

# The Harman Kardon Model HD300

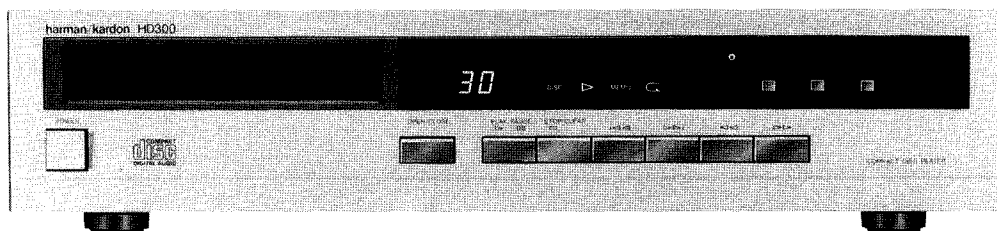
---

## COMPACT DISC PLAYER

Manual 109A

HD300

# Technical Manual



### CLASS 1 LASER PRODUCT

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

**DANGER**—invisible laser radiation when open 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.

**CLASS 1  
LASER PRODUCT**

**harman/kardon**

240 Crossways Park West, Woodbury, N.Y. 11797  
1112-3152109A3 P-088610 1500 Printed in Japan

**TABLE OF CONTENTS**

SPECIFICATIONS ..... 2  
 SAFETY PRECAUTIONS ..... 3  
 CONTROLS AND FUNCTIONS ..... 5  
 REMOTE CONTROL ..... 6  
 DISASSEMBLY PROCEDURES ..... 7  
 DISASSEMBLING THE CD PLAYER MECHANICAL ASSEMBLY ..... 8  
 POWER CORD REPLACEMENT ..... 8  
 BLOCK DIAGRAM ..... 9  
 ADJUSTMENT PROCEDURE ..... 10  
 INSTALLATION OF DISC DRAWER AND CLAMPER ..... 16  
 TROUBLE SHOOTING ..... 17  
 IC BLOCK DIAGRAM ..... 26  
 GENERAL UNIT EXPLODED VIEW ..... 28  
 CD PLAYER MECHANISM EXPLODED VIEW ..... 29  
 GENERAL UNIT PARTS LIST ..... 30  
 CD PLAYER MECHANISM PARTS LIST ..... 30  
 ELECTRICAL PARTS LIST ..... 31  
 PACKAGE ..... 33  
 P. C. BOARDS ..... 34  
 WIRING DIAGRAM ..... 36  
 SCHEMATIC DIAGRAM ..... 37

**SPECIFICATIONS**

System : Compact Disc Digital Audio  
 Signal Detection : 3-Beam Semiconductor Laser  
 Error Correction : CIRC System  
 Sampling Frequency (Disc) : 44.1kHz  
 D/A Conversion Frequency : 88.2kHz  
 Quantization : 16 Bit Linear  
 Channels : 2 Channel Stereo  
 Frequency Response : 4Hz—20kHz ±0.5dB  
 Total Harmonic Distortion : 0.01% (1kHz)  
 Dynamic Range : 100dB  
 Signal-to-Noise Ratio : 98dB  
 Channel Separation : 80dB (1kHz)  
 Wow & Flutter : Immeasurable  
 Line Output Level/ Load Impedance : 2.0V/10k Ohms

Power Supply  
 General model : AC 220/240V, 50/60Hz  
 Canada model : AC 120V, 60Hz  
 Power Consumption : 18 Watts  
 Dimensions (W × H × D) : 17-1/2" × 4-1/16" × 11-1/2"  
 (443 × 103 × 285 mm)  
 Weight : 10.2lbs. (4.6kg)  
 Accessories : Stereo Connecting Cords,  
 Remote Control,  
 AA Battery ( × 2)

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

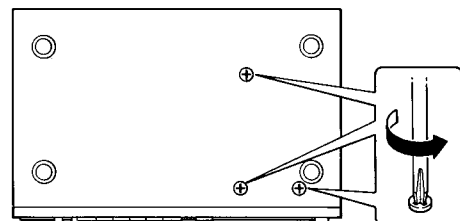
Adjustment of this unit requires following measuring instruments and jigs.

- Oscilloscope (3 or more modes, 100MHz, X-Y input possible) 1740A
- Dual Channel Voltmeter (ACVM) MN445B
- Distortion Meter 339A
- Frequency Counter FT-2752
- Optical Power Meter LPM8000
- Jitter Meter MJM-634
- Low Frequency Oscillator (A. F. OSC) 3312A
- Turntable Base Space Jig SJ-300
- Diffraction Grating Screwdriver SD-300
- Test Discs:
  - Philips Test Sample 5 814 125-2 (Non-Scratched)
  - Philips Test Sample 5A 814 126-2 (Scratched)
  - Sony Type III

**IMPORTANT**

Before plugging the unit in, be sure to remove the transportation screws on the bottom of the unit.

1. Place a cloth under the unit in order to prevent it from being scratched.
2. Turn the unit upside down.
3. Remove the three transportation screws with a screw driver, as shown in the illustration below.



**NOTE:** Be sure to tighten screws by the reverse procedure before transporting the unit.

**SAFETY PRECAUTIONS**

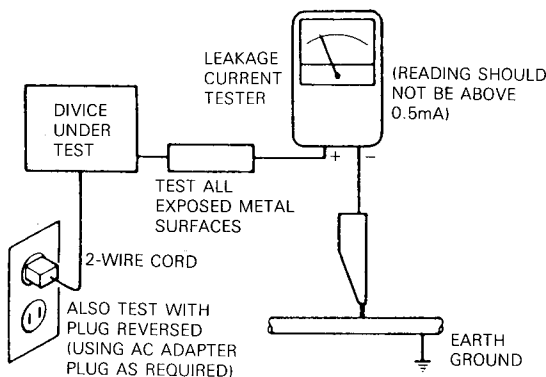
Before returning an instrument to the customer, always make a safety check of the entire instrument, including, but not limited to, the following items:

- 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.
- 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.

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

- 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.**

**AC Leakage Test**

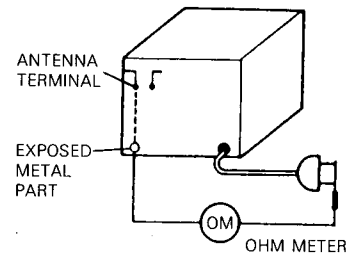


**d. Insulation Resistance Test**

- (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.

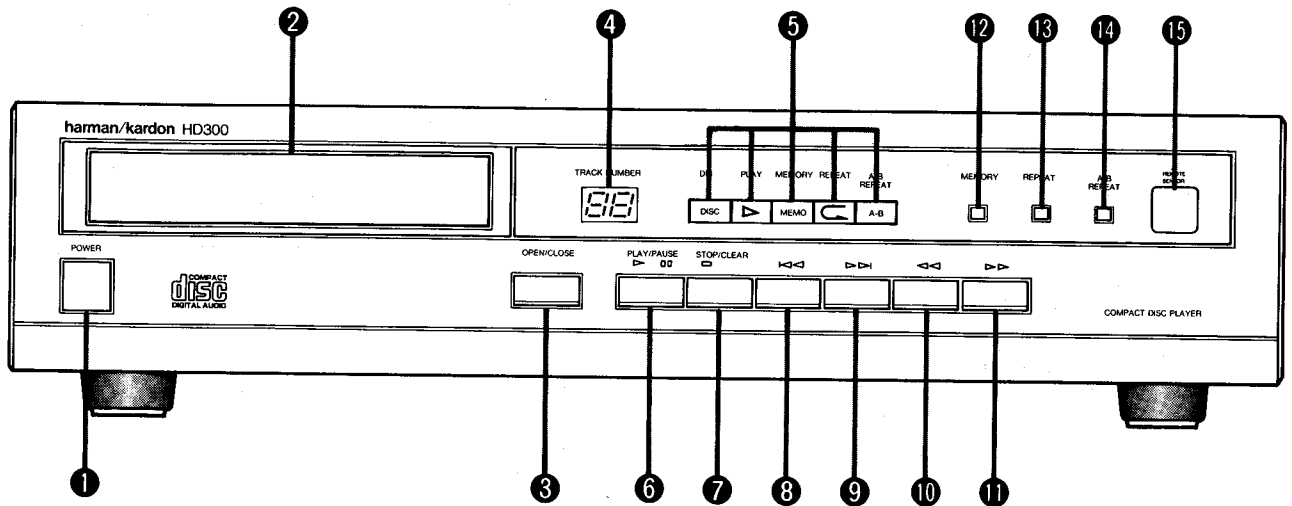
**Note 1:** Accessible Conductive Parts including Metal panels, Output jacks, etc.

## 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 field-effect 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

Pressing this switch will turn on the power. Press the switch again to turn the power off.

### 2 DISC TRAY

By pressing the "OPEN/CLOSE" button, the tray onto which the discs are loaded will slide out.

### 3 OPEN/CLOSE BUTTON

Press this button to open or close the DISC TRAY. Press it once to make the DISC TRAY slide out, and again to make the DISC TRAY slide in.

### 4 TRACK NUMBER DISPLAY

Displays the track number of the song being played or the song entered in the memory. Blinks during selection.

### 5 FUNCTION DISPLAY

**DISC** : Flashes when DISC TRAY is opened or closed. The indicator will light up when the disc has been correctly loaded and the unit is in the standby mode. It will continue to be lit during playback.

**▶** : Lights up during playback, blinks when in pause, goes out when in stop.

**MEMO** : Lights during memory playback, blinks when in memory programming.

**⌂** : Lights when repeat playback has been programmed.

**A-B** : Lights during repetition of one section of the disc.

### 6 PLAY/PAUSE BUTTON

Press this button to start playback. Pressing this button during playback activates the pause mode. Playback continues when this button is pressed again.

### 7 STOP/CLEAR BUTTON

Press this button to stop playing a disc or to cancel the pause mode. Press the button once again to erase the memory program.

### 8 ◀◀ BUTTON (PROGRAM SELECTION)

Pressing this button once skips playback backward to the beginning of the present program. Pressing it once more skips it to the beginning of the previous program, pressing it twice skips it to the beginning of the program before that, and so on.

### 9 ▶▶ BUTTON (PROGRAM SELECTION)

Pressing this button once skips playback forward to the beginning of the next program. Pressing it twice skips it to the beginning of the program after that, and so on.

### 10 ◀◀ BUTTON (REVERSE)

Pressing this button starts low speed reverse. Holding the button down longer than two seconds changes the reverse mode to high speed. Sound can be heard at a reduced level in this mode.

### 11 ▶▶ BUTTON (FAST-FORWARD)

Pressing this button starts low speed fast-forwarding. Holding the button down longer than two seconds changes the fast-forward mode to high speed. Sound can be heard at a reduced level in this mode.

### 12 MEMORY BUTTON

Used to program the memory for non-sequential playback of disc tracks. Up to 15 program selections can be stored in the memory.

### 13 REPEAT BUTTON

Pressing this button enables continuous repeat playback of the disc. Pressing this button again disables the repeat playback mode. Pressing this button while in memory playback repeats the programs stored in the memory.

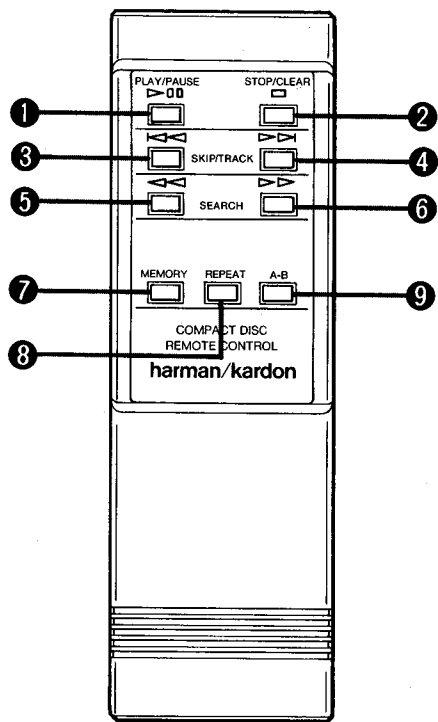
### 14 A-B REPEAT BUTTON

Pressing this button while in playback marks the start position for the repeat function. Pressing it again marks the finish position and restarts the playback from the start position.

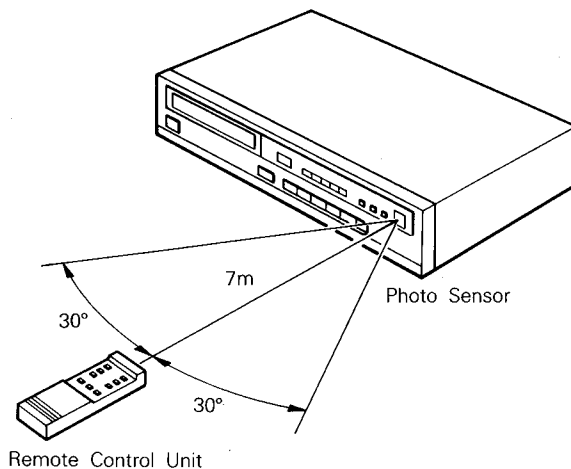
### 15 REMOTE CONTROL SENSOR

Receives signals from the supplied remote control unit.

## REMOTE CONTROL



Use the remote control unit within the range shown in the diagram below.



**NOTE:** When changing the batteries of the remote control, insert the batteries with their polarity aligned according to the diagram on the back of the battery case. 2 AA size (UM-3) batteries are recommended.

**1 PLAY/PAUSE BUTTON**

Refer to the main unit's Play/Pause Button section.

**2 STOP/CLEAR BUTTON**

Refer to the main unit's Stop/Clear Button section.

**3 ◀◀ BUTTON (PROGRAM SELECTION)**

Refer to the main unit's ◀◀ Button section.

**4 ▶▶ BUTTON (PROGRAM SELECTION)**

Refer to the main unit's ▶▶ Button section.

**5 ◀◀ BUTTON (REVERSE)**

Refer to the main unit's ◀◀ Button section.

**6 ▶▶ BUTTON (FAST-FORWARD)**

Refer to the main unit's ▶▶ Button section.

**7 MEMORY BUTTON**

Refer to the main unit's Memory Button section.

**8 REPEAT BUTTON**

Refer to the main unit's Repeat Button section.

**9 A-B REPEAT BUTTON**

Refer to the main unit's A-B Repeat Button section.

## DISASSEMBLY PROCEDURES

### 1. Removal of Cabinet Top (Fig. 1)

Remove screws (A), then lift and remove the Cabinet Top and shown in Fig. 1.

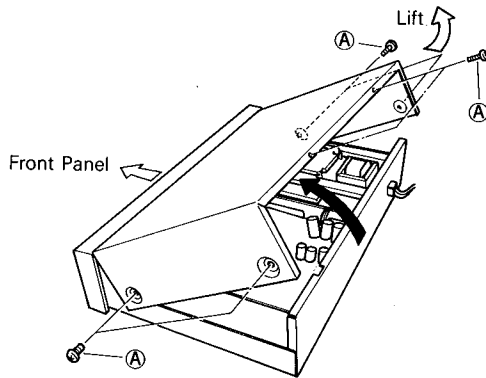


Fig. 1

### 2. Removal of Front Panel Assembly

Open the disc tray and remove the ornamental front piece. (Fig. 2)

Remove the Cabinet Top, the five screws fastening the Front Panel Assembly (two on top, three on bottom), then release the catches located on both sides of the chassis.

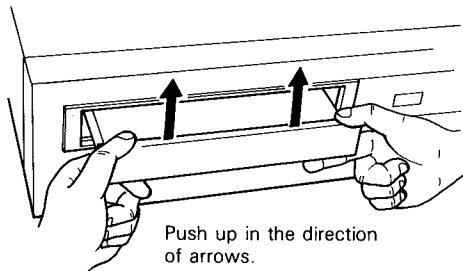


Fig. 2

### 3. Removal of Switches P. C. Board (PCB-3)

Remove the Front Panel Assembly, the one screw (B), and catches (C). (Fig. 3).

### 4. Removal of Main P. C. Board (PCB-1)

Remove the Cabinet Top and the three screws (D), support and screw (E) holding the output jack (Fig. 3).

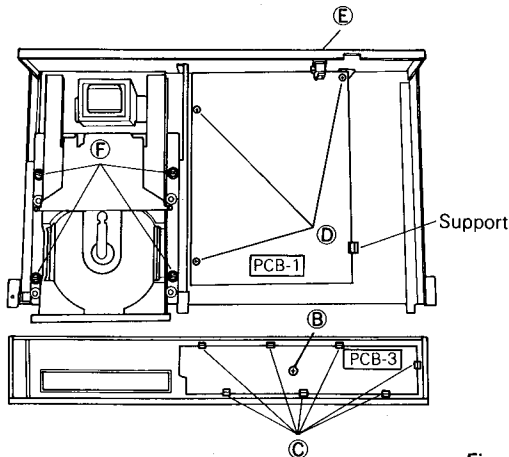


Fig. 3

### 5. Removal of CD Player Mechanical Assembly

Remove the Cabinet Top, the four screws (F), and the CN201 ~ CN206 connectors on the Main P. C. Board.

### 6. Removal of Servo P. C. Board (PCB-2)

Remove the Cabinet Top and Cabinet Bottom, six screws (G). (Fig. 4)

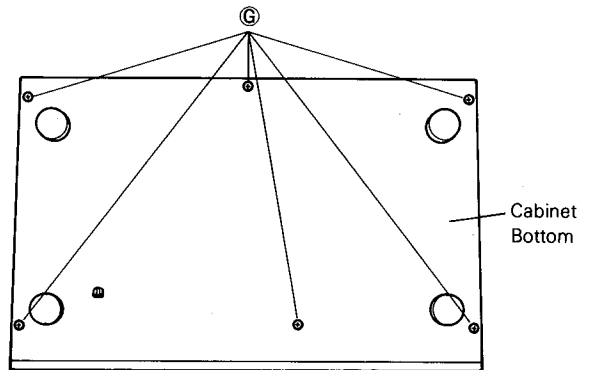


Fig. 4

Remove the CN201 ~ CN206 connectors on the Main P. C. Board, and remove the CN101 and CN102 connectors on the Servo P. C. Board.

Remove the hand-soldered circuit, six points (H) on the Servo P. C. Board. (Fig. 5).

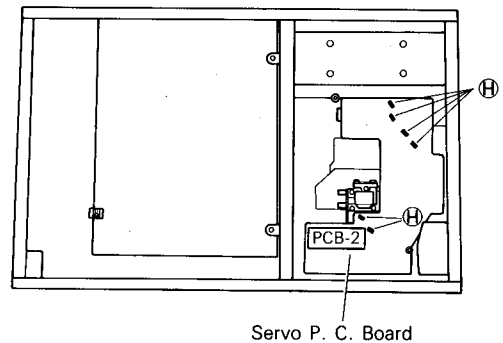


Fig. 5

## DISASSEMBLING THE CD PLAYER MECHANICAL ASSEMBLY

### 1. Removing the Clamper

Removing the two springs at (J) enables you to remove the Clamper. (Fig. 6)

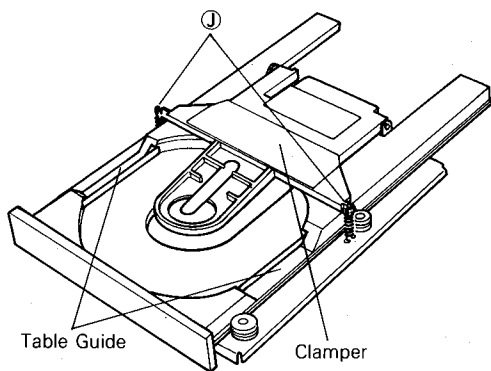


Fig. 6

### 2. Removing the Disc Tray

Straighten the two catches at (K) and pull out the Disc Tray.

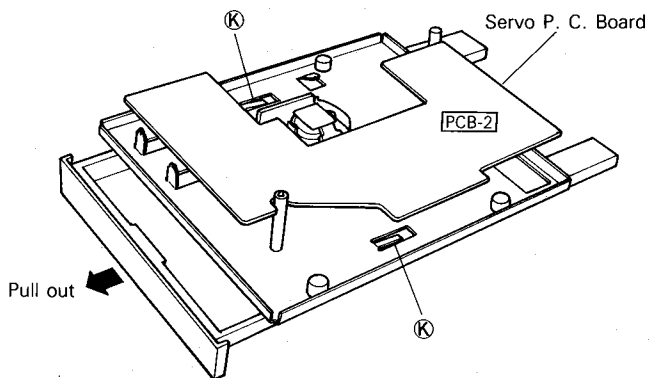


Fig. 7

### 3. Removing the Optical Pick-up

Remove the connector (CN101 and CN102) connected to the Servo P. C. Board. (Fig. 8)  
Remove the three screws located at (M) and the Optical Pick-up can be removed. (Fig. 8)

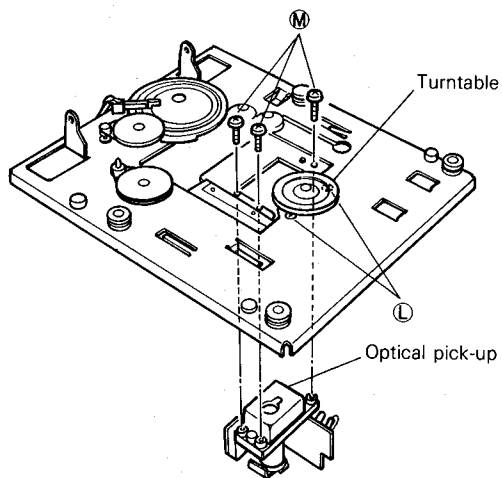


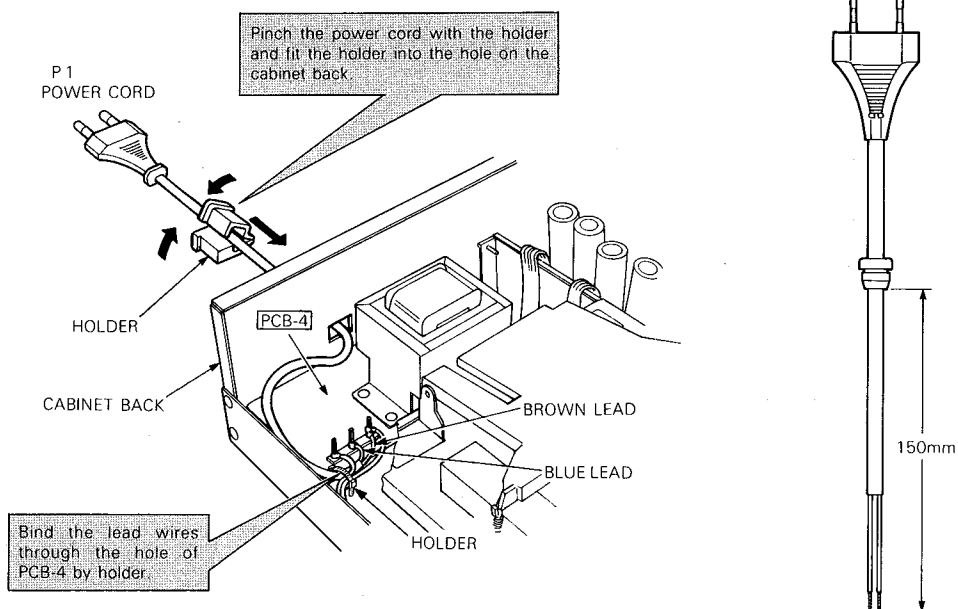
Fig. 8

### 4. Removal of Spindle Motor (Fig. 8)

Perform instructions 3 for removal of the Optical Pick-up. Loosen and remove the Turntable. Remove the two screws (L) to allow for removal of the Spindle Motor. (Use the turntable base spacer jig to set to the height of the turntable upon assembly.)

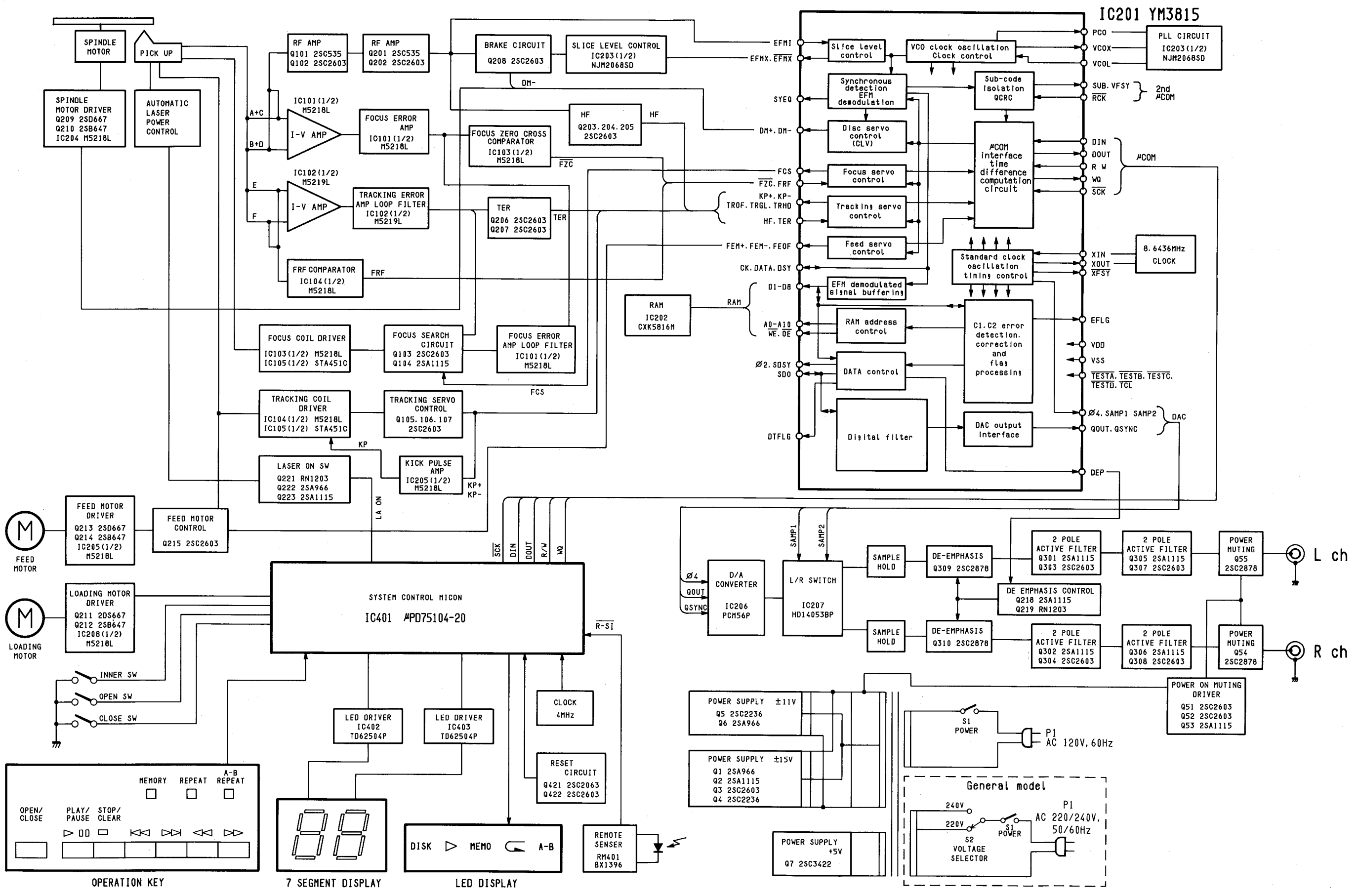
## POWER CORD REPLACEMENT (FOR SERVICE ENGINEERS OTHER THAN NORTH AMERICA)

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.

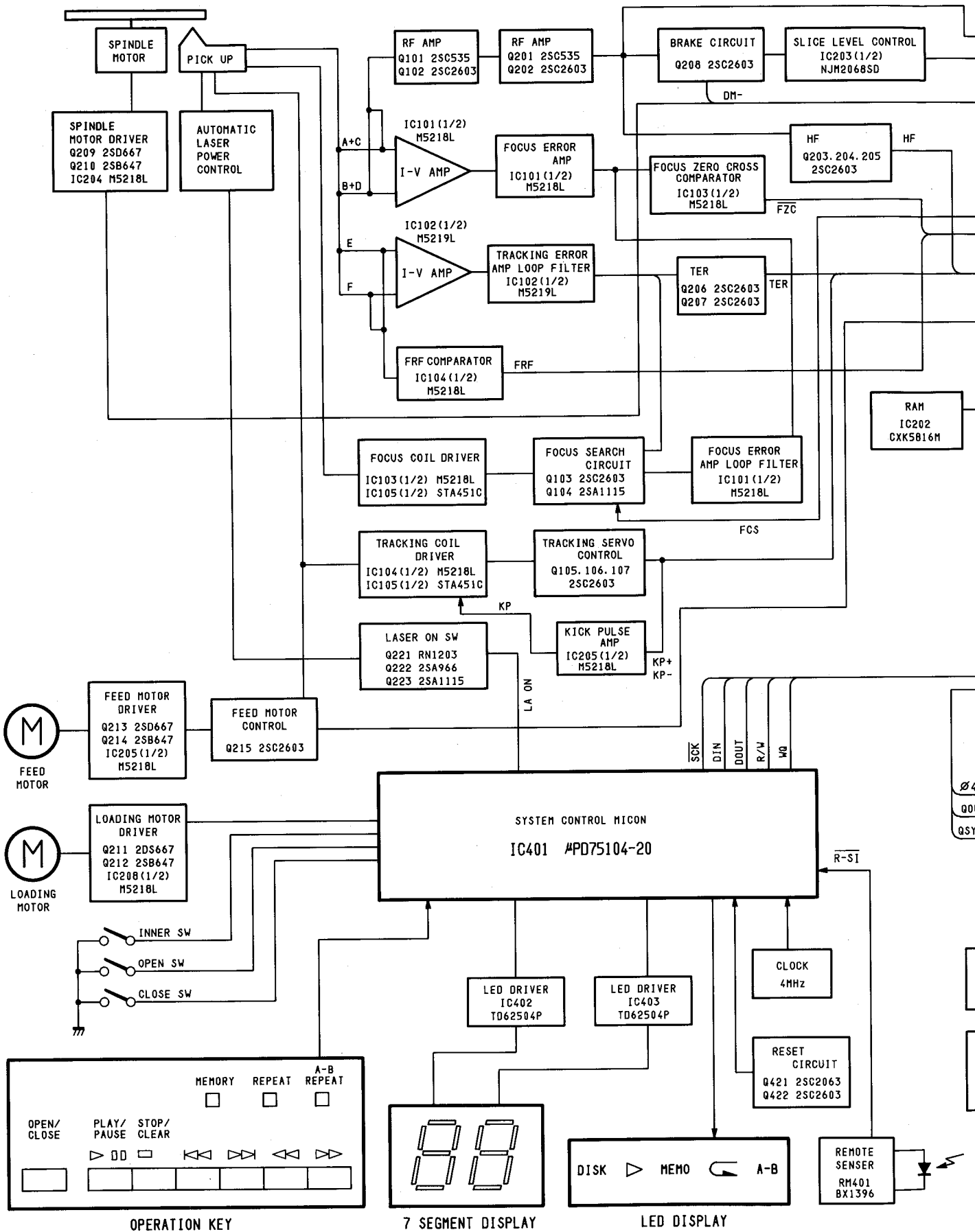


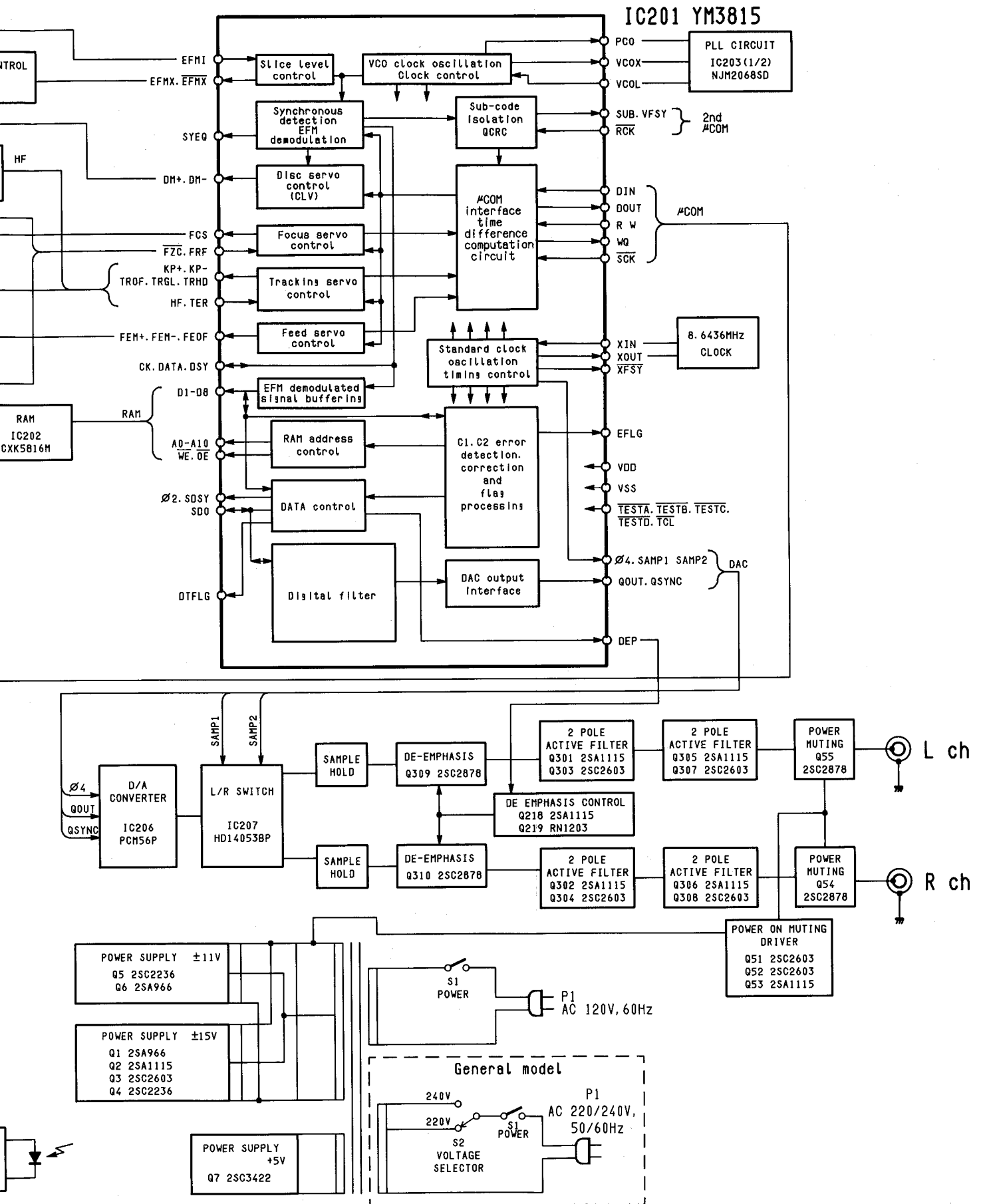


BLOCK DIAGRAM



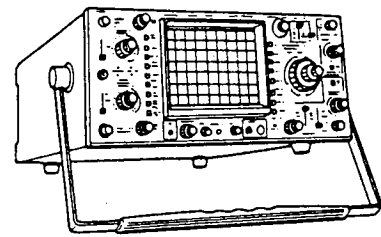
# BLOCK DIAGRAM





**ADJUSTMENT PROCEDURE**

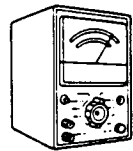
**1. Meters and Jigs**



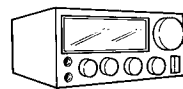
Oscilloscope (3 or more modes, 100MHz, X-Y input possible)



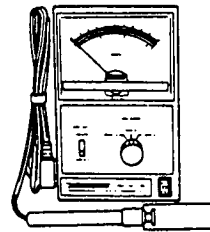
Dual Channel Voltmeter (ACVM)



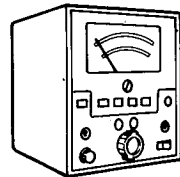
Distortion Meter



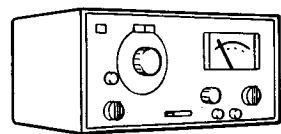
Frequency Counter



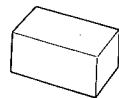
Optical Power Meter



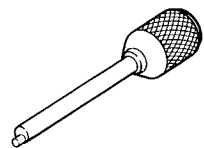
Jitter Meter



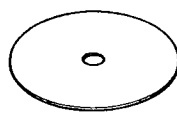
Low Frequency Oscillator (A. F. OSC)



Turntable Base Space Jig SJ-300



Diffraction Grating Screwdriver SD-300



Test Discs

- Philips Test Sample 5 814 125-2 (Non-Scratched)
- Philips Test Sample 5A 814 126-2 (Scratched)
- Sony Type III

**2. Adjustment Points**

**2-1 VR and TP Layout for Servo P. C. Board Adjustment**

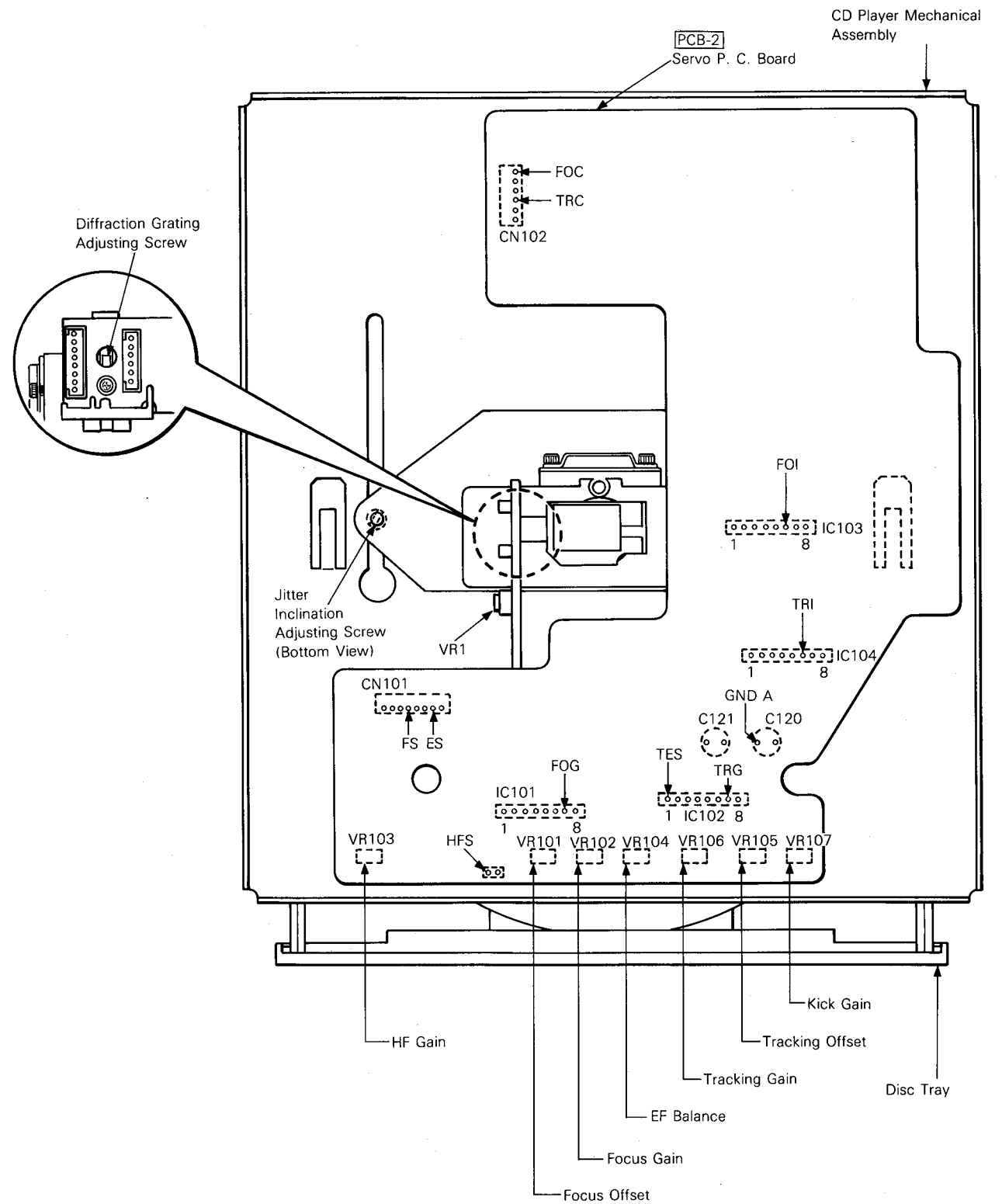
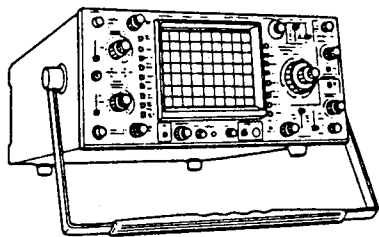


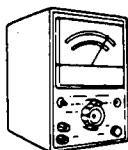
Fig. 9

## ADJUSTMENT PROCEDURE

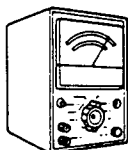
### 1. Meters and Jigs



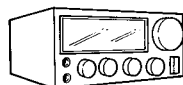
Oscilloscope (3 or more modes, 100MHz, X-Y input possible)



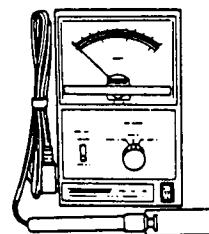
Dual Channel  
Voltmeter  
(ACVM)



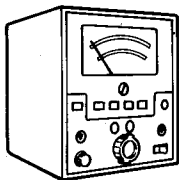
Distortion Meter



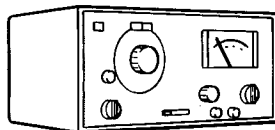
Frequency Counter



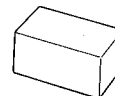
Optical Power Meter



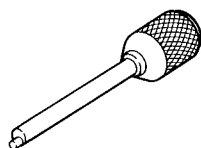
Jitter Meter



Low Frequency Oscillator  
(A. F. OSC)



Turntable Base Space Jig  
SJ-300



Diffraction Grating Screwdriver  
SD-300



Test Discs  
Philips Test Sample 5 814 125-2 (Non-Scratched)  
Philips Test Sample 5A 814 126-2 (Scratched)  
Sony Type III

## 2. Adjustment Points

### 2-1 VR and TP Layout for Servo P. C. Board Adjustment

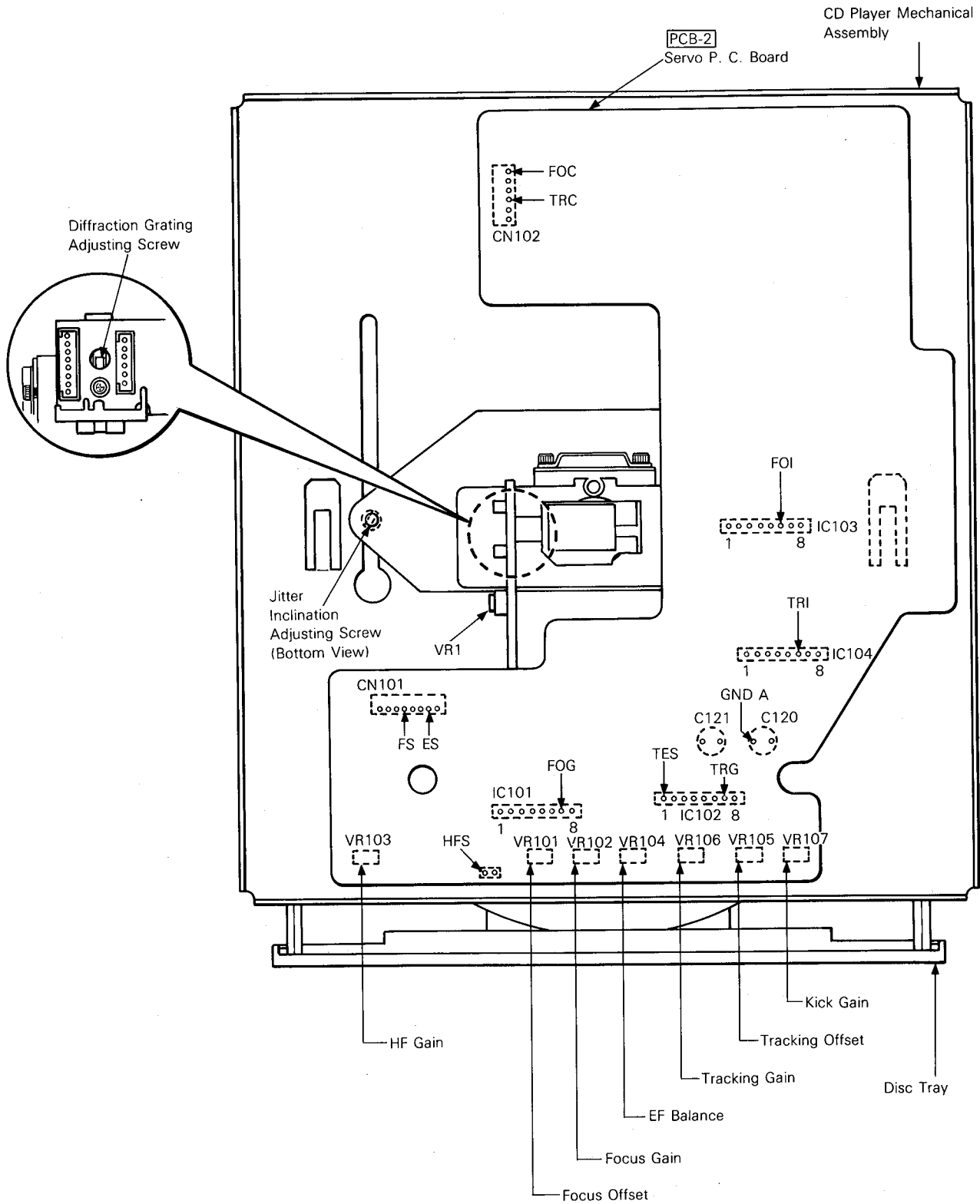


Fig. 9

2-2 Coil and TP Layout for Main P. C. Board Adjustment

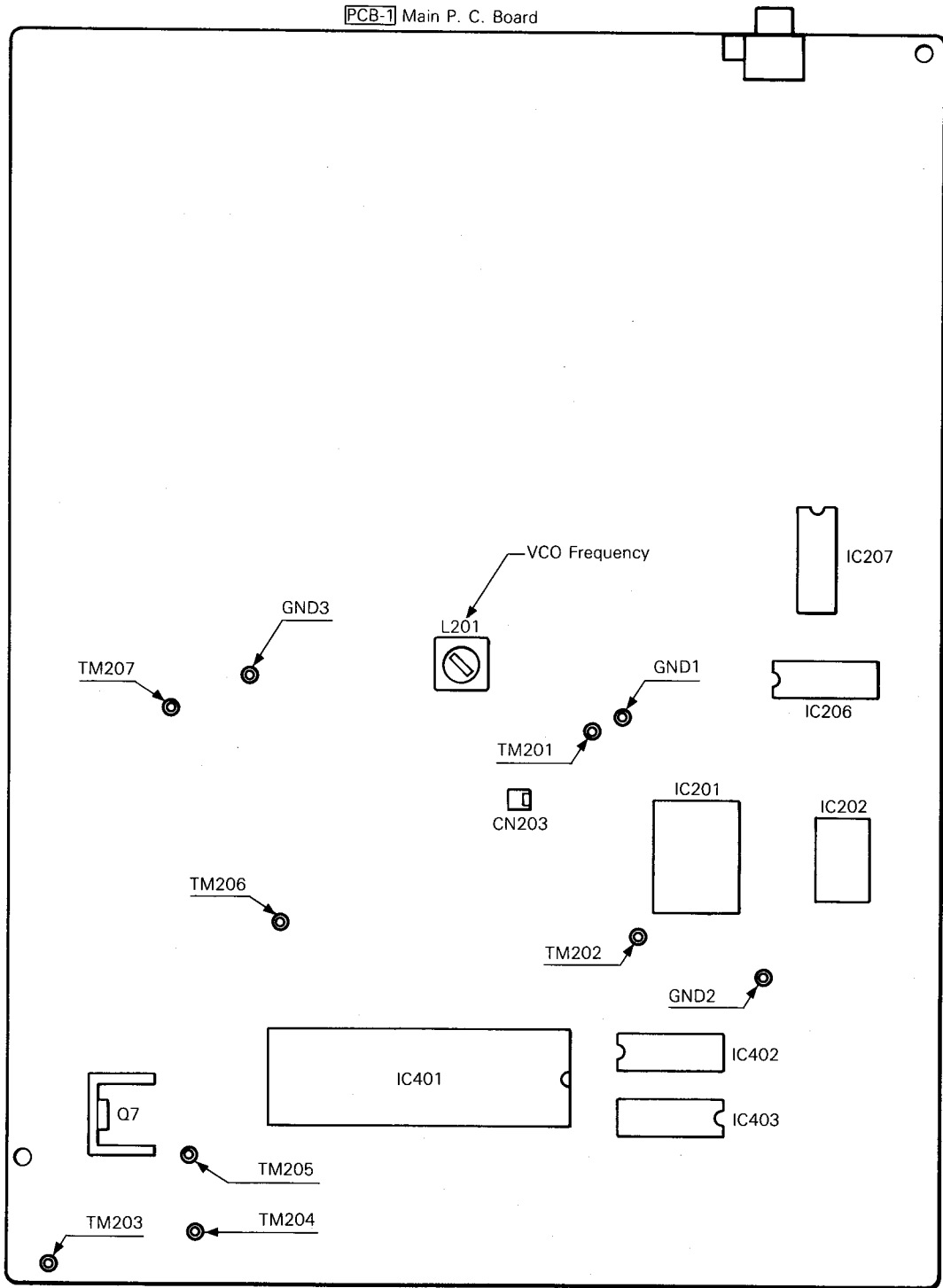


Fig. 10

### 3. CD Player Mechanical Assembly Adjustment

#### 3-1 Adjustment of Turntable Height (Fig. 11)

- (1) Loosen the turntable and insert the turntable base space jig.
- (2) Rotate the turntable, check that there are no gaps or rattling.
- (3) If there is no turntable base space jig, adjust to a height of 6.9mm.

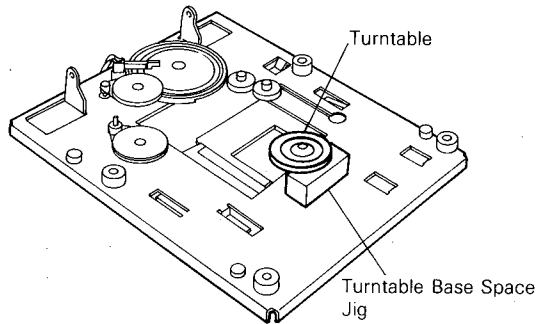


Fig. 11

#### 4. Optical Pick-up Laser Power Check

- (1) Short-circuit TM203 and TM205 located on the main P. C. board.
- (2) Remove the cabinet top, place the optical power meter against the pick-up, and check that the power is between 0.15mW and 0.4mW.

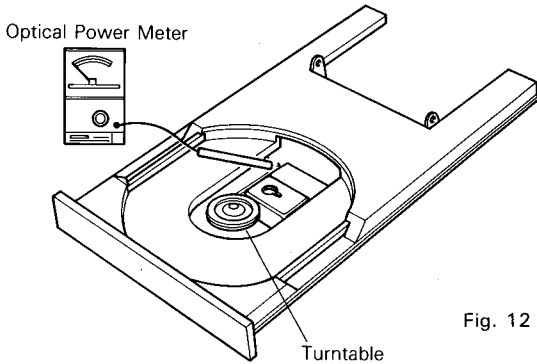


Fig. 12

#### 5. Adjustment of Main P. C. Board

##### 5-1 VCO Frequency Adjustment (Set is No signal).

- (1) Connect the frequency counter to TM202 (CLK) and GND2. (Fig. 13)
- (2) Remove wire connector CN203, turn the power switch on.
- (3) Rotate the L201 core and adjust so that the frequency counter shows a value of 4.3218MHz  $\pm$  0.02MHz.
- (4) After adjusting, turn the power off and connect the CN203 wire connector.

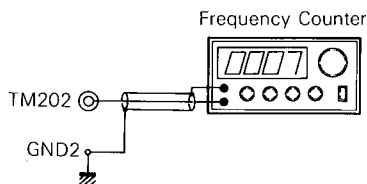


Fig. 13

#### 6. Adjustment of Servo P. C. Board

##### 6-1 Initial Setting of Adjustment Potentiometers

Before adjusting, preset adjustment potentiometers VR101, 102, 103, 104, 105, 106 and 107 for mechanical center.

##### 6-2 Disc Used for Adjustment

Test Discs: Philips Test Sample 5 814 125-2 (non scratched)  
Philips Test Sample 5A 814 125-2 (scratched)  
Sony Type III.

##### 6-3 Releasing Tracking Servo

- (1) Connect oscilloscope to TM201 and GND2. (fig. 14)
- (2) Insert the Philips test disc #5 and place the unit in the play mode. Select track number 12.
- (3) Check to make sure that the track number flashes first and the eye pattern on the oscilloscope stays still.
- (4) Defeat the laser interlock by connecting test points TM203 and TM205 together. In addition, connect TM206 to the jumper wire between TM203 and TM205.
- (5) Within 5 seconds after the above step 4, connect GND2 to TM204.
- (6) If the disc stops, or, starts spinning VERY VERY fast, repeat the above steps from item 2.

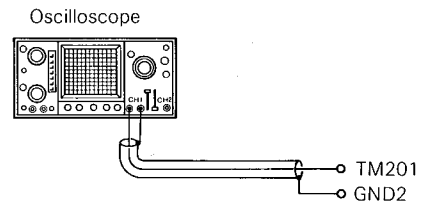


Fig. 14

##### 6-4 Diffraction Grating Adjustment

- (1) Connect oscilloscope to TES and GNDA. (fig. 15)
- (2) Insert the disc and place the unit in the play mode.
- (3) Release the tracking servo. (Step 6-3)
- (4) Adjust diffraction grating screw so that the waveform becomes maximum.

#### NOTES

- Use alignment tool part number SD-300 for the diffraction grating adjustment.
- Adjust at track numbers 8 and 1 of Philips test disc #5.
- There are 2 points where the waveform is maximized while turning the alignment tool once fully (360°). The servo system works at only one of them.

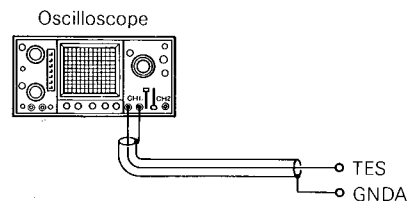


Fig. 15



6-5 Jitter Inclination Adjustment

- (1) Connect the jitter meter to TM201 and GND1. (fig. 16)
- (2) Insert Philips test disc #5 and place unit in play mode on track number 9.
- (3) Confirm the jitter meter reading does not exceed 35ns.
- (4) If 35ns is exceeded, remove the disc tray. (Refer to step 2 on page 8.)
- (5) Place Philips test disc #5 on the spindle motor.
- (6) Put unit into play mode on track number 9.
- (7) Adjust the jitter inclination screw (see figure. 9) for minimum reading.

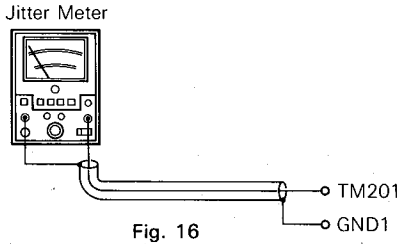


Fig. 16

6-5A Jitter Inclination Adjustment (without Jitter Meter)

- (1) Remove the disc tray. (Refer to step 2 on page 8.)
- (2) Place Philips test disc #5 on the spindle motor.
- (3) Put unit into play mode on track number 9.
- (4) Connect oscilloscope to TM201 and GND1. (fig. 17)
- (5) Adjust the jitter inclination screw until the signal waveform (eye pattern fig. 18) is distinct and clear.

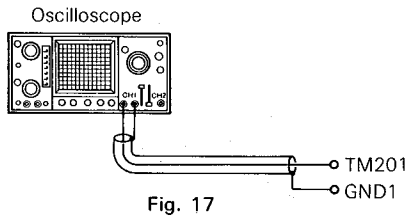
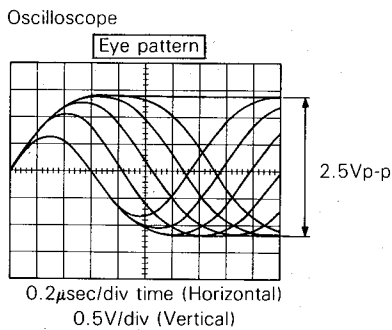
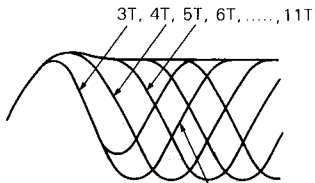


Fig. 17

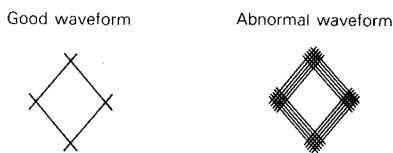


Waveforms 3T-11T



This portion is referred to as the eye pattern.

The abnormal eye pattern has less distinct lines and smaller amplitude than that of the good waveform.



Adjust so that the good waveform is obtained.

Fig. 18

6-6 Focus Offset Adjustment

- (1) Connect the jitter meter to TM201 and GND1. (fig. 16)
- (2) Insert the disc and place the unit in the play mode.
- (3) Adjust VR101 until the jitter becomes minimum.

6-6A Focus Offset Adjustment (without Jitter Meter)

- (1) Connect oscilloscope to TM201 and GND1. (fig. 17)
- (2) Insert the disc and place the unit in the play mode.
- (3) Adjust VR101 until the signal waveform (eye pattern fig. 18) is distinct and clear.

6-7 Focus Gain Adjustment

- (1) Connect an audio frequency oscillator with 220k ohm resistor in series to FOI and GNDA. (fig. 19)
- (2) Set the audio frequency oscillator output to 800Hz, 1.5V rpm.
- (3) Connect AC volt meter to B.P.F. (fig. 20)
- (4) Connect B.P.F. to test point FOG and GNDA and then to FOC and GNDA. Measure the output level at each point. (fig. 20)
- (5) Insert the Philips disc #5 and place the unit in the play mode on track number 8.
- (6) Adjust VR102 so that the voltage differential between FOC and FOG becomes 13dB ± 2dB. (FOC - FOG = 13dB)

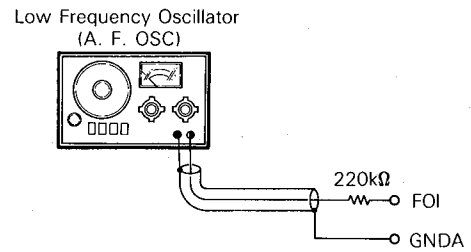


Fig. 19

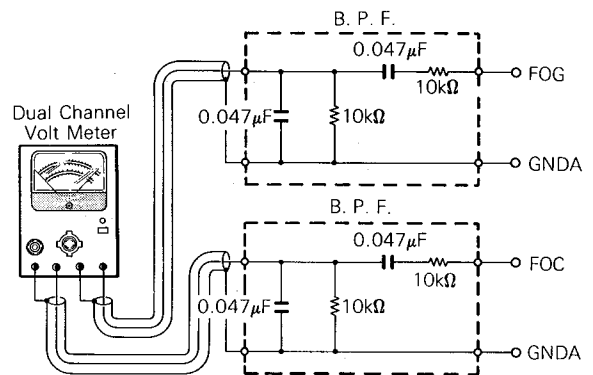


Fig. 20

6-8 HF Gain Adjustment

- (1) Connect the oscilloscope to TM201 and GND1. (fig. 17)
- (2) Insert the disc and place the unit in the play mode.
- (3) Adjust VR103 so that the voltage becomes 2.5Vp-p  $\pm$  0.3V. (fig. 21)

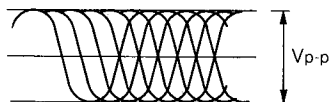


Fig. 21

6-9 EF Balance Adjustment

- (1) Connect the oscilloscope (DC input) to TES and GNDA. (fig. 15)
- (2) Insert the disc and place the unit in the play mode.
- (3) Release tracking servo. (See step 6-3)
- (4) Adjust VR104 so that the amplitude above and below the zero DC line becomes equal. (Amplitude A = amplitude B) (fig. 22)

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

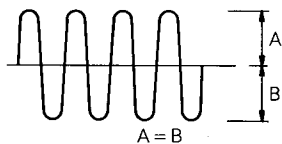


Fig. 22

6-10 Tracking Offset Adjustment

- (1) Switch the power switch on and slide the disc tray out by pressing the open/close button.
- (2) Connect the oscilloscope (DC input) to TRC and GNDA. (fig. 23)
- (3) Adjust VR105 for zero volts DC  $\pm$  20mV.

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

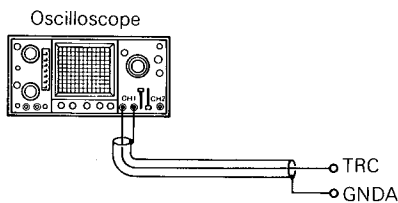


Fig. 23

6-11 Tracking Gain Adjustment

- (1) Connect the audio frequency oscillator with 220k ohm resistor to TRI and GNDA. (fig. 24)
- (2) Set the audio frequency oscillator for 800Hz, 20mV.
- (3) Connect AC voltmeter to B.P.F. (fig. 25)
- (4) For the measurements indicated below it is convenient to connect extending wires to TRG, TRC and GNDA.
- (5) Insert the Philips test disc #5 and place the unit in the play mode on track number 8.
- (6) Connect B.P.F. to test point TRG and GNDA and then to TRC and GNDA. Measure the output level at each point. (fig. 25)
- (7) Adjust VR106 so that the voltage difference between TRG and TRC becomes 14dB  $\pm$  2dB. (TRG - TRC = 14dB)
- (8) Check tracking offset in step 6-10 and repeat step 6-10 and step 6-11 if necessary.

Low Frequency Oscillator  
(A. F. OSC)

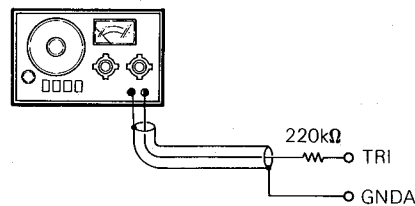


Fig. 24

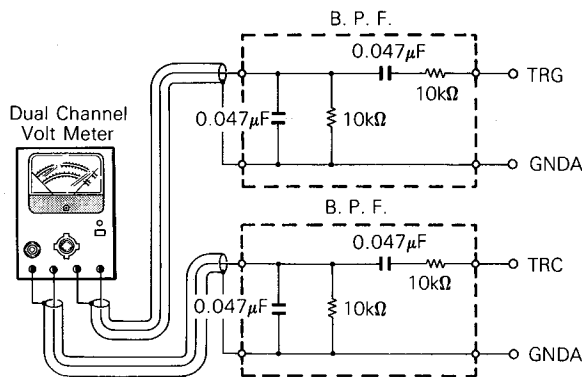


Fig. 25

6-12 Kick Gain Adjustment

- (1) Connect oscilloscope external trigger input to TM207 and GND3. Connect oscilloscope vertical input to TM201 and GND1. (fig. 26)
- (2) Insert the Philips test disc #5 and place unit in pause mode on track number 1.
- (3) Adjust VR107 so that the amplitude of the waveform becomes the same at A and B. (fig. 27)

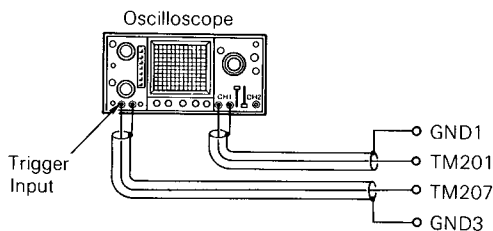


Fig. 26

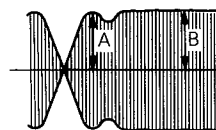


Fig. 27

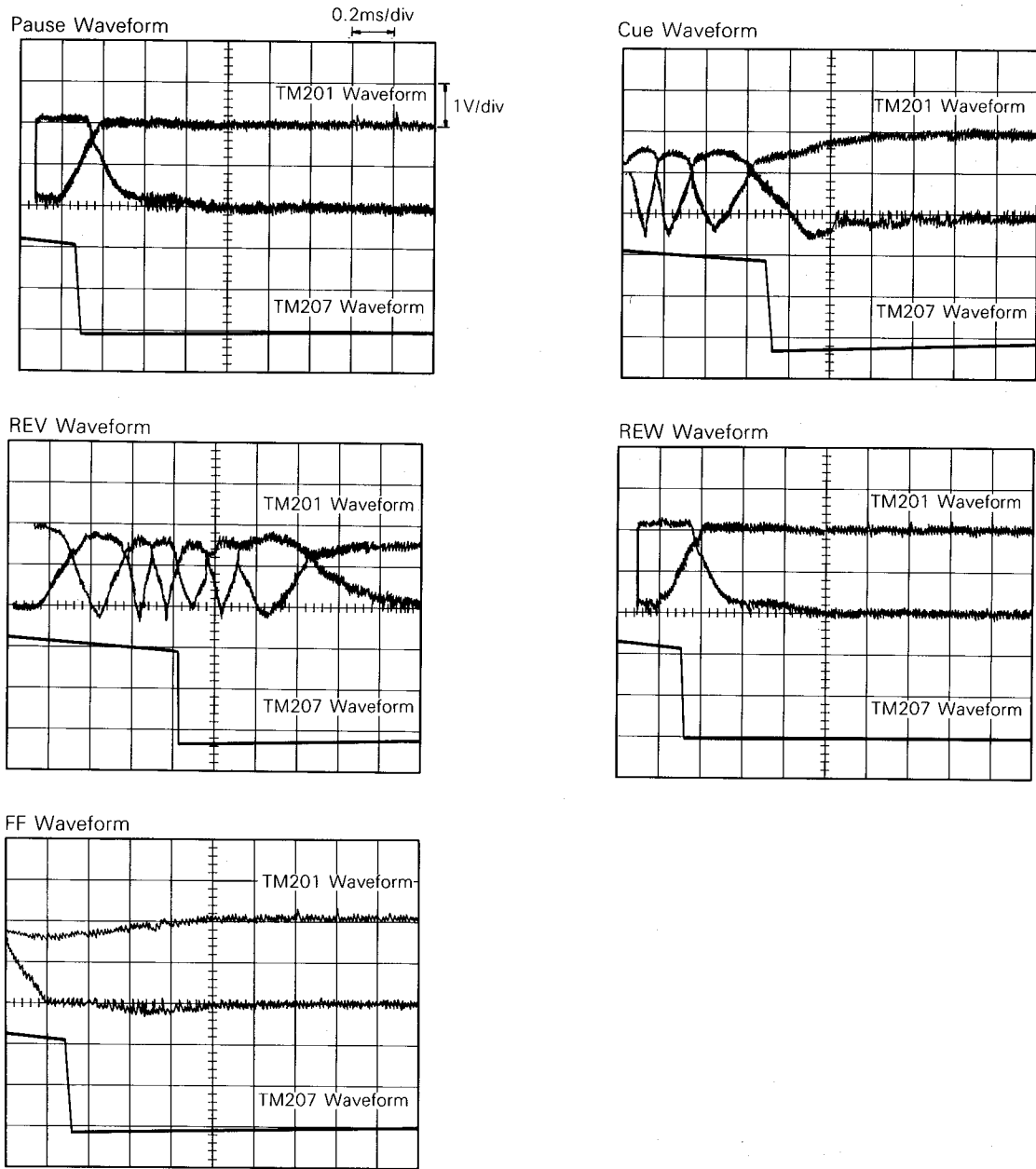


Fig. 28 Eye Pattern Waveforms Upon Track Jump

7. Operation Check

7-1 Playability

Use the Philips Test 5A (scratched) test disc, play the following portions and make sure no tracks are jumped.

- (1) Wedge (Interruption)  
700µm Selection 8 0'00"—0'30"
- (2) Black Spot (Black Dot)  
600µm Selection 13 4'10"—Selection 14 0'30"
- (3) Fingerprint  
Selection 19 0'00"—0'30"

7-2 Discs for Adjustments

	Adjustment	Disc	Check
1	Frequency Response	SONY TEST CD TYPE III	20Hz—20kHz +0.5dB/—1.5dB
2	Distortion Rate	SONY TYPE III Selection 1	0.05% or below
3	S/N	SONY TYPE III Selection 1 PLAY/PAUSE	90dB or greater
4	Emphasis Response	SONY TYPE III Selection 39—41	(39) 1kHz —0.37dB±0.5dB (40) 5kHz —4.53dB±0.5dB (41) 16kHz —9.04dB±0.5dB
5	Cross Talk	SONY TYPE III Selection 30 (L), Selection 34 (R)	70dB or greater

INSTALLATION OF DISC DRAWER AND CLAMPER

1. Press the power button in the OFF position.
2. Place cam gear in position as indicated in figure A. Make sure the disc drawer switch is in the position as indicated. If is not, rotate cam gear counterclockwise until disc drawer switch is in the position as indicated in figure A.
3. Push the drawer in all the way. Bend drawer catches upward to prevent drawer from sliding out of unit.
4. Press the power button in the ON position.
5. Press the open/close button. The drawer should move outward all the way into the "load" position.
6. Press the open/close button. The drawer should move inward all the way into the "play" position.
7. Reinstall clamper while making sure that clamper pin inserts into cam gear on the outside edge of the spring.

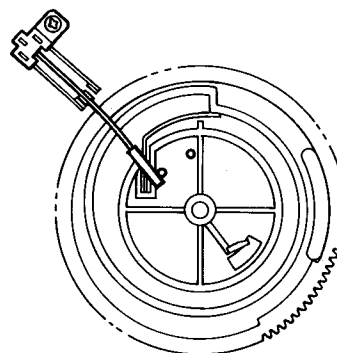
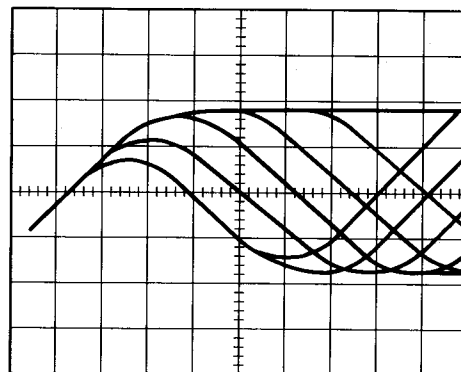
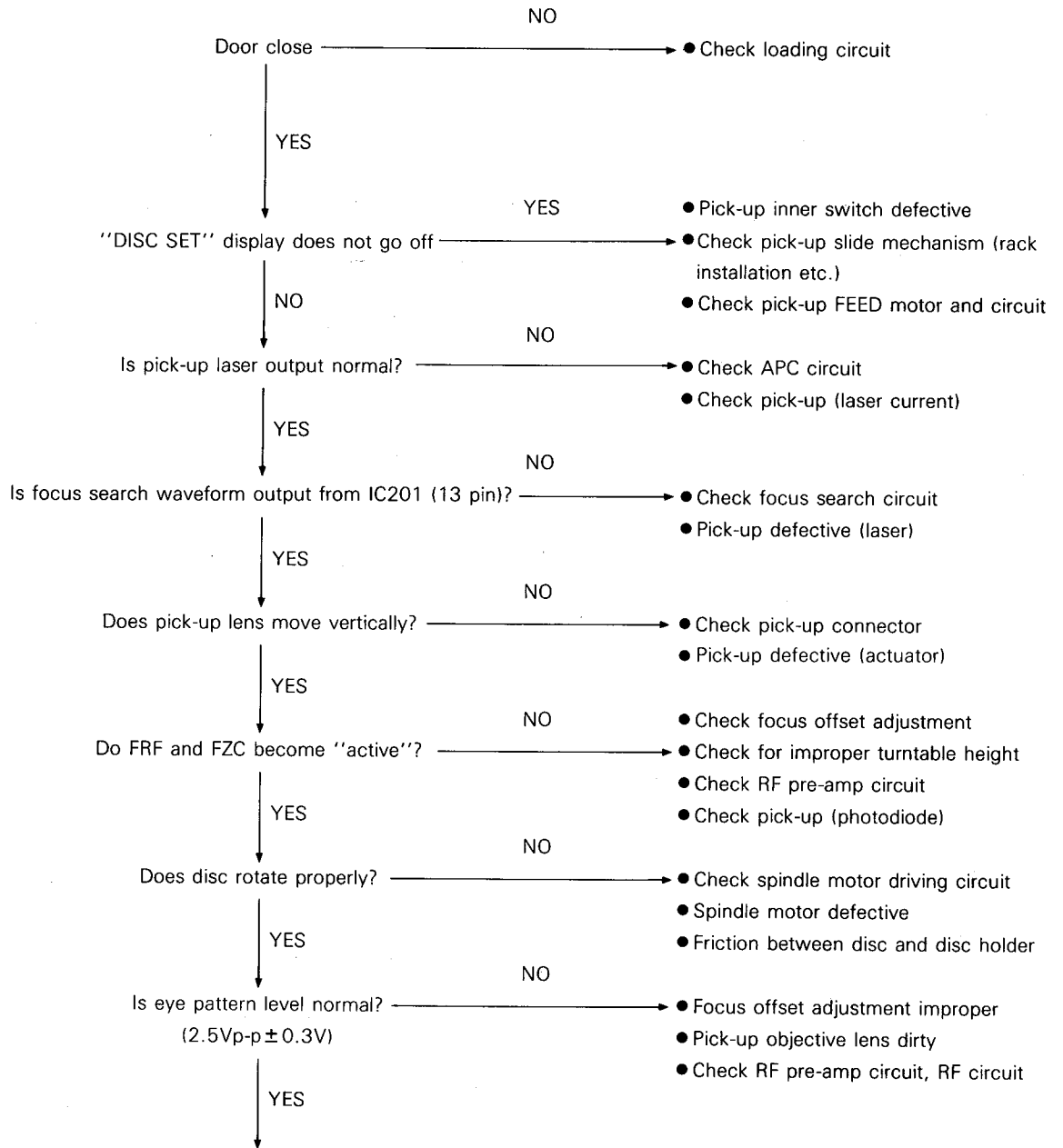


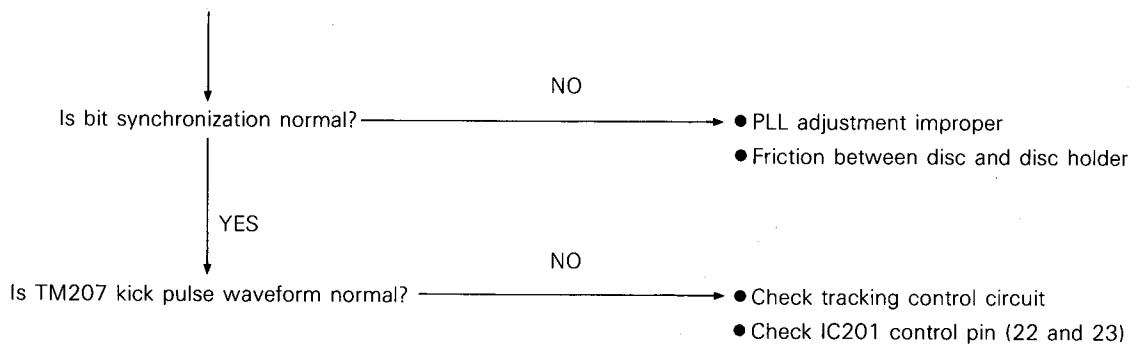
Figure A

**TROUBLE SHOOTING**

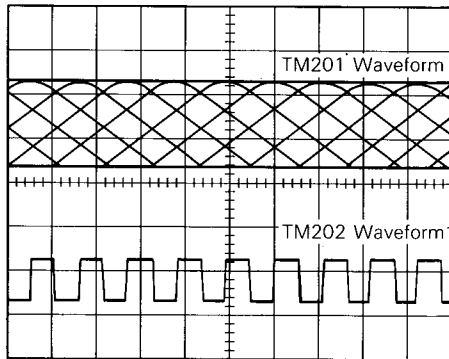
**1. Does not initialize**



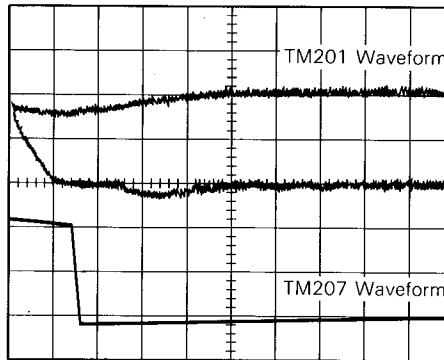
Eye Pattern



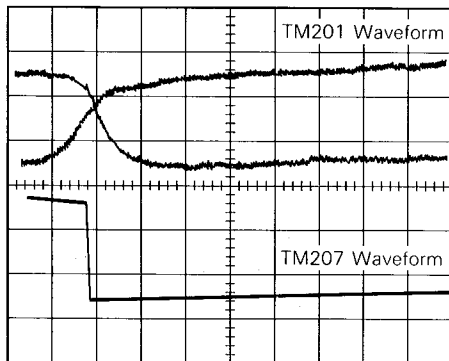
Bit Synchronization Waveform



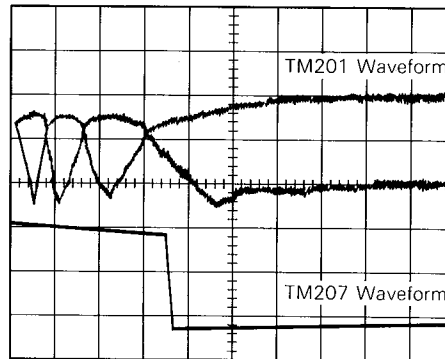
FF Waveform



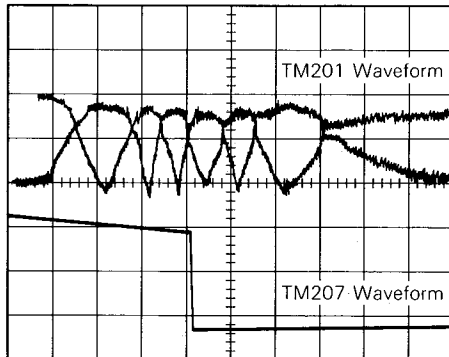
Pause Waveform



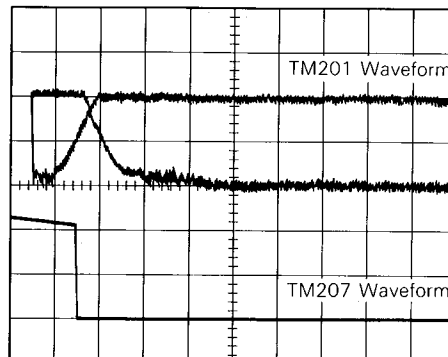
Cue Waveform



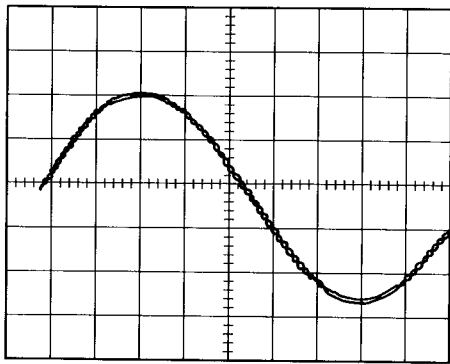
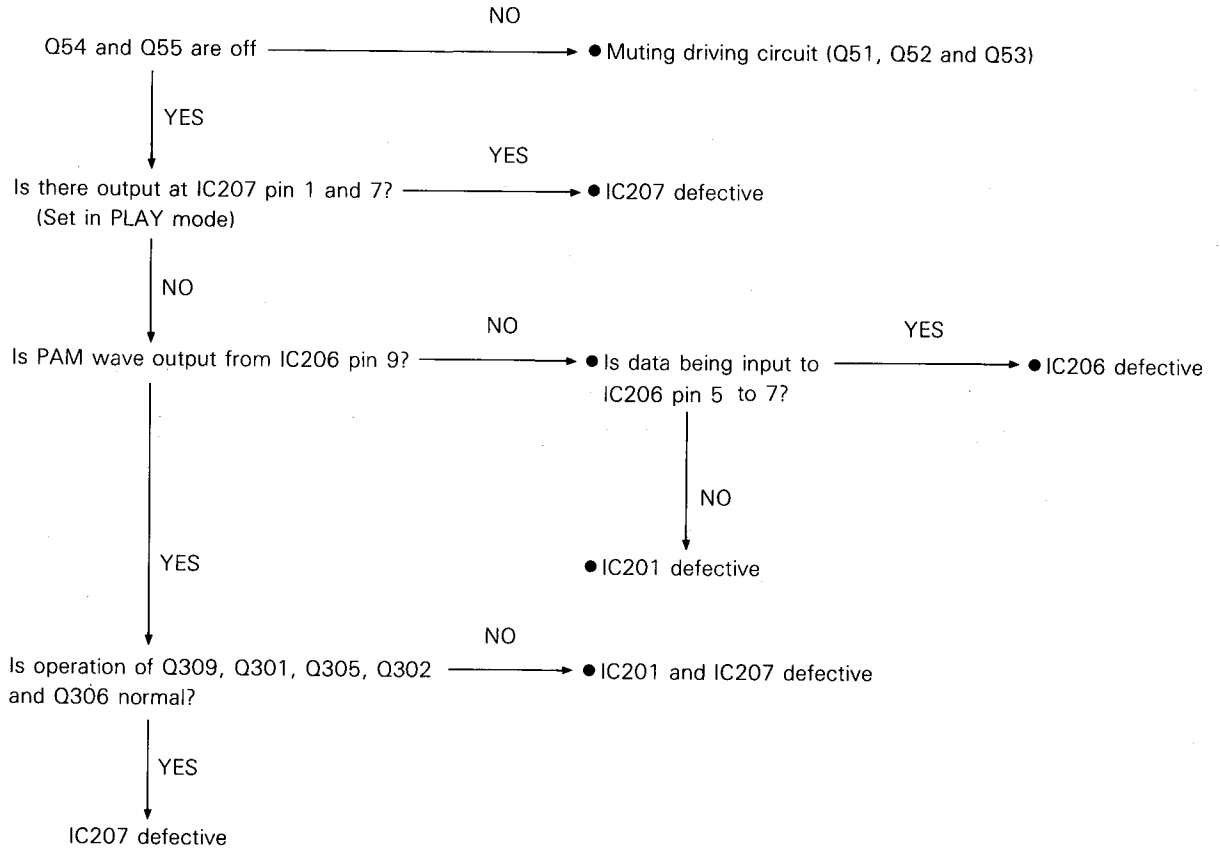
REV Waveform



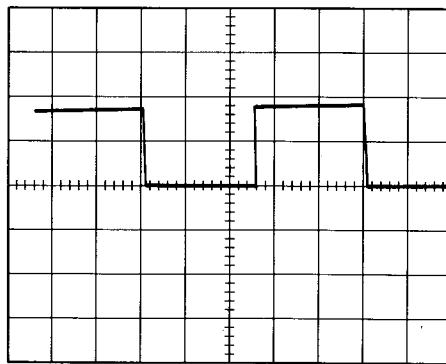
REW Waveform



2. No sound is produced



RAM Waveform  
(Test Disc: Sony Type III, 1st selection)



IC206 Pin 7 Waveform  
(Test Disc: Sony Type III, 1st selection)

## 3. IC201 Terminal Functions

Terminal number	Terminal code	I/O	Outline of functions
1	VDD	I	+5V power supply terminal.
2 3	VCOX VCOI	O I	The LC resonance circuit is connected between these terminals. These terminals are used for the VCO clock oscillation (average 8.6436MHz).
4	PCO	O	This is the VCO clock control output terminal. This sets the VCO clock oscillation circuit so that the frequency increases when the average DC voltage between these terminals is high.
5 9	VOC VSS	I I	These are the grounding terminals.
6 7	EFMX $\overline{\text{EFMX}}$	O O	Connect to the EFM signal slice level control circuit. This is the amplification-limited EFM signal output terminal, $8 > 7$ . The gain of $7 > 6$ is 15.
8	EFMI	I	Input the EFI signal (1–2V <sub>p-p</sub> ) into this terminal.
10	SYEQ	O	This is the monitor output terminal that gives a "H" level signal when the synchronization signal of the EFM pattern and the synchronization signal of the internal counter correspond.
11 12	DM+ DM–	O O	These are the PWM output terminals, connected to the disc motor drive circuit. It is not possible for both terminals to register "H" simultaneously.
13	FCS	O	This is the focusing output terminal.
14	$\overline{\text{FZC}}$	I+	Based on the focus error signal, a "L" signal will be input when the focus point is reached.
15	FRF	I	A "H" signal will be entered into this terminal when reflected light is received.
16	HF	I	The EFM envelope signal (amplitude logic level) is entered into this terminal.
17	TER	I	The tracking error signal (amplitude logic level) is entered into this terminal.
18	$\overline{\text{TEST D}}$	I+	This test terminal is to be grounded, and contains pull-up resistors.
74	TCL	I+	This test terminal is ungrounded, and contains pull-up resistors.
19	TROF	O	This is the output terminal that switches off the tracking signal of the tracking servo circuit.
20	TRGL	O	This the output terminal minimizes the gain of the tracking servo circuit.
21	TRHD	O	This the output terminal holds the tracking error signal of the tracking servo circuit while KP+ or KP– (see below) are being output.
22 23	KP+ KP–	O	These output terminals are for the track kick function, and are connected to the tracking servo circuit.
24	FEOF	O	This output terminal is used to switch off the input signal of the feed servo circuit.



Terminal number	Terminal code	I/O	Outline of functions
25 26	FEM + FEM -	O O	These output terminals are for the high-speed feed function, and are connected to the feed servo circuit.
35	WQ	O	This request output terminal is connected to $\mu$ COM, and requests that data be sent from SVC > $\mu$ COM.
36	R/W	O	This output terminal is connected to $\mu$ COM, and is used for the switching of the data transmission mode. When R/W = "L", data is transmitted from SVC > $\mu$ COM, and when R/W = "H", data is transmitted from $\mu$ COM > SVC.
37	D OUT	O	This data output terminal is connected to $\mu$ COM. When R/W = "L", data can be transmitted from SVC > $\mu$ COM according to the SCK clock input.
38	D IN	I	This data input terminal is connected to $\mu$ COM. When R/W = "H", data is transmitted from $\mu$ COM > SVC according to the SC key clock input.
39	$\overline{\text{SCK}}$	I	Connected to $\mu$ COM, this terminal is for the clock input, required for data transmission.
75	$\overline{\text{XFSY}}$	I	This is the frame synchronization signal (7.35kHz) input terminal, connected to the SCG output.
68	$\phi 4$	O	This is the crystal clock (4.321MHz) output terminal.
33	$\overline{\text{RCK}}$	I+	Connected to $\mu$ COM, this terminal is for the clock input, required for the subcode transmission. It is disconnected when not being used.
31	VFSY	O	This is the VCO frame synchronization signal (average 7.35kHz) output terminal.
30	SUB	O	This is the subcode output terminal, connected $\mu$ COM. The subcode can be transmitted from SVC > $\mu$ COM, according to the RCK clock input.
29	DSY	O	This is the synchronization signal output terminal for the serial signals (see below).
28	DATA	O	This is the serial signal output terminal for the 8 bit EFM demodulation signals and the 5 bit control signals.
27	CK	O	This is the VCO clock (average 4.3218MHz) output terminal.
41 78	VSS VSS	I I	These are the grounding terminals.
69 70 71	$\overline{\text{TEST A}}$ $\overline{\text{TEST B}}$ $\overline{\text{TEST C}}$	I+ I+ I+	These test terminal are ungrounded, and contain pull-up resistors.
40 42 43 44 45	A0 A1 A2 A3 A4	O O O O O	These are the address output terminals, connected to the RAM address terminals.

Terminal number	Terminal code	I/O	Outline of functions
46	A5	O	There are the address output terminals, connected to the RAM address terminals.
47	A6	O	
48	A7	O	
49	A8	O	
50	A9	O	
53	A10	O	
51	$\overline{WE}$	O	This is connected to the RAM WE terminal. When a "L level" signal is registered, the RAM will be set to the WRITE mode.
52	$\overline{OE}$	O	This is connected to the RAM OE terminal. When a "L level" signal is registered, the RAM will be set to the READ mode.
54	D8	I/O	These are connected to the RAM data terminals. The output mode is set when the cycle at the data input terminal is WE = "L", and the input mode is set when the cycle is WE = "H".
55	D7	I/O	
56	D6	I/O	
57	D5	I/O	
58	D4	I/O	
59	D3	I/O	
60	D2	I/O	
61	D1	I/O	
62	DEP	O	This is the output terminal for the audio frequency characteristics switching signals of the audio filter. The emphasis will be required when "H" is registered.
34	$\phi 2$	O	This is the crystal clock (2.1609MHz) output.
66	SD0	I/O	This is the serial signal output for the DAC. Using $\phi 2$ clock beat rate, the signals are output from LSB in the order of L channel 24 bit—R channel 25 bit.
67	SDSY	O	This is the synchronization signal output for the above serial signals. The level is "H" for L channel and "L" for R channel.
73	EFLG	O	This monitor output terminal depicts the C1 and C2 error correction operation mode.
76	SAMP 1	O	This is the degliche signal for the respective channels of the DAC analog output.
77	SAMP 2	O	
32	VDD	I	This is the +5V power supply terminal.
72	VDD	I	
79	X IN	I	A crystal oscillator is connected between these terminals, which are used for the crystal clock (8.6436MHz) oscillation.
80	X OUT	O	
65	Q OUT	O	This is the serial signal output for the DAC.
64	Q SYNC	O	This is the synchronization signal output for the Q OUT
63	DNFLG	O	Error flag to the serial signal output for the DAC.

## 4. IC401 Terminal Functions

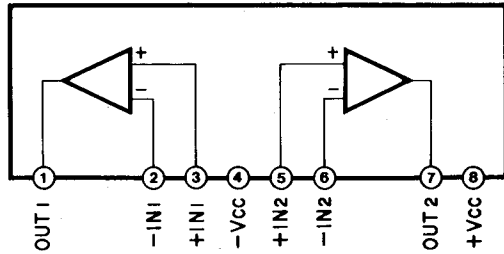
Terminal number	Terminal code	I/O	Outline of functions	Active level
1		I		
2		I		
3		I		
4	$\overline{R-SI}$	I	Remote control serial signal input	L
5		I		
6		I		
7		I		
8		I		
9		I		
10		I		
11		O		
12		O		
13		O		
14	R/W	O	Serial communications direction control ( $\rightarrow$ YM3815)	H (command) L (data)
15	D OUT	I	Command transmission time (75104 $\rightarrow$ 3815)	H
16	D IN	O	Time data transmission line (3815 $\rightarrow$ 75104)	H
17	$\overline{SCK}$	O	Serial communications clock	L
18	WQ	I	Time data read out demand	H
19	$\overline{A-B}$	I	Key input	L
20	$\overline{REPEAT}$	I	Key input	L
21	$\overline{MEMO}$	I	Key input	L
22	$\overline{FF}$	I	Key input	L
23	$\overline{FR}$	I	Key input	L
24	$\overline{FS}$	I	Key input	L
25	$\overline{RS}$		Key input	L

Terminal number	Terminal code	I/O	Outline of functions	Active level
26	$\overline{\text{STOP/}}\overline{\text{CREAR}}$	I	Key input	L
27	$\overline{\text{PLAY/}}\overline{\text{PAUSE}}$	I	Key input	L
28	$\overline{\text{OPEN/}}\overline{\text{CLOSE}}$	I	Key input	L
29		I		
30	$\overline{\text{TEST}}$	I	Test terminal	L
31				
32	VDD	I	+5V power supply terminal	
33	$\overline{\text{DISC}}$	O	Display output	L
34	$\overline{\text{PLAY}}$	O	Display output	L
35	$\overline{\text{MEMO}}$	O	Display output	L
36	$\overline{\text{REP}}$	O	Display output	L
37	a1	O	7 segment display (a)	H
38	b1	O	7 segment display (b)	H
39	c1	O	7 segment display (c)	H
40	d1	O	7 segment display (d)	H
41	e1	O	7 segment display (e)	H
42	f1	O	7 segment display (f)	H
43	g1	O	7 segment display (g)	H
44		O		
45	$\overline{\text{RST}}$	I	Reset input	L
46	X2	I	Oscillator circuit input	H
47	X2	I	Oscillator circuit input	H
48	a2	O	7 segment display (a)	H
49	b2	O	7 segment display (b)	H
50	c2	O	7 segment display (c)	H

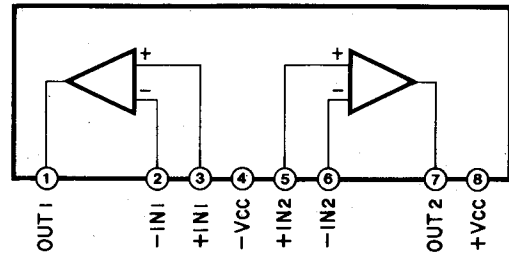
Terminal number	Terminal code	I/O	Outline of functions	Active level
51	d2	O	7 segment display (d)	H
52	e2	O	7 segment display (e)	H
53	f2	O	7 segment display (f)	H
54	g2	O	7 segment display (g)	H
55				
56				
57	$\overline{\text{CLOSE}}$	I	Disc tray closed position detection switch input	L
58	$\overline{\text{OPEN}}$	I	Disc tray open position detection switch input	L
59	$\overline{\text{INNER}}$	I	Pick-up inner circumference position detection switch input	L
60	$\overline{\text{A-B}}$	O	Display output	L
61	CLOSE	O	Disc tray closing direction driving output	H
62	OPEN	O	Disc tray opening direction driving output	H
63	LD ON	O	Pick-up laser output signal	H
64	GND		GND pin	

IC BLOCK DIAGRAM

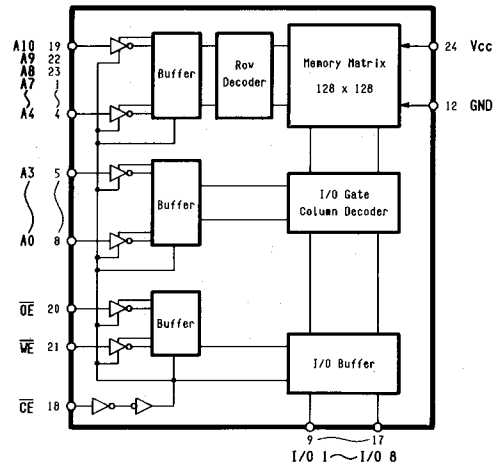
IC101, IC103, IC104,  
IC204, IC205, IC208 : M5218L  
Dual Operational Amplifier



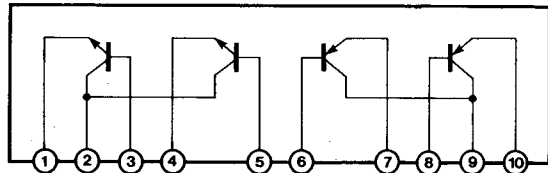
IC102 : M5219L  
Dual Operational Amplifier



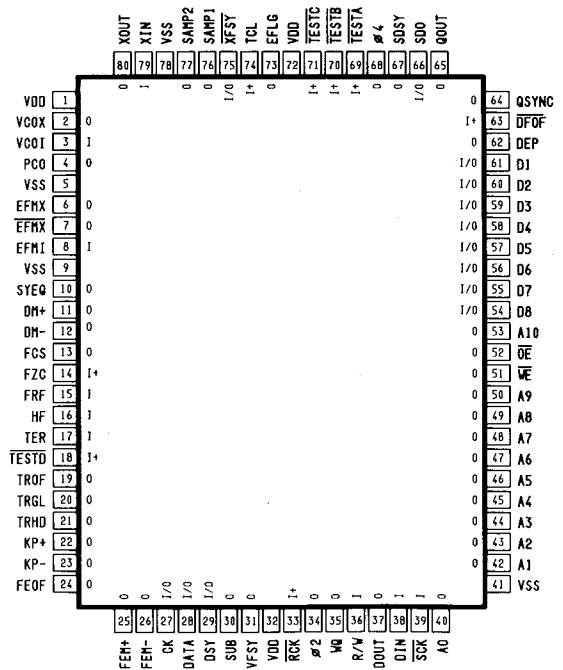
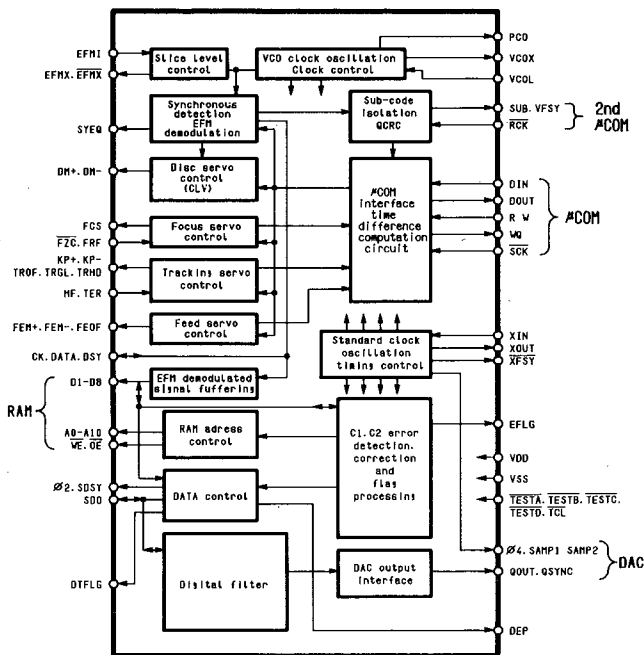
IC202 : CXK5816M-15L  
2000 word x 8 bit Static RAM



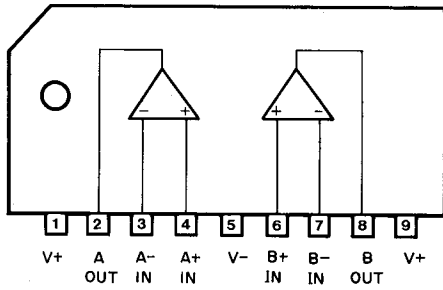
IC105 : STA451C  
Transistor Array



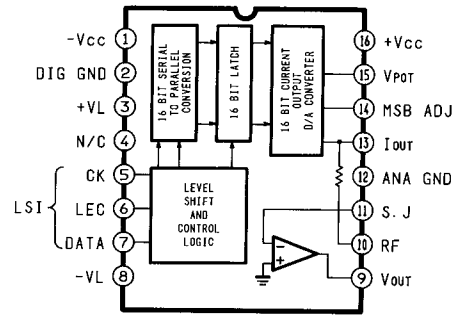
IC201 : YM3815  
Microcomputer



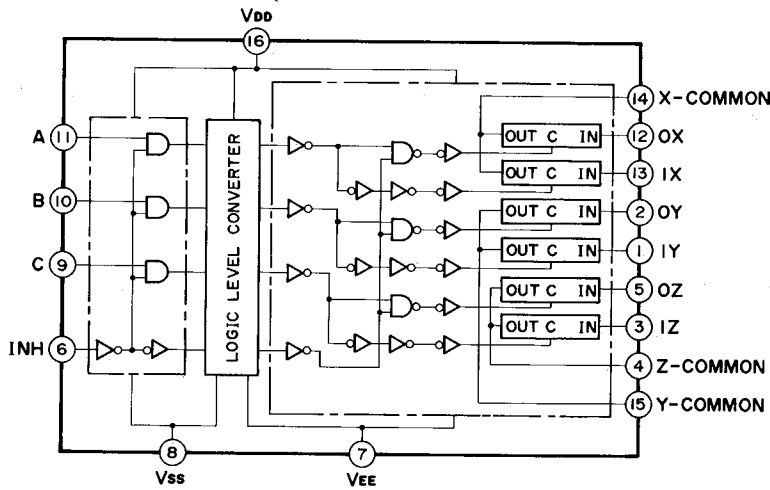
IC203 : NJM2068SD  
Dual Operational Amplifier



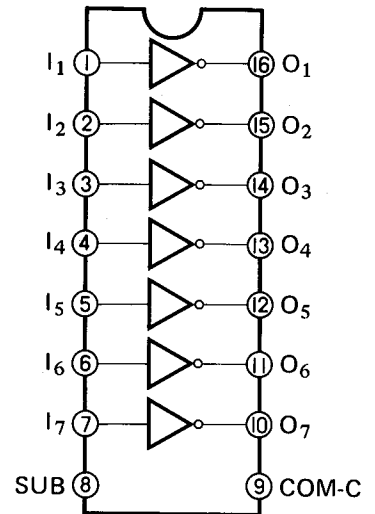
IC206 : PCM56P  
16 bit Serial Input D/A Converter



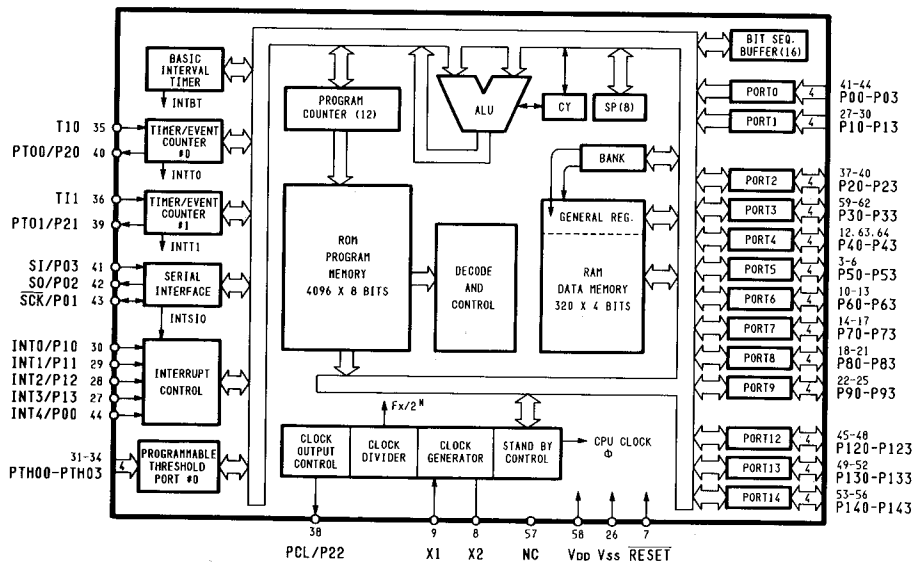
IC207 : HD14053BP  
Triple-2 channel Multiplexer



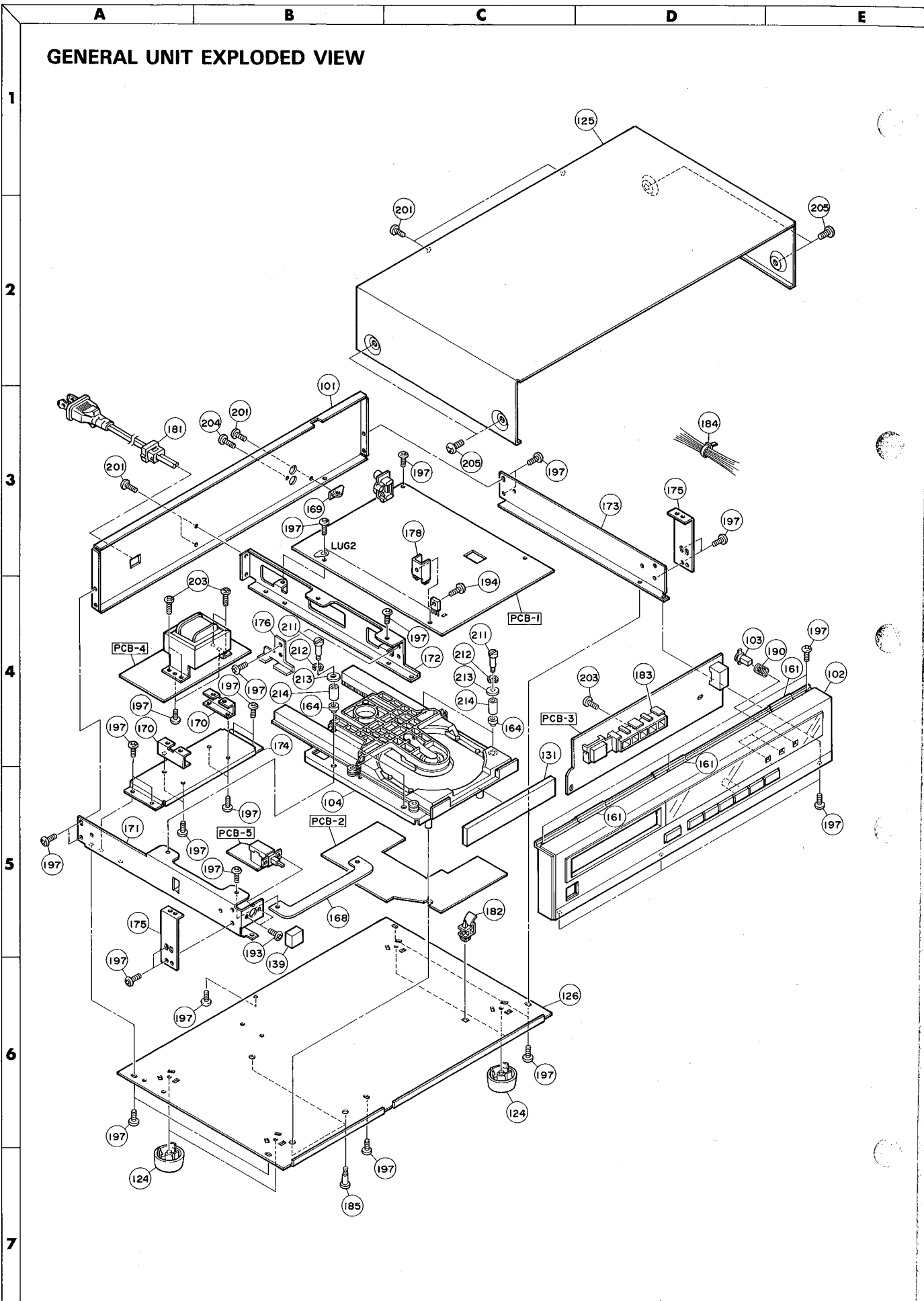
IC402, IC403 : TD62504P  
LED Driver



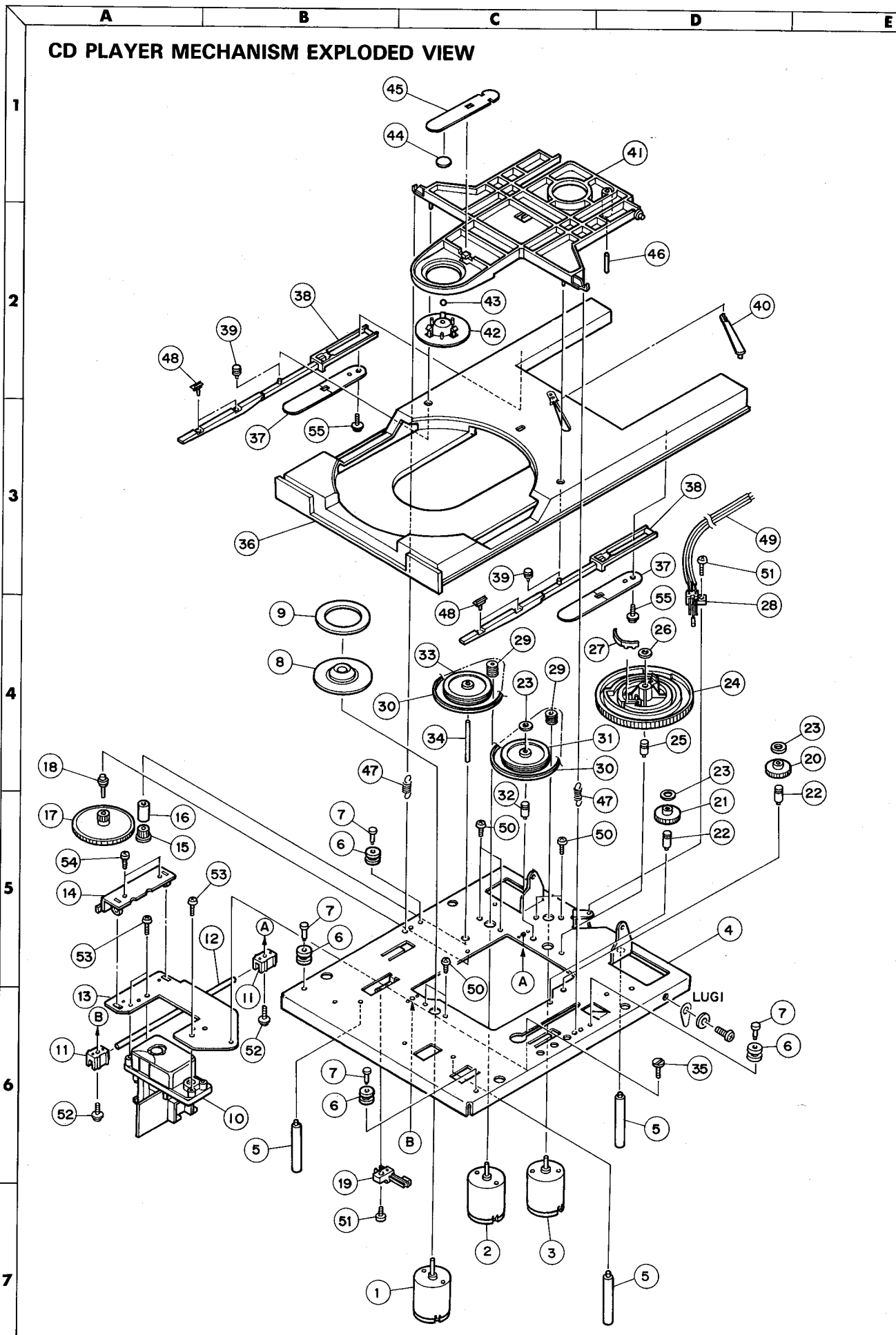
IC401 :  $\mu$ PD75104-20  
Microcomputer



GENERAL UNIT EXPLODED VIEW







**GENERAL UNIT PARTS LIST**

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
101	A424-HD300B	Cabinet Back Ass'y <b>U</b> <b>BK</b>	174	2219-8108	Bracket
101	A424-HD300D	Cabinet Back Ass'y <b>G</b> <b>GB</b>	175	2219-8109	Bracket
102	A443-HD300A	Front Panel Ass'y <b>U</b> <b>G</b>	176	2219-8132	Bracket
102	A443-HD300B	Front Panel Ass'y <b>BK</b> <b>GB</b>	178	2222-7194	Heat Sink
103	A662-HD300A	Push Button Ass'y, Memory, Repeat, A-B Repeat <b>U</b> <b>G</b>	181	2240-364	Holder
103	A662-HD300B	Push Button Ass'y, Memory, Repeat, A-B Repeat <b>BK</b> <b>GB</b>	182	2240-7264	Holder
104	C119-HD300A	CD Player Mechanical Ass'y	183	2240-7272	Holder
124	1319-0139	Foot	184	2240-7120	Holder
125	1414-07001	Cabinet Top	185	2320-7015	Special Screw
126	1424-18901	Cabinet Bottom	190	2651-210189	Spring
131	1452-03701	Lid	193	2327-300629	Screw (3×6mm)
139	1660-00401	Push Button, Power <b>U</b> <b>G</b>	194	2327-300829	Screw (3×8mm)
139	1660-00403	Push Button, Power <b>BK</b> <b>GB</b>	197	2347-300626	Screw (3×6mm)
161	2111-11758	Felt	201	2347-300646	Screw (3×6mm)
164	2114-01297	Bushing	203	2347-301026	Screw (3×10mm)
168	2219-8139	Bracket	204	2347-301046	Screw (3×10mm)
169	2219-8096	Bracket	205	2347-400646	Screw (4×6mm)
170	2219-8100	Bracket	211	2327-302029	Screw (3×20mm)
171	2219-8105	Bracket	212	2412-3022	Spring Washer
172	2219-8106	Bracket	213	2401-0343	Washer
173	2219-8107	Bracket	214	2132-3014021	Spacer

**NOTES**

Parts with the following marks are used only in the models intended for particular markets:

- U** : U.S.A. model
- BK** : U.S.A. model Black Version
- G** : General model
- GB** : General model Black Version

**CD PLAYER MECHANISM PARTS LIST**

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
1	NBS4R-02	Spindle Motor	29	PBE16692	Motor Pulley
2	VA611B-06	Feed Motor	30	PDE5001	Belt
3	NBS6B-02	Loading Motor	31	PDE1019	Gear Pulley
4	PDC1002	Chassis	32	PDE1025	Gear Pulley Shaft
5	PDE1005	Chassis Support	33	PDE1018	Pulley
6	PDE1010	Roller	34	PDE1008	Pinion Shaft
7	PDE1007	Roller Shaft	35	PDE1029	Guide B
8	PDD1004	Turntable	36	PDB2001	Loading Case
9	PDE1022	Rubber	37	PDE6001	Lever Spring
10	MLP-3C	Pick-up	38	PDD1003	Lever
11	PDE1011	Support	39	PDE1028	Rubber Cushion
12	PDE1009	Rack Shaft	40	PDE1027	Stopper
13	PDD1001	Pick-up Plate	41	PDC1001	Press Plate
14	PDD1002	Rack	42	PDD1005	Rotational Press
15	PDE1016	Pinion	43	PBE14901	Steel Ball
16	PDE1001	Bearing	44	PDE1021	Slider
17	PDE1013	Gear	45	PDE6002	Rotational Press Spring
18	PDE1002	Gear Shaft	46	PDE1031	Press Plate Shaft
19	LSA-1123-16-AU	Inner Switch	47	PDE6004	T.Spring
20	PDE1015	Idler Gear	48	PDE1032	Rubber Cushion B
21	PDE1026	Idler Gear B	49	PDE3005	Lead Wire
22	PDE1024	Idler Gear Shaft	50	PGSP10A2003	P. Screw
23	PGWP26X060025S	P. Washer	51	PGSP10A2605	P. Screw
24	PDC1003	Cum Gear	52	PGSP15A3012	P. Screw
25	PDE1023	Cum Shaft	53	PGSP10A2608	P. Screw
26	PGWP36X080025S	P. Washer	54	PGSP10A2005	P. Screw
27	PDE6003	Cum Spring	55	PGSL15A2005	L. Screw
28	MSW-1585	Open/Close Switch			

**ELECTRICAL PARTS LIST**

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
<b>CHASSIS MISCELLANEOUS</b>					
△	PI	4161-71151			Power Cord <b>U</b> <b>BK</b>
△	PI	4161-72556			Power Cord <b>G</b> <b>GB</b>
	LUG1	4211-4			Lug Terminal
	LUG2	4211-4			Lug Terminal
<b>PCB-1 MAIN P. C. BOARD</b>					
<b>RESISTORS</b>					
△	R3	5102-1004715			10Ω, 1/4W, FR
△	R4	5102-1004715			10Ω, 1/4W, FR
△	R11	5102-1004715			10Ω, 1/4W, FR
△	R12	5102-1004715			10Ω, 1/4W, FR
△	R15	5102-1005117F			10Ω, 1/4W, FR
△	R16	5102-1514715			150Ω, 1/4W, FR
△	R17	5102-3314715			330Ω, 1/4W, FR
△	R18	5102-3314715			330Ω, 1/4W, FR
△	R19	5102-3314715			330Ω, 1/4W, FR
△	R20	5102-3314715			330Ω, 1/4W, FR
△	R215	5102-1014715			100Ω, 1/4W, FR
△	R269	5102-4R74715			4.7Ω, 1/4W, FR
<b>CAPACITORS</b>					
	C6	5345-228D041			2200μF/25V, EC
	C7	5345-228D041			2200μF/25V, EC
	C8	5345-477C041			470μF/16V, EC
	C9	5345-477C041			470μF/16V, EC
	C10	5345-228C041			2200μF/16V, EC
	C11	5345-228C041			2200μF/16V, EC
	C12	5345-227C041			220μF/16V, EC
	C13	5345-227C041			220μF/16V, EC
	C14	5345-108C041			1000μF/16V, EC
	C15	5345-108C041			1000μF/16V, EC
	C16	5345-228C041			2200μF/16V, EC
	C17	5345-228C041			2200μF/16V, EC
	C18	5345-477C041			470μF/16V, EC
	C19	5345-477A041			470μF/6.3V, EC
	C20	5345-108A041			1000μF/6.3V, EC
	C21	5345-227B041			220μF/10V, EC
	C22	5345-227B041			220μF/10V, EC
	C23	5345-227B041			220μF/10V, EC
	C24	5345-227B041			220μF/10V, EC
	C51	5345-227C041			220μF/16V, EC
	C52	5345-475F041			4.7μF/50V, EC
	C53	5345-106C041			10μF/16V, EC
	C201	5345-476C041			47μF/16V, EC
	C203	5345-105F041			1μF/50V, EC
	C204	5345-477A041			470μF/6.3V, EC
	C206	5353-680534			68pF/500V, MC
	C207	5342-105F041			1μF/50V, EC
	C208	5345-106C041			10μF/16V, EC
	C211	5359-4715851			470pF/100V, PC
	C212	5359-2215851			220pF/100V, PC
	C213	5359-3325851			3300pF/100V, PC
	C214	5359-1025851			1000pF/100V, PC
	C221	5345-107D041			100μF/25V, EC
	C223	5345-225F041			2.2μF/50V, EC
	C224	5345-107D041			100μF/25V, EC
	C227	5345-476A0951			47μF/6.3V, EC
	C228	5345-476A0951			47μF/6.3V, EC
	C229	5359-3925851			3900pF/100V, PC
	C230	5359-3925851			3900pF/100V, PC
	C233	5345-227C041			220μF/16V, EC
	C234	5345-226C041			22μF/16V, EC
	C235	5345-335D041			3.3μF/25V, EC
	C303	5359-1535851			0.015μF/100V, PC
	C304	5359-1535851			0.015μF/100V, PC
	C305	5359-3315851			330pF/100V, PC
	C306	5359-3315851			330pF/100V, PC
	C307	5359-6815851			680pF/100V, PC
	C308	5359-6815851			680pF/100V, PC
	C309	5345-476C0951			47μF/16V, EC
	C310	5345-476C0951			47μF/16V, EC
	C311	5345-476C0951			47μF/16V, EC
	C312	5345-476C0951			47μF/16V, EC
	C313	5359-1025851			1000pF/100V, PC
	C314	5359-1025851			1000pF/100V, PC
	C315	5359-8225851			8200pF/100V, PC
	C316	5359-8225851			8200pF/100V, PC
	C317	5345-476C0951			47μF/16V, EC
	C318	5345-476C0951			47μF/16V, EC
	C319	5345-476C0951			47μF/16V, EC
	C320	5345-476C0951			47μF/16V, EC
	C321	5345-227C041			220μF/16V, EC
	C322	5345-227C041			220μF/16V, EC
	C323	5345-227C041			220μF/16V, EC
	C324	5345-227C041			220μF/16V, EC
	C424	5345-226C041			22μF/16V, EC
<b>INTEGRATED CIRCUIT</b>					
	IC201	5654-YM3815			YM3815
	IC202	5654-CXK5816M			CXK5816M-15L
	IC203	5653-NJ2068SD			NJM2068SD
	IC204	5652-M5218L			M5218L
	IC205	5652-M5218L			M5218L
	IC206	5654-PCM56P			PCM56P
	IC207	5654-HD14053BP			HD14053BP
	IC208	5652-M5218L			M5218L
	IC401	5654-75104-20			μPD75104-20
	IC402	5654-TD62504P			TD62504P
	IC403	5654-TD62504P			TD62504P
<b>TRANSISTORS</b>					
	Q1	5611-966(Y)			2SA966(Y)
	Q2	5613-2236(Y)			2SC2236(Y)
	Q3	5613-2603(F)			2SC2603(F)
	Q4	5611-1115(F)			2SA1115(F)
	Q5	5613-2236(Y)			2SC2236(Y)
	Q6	5611-966(Y)			2SA966(Y)
	Q7	5613-3422(Y)			2SC3422(Y)
	Q51	5613-2603(F)			2SC2603(F)
	Q52	5613-2603(F)			2SC2603(F)
	Q53	5611-1115(F)			2SA1115(F)
	Q54	5613-2878(B)			2SC2878(B)
	Q55	5613-2878(B)			2SC2878(B)
	Q201	5613-535(B)			2SC535(B)
	Q202	5613-2603(F)			2SC2603(F)
	Q203	5613-2603(F)			2SC2603(F)
	Q204	5613-2603(F)			2SC2603(F)
	Q205	5613-2603(F)			2SC2603(F)
	Q206	5613-2603(F)			2SC2603(F)
	Q207	5613-2603(F)			2SC2603(F)
	Q208	5613-2603(F)			2SC2603(F)
	Q209	5614-667(C)			2SD667(C)
	Q210	5612-647(C)			2SB647(C)
	Q211	5614-667(C)			2SD667(C)
	Q212	5612-647(C)			2SB647(C)
	Q213	5614-667(C)			2SD667(C)
	Q214	5612-647(C)			2SB647(C)
	Q215	5613-2603(F)			2SC2603(F)
	Q218	5611-1115(F)			2SA1115(F)
	Q219	5613-RN1203			RN1203
	Q221	5613-RN1203			RN1203
	Q222	5611-966(Y)			2SA966(Y)
	Q223	5611-1115(F)			2SA1115(F)
	Q301	5611-1115(F)			2SA1115(F)
	Q302	5611-1115(F)			2SA1115(F)
	Q303	5613-2603(F)			2SC2603(F)
	Q304	5613-2603(F)			2SC2603(F)
	Q305	5611-1115(F)			2SA1115(F)
	Q306	5611-1115(F)			2SA1115(F)
	Q307	5613-2603(F)			2SC2603(F)
	Q308	5613-2603(F)			2SC2603(F)
	Q309	5613-2878(B)			2SC2878(B)

Ref. No.	Part No.	Description
Q310	5613-2878(B)	2SC2878(B)
Q421	5613-2603(F)	2SC2603(F)
Q422	5613-2603(F)	2SC2603(F)
<b>DIODES</b>		
D1	5632-S5277B-6	S5277B
D2	5632-S5277B-6	S5277B
D3	5632-S5277B-6	S5277B
D4	5632-S5277B-6	S5277B
D5	5632-S5277B-6	S5277B
D6	5632-S5277B-6	S5277B
D7	5632-S5277B-6	S5277B
D8	5632-S5277B-6	S5277B
D9	5635-HZ16-1L	ZD, HZ16-1L
D10	5635-HZ16-1L	ZD, HZ16-1L
D11	5635-HZ12C1L	ZD, HZ12C1L
D12	5635-HZ12C1L	ZD, HZ12C1L
D13	5635-HZ6B1L	ZD, HZ6B1L
D14	5635-HZ9A1L	ZD, HZ9A1L
D15	5635-HZ9A1L	ZD, HZ9A1L
D16	5635-HZ9A1L	ZD, HZ9A1L
D17	5635-HZ9A1L	ZD, HZ9A1L
D51	5631-IS2473	IS2473
D52	5631-IS2473	IS2473
D53	5631-IS2473	IS2473
D201	5635-HZ9B2L	ZD, HZ9B2L
D202	5633-SVC211SP	SVC211SP
D203	5631-IS2473	IS2473
D204	5631-IS2473	IS2473
D407	5631-IS2473	IS2473
D421	5631-IS2473	IS2473

Ref. No.	Part No.	Description
L201	5923-70134	8μH

Ref. No.	Part No.	Description
<b>MISCELLANEOUS</b>		
X201	5691-00864317	Crystal Osc.
X401	5693-CSA400MG	Crystal Osc.
J301/ J302	4482-0131	2 Pin Jack, Output
CN201	4443-1101140	Connector, 10 Pos.
CN202	4443-0901140	Connector, 9 Pos.
CN203	4443-0201140	Connector, 2 Pos.
CN204	4443-030185	Connector, 3 Pos.
CN205	4443-030185	Connector, 3 Pos.
CN206	4443-030185	Connector, 3 Pos.
CN207	4443-030185	Connector, 3 Pos.
CN208	4443-040185	Connector, 4 Pos.

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

Ref. No.	Part No.	Description
<b>RESISTORS</b>		
△ R136	5102-4R74715	4.7Ω, 1/4W, FR <b>G GB</b>
△ R139	5102-4R74715	4.7Ω, 1/4W, FR <b>G GB</b>
<b>CONTROLS</b>		
VR101	5101-10471716	100kΩB
VR102	5101-10471716	100kΩB
VR103	5101-10371716	10kΩB
VR104	5101-10471716	100kΩB
VR105	5101-10371716	10kΩB
VR106	5101-47371716	47kΩB
VR107	5101-47471716	470kΩB

Ref. No.	Part No.	Description
<b>CAPACITORS</b>		
C101	5345-107B041	100μF/10V, EC
C104	5345-107B041	100μF/10V, EC
C106	5345-226C041	22μF/16V, EC
C107	5345-226C041	22μF/16V, EC
C110	5359-6815851	680pF/100V, PC
C112	5345-476C041	47μF/16V, EC
C119	5345-107B041	100μF/10V, EC
C120	5345-226C041	22μF/16V, EC
C121	5345-226C041	22μF/16V, EC
C123	5345-226C041	22μF/16V, EC

Ref. No.	Part No.	Description
C124	5345-226C041	22μF/16V, EC
C125	5345-227C041	220μF/16V, EC
C126	5345-227C041	220μF/16V, EC
C127	5345-227C041	220μF/16V, EC
C128	5345-227C041	220μF/16V, EC

**INTEGRATED CIRCUITS**

Ref. No.	Part No.	Description
IC101	5652-M5218L	M5218L
IC102	5653-M5219L	M5219L
IC103	5652-M5218L	M5218L
IC104	5652-M5218L	M5218L
IC105	5653-STA451C	STA451C

**TRANSISTORS**

Ref. No.	Part No.	Description
Q101	5613-535(C)	2SC535(C)
Q102	5613-2603(F)	2SC2603(F)
Q103	5613-2878(B)	2SC2878(B)
Q104	5611-1115(F)	2SA1115(F)
Q105	5613-2878(B)	2SC2878(B)
Q106	5613-2878(B)	2SC2878(B)
Q107	5613-2878(B)	2SC2878(B)

**MISCELLANEOUS**

Ref. No.	Part No.	Description
CN101	4443-0801141	Connector, 8 Pos.
CN102	4443-0601141	Connector, 6 Pos.
LCN101	4163-001144	CLW, 11 Pos.
LCN102	4163-002144	CLW, 9 Pos.
LCN103	4163-003144	CLW, 2 Pos.
LCN104	4163-004144	CLW, 6 Pos.
LCN105	4163-005144	CLW, 7 Pos.

**PCB-3 SWITCHES P. C. BOARD**

Ref. No.	Part No.	Description
<b>CAPACITORS</b>		
C401	5345-227A041	220μF/6.3V, EC
<b>DIODES</b>		
D401	5623-LB402MA4	LED Display, Track Number
D402	5637-SLV56VC3	L.E.D., SLV56VC3, Red, Memory
D403	5637-SLV56MC3	L.E.D., SLV56MC3, Green, Disk
D404	5637-SLV56MC3	L.E.D., SLV56MC3, Green, Play
D405	5637-SLV56MC3	L.E.D., SLV56MC3, Green, Repeat
D406	5637-SLV56MC3	L.E.D., SLV56MC3, Green, A-B Repeat

**MISCELLANEOUS**

Ref. No.	Part No.	Description
RM401	6143-00101	Remote Sensor
S401	4431-A017240	Push Switch, Open/Close
S402	4431-A017240	Push Switch, Play/Pause
S403	4431-A017240	Push Switch, Stop/Clear
S404	4431-A017240	Push Switch, Skip (Backward)
S405	4431-A017240	Push Switch, Skip (Forward)
S406	4431-A017240	Push Switch, Reverse
S407	4431-A017240	Push Switch, Fast-Forward
S408	4431-A017240	Push Switch, Memory
S409	4431-A017240	Push Switch, Repeat
S410	4431-A017240	Push Switch, A-B Repeat

**PCB-4 POWER SUPPLY P. C. BOARD**

Ref. No.	Part No.	Description
△ T1	5584-701523	Power Transformer <b>U BK</b>
△ T1	5584-702523	Power Transformer <b>G GB</b>
△ S2	4411-1047111	Rotary Switch, Voltage Selector <b>G GB</b>

Ref. No.	Part No.	Description
<b>PCB-5 POWER SWITCH P. C. BOARD</b>		
△ RI	5135-335J50P	Resistor, 3.3MΩ, 1/2W, CAR <b>G</b> <b>GB</b>
△ CI	5361-1030419	Capacitor, 0.01μF/AC125V, CC <b>U</b> <b>BK</b>
△ CI	5352-1030958	Capacitor, 0.01μF/AC250V, MPC <b>G</b> <b>GB</b>
△ SI	4431-A01056	Push Switch, Power

**NOTES**

Parts with the following marks are used only in the models intended for particular markets:

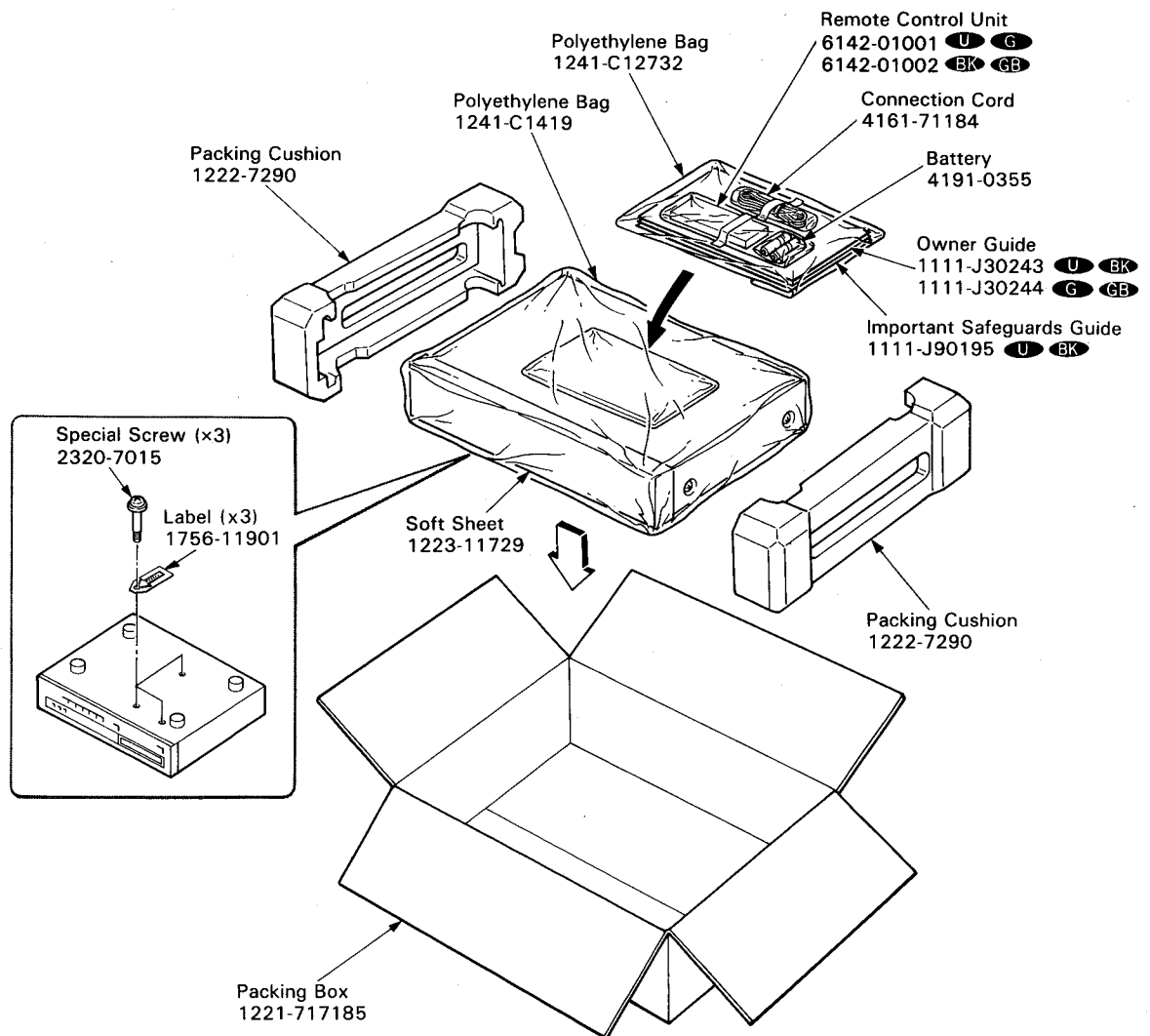
- U** : U.S.A. model
- BK** : U.S.A. model Black Version
- G** : General model
- GB** : General model Black Version

**KEY TO ABBREVIATIONS**

- FR : Fuse Resistor
- MR : Metal Resistor
- CR : Cement Resistor
- CAR : Carbon Resistor
- EC : Electrolytic Capacitor
- PC : Polypropylene Capacitor
- MC : Mica Capacitor
- CC : Ceramic Capacitor
- MPC : Metalized Polyester Capacitor
- SPC : Special Capacitor
- ZD : Zener Diode
- CLW : Connector with Lead Wire

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

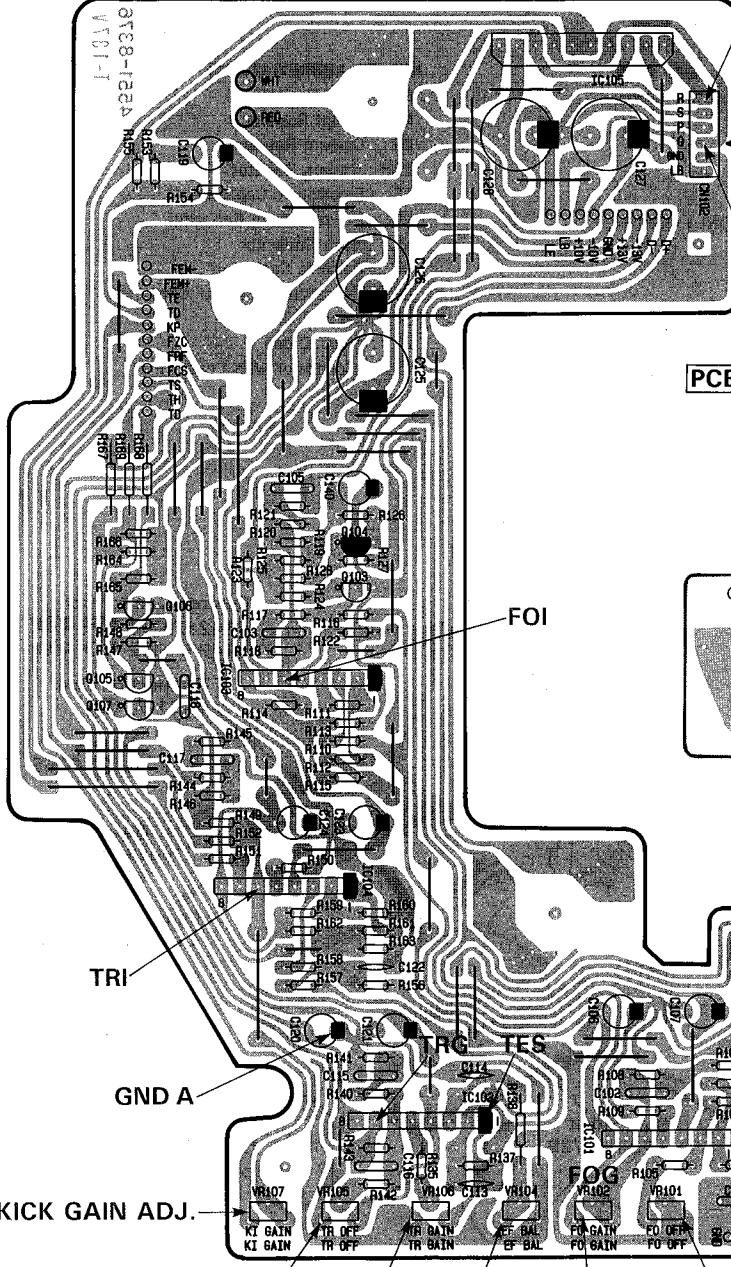
**PACKAGE**



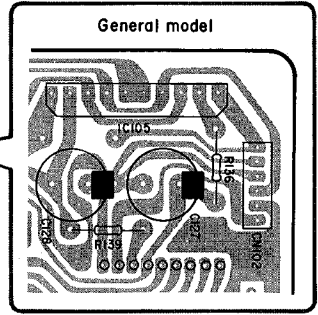
P. C. BOARDS (1)

1  
2  
3  
4  
5  
6  
7

**PCB-2** Servo P. C. Board

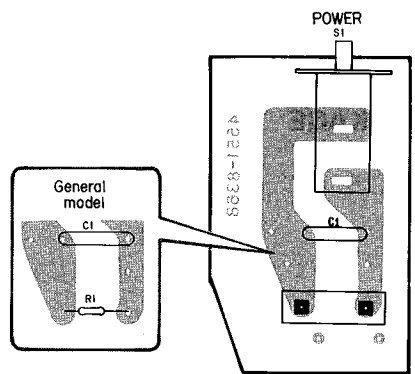


FOC



TRC

**PCB-5** Power Switch P. C. Board



FOI

TRI

GND A

KICK GAIN ADJ.

TRACKING OFFSET ADJ.

TRACKING GAIN ADJ.

EF BALANCE ADJ.

ES

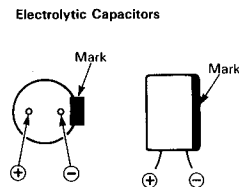
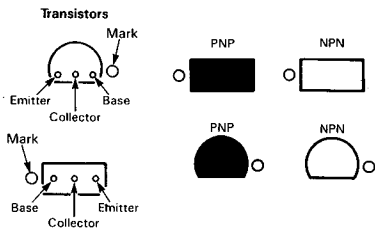
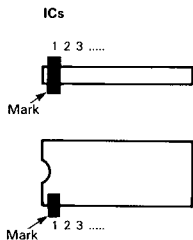
FS

HFS HF GAIN ADJ.

FOCUS OFFSET ADJ.

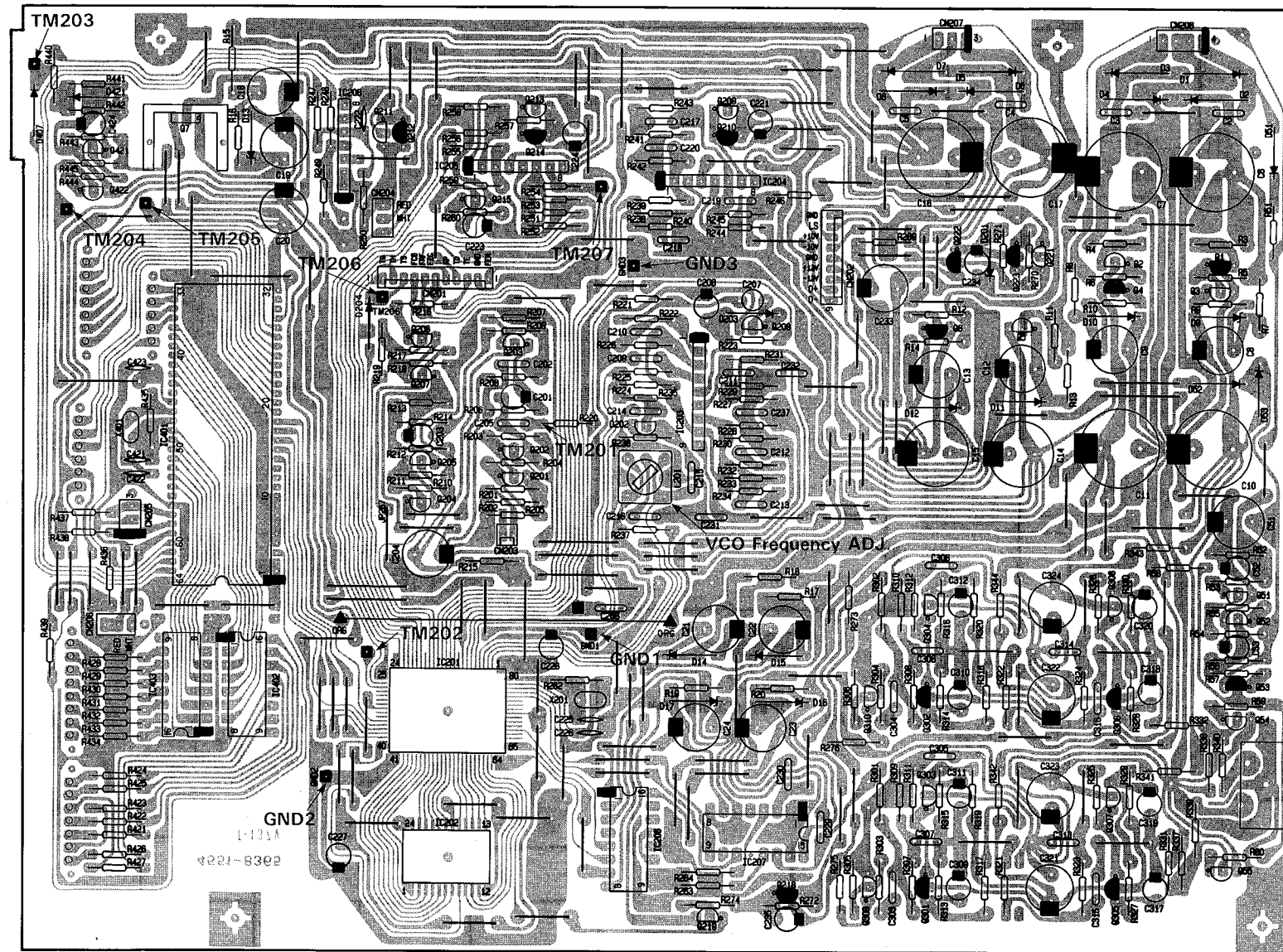
FOCUS GAIN ADJ.

NOTE:  
In the figures of the P. C. Boards, a mark is provided on the base side of the transistor.

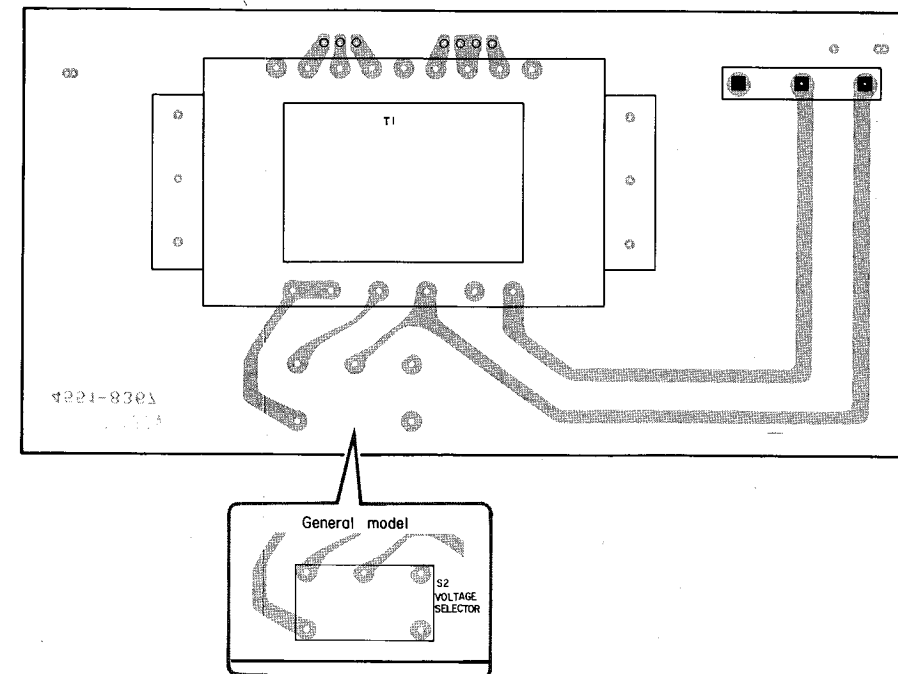


P. C. BOARDS (2)

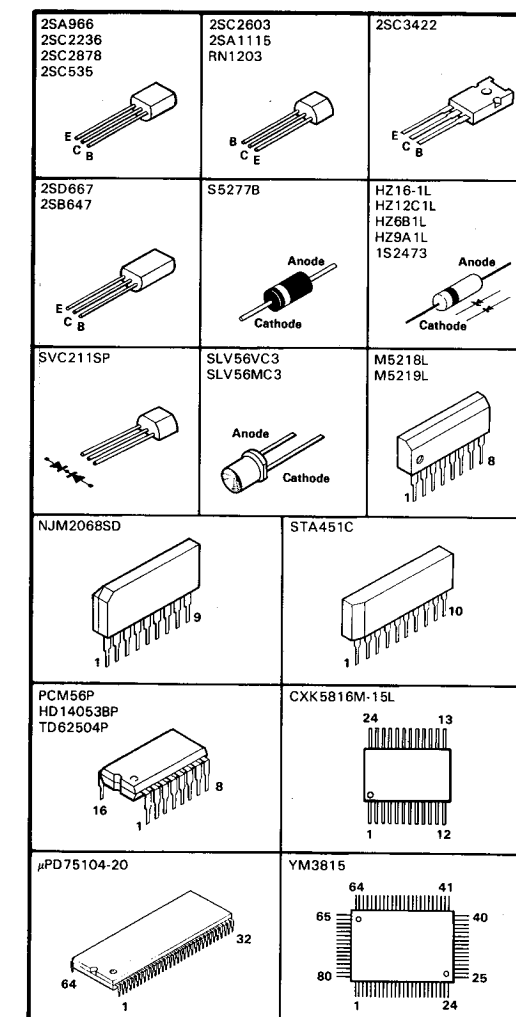
**PCB-1** Main P. C. Board



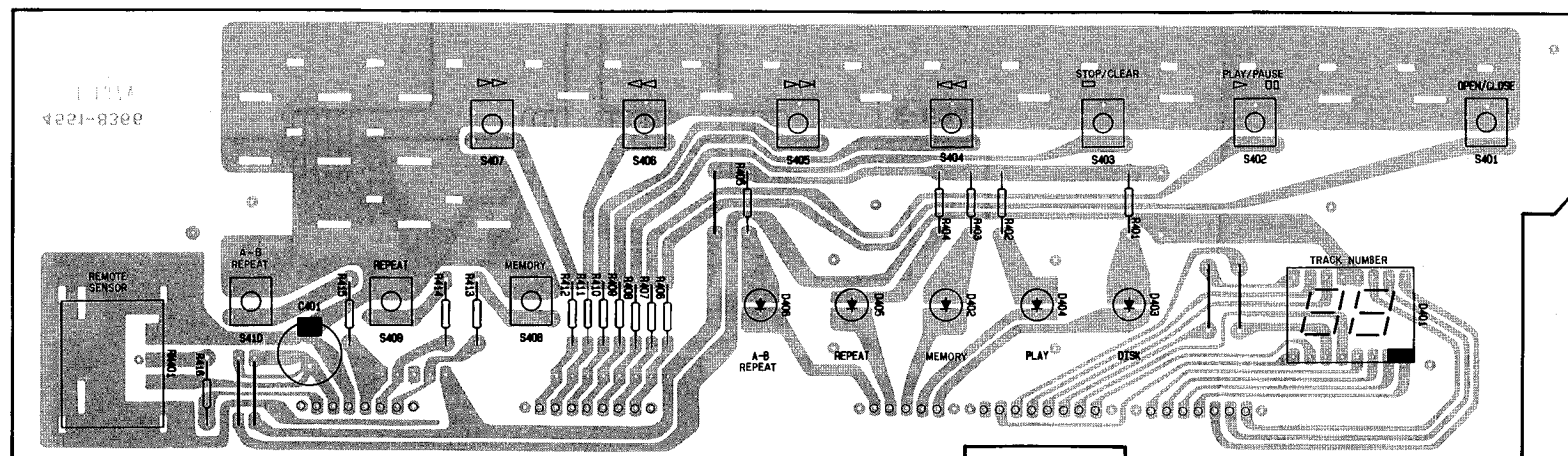
**PCB-4** Power Supply P. C. Board



PIN CONNECTION DIAGRAM OF TRANSISTORS, DIODES AND ICs



**PCB-3** Switches P. C. Board

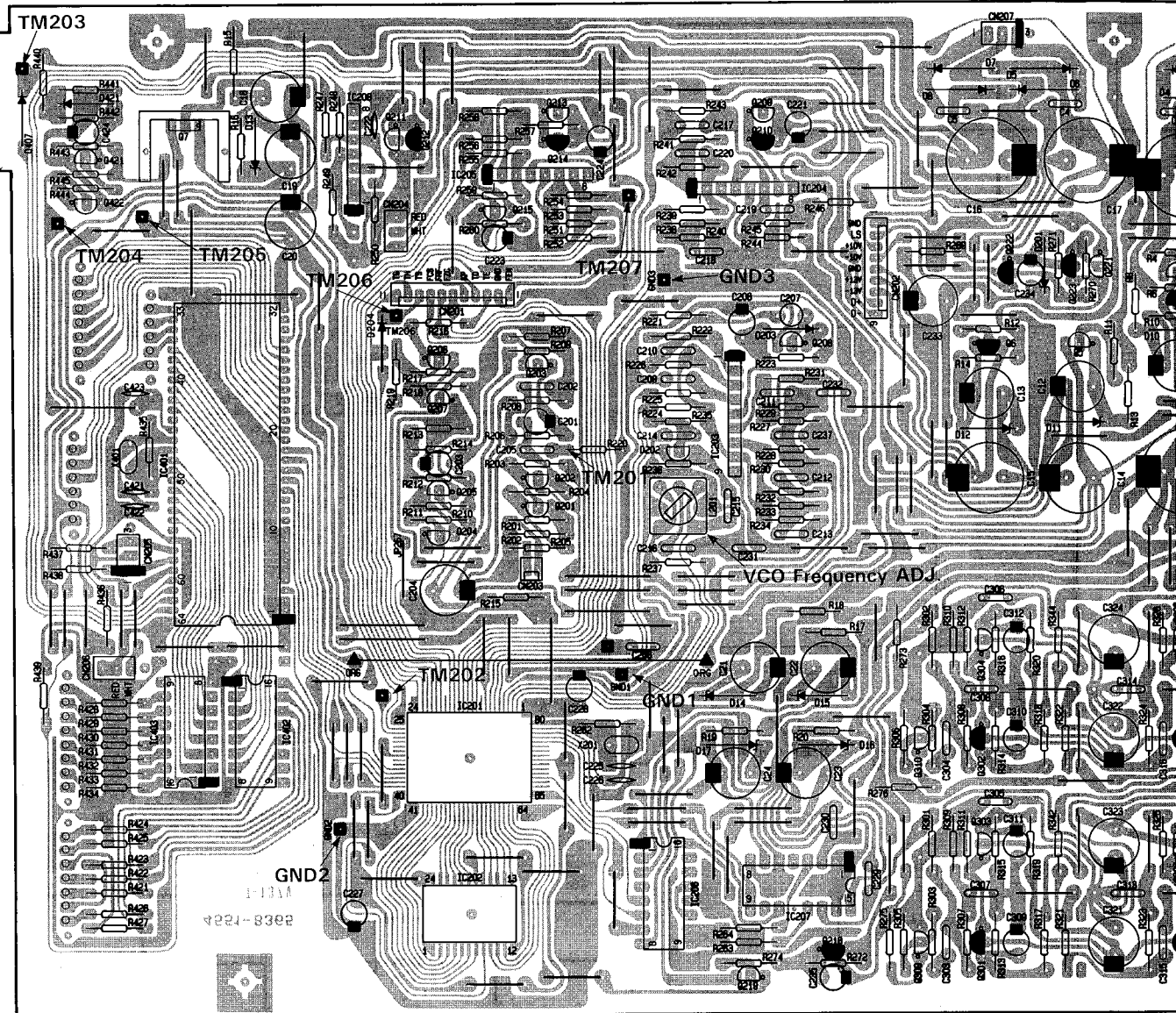


OUTPUT  
J301 LEFT  
J302 RIGHT

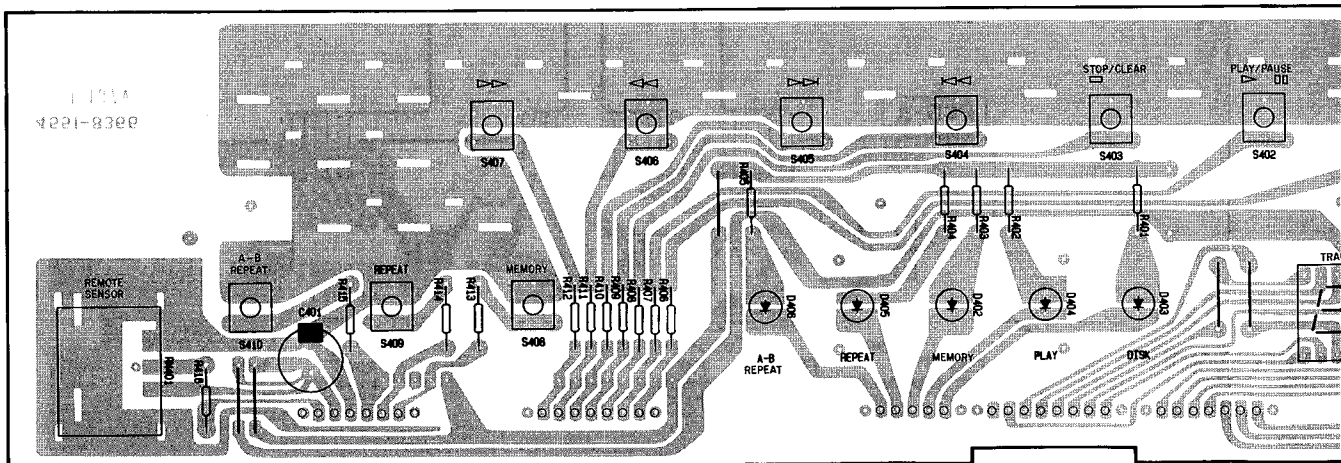


P. C. BOARDS (2)

**PCB-1** Main P. C. Board



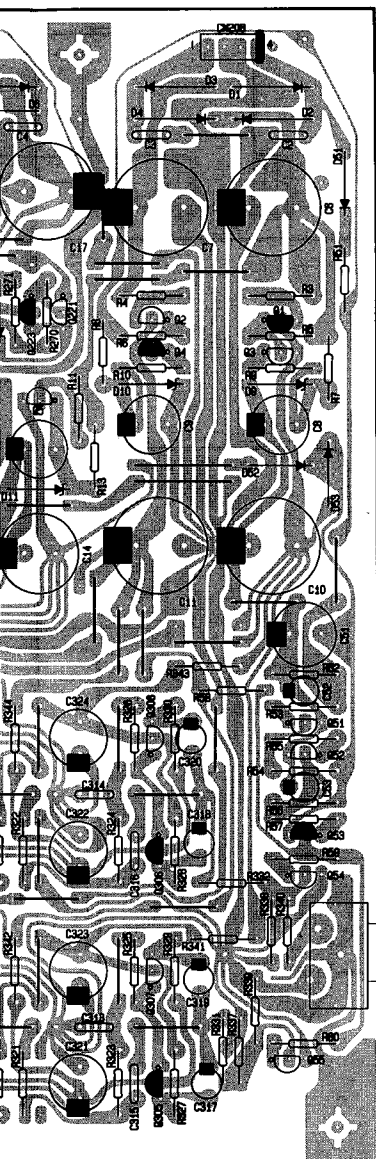
**PCB-3** Switches P. C. Board



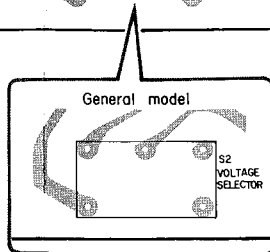
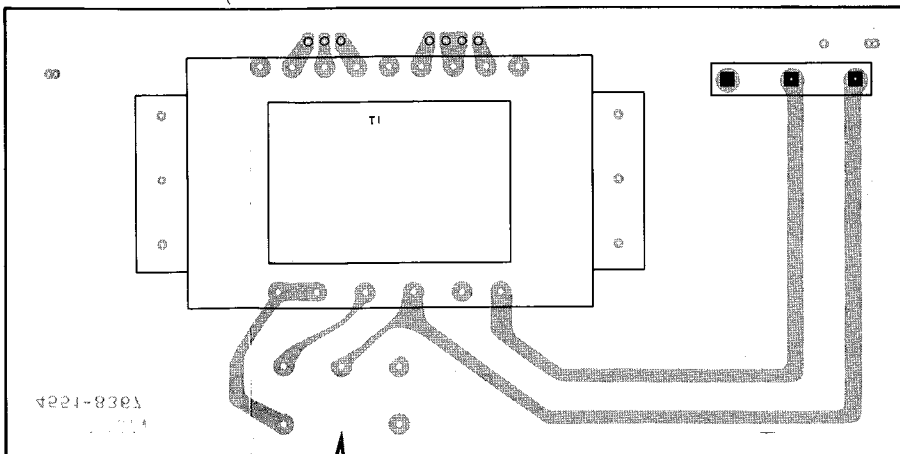


E F G H I J

**PCB-4** Power Supply P. C. Board

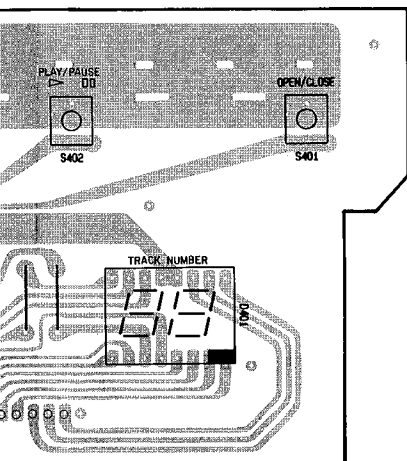


OUTPUT  
J301 LEFT  
J302 RIGHT



**PIN CONNECTION DIAGRAM OF TRANSISTORS, DIODES AND ICs**

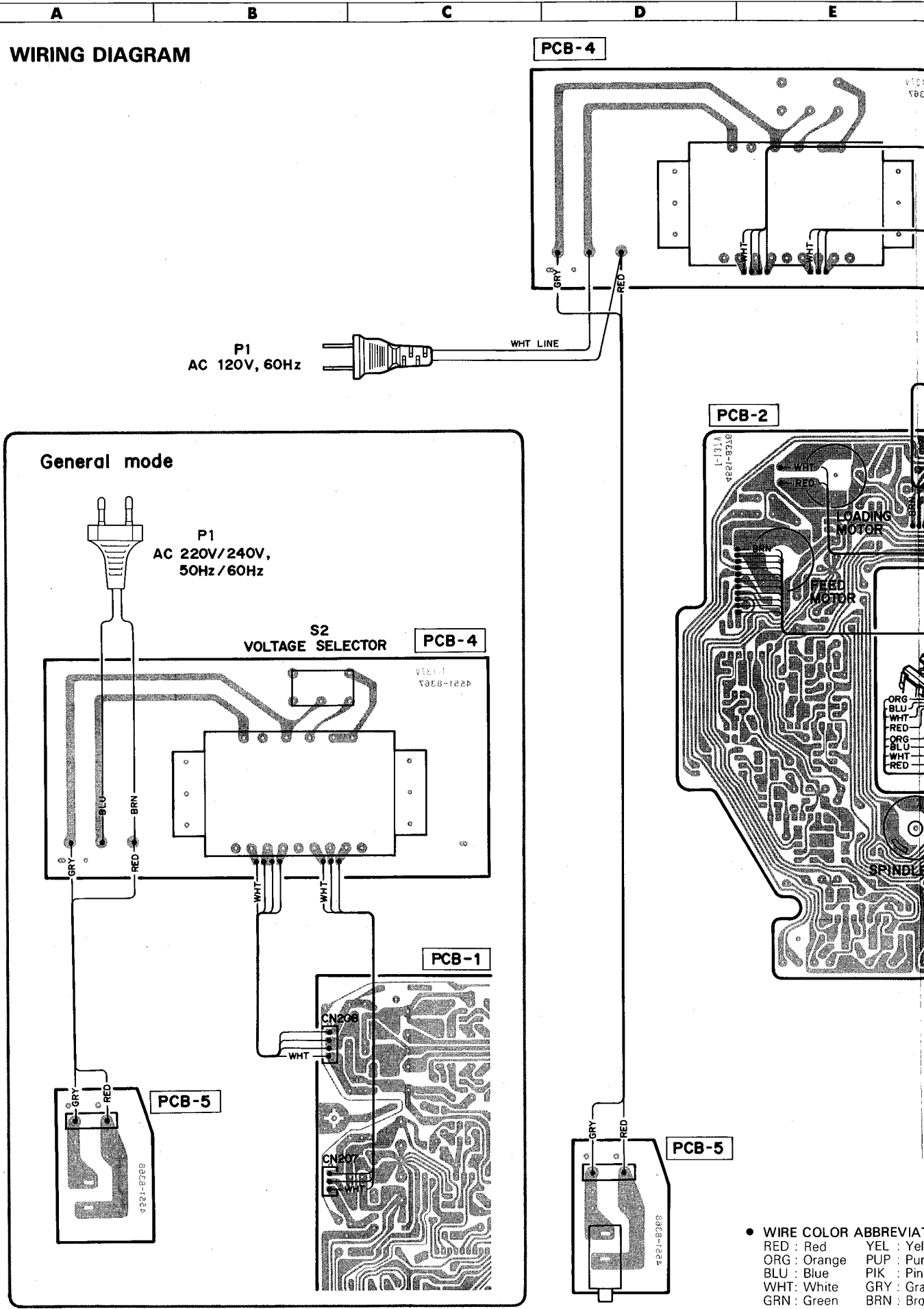
<p>2SA966 2SC2236 2SC2878 2SC535</p>	<p>2SC2603 2SA1115 RN1203</p>	<p>2SC3422</p>
<p>2SD867 2SB647</p>	<p>S5277B</p>	<p>HZ16-1L HZ12C1L HZ6B1L HZ9A1L 1S2473</p>
<p>SVC211SP</p>	<p>SLV56VC3 SLV56MC3</p>	<p>M5218L M5219L</p>
<p>NJM2068SD</p>	<p>STA451C</p>	
<p>PCM56P HD14053BP TD62504P</p>	<p>CXK5816M-15L</p>	
<p>μPD75104-20</p>	<p>YM3815</p>	





WIRING DIAGRAM

1  
2  
3  
4  
5  
6  
7



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







# SCHEMATIC DIAGRAM

1

2

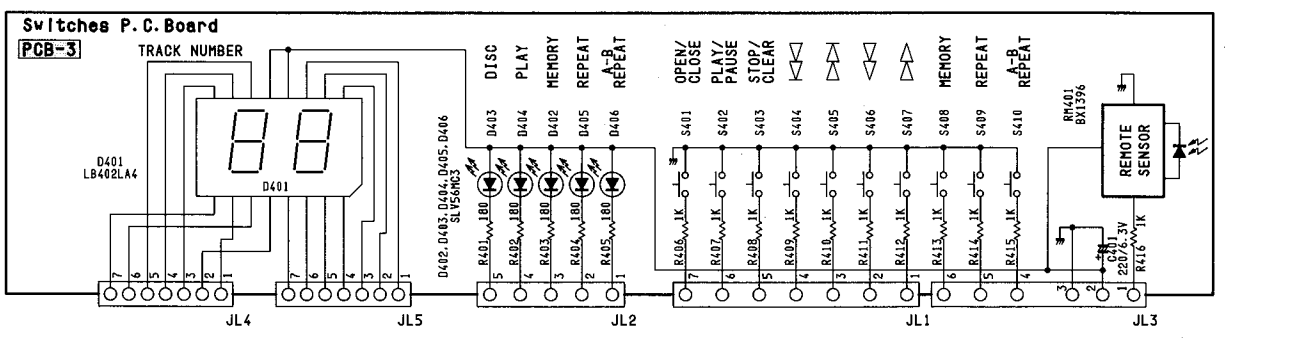
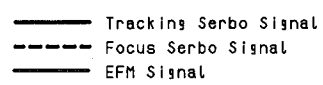
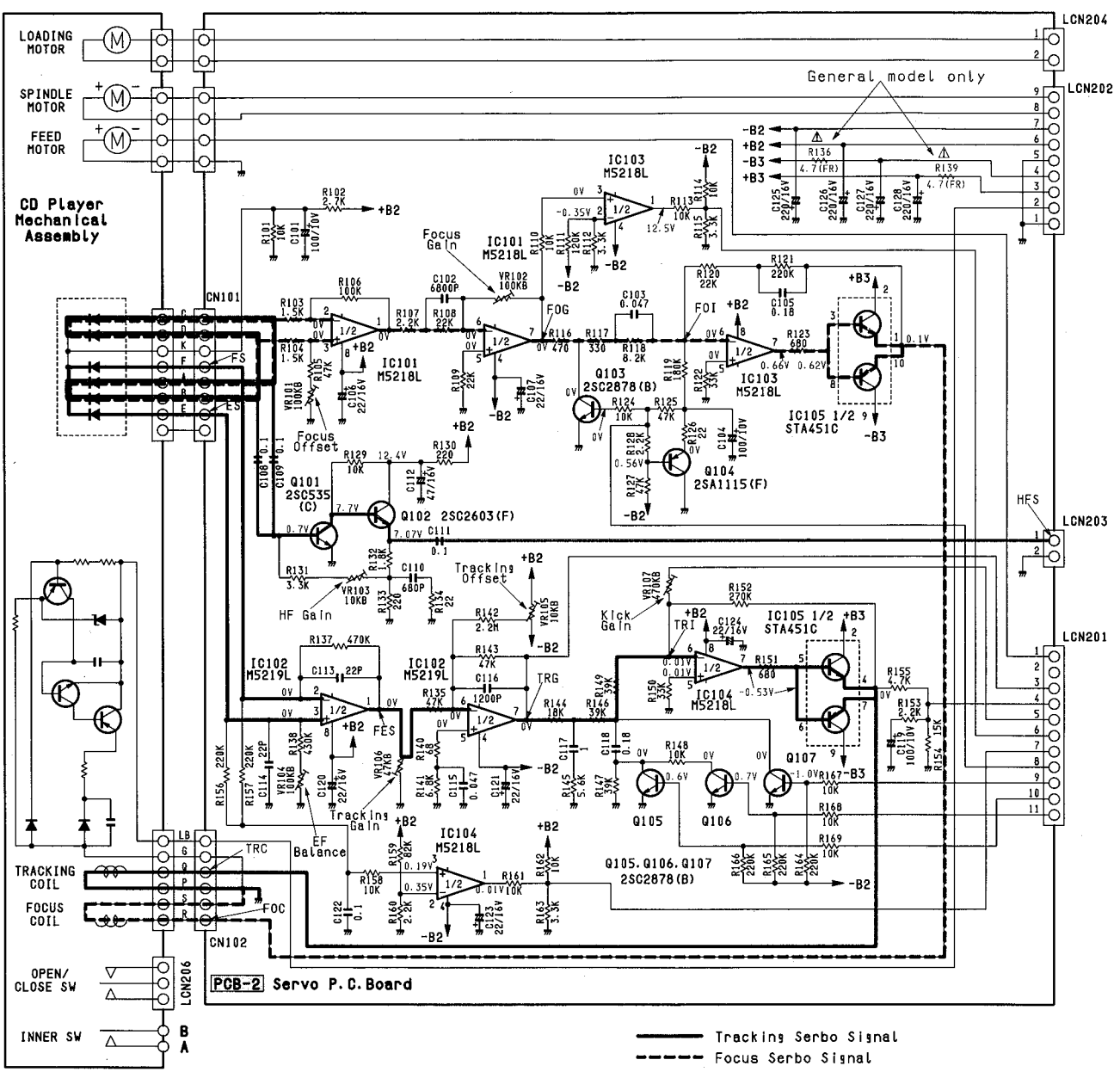
3

4

5

6

7



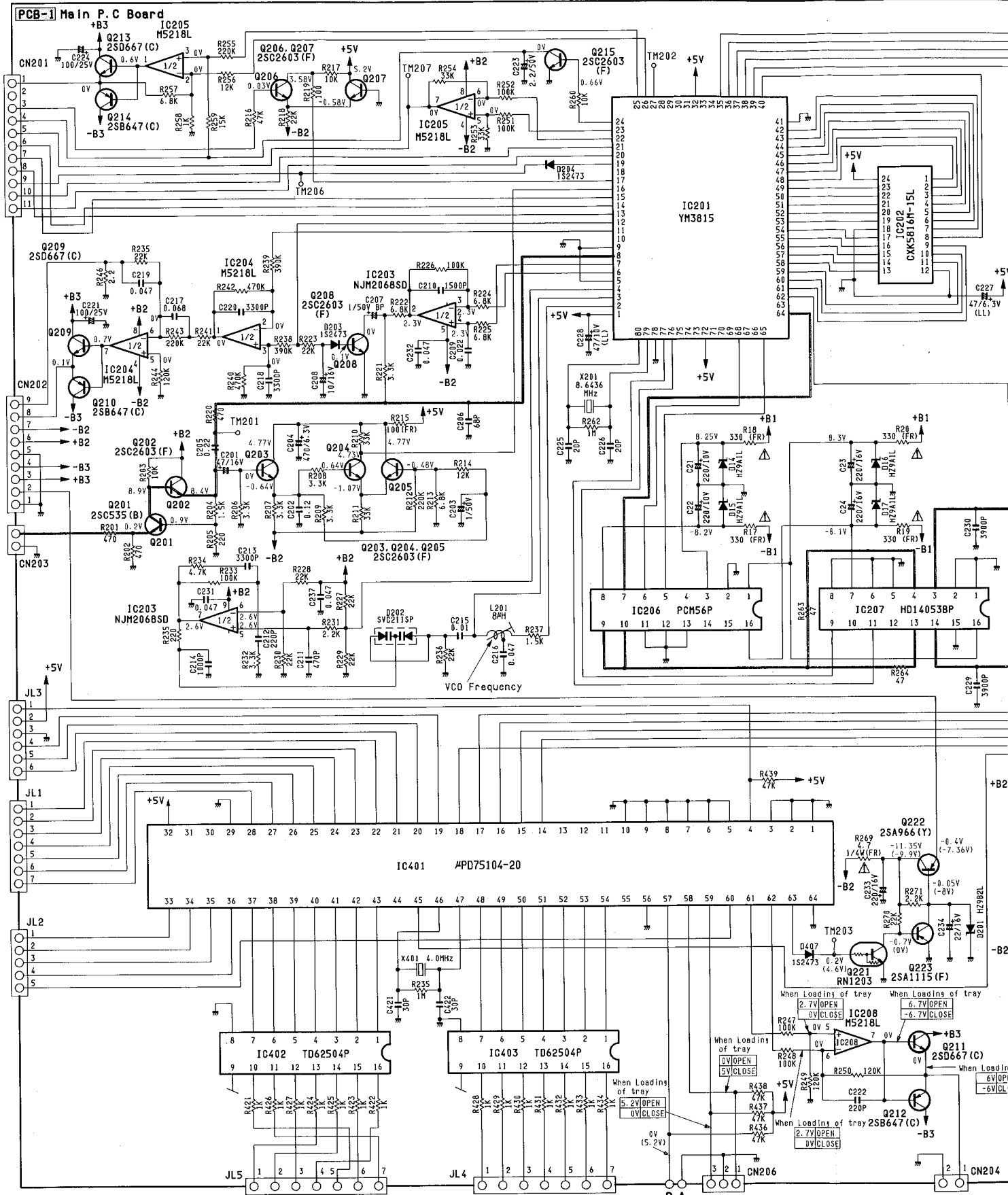
F

G

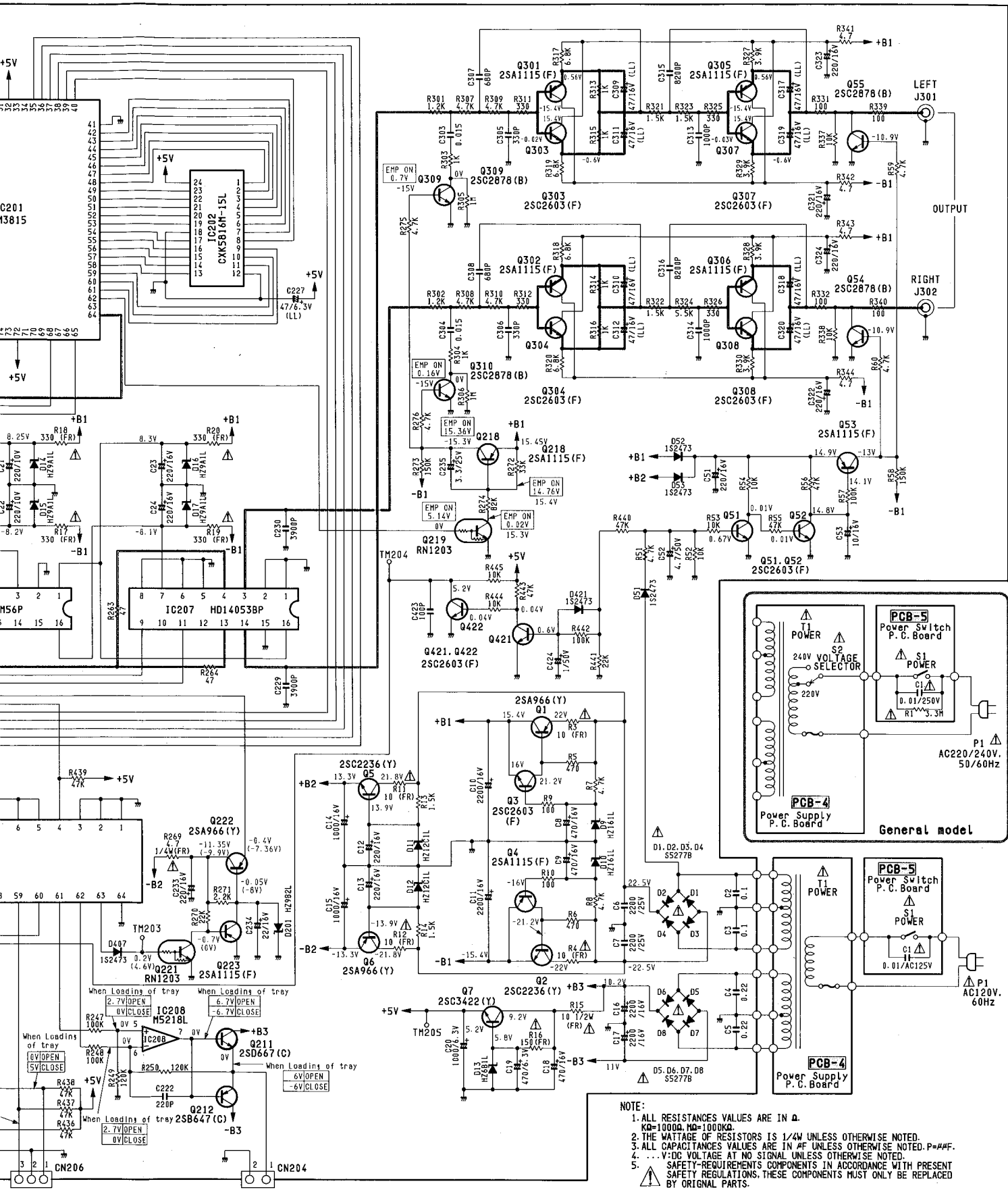
H

I

J



I J K L M N



NOTE:  
 1. ALL RESISTANCES VALUES ARE IN Ω.  
 2. THE WATTAGE OF RESISTORS IS 1/4W UNLESS OTHERWISE NOTED.  
 3. ALL CAPACITANCES VALUES ARE IN pF UNLESS OTHERWISE NOTED. P=μF.  
 4. ...V:DC VOLTAGE IN NO SIGNAL UNLESS OTHERWISE NOTED.  
 5. SAFETY-REQUIREMENTS COMPONENTS IN ACCORDANCE WITH PRESENT SAFETY REGULATIONS, THESE COMPONENTS MUST ONLY BE REPLACED BY ORIGINAL PARTS.

EFM Signal