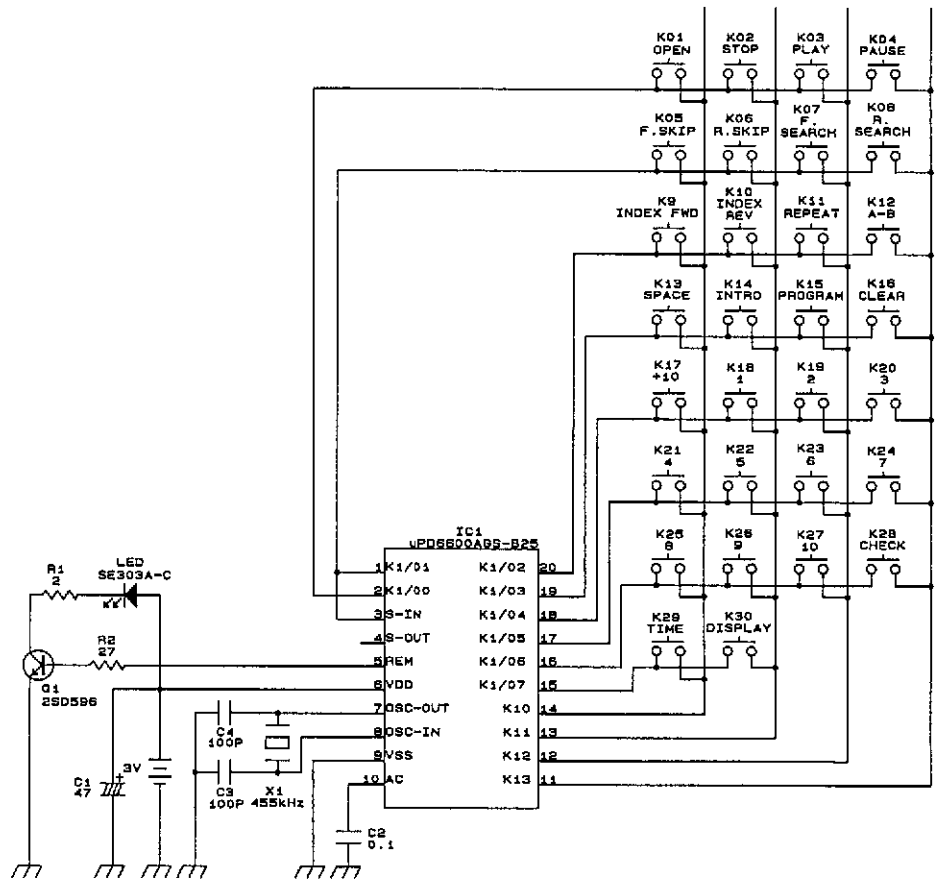
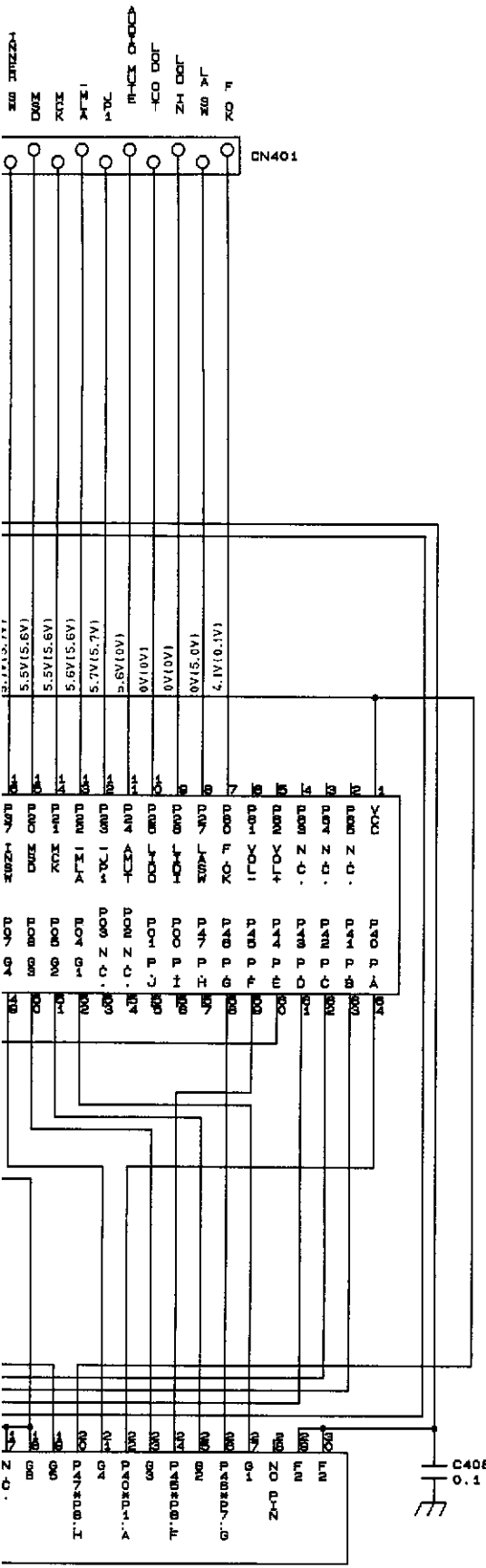
**SCHEMATIC DIAGRAM**



Type	R1	R2
DTA143ES	4.7k	4.7k
DTA114ES	10k	10k

- NOTE:**
1. ALL RESISTANCES VALUES ARE IN Ω.  
KΩ=1000Ω, MΩ=1000KΩ.
  2. ALL CAPACITANCES VALUE ARE IN μF
  3. ... V : DC VOLTAGE AT PLAY MODE.  
(... V): DC VOLTAGE AT STOP MODE.
  4. SAFETY REQUIREMENTS COMP  
SAFETY REGULATIONS, THESE BY ORIGINAL PARTS.

# INFRA-RED REMOTE CONTROL SCHEMATIC DIAGRAM



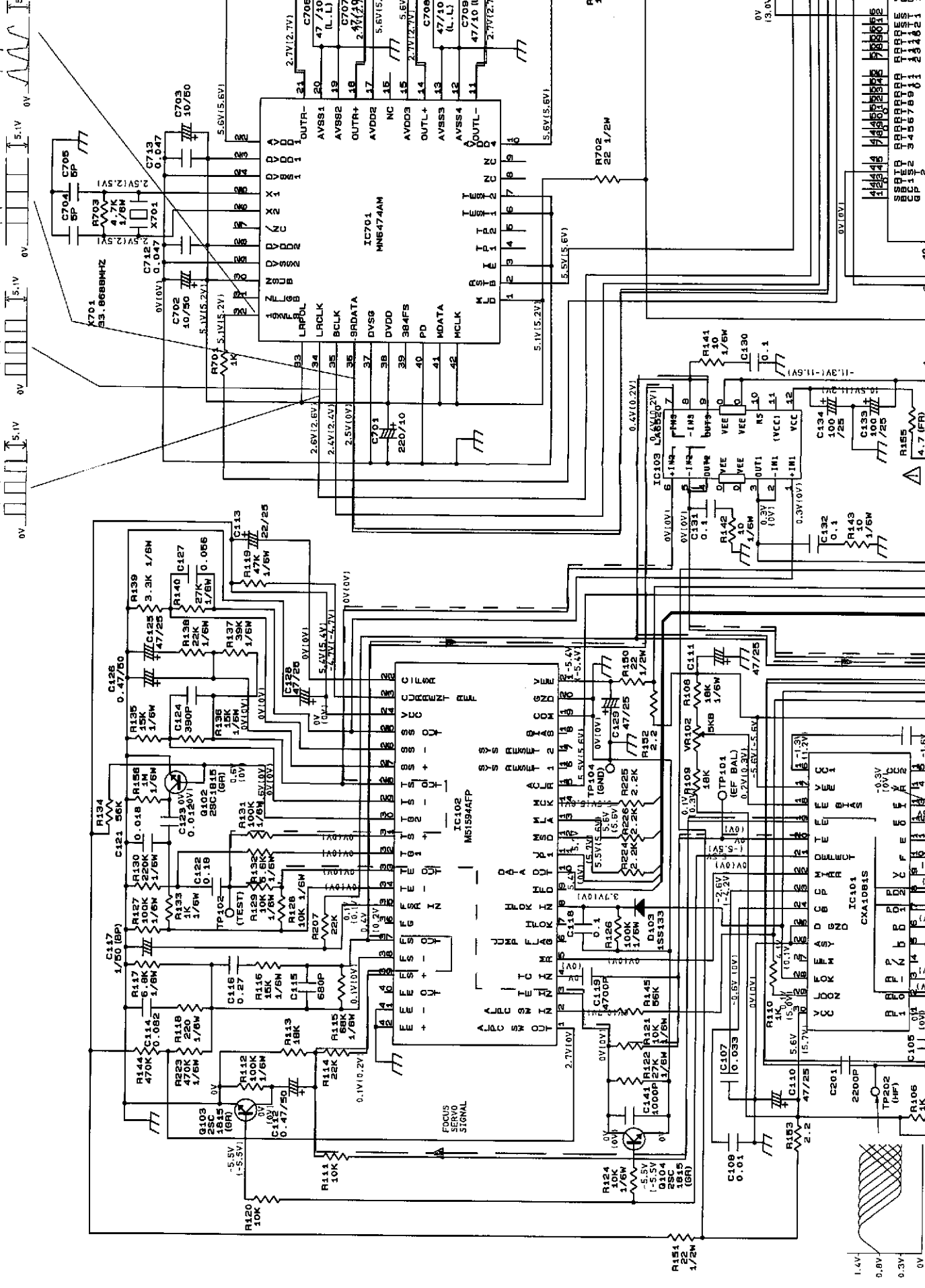
NOTE : Infrared Remote Control parts not available.  
Schematic diagram supplied for reference only.

VALUES ARE IN Ω.  
K=1000Ω.  
K VALUE ARE IN µF UNLESS OTHERWISE NOTED. P=µµF.  
S= AT PLAY MODE.  
S= AT STOP MODE.  
REQUIREMENTS COMPONENTS IN ACCORDANCE WITH PRESENT  
SOLUTIONS, THESE COMPONENTS MUST ONLY BE REPLACED  
WITH ORIGINAL PARTS.



# SCHEMATIC DIAGRAM

A B C D E F G

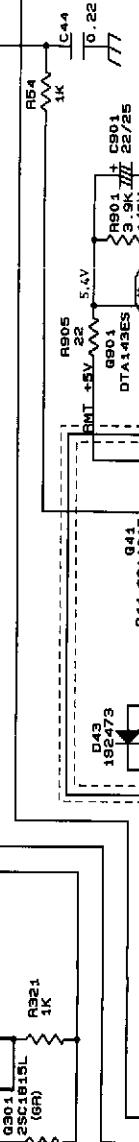
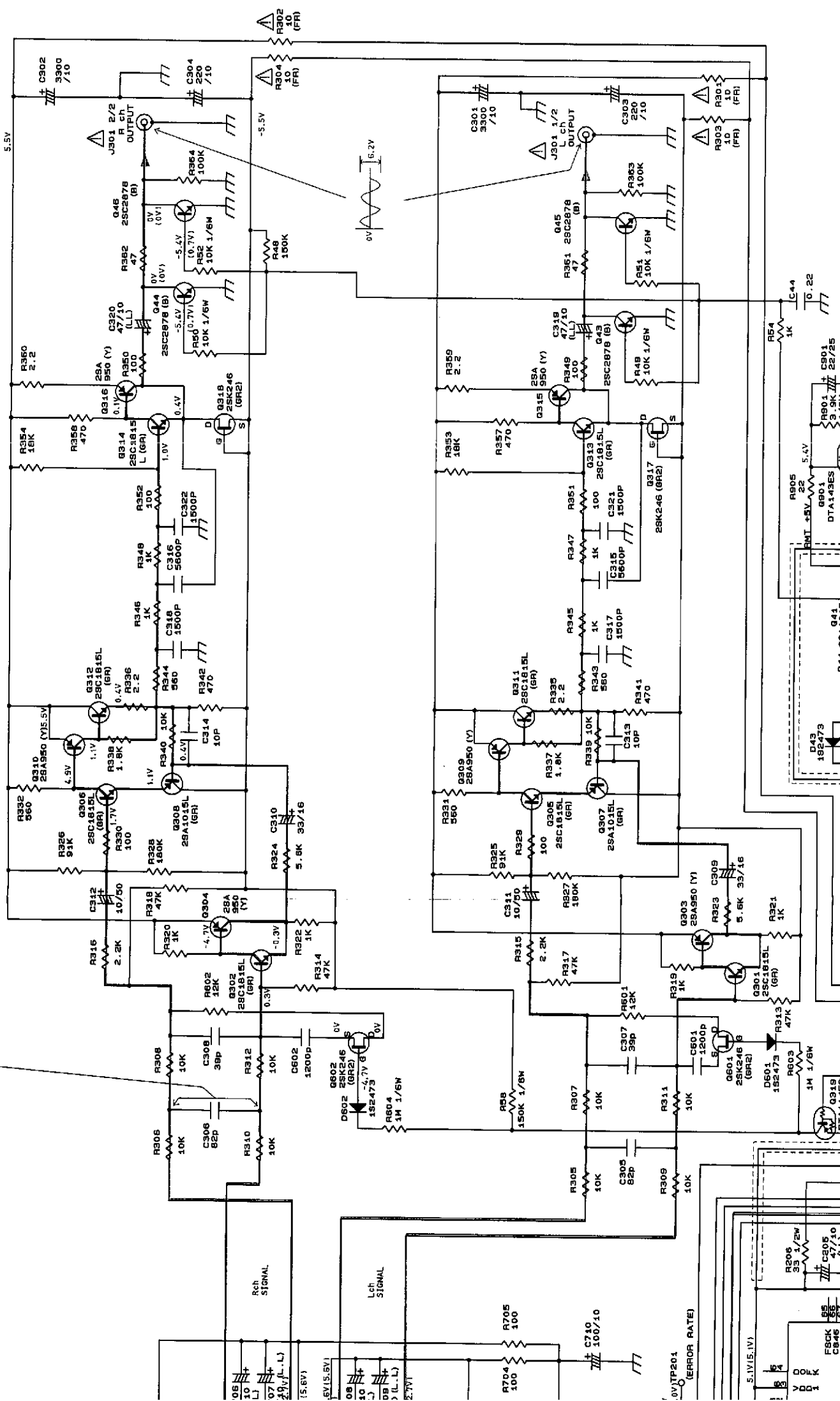


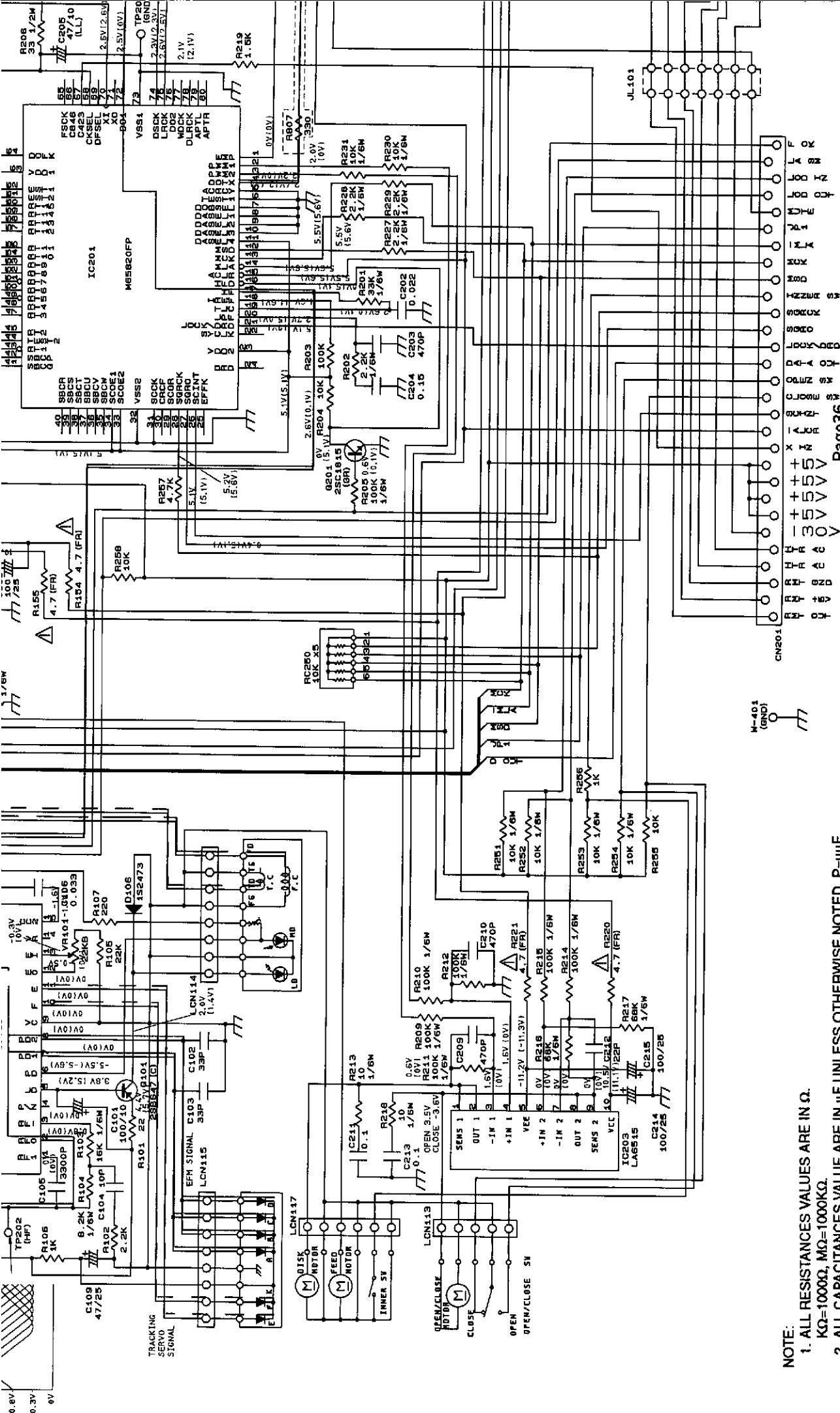
1 2 3 4 5

H I J K L M N

5.1V

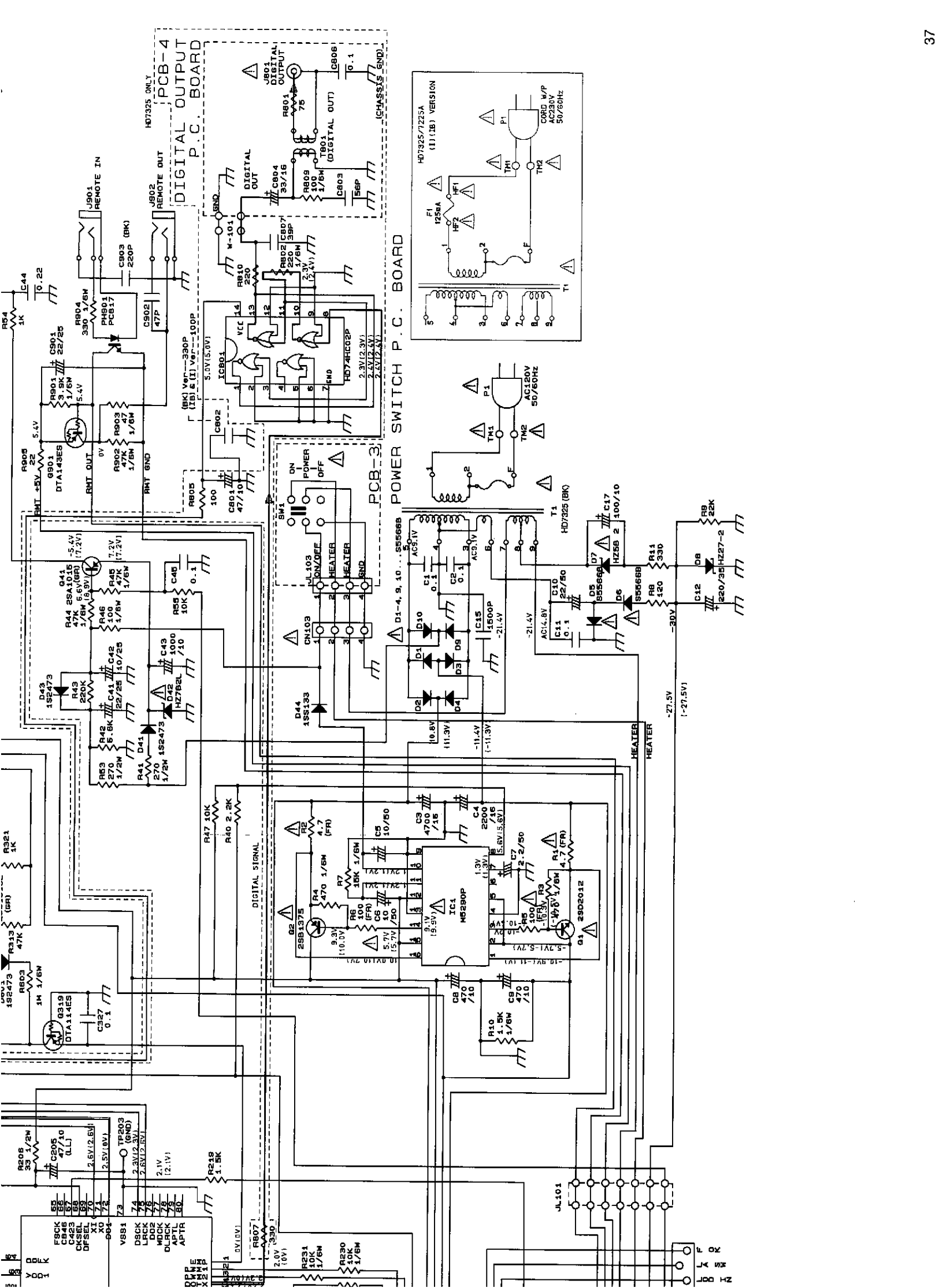
1.5V  
0V  
2.2V





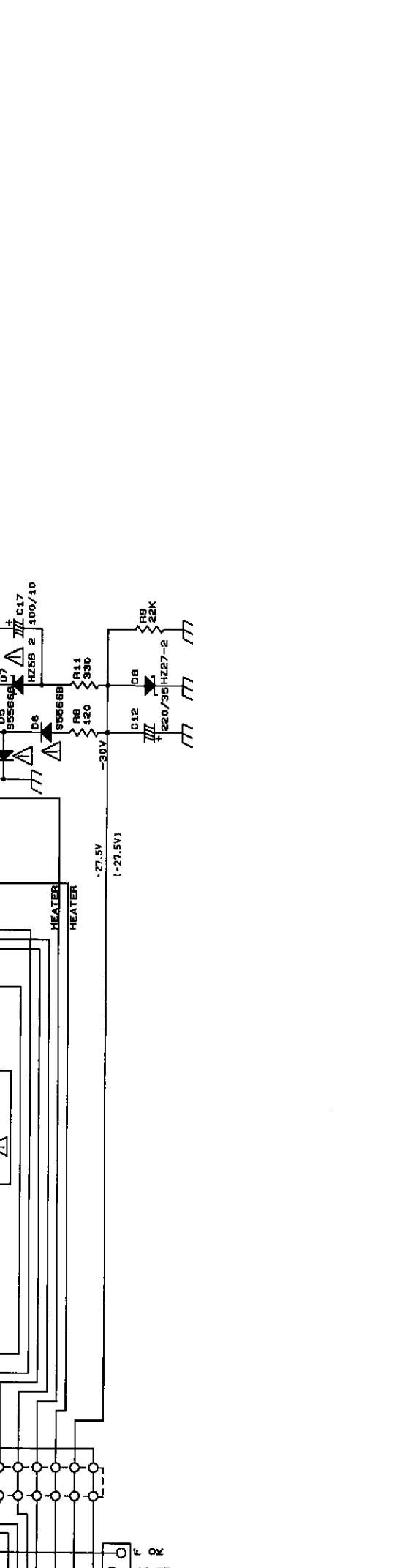
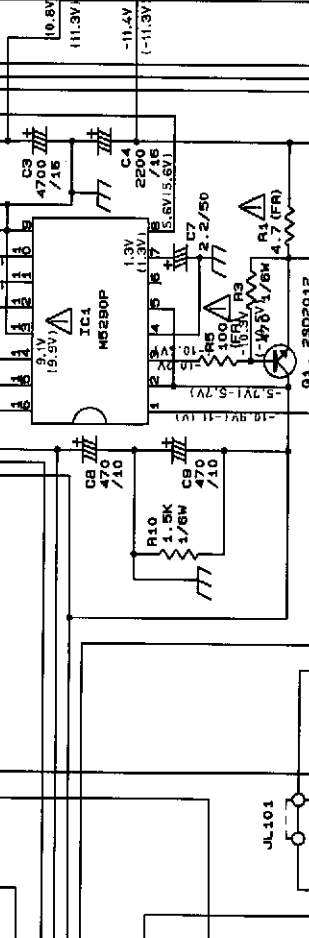
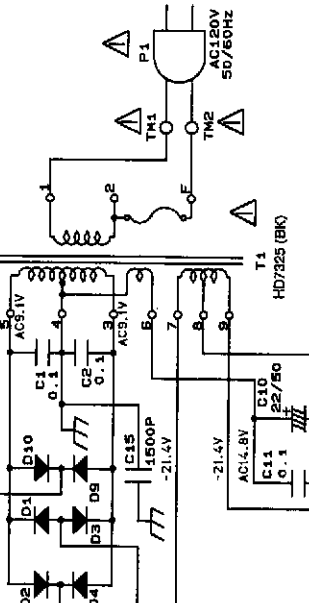
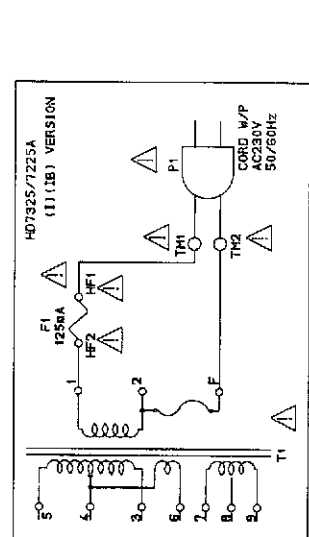
- NOTE:**
1. ALL RESISTANCE VALUES ARE IN  $\Omega$ .  
K $\Omega$ =1000 $\Omega$ , M $\Omega$ =1000K $\Omega$ .
  2. ALL CAPACITANCE VALUES ARE IN  $\mu$ F UNLESS OTHERWISE NOTED. P= $\mu$ F.
  3. ... V : DC VOLTAGE AT PLAY MODE.  
(... V) : DC VOLTAGE AT STOP MODE.
  4. SAFETY REQUIREMENTS COMPONENTS IN ACCORDANCE WITH PRESENT SAFETY REGULATIONS, THESE COMPONENTS MUST ONLY BE REPLACED BY ORIGINAL PARTS.





PCB-4  
DIGITAL OUTPUT  
P.C. BOARD

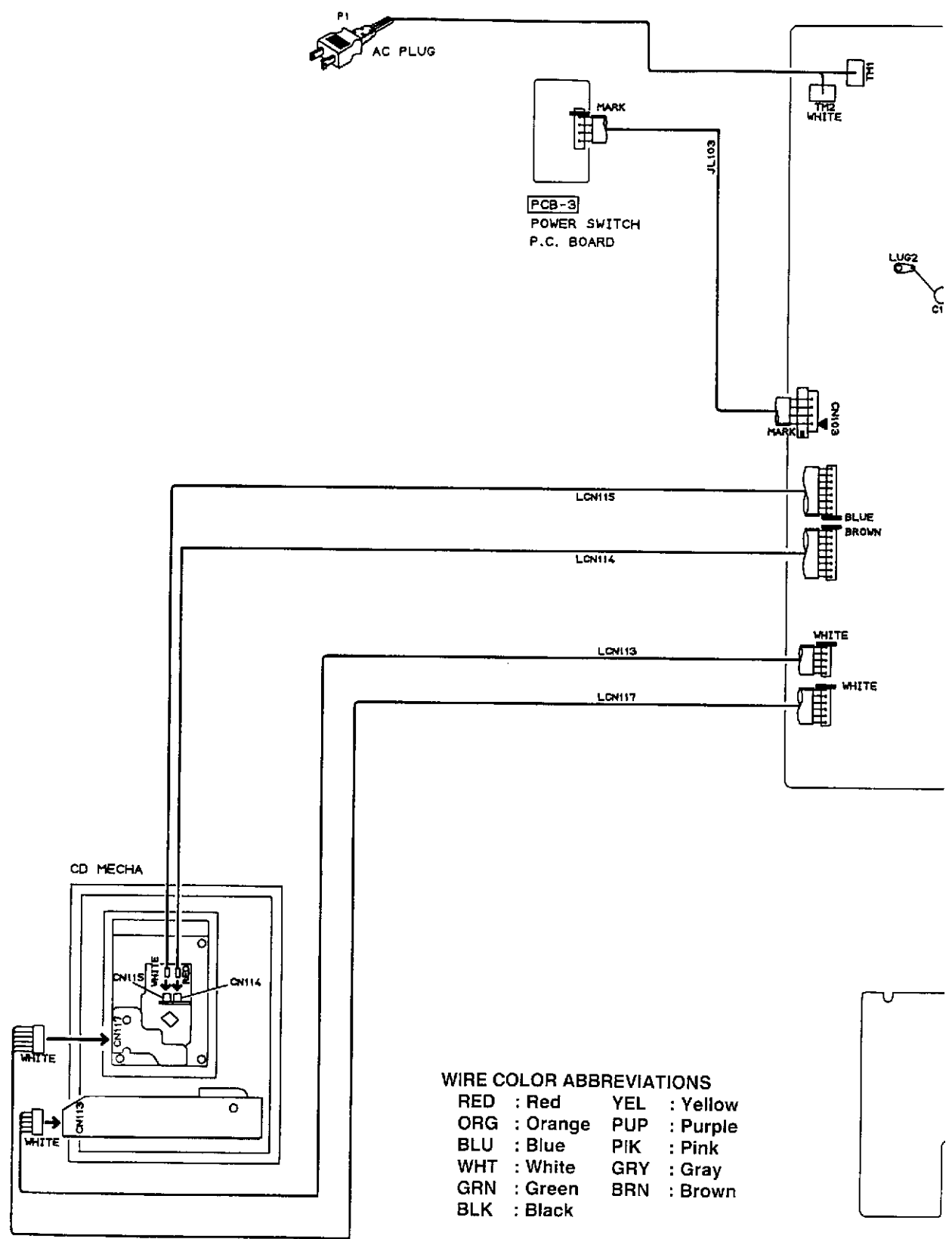
PCB-3  
POWER SWITCH P.C. BOARD



# WIRING DIAGRAM

A B C D E

1  
2  
3  
4  
5  
6  
7



- WIRE COLOR ABBREVIATIONS**
- |              |              |
|--------------|--------------|
| RED : Red    | YEL : Yellow |
| ORG : Orange | PUP : Purple |
| BLU : Blue   | PIK : Pink   |
| WHT : White  | GRY : Gray   |
| GRN : Green  | BRN : Brown  |
| BLK : Black  |              |

F

G

H

I

J

