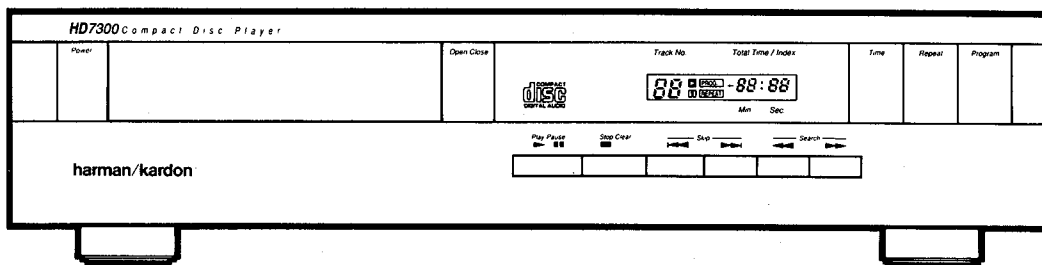


The Harman Kardon Model HD7300 COMPACT DISC PLAYER

Manual 151A

Technical Manual



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

- Ⓚ : North America area model Black version
- Ⓜ : International model Black version
- Ⓛ : Australia model Black version

harman/kardon

240 Crossways Park West, Woodbury, N. Y. 11797
1112-3152151A4 P-1189081500 Printed in Japan

HD7300

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**

SPECIFICATION

| | |
|---------------------------|------------------------------|
| System | : Compact Disc Digital Audio |
| Signal Detection | : 3-Beam Semiconductor Laser |
| Error Correction | : CIRC System |
| Sampling Frequency | : 176.4kHz |
| Quantization | : 18-bit Linear |
| Channels | : 2 Channel Stereo |
| Frequency Response | : 4Hz-20kHz ± 0.2 dB |
| Total Harmonic Distortion | : 0.008% (1kHz) |
| Dynamic Range | : 96dB |
| Signal-to-Noise Ratio | : 100dB |
| Channel Separation | : 88dB (1kHz) |
| Wow & Flutter | : Immeasurable |

| | |
|--------------------------|--|
| Line Output Level/Load | |
| Impedance | : 2.0V/10k Ohms |
| Power Supply | |
| U.S.A. and Canada models | : AC 120V, 60Hz |
| International model | : AC 220/240V, 50/60Hz |
| Power Consumption | : 15 Watts |
| Dimensions (WxHxD) | : 17-3/8" x 4" x 13" (443 x 103 x 330 mm) |
| Weight | : 11lbs. (5kg) |

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, input Select DC range) 1740A
- Test Disc:: EIAJ CD-1
- Distortion Meter 339A

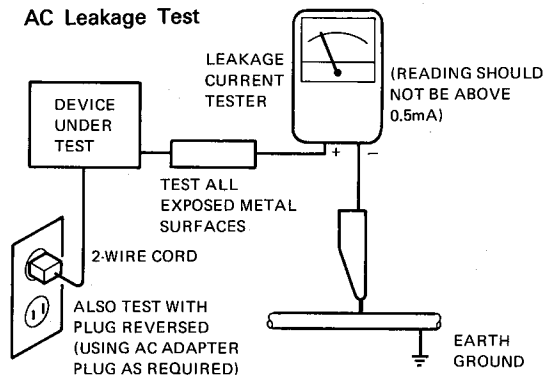
SAFETY PRECAUTIONS

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.**

AC Leakage Test

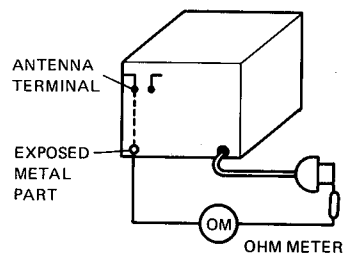


d. Insulation Resistance Test

- (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 (Δ) 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 flammability and dielectric strength. When replacing any components, use components which has the same ratings. Components marked (Δ) 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.

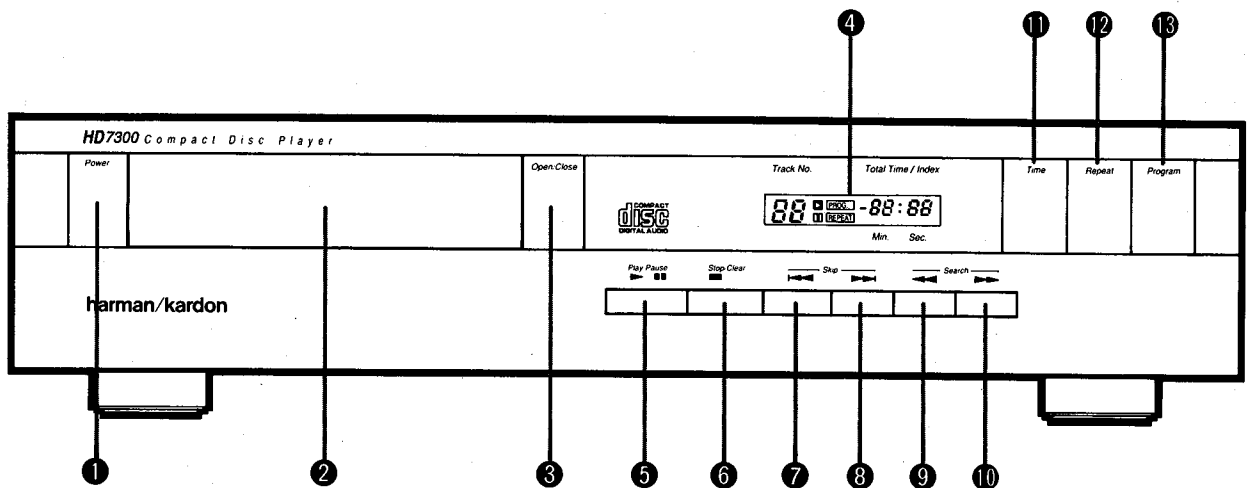
ELECTROSTATICALLY SENSITIVE (ES) DEVICES

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 fieldeffect 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 MULTI DISPLAY

Displays the track number during playback, and displays elapsed playback time from the beginning of the program being played or the index number during stop mode.

5 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.

6 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.

7 << SKIP BUTTON (SKIP)

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 to the beginning of the program before that, and so on.

8 >> SKIP BUTTON (SKIP)

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.

9 <<< BUTTON (REVERSE SEARCH)

Pressing this button starts low speed reverse. Holding the button down longer than two seconds changes the reverse mode to high speed can be heard at a reduced level in this mode. Also, when this button is pressed in the stop mode, the index number is decreased.

10 >>> BUTTON (FAST-FORWARD SEARCH)

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. Also, when this button is pressed in the stop mode, the index number is increased.

11 TIME BUTTON (T)

Press to change the display. When pressed, display is switched between the elapsed playback time of a track and the time remaining before the end of the last selection. The display is also switched to the remaining number of programs during program playback.

12 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.

13 PROGRAM BUTTON

Used to program the memory for non-sequential playback of disc tracks. Up to 36 program selections can be stored in the memory.

DISASSEMBLY PROCEDURES (REFER TO PAGES 35, 36, 37 AND 39)

[1] CABINET TOP (123) REMOVAL

Remove 7 screws (A) and then remove the Cabinet Top (123).

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

1. Remove the Cabinet Top (123), referring to the previous step [1].
2. Disconnect the connector with lead wire (LCN401) from connector (CN108) on the Main P. C. Board (PCB-1).
3. Open the lid of connectors (CN105, CN106 and CN107) on the Main P. C. Board (PCB-1) and then disconnect the jumper leads (JL402, JL403 and JL404).
4. Remove 6 screws (B) and then remove the Front Panel Ass'y (AA) with the Front P. C. Board (PCB-2).
5. Remove 7 screws (C) and then remove the Front P. C. Board (PCB-2) from the Front Panel Ass'y (AA).

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

1. Remove the Cabinet Top (123), referring to the previous step [1].

2. Disconnect the connector with lead wires (LCN101, LCN102, LCN103, LCN104 and LCN401) from connectors (CN101, CN102, CN103, CN104 and CN108) on the Main P. C. Board (PCB-1).
3. Open the lid of connectors (CN1, CN2, CN105, CN106 and CN107) on the Main P. C. Board (PCB-1) and then disconnect the jumper leads (JL1, JL2, JL402, JL403 and JL404).
4. Remove 5 screws (D) and then remove the Main P. C. Board (PCB-1).

[4] CD PLAYER MECHANICAL ASSEMBLY (103) REMOVAL

1. Remove the Cabinet Top (123), referring to the previous step [1].
2. Disconnect the connector with lead wires (LCN101, LCN102, LCN103 and LCN104) from connectors (CN101, CN102, CN103 and CN104) on the Main P. C. Board (PCB-1).
3. Remove 3 screws (E) and then remove the CD Player Mechanical Assembly (103) backward.

DISASSEMBLING THE CD PLAYER MECHANICAL ASSEMBLY

[5] DISC TRAY (16) REMOVAL

1. Remove the Cabinet Top (123), 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 (16) by pressing the Open/Close button.
4. With the Disc Tray (16) opened as it is, pull out the power plug.
5. Push the Disc Tray (16) by hand to slide it in once.
6. Loosen 2 screws (F) and then slide out the Disc Tray (16) by hand.

2. Remove 4 screws (G) and then remove the Disc Motor Ass'y (63) with Pick-up, Slide Motor and etc.
3. Remove 2 screws (H) and then remove the Gears (59 and 60).
4. Remove the 2 screws (I) and then remove the Shaft Clamps (62), then remove the Pick-up (52) with shaft.

[6] OPTICAL PICK-UP (52) REMOVAL

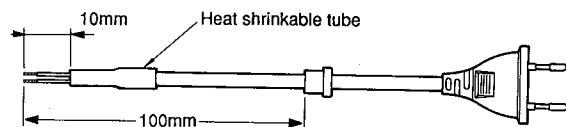
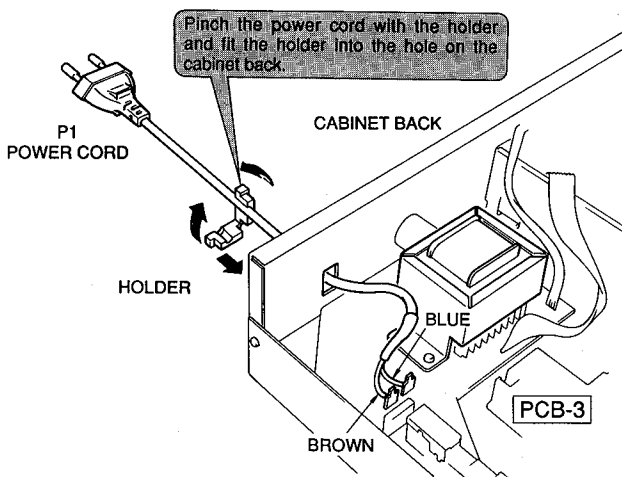
1. Remove the CD Player Mechanical Assembly (103), referring to the previous step [4].

[7] SLIDE MOTOR (57) REMOVAL

1. Remove the Gears (59 and 60), referring to the previous step [6]-3.
2. Unsolder the terminal of Disc and Slide Motors, then remove the Motor P. C. Board (65).
3. Remove 2 screws (J) and then remove the Slide Motor (57).

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.



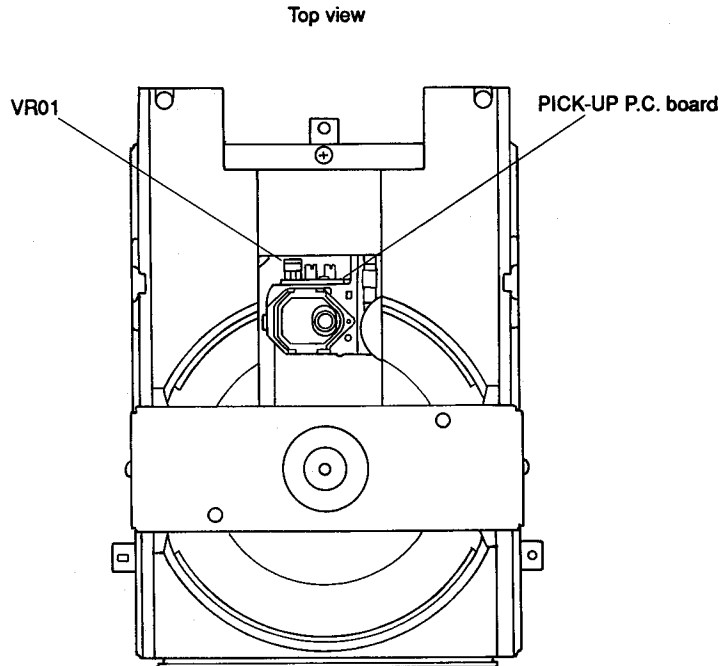
ADJUSTMENT PROCEDURE

1. Instruments required

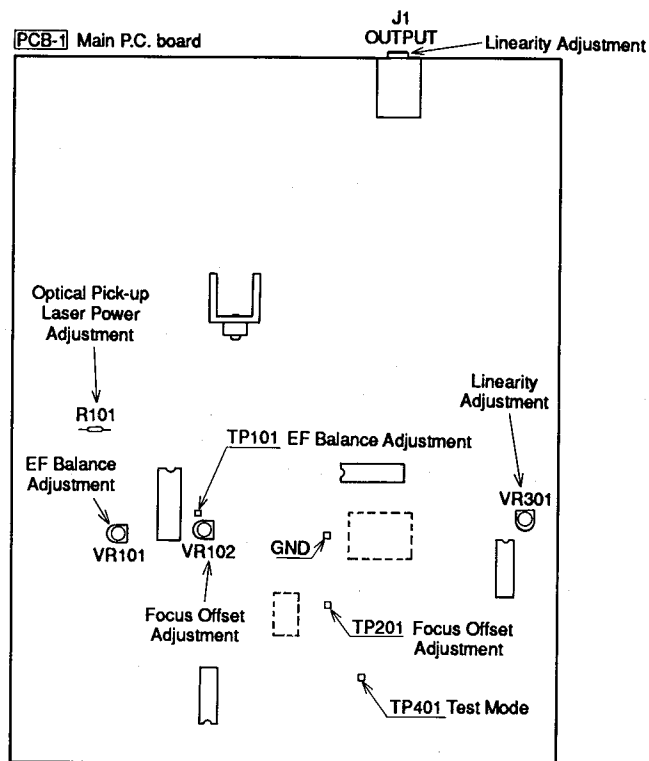
- DC voltmeter
- Oscilloscope (3 or more modes, 100 MHz, input select DC range)
- Jitter meter
- Distortion meter
- Test disc: EIAJ CD-1

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. Test Mode

- Short-circuit TP401 and GND located on the Main P.C. board.
Push the power switch button. (Test Mode)

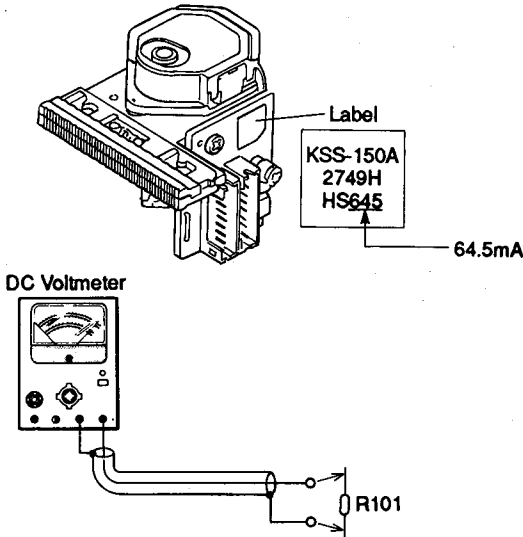
| Press buttons in sequence below | Test mode number | Display | Operation |
|---------------------------------------|------------------------|---------|--|
| POWER | 0 | | LD OFF All servo OFF |
| PLAY | 1 | | LD ON |
| PLAY | 2 | | FS ON (Focus search) |
| PLAY (Disc must be in tray) | 3 | | FS ON (focus ON) Disc motor rotate Mute OFF |
| FORWARD SKIP | 4 | | TS (Tracking servo) ON SS (Slide servo) ON |
| FORWARD SKIP | 5 | | Displays the track number and playback time. |
| REVERSE SKIP | 6 | | TS (Tracking servo) OFF SS (Slide servo) OFF |
| F.F. or REVERSE SEARCH | 7 | _____ | Move the pick-up. (Manual) |
| STOP, then press OPEN/CLOSE | 8 | _____ | Disc tray open or close This function can be activated from stop mode. |

4. 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.

- (a) Read the current value on the label of the pick-up P.C.board.
- (b) Using the amperage of the current and the following equation, calculate the voltage value.
When the current is 64.5mA:
 $V=0.0645A \times 22=1.419V$

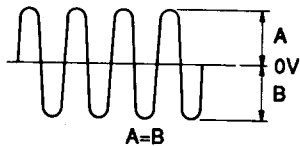
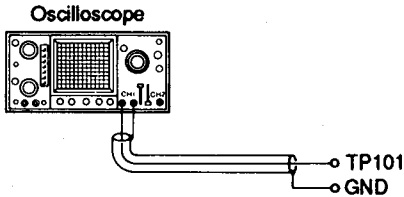
- (1) Connect the DC voltmeter to both ends of R101.
- (2) Insert EIAJ CD-1 test disc and place the unit in the Test Mode 2.
- (3) Adjust VR01 in the pick-up P.C.board to the voltage obtained in step (b) above.



5. EF Balance Adjustment

- (1) Connect the oscilloscope (0.5V/div, 5msec/div) to TP101 and GND.
- (2) Insert EIAJ CD-1 test disc and place the unit in the Test Mode 3.
- (3) Adjust VR101 so that the amplitude above and below the zero DC line becomes equal. (Amplitude A = Amplitude B)

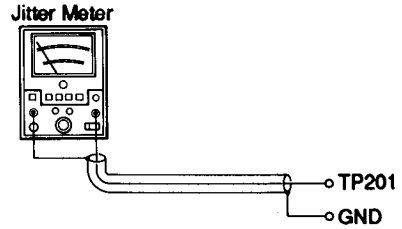
NOTE: Instead of using the DC input of an oscilloscope, you may also use a DC null voltmeter for this alignment.



(approx. 1.5Vp-p)

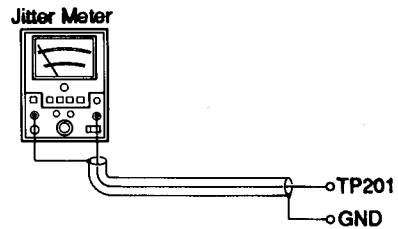
6. Focus Offset Adjustment

- (1) Connect the Jitter meter to TP201 and GND.
- (2) Insert EIAJ CD-1 test disc and place the unit in the play mode.
- (3) Adjust VR102 until the jitter for optimum sensitivity.



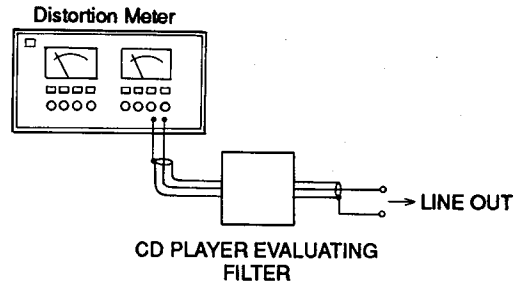
7. Jitter Inclination Confirmation

- (1) Connect the Jitter meter (sigma range) to TP201 and GND.
- (2) Insert EIAJ CD-1 test disc and place the unit in the test mode 4.
- (3) Confirm the jitter meter reading is less than 30ns.



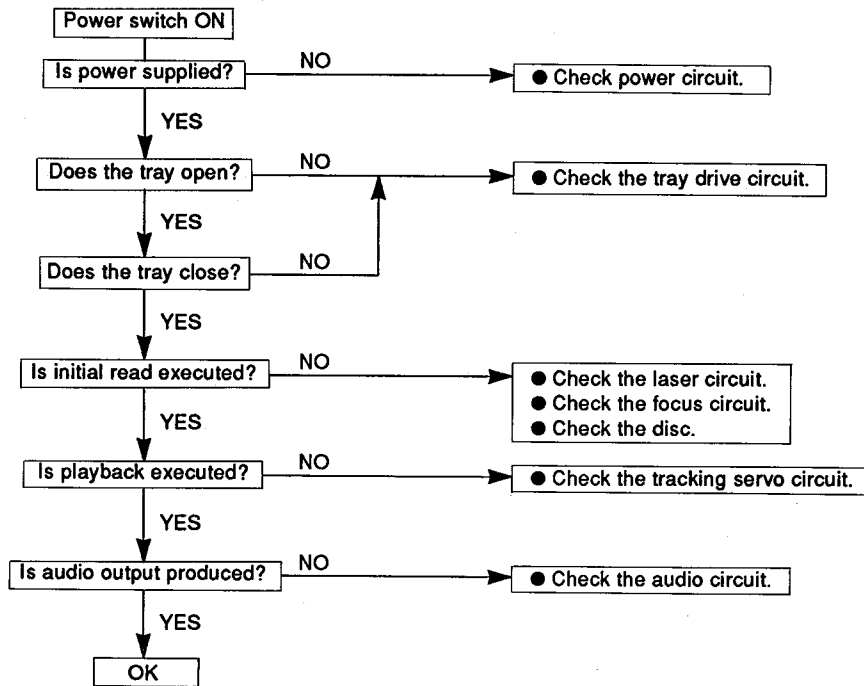
8. Linearity Adjustment

- (1) Connect the distortion meter to line out jacks.
- (2) Insert EIAJ CD-1 test disc track number 5 (recorded level -60 dB) and place the unit in the play mode.
- (3) Adjust VR301 so that the distortion is minimized.

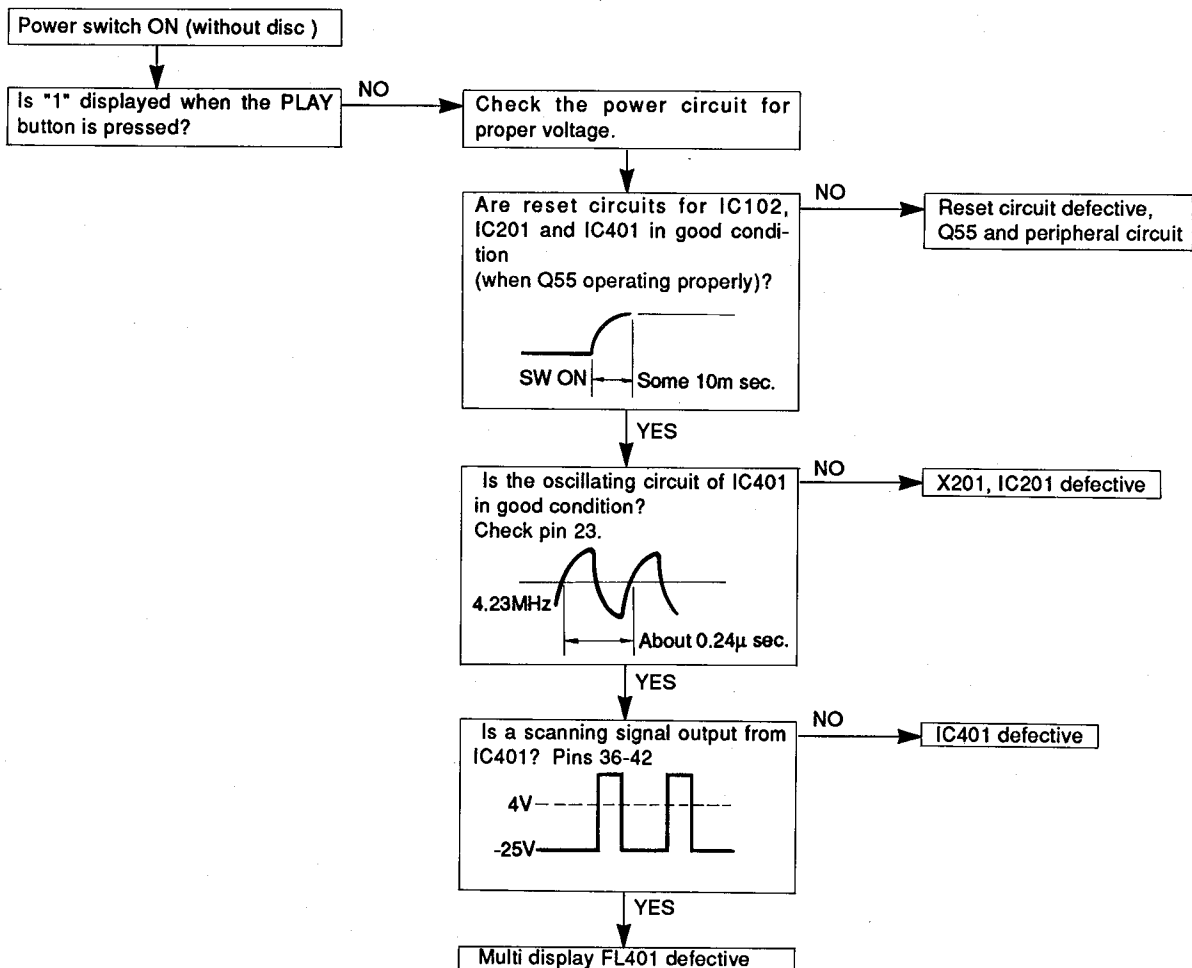


TROUBLE SHOOTING

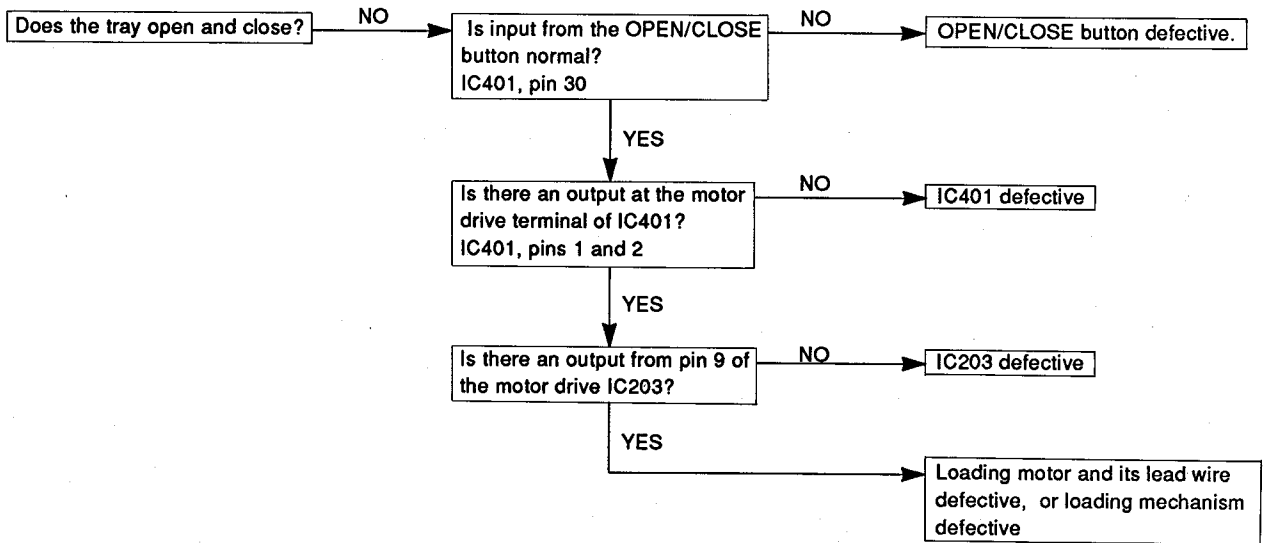
When a trouble has occurred, first check the pick-up lens for dirt and each connector for tight and secure connection. If the problem persists after checking both of these items, use the following check procedures.



(1) When Multi Display falls to light properly

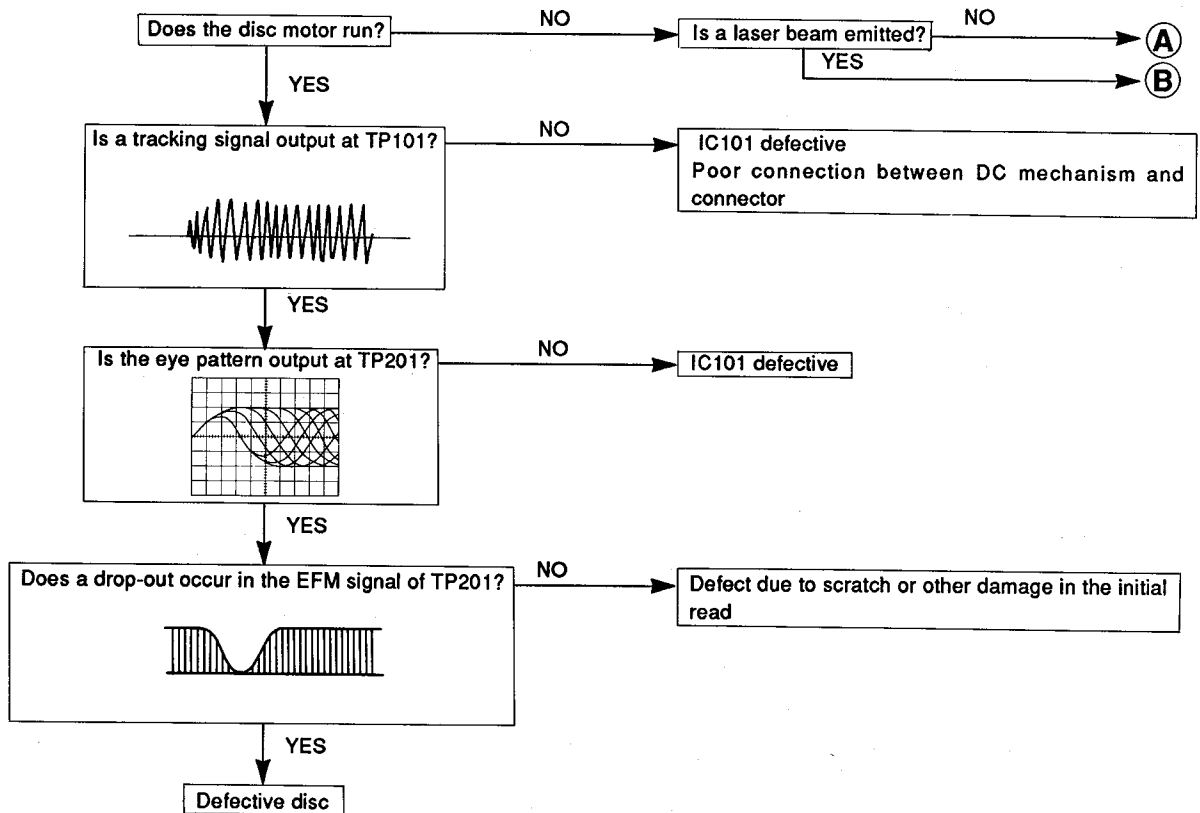


(2) When the tray fails to operate properly

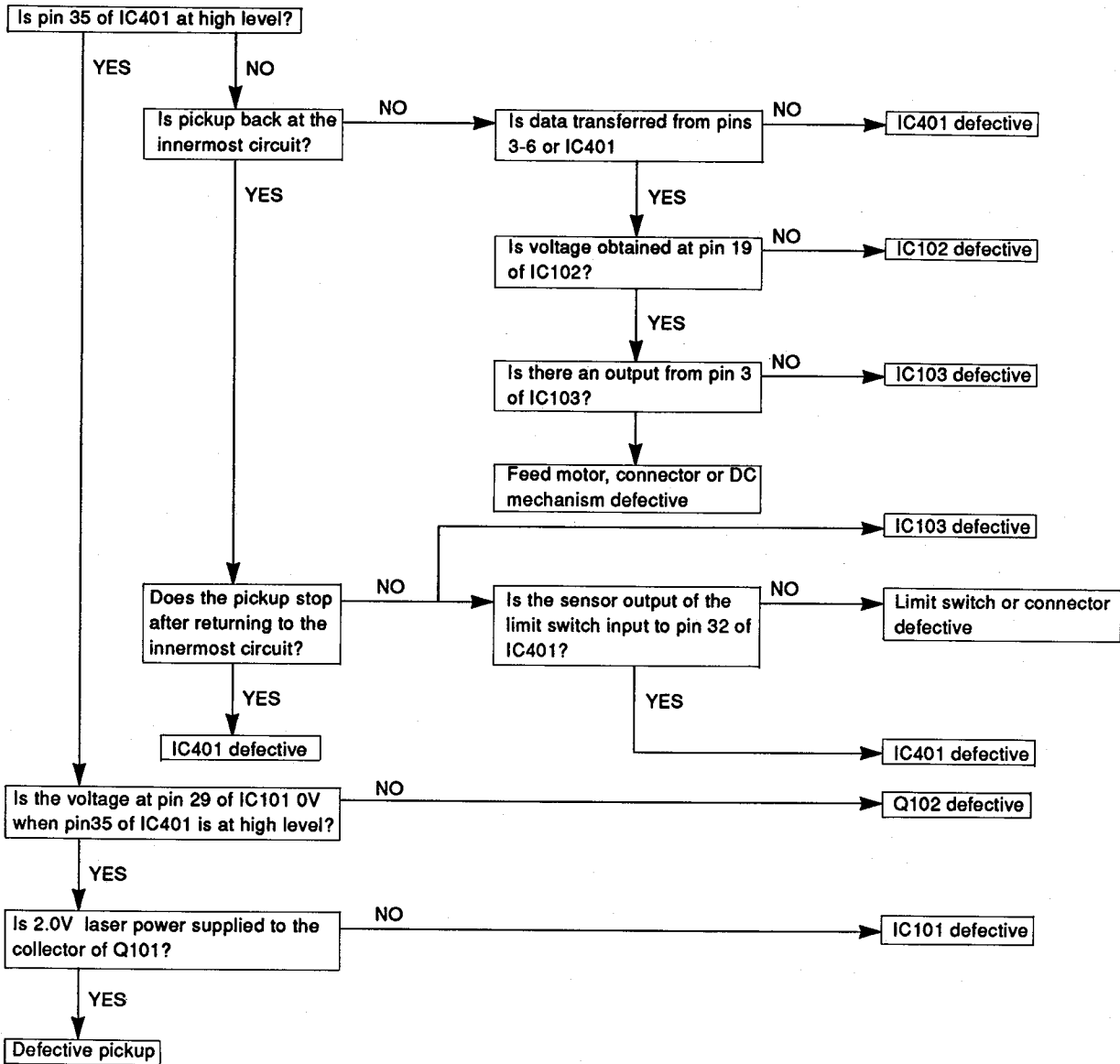


(3) When initial read cannot be executed

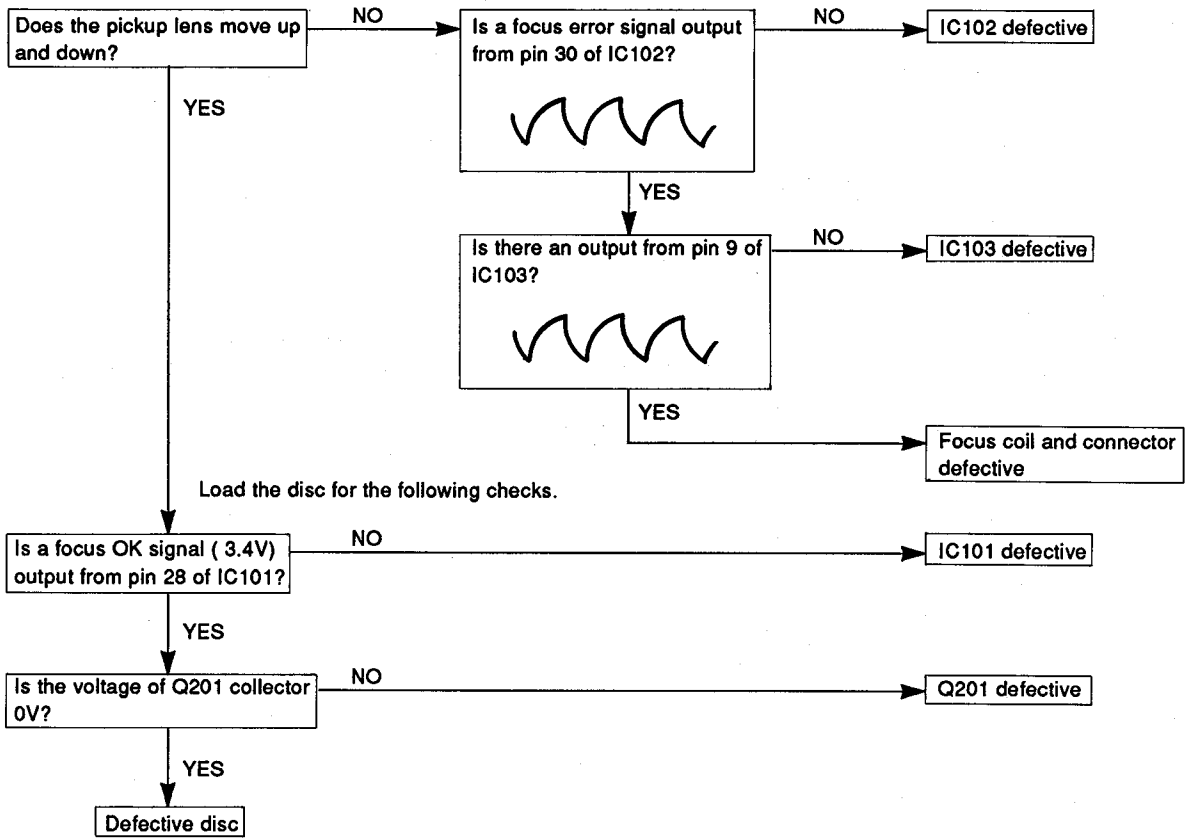
The following checks can be done without a disc loaded.



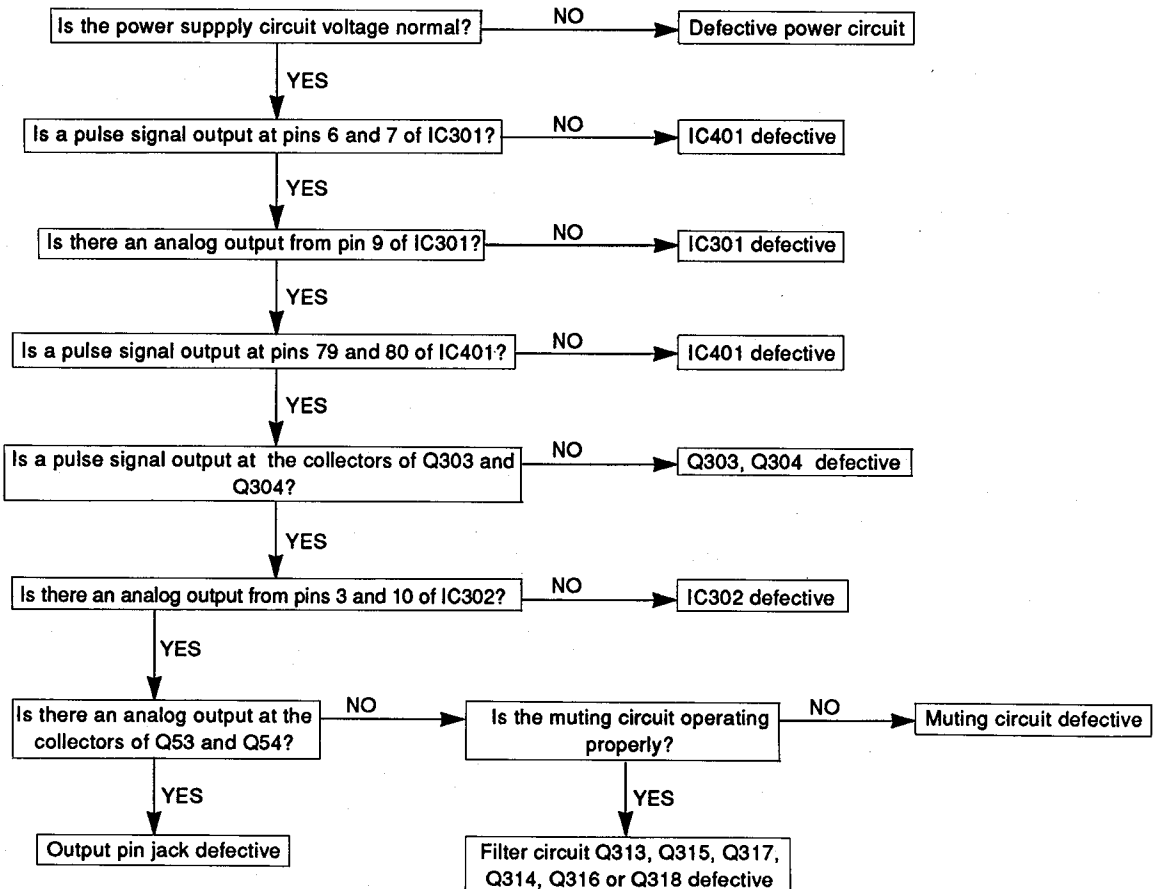
A When laser beam is not emitted



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 | VEE | | — | 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 | $\overline{\text{LD ON}}$ | | I | Laser diode on/off select terminal. |
| | 30 | VCC | | — | Positive power terminal. |
| IC102 | 1 | TE IN | Pre amp. input | I | Tracking error signal input terminal. |

| IC number | Terminal number | Port name | Terminal code | I/O | Outline of functions |
|-----------|-----------------|--------------------------|----------------|-----|--|
| IC102 | 2 | TC IN | Pre amp. input | I | Track cross signal input terminal. |
| | 3 | SHOCK IN | Pre amp. input | I | Shock detector signal input terminal. |
| | 4 | HF OK | Pre amp. input | I | HF OK 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. |
| | 7 | $\overline{\text{HFD}}$ | Mi-com I/O | O | "1" indicates that MR input is "1" and track servo loop is off (TS OFF, JF, JR). |
| | 8 | T-HLD | Track servo | I | Direct control terminal for TS1 switch. "1" indicates that TS1 switch is "b" "0" indicates that priority is given to controller command. |
| | 9 | DATA OUT | Mi-com I/O | O | Inner condition output changed by command modes. |
| | 10 | $\overline{\text{JPi}}$ | Mi-com I/O | I | 1 track jump control signal. Usually "H". |
| | 11 | MSD | Mi-com I/O | I | Serial data input terminal (LSB first, 8-bit data). |
| | 12 | $\overline{\text{MLA}}$ | Mi-com I/O | I | Latch signal of serial data from mi-com to servo IC. |
| | 13 | MCK | Mi-com I/O | I | Clock signal of serial data from mi-com to servo IC. Receives data on leading edge. |
| | 14 | $\overline{\text{ACLR}}$ | Mi-com I/O | I | All clear input. (Clear inner registers and flip-flops by "L" signal.) |
| | 15 | Bias | Power supply | O | Vcc/2 bias power supply output when single-pole power supply is used. |
| | 16 | 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. |
| | 17 | GND | Power supply | I | GND terminal. |
| | 18 | VEE | Power supply | I | Negative power terminal. Connect to GND when single-pole power supply is used. |
| | 19 | SS OUT | Slide servo | O | Operation amplifier SS output. |
| | 20 | SS \ominus | Slide servo | I | Operation amplifier SS reverse input. |
| | 21 | SS \oplus | Slide servo | I | Operation amplifier SS non-reverse input. |
| | 22 | TS OUT | Track servo | O | Operation amplifier TA output. |
| | 23 | TS \ominus | Track servo | I | Operation amplifier TA reverse input. |

| IC number | Terminal number | Port name | Terminal code | I/O | Outline of functions |
|-----------|-----------------|--------------|---------------|-----|---|
| IC102 | 24 | TG2 | Track servo | — | Track gain select switch TG2 output. Set to open or common level. |
| | 25 | TS \oplus | Track servo | I | Operation amplifier TA non-reverse input. |
| | 26 | TG1 | Track servo | — | Track gain select switch TG1 output. Set to open or common level. |
| | 27 | TE OUT | Track servo | O | Operation amplifier TE output. |
| | 28 | TE \ominus | Track servo | I | Operation amplifier TE reverse input. |
| | 29 | FSR IN | Focus servo | I | Focus search voltage level detector input. |
| | 30 | FS OUT | Focus servo | O | Operation amplifier FA output. |
| | 31 | FS \ominus | Focus servo | I | Operation amplifier FA reverse input. |
| | 32 | FS \oplus | Focus servo | I | Operation amplifier FA non-reverse input. |
| | 33 | FG | Focus servo | — | Focus gain select switch FG output. Set to open or common level. |
| | 34 | C-FSR | Focus servo | — | Connect capacitor which determines time constant of focus search waveform. |
| | 35 | I-Ref | Power supply | I | Terminal for connecting resistor for setting current value of reference current source. |
| | 36 | Vcc | Power supply | I | Positive power terminal. |
| | IC103 | 1 | +VIN 1 | | I |
| 2 | | -VIN 1 | | I | Negative input terminal 1 for amp. 1. |
| 3 | | OUT 1 | | O | Output terminal 1. |
| 4 | | OUT 2 | | O | Output terminal 2. |
| 5 | | -VIN 2 | | I | Negative input terminal 2 for amp. 2. |
| 6 | | +VIN 2 | | I | Positive input terminal 2 for amp. 2. |
| 7 | | +VIN 3 | | I | Positive input terminal 3 for amp. 3. |
| 8 | | -VIN 3 | | I | Negative input terminal 3 for amp. 3. |
| 9 | | OUT 3 | | O | Output terminal 3. |
| 10 | | NC | | — | |
| 11 | | NC | | — | |
| 12 | | Vcc | | — | Positive power supply. |

| IC number | Terminal number | Port name | Terminal code | I/O | Outline of functions |
|-----------|-----------------|-------------------|---------------|-----|--|
| 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 | \overline{MLA} | | I | Microcomputer interface data latch clock input |
| | 15 | \overline{ACLR} | | I | Microcomputer interface register clear input. |
| | 16 | \overline{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 | VDD2 | | 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. |

| IC number | Terminal number | Port name | Terminal code | I/O | Outline of functions |
|-----------|-----------------|-------------------------|---------------|-----|--|
| IC201 | 32 | VSS2 | | 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 | RAS | | O | Row address strobe signal output. |
| | 44 | NC | | — | |
| | 45 | RDB2 | | I/O | External memory data I/O 2. |
| | 46 | NC | | — | |
| | 47 | RDB1 | | I/O | External memory data I/O 1. |
| | 48 | RDB4 | | I/O | External memory data I/O 4. |
| | 49 | $\overline{\text{CAS}}$ | | O | Column address strobe signal output. |
| | 50 | RDB3 | | I/O | External memory data I/O 3. |
| | 51 | $\overline{\text{WE}}$ | | O | Write enable signal output. |
| | 52 | NC | | — | |
| | 53 | RAD1 | | O | External memory address output 1. |
| | 54 | RAD2 | | O | External memory address output 2. |
| | 55 | RAD3 | | O | External memory address output 3. |
| | 56 | RAD7 | | O | External memory address output 7. |
| | 57 | RAD4 | | O | External memory address output 4. |
| | 58 | RAD5 | | O | External memory address output 5. |
| | 59 | RAD6 | | O | External memory address output 6. |
| | 60 | RAD0 | | O | External memory address output 0. |
| | 61 | EST2 | | O | Error status 2. |
| | 62 | EST1 | | O | Error status 1. |

| IC number | Terminal number | Port name | Terminal code | I/O | Outline of functions |
|-----------|-----------------|-------------------------|---------------|---------------------------------|--|
| IC201 | 63 | VDD1 | | I | 5V power supply. |
| | 64 | DOFK | | O | OSC frame clock output. |
| | 65 | FSCK | | O | Clock output. 44.1kHz |
| | 66 | C846 | | O | Clock output. 8.4672MHz |
| | 67 | C423 | | O | Clock output. 4.2336MHz |
| | 68 | C16MI | | I | 1/2 divider input. |
| | 69 | C8MO | | 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 | VSS1 | | 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. | |
| IC202 | 1 | $\overline{\text{OE}}$ | | I | Output enable input. |
| | 2 | DQ1 | | I/O | Data I/O. |
| | 3 | DQ2 | | I/O | Data I/O. |
| | 4 | $\overline{\text{W}}$ | | I | Write control input. |
| | 5 | $\overline{\text{RAS}}$ | | I | Row address strobe input. |
| | 6 | A6 | | I | Address input. |
| | 7 | A5 | | I | Address input. |
| | 8 | A4 | | I | Address input. |
| | 9 | Vcc | | — | Power supply (5V). |
| | 10 | A7 | | I | Address input (row address only). |
| | 11 | A3 | | I | Address input. |
| | 12 | A2 | | I | Address input. |
| | 13 | A1 | | I | Address input. |
| | 14 | A0 | | I | Address input (row address only) |

| IC number | Terminal number | Port name | Terminal code | I/O | Outline of functions |
|-----------|-----------------|-----------|---------------|-----|---------------------------------|
| IC202 | 15 | DQ3 | | I/O | Data I/O. |
| | 16 | CAS | | I | Column address strobe input. |
| | 17 | DQ4 | | I/O | Data I/O. |
| | 18 | Vss | | — | Power supply (0V). |
| IC203 | 1 | VSENCE1 | | | |
| | 2 | OUT1 | | O | Output terminal 1. |
| | 3 | -VIN1 | | I | Negative input 1. |
| | 4 | +VIN1 | | I | Positive input 1. |
| | 5 | VEE | | | Negative power supply. |
| | 6 | +VIN2 | | I | Positive input 2. |
| | 7 | -VIN2 | | I | Negative input 2. |
| | 8 | OUT2 | | O | Output terminal 2. |
| | 9 | VSENCE2 | | | |
| | 10 | VCC | | | Positive power supply. |
| IC301 | 1 | -Vs | | — | Negative analog power supply. |
| | 2 | DIG GND | | — | Digital ground. |
| | 3 | +VL | | — | Positive logic power supply. |
| | 4 | NC | | — | |
| | 5 | CLK | | I | Clock input. |
| | 6 | LEC | | I | Latch enable control input. |
| | 7 | DATA | | I | Data input. |
| | 8 | -VL | | — | Negative logic power supply. |
| | 9 | VOUT | | O | Voltage output. |
| | 10 | RF | | I | Feedback resistor. |
| | 11 | SJ | | I | Summing junction. |
| | 12 | ANA GND | | — | Analog ground. |
| | 13 | IOUT | | O | Current output. |
| | 14 | MSB ADJ | | — | MSB adjustment terminal. |
| | 15 | V POT | | — | Potentiometer terminal. |
| | 16 | +Vcc | | — | Positive analog power terminal. |
| IC302 | 1 | SW1 I/O | | I/O | SW1 input/output terminal. |
| | 2 | SW1 O/I | | I/O | SW1 output/input terminal. |

| IC number | Terminal number | Port name | Terminal code | I/O | Outline of functions |
|-----------|-----------------|-----------|---------------|------------------------|---|
| IC302 | 3 | SW2 O/I | | I/O | SW2 output/input terminal. |
| | 4 | SW2 I/O | | I/O | SW2 input/output terminal. |
| | 5 | CONT2 | | I | Control input 2 terminal. |
| | 6 | CONT3 | | I | Control input 3 terminal. |
| | 7 | VSS | | | Negative power supply. |
| | 8 | SW3 I/O | | I/O | SW3 input/output terminal. |
| | 9 | SW3 O/I | | I/O | SW3 output/input terminal. |
| | 10 | SW4 O/I | | I/O | SW4 output/input terminal. |
| | 11 | SW4 I/O | | I/O | SW4 input/output terminal. |
| | 12 | CONT4 | | I | Control input 4 terminal. |
| | 13 | CONT1 | | I | Control input 1 terminal. |
| 14 | VDD | | | Positive power supply. | |
| IC401 | 1 | P27 | I/O port | I/O | Disc tray open direction driving output. |
| | 2 | P26 | I/O port | I/O | Disc tray close direction driving output. |
| | 3 | P25 | I/O port | I/O | |
| | 4 | P24 | I/O port | I/O | Serial data output. |
| | 5 | P23 | I/O port | I/O | Shift clock output. |
| | 6 | P22 | I/O port | I/O | Data latch clock output. |
| | 7 | P21 | I/O port | I/O | |
| | 8 | P20 | I/O port | I/O | |
| | 9 | NC | | — | |
| | 10 | P07 | I/O port | I/O | Serial data input. |
| | 11 | P06 | I/O port | I/O | Frame synchronous state output. |
| | 12 | P05 | I/O port | I/O | Low disc rotate state output. |
| | 13 | P04 | I/O port | I/O | Sub-code synchronous signal output. |
| | 14 | P03 | I/O port | I/O | Sub-code Q check. |
| | 15 | P02 | I/O port | I/O | Sub-code channel Q output. |
| | 16 | P01 | I/O port | I/O | Interrupt input. |
| | 17 | P00 | I/O port | I/O | |
| | 18 | INT2 | | I/O | |
| | 19 | INT1 | | I | EFM frame clock output. |
| 20 | NC | | — | | |

| IC number | Terminal number | Port name | Terminal code | I/O | Outline of functions |
|-----------|-----------------|-----------|---------------|-----|-----------------------------|
| IC401 | 21 | CNVss | | | Usually connected to Vss. |
| | 22 | RESET | | I | Reset input. |
| | 23 | XIN | CLOCK IN | I | Clock input. |
| | 24 | XOUTF | CLOCK OUT | O | Clock output. |
| | 25 | XOUTS | CLOCK OUT | O | Clock output. |
| | 26 | VSS | | | Power supply. |
| | 27 | XCIN | CLOCK IN | I | Serial data input. |
| | 28 | XCOU | CLOCK OUT | O | Clock output. |
| | 29 | R3 | IN PORT | I | Key input 3. |
| | 30 | R2 | IN PORT | I | Key input 2. |
| | 31 | R1 | IN PORT | I | Key input 1. |
| | 32 | R0 | IN PORT | I | Key input 0. |
| | 33 | Ø | | O | Timing output. |
| | 34 | VP | | I | Pull down voltage input. |
| | 35 | P17 | OUT PORT | O | Laser diode control output. |
| | 36 | P16 | OUT PORT | O | Display output 7. |
| | 37 | P15 | OUT PORT | O | Display output 6. |
| | 38 | P14 | OUT PORT | O | Display output 5. |
| | 39 | P13 | OUT PORT | O | Display output 4. |
| | 40 | P12 | OUT PORT | O | Display output 3. |
| | 41 | P11 | OUT PORT | O | Display output 2. |
| | 42 | P10 | OUT PORT | O | Display output 1. |
| | 43 | P37 | OUT PORT | O | Display output i. |
| | 44 | P36 | OUT PORT | O | Display output g. |
| | 45 | P35 | OUT PORT | O | Display output f. |
| | 46 | P34 | OUT PORT | O | Display output e. |
| | 47 | P33 | OUT PORT | O | Display output d. |
| | 48 | P32 | OUT PORT | O | Display output c. |
| | 49 | P31 | OUT PORT | O | Display output b. |
| | 50 | P30 | OUT PORT | O | Display output a. |
| | 51 | NC | | | |
| | 52 | VCC | | | Power supply. |

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.

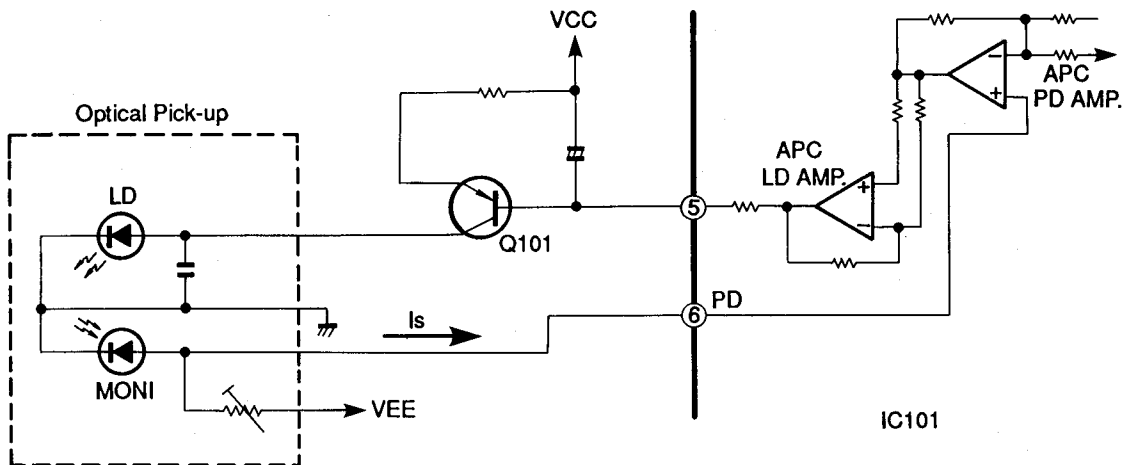


Fig. 1

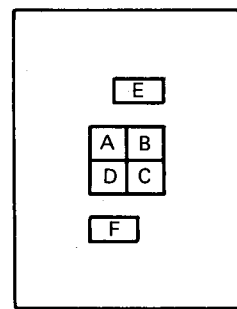
2. FOCUS SERVO

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.

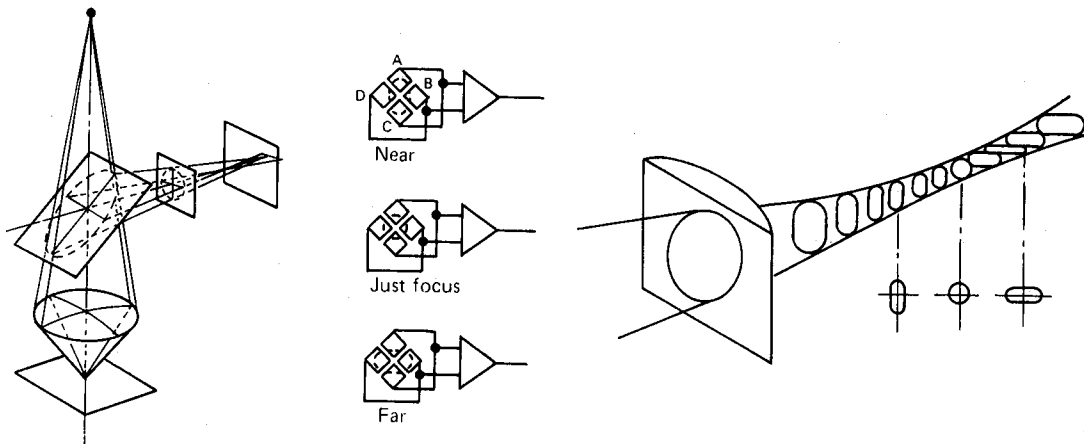


Fig.3

2-3. Focus servo control operation

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

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

The output voltage(focus error signal) from pin 19 of IC101 passes through IC102, in from pin 32 and out from pin 30, 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.

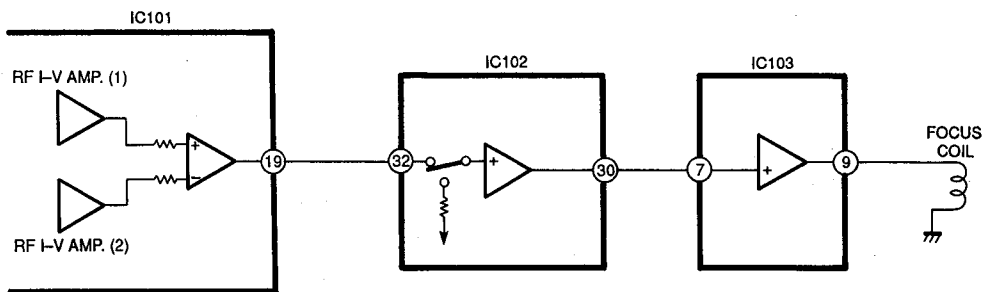


Fig. 4

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.

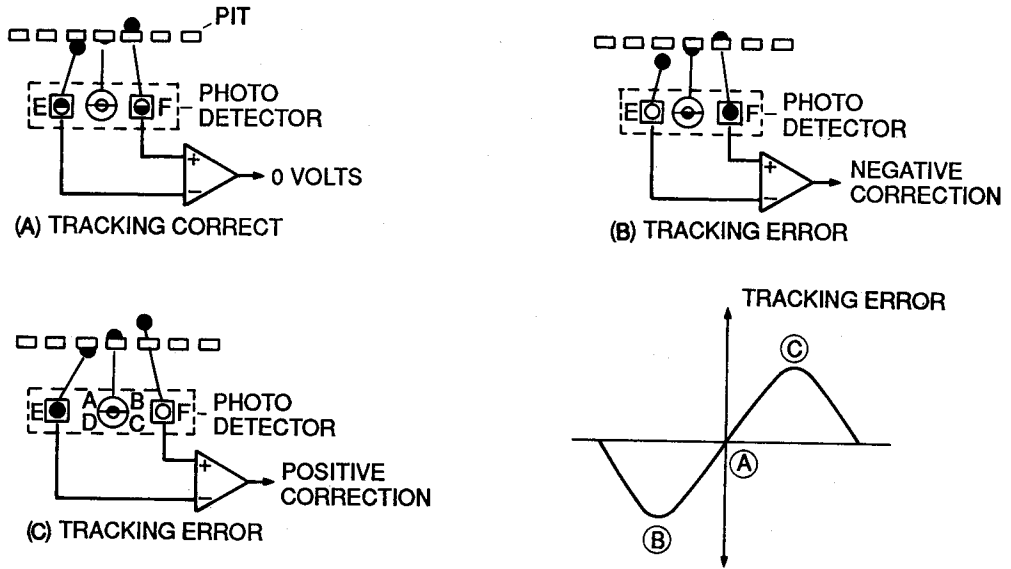


Fig. 5

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 amplifier and F I-V amplifier, transmitted to the tracking error amplifier and output through pin 20. While it passes through IC102, in from pin 1 and out from pin 22, and IC103, in from pin 6 and out from pin 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.

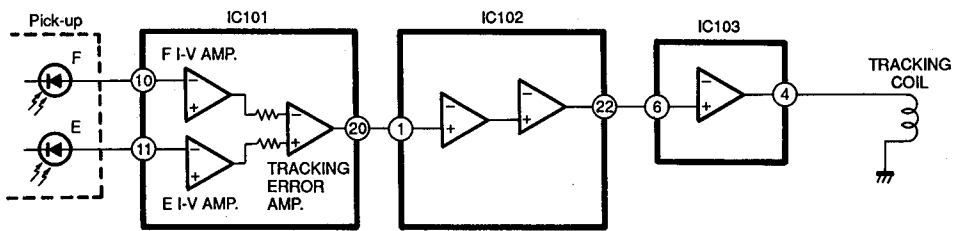


Fig. 6

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 7 of IC201, it can be checked at the test point (TP201) provided on its way by means of the eye pattern check.

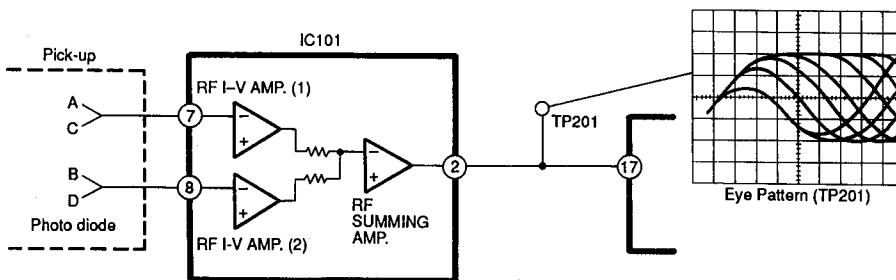


Fig. 7

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 digital filter where they undergo quadruple oversampling conversion and move on to the D/A converter interface. After that, they are output as 18-bit digital signals from pins 72, 74 and 77 of IC201 and fed to the D/A converter of IC301. Also, deglitch pulse signals are output from D/A converter interface of IC201 (through pins 79 and 80). After their levels are shifted in the deglitcher circuit consisting of Q301, Q302, Q303 and Q304, they are sent to IC302.

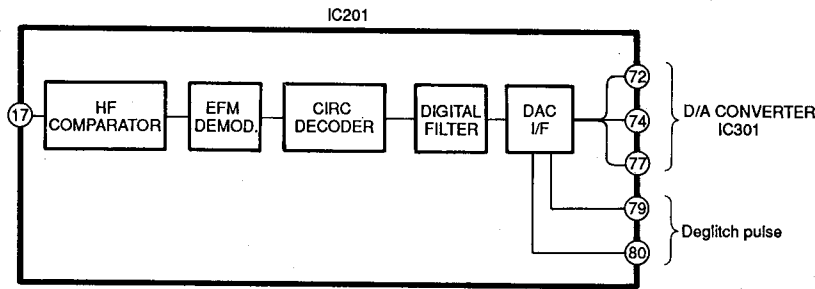


Fig. 8

3-3. Digital filter

Fig. 9 shows the signal data of an audio signal up to 20kHz that has been digitalized, along with the frequency distribution of the signal data. The graphs show the conditions for a sampling frequency of 44.1kHz, plus its doubled frequency, 88.2kHz, and its quadrupled frequency, 176.4kHz.

As the figure shows, for the same signal up to 20kHz, the noise portion of the digitalized signal component tends to shift toward the higher range of the signal if the sampling frequency is increased. However, at any sampling frequency, the volume of necessary audio signal information remains constant up to 20kHz. This allows certain important results to be derived; that is, if the information represented in section (a) is obtained, then it should be possible to create a signal in the form shown in (b) or (c).

When the noise caused by sampling shifts to the higher frequency range, as shown in (b) or (c), the low pass filter characteristic to eliminate noise during re-conversion to an audio signal needs not be steep but can be rather gradual as shown. It is comparatively simple to provide a high audio quality low pass filter of such characteristic with little phase fluctuation or distortion.

The question now becomes how to make a signal sampled at 44.1kHz resemble one sampled at a much higher frequency. Fig. 10 shows the signal sequence sampled at the same 44.1kHz as in Fig. 9 and its frequency distribution.

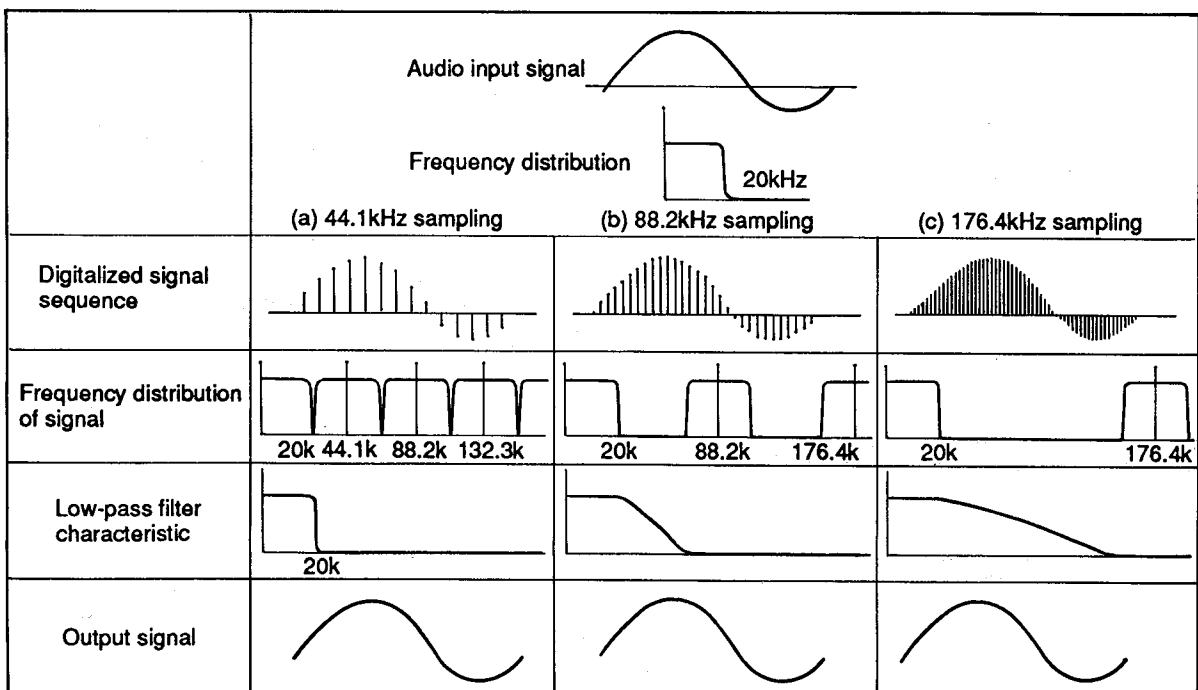


Fig. 9

If the frequency is to be doubled as the first step in increasing the sampling frequency of the signal, zero-level data is added between the data marked with X in Fig. 10(b). In the original signal sequence sampled at 44.1kHz, there are data only at the points of the sampling timing, while the intervals between those points have all been made zero-level. Introducing zero data in these intervals does not change the original data in any way, nor is the frequency distribution altered. Only the sampling frequency is doubled.

Passing this data in its modified form through a digital filter with the characteristic as shown in Fig.10(c) causes the portion corresponding to N1 to be eliminated, resulting in a signal sequence with the frequency distribution shown in (d). This signal sequence possesses exactly the same shape as that obtained for the signal in Fig. 9(b), sampled at 88.2kHz.

In other words, this method enables the sampling frequency to be doubled.

The digital filter used in this unit is a non-cyclic type. Its circuit diagram is shown in Fig. 11.

The sampling frequency of this unit has been quadrupled, and the phase characteristic has been improved by using a softer analog low-pass filter.

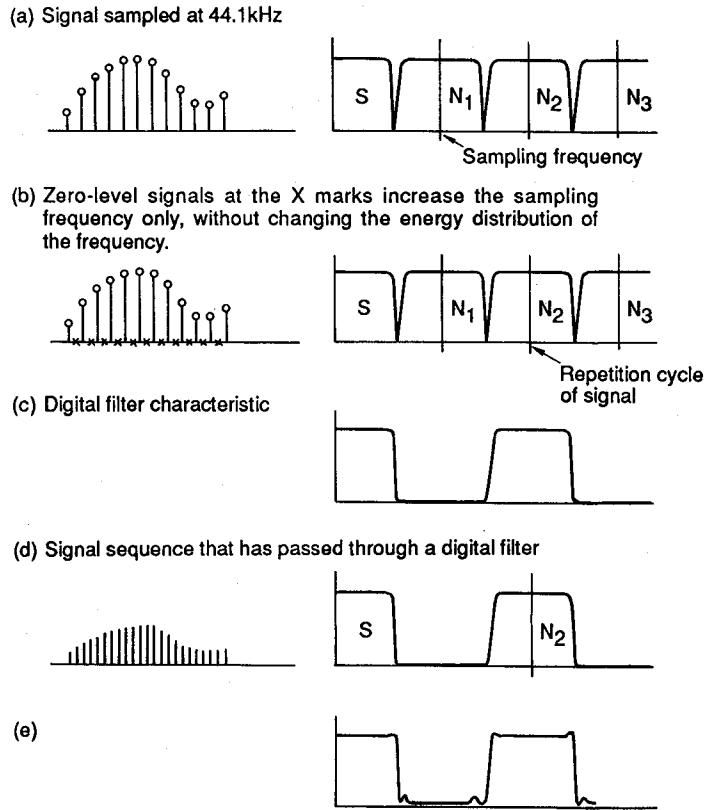


Fig. 10

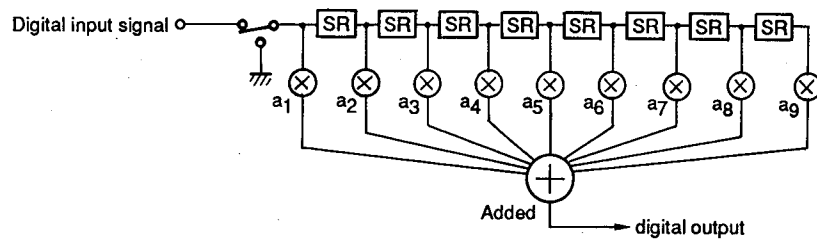


Fig. 11

3-4. Sampling and hold circuit

Because not all of the switches of the D/A converter are turned on at the same time, the output waveform of the D/A converter contains a kind of transient noise known as "glitch". In addition, the settling time (the time required to arrive at the true value) of the current/voltage converter amplifier of the output must also be added, making it fairly impossible to obtain an ideal waveform. If the waveform is input to the filter as it is, the error within itself generates a beat with a fraction of sampling frequency divided by an odd number, and this in turn creates a terrible sound.

The waveform demodulated by the D/A converter must be an ideal impulse with no width as a principle. However, there are cases where such ideal impulse is difficult to obtain or the S/N ratio can not be measured. And to cope with such difficulties and others, demodulation is actually carried out on a pulse with a width.

As shown in Fig. 12, a circuit in which the distortion and error in the output waveform converted by the D/A converter are discarded and only the portion indicating the true value is used is called "deglitcher".

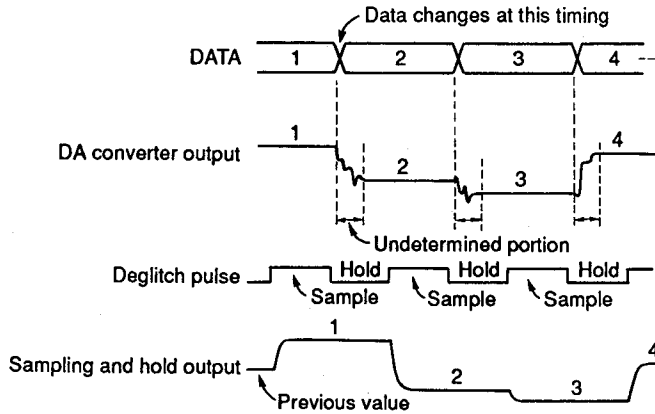


Fig. 12

Fig. 13 shows the sampling and hold circuit used in this unit.

C305 and C304 are capacitors for boosting the speed. The deglitch pulse signal outputs from the APTR(pin 80) and APTL(pin79) terminals of DSP IC201 are added to the bases of Q301 (left channel) and Q302 (right channel) respectively. Q301 and Q302 are switching transistors which are turned on when biased in the forward direction. When Q301 and Q302 are turned on, Q303 and Q304 are also turned on, and the collectors of these latter two are connected to +V. As they are connected to -V through R313 and R312, a deglitch pulse signal which has been level shifted here is input to the control terminals (pin 5 and pin 12) of IC302. This signal turns the analog switch of IC302 on and off, so that the sampling and hold operations are carried out. C308 and C309 are capacitors for hold operation.

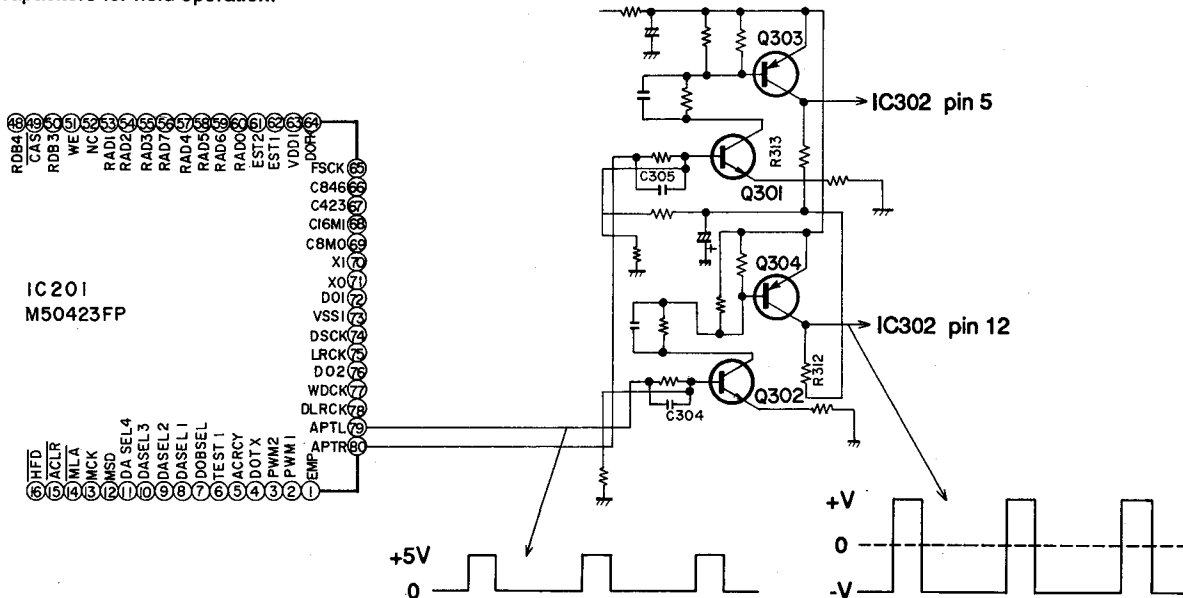


Fig. 13

3-5. Buffer amplifier and low-pass filter

Fig. 14 shows a final-stage circuit which includes a buffer, a low-pass filter and other elements. Q305, Q307 and Q309 (left channel), and Q306, Q308 and Q310 (right channel) are buffer circuits of inverted darlington configuration, and Q309 and Q310 are FET controlled constant-current circuits. The purpose of this circuit is to prevent an interference from occurring between the hold circuit in the previous stage and the de-emphasis circuit or LPF (low pass filter) in the following stage.

The emphasis data from the disc is output through the EMP terminal (pin 1) of IC201. When a disc to which emphasis is applied is played back, this terminal is set high and Q319 turns on. Following this, Q311 (left channel) and Q312 (right channel) are also turned on. Then connecting C317 (left channel) and C316 (right channel) to the ground provides the de-emphasis characteristic.

The portion of Fig. 14 enclosed by the broken line is a 3rd-order active LPF. This LPF causes noise in the high range to be cut. Q315 and Q317 (left channel) and Q316 and Q318 (right channel) are buffer circuits of inverted darlington configuration. Q313 and Q314 are FET controlled constant current circuits.

Q51, Q52 and Q53 are power muting circuits.

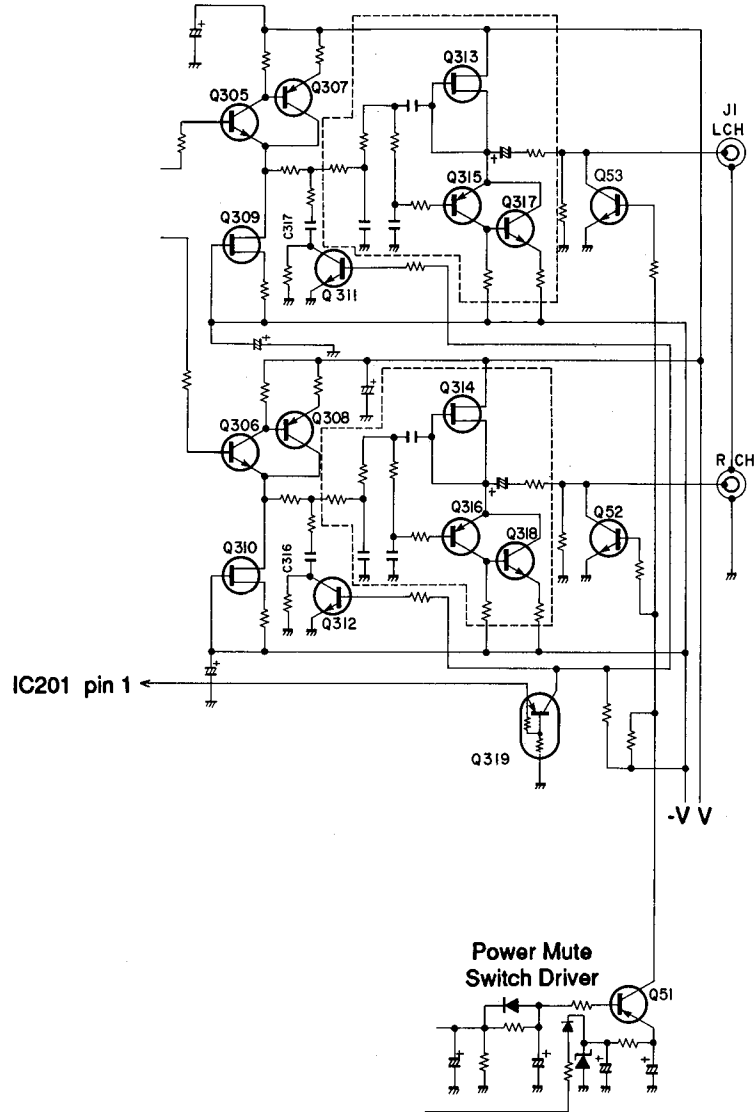
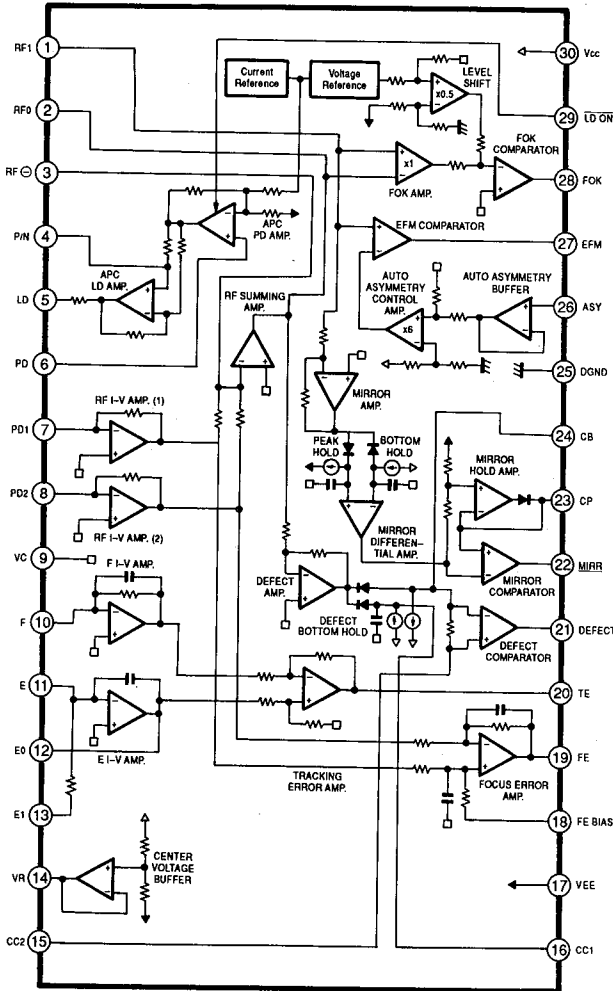


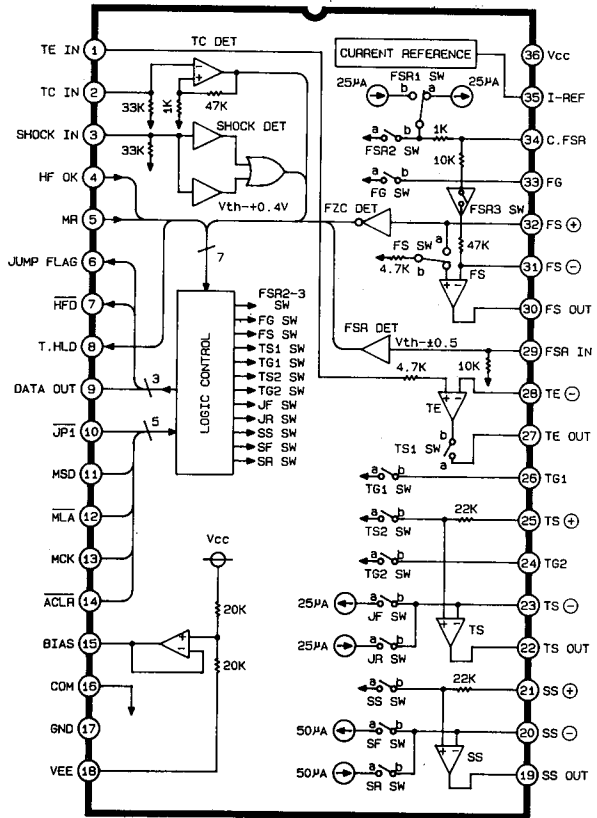
Fig. 14

IC BLOCK DIAGRAM

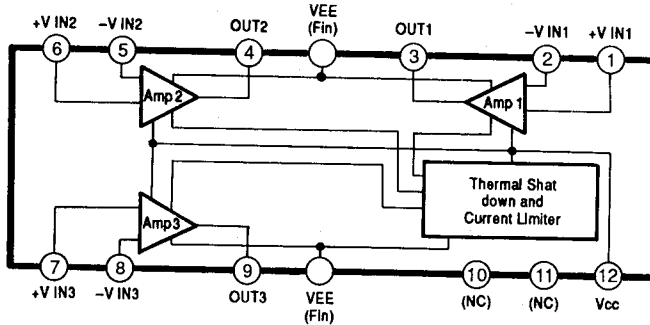
IC101 : CXA1081S
RF Amp.



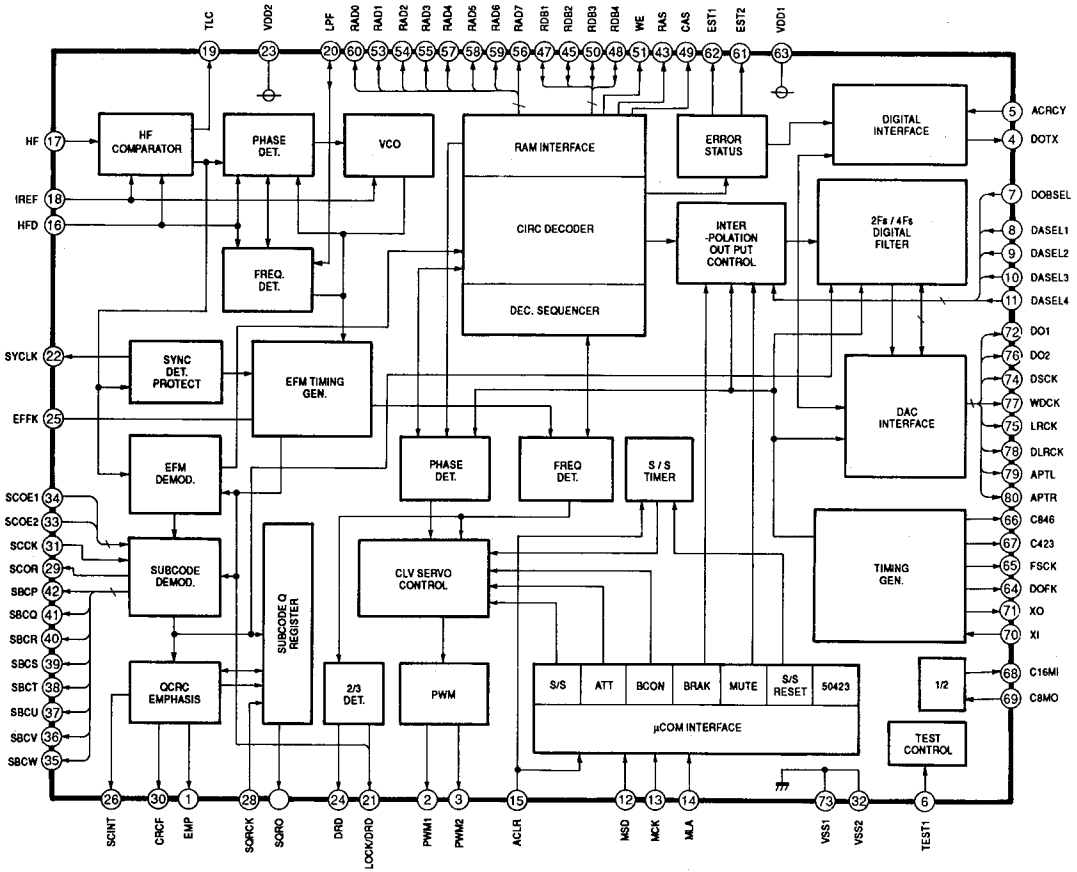
IC102
M51564P
Optical Pick-up Servo Control



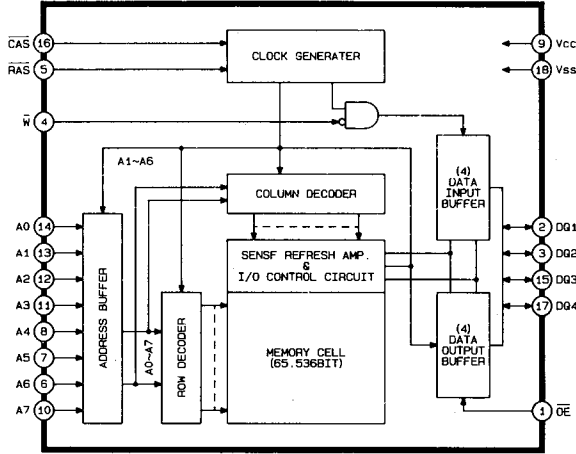
IC103 : LA6520
3 channel Power OP-Amp.



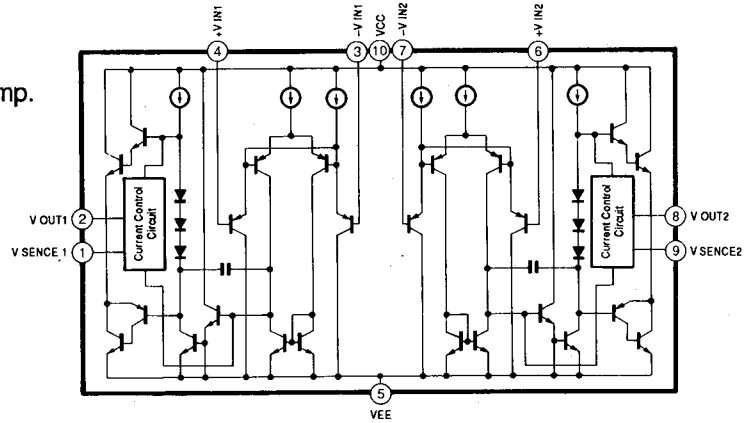
IC201 : M50423FP
Digital Signal Processor



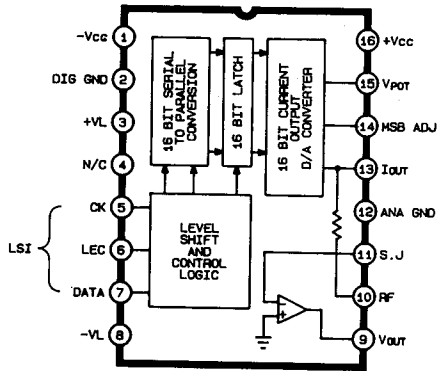
IC202
M5M4416P
65536-Bit (16384-Word by 4-Bit)
Dynamic RAM



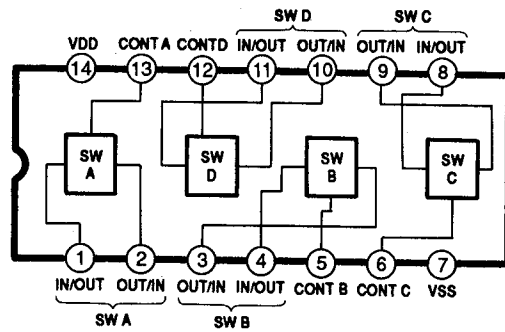
IC203 : LA6515
2 channel Power OP-Amp.



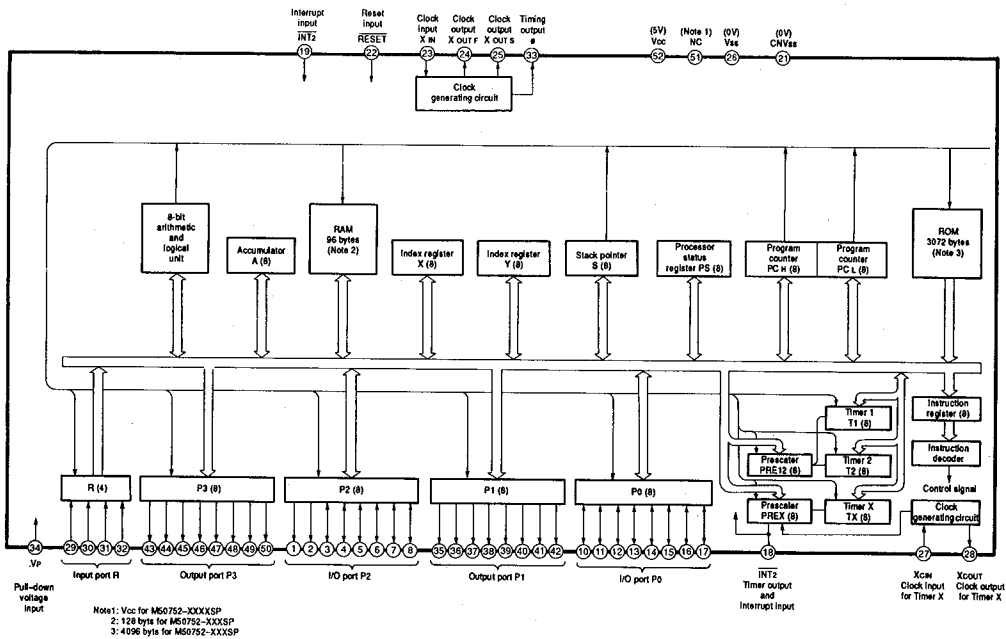
IC301 : PCM61P
D/A Converter



IC302 : LC4966
Sample and Hold



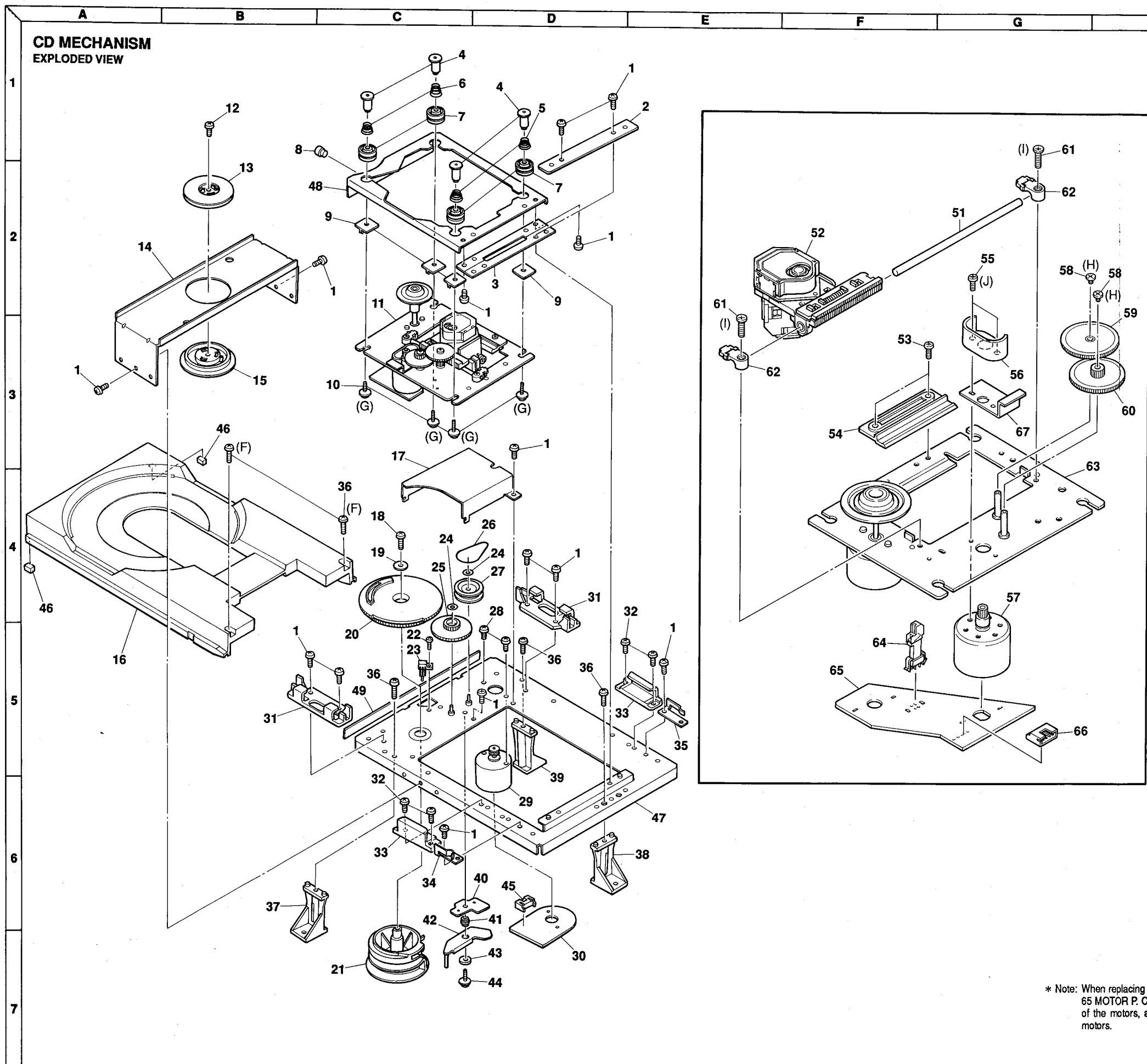
IC401 : M50752-103SP
Microcomputer



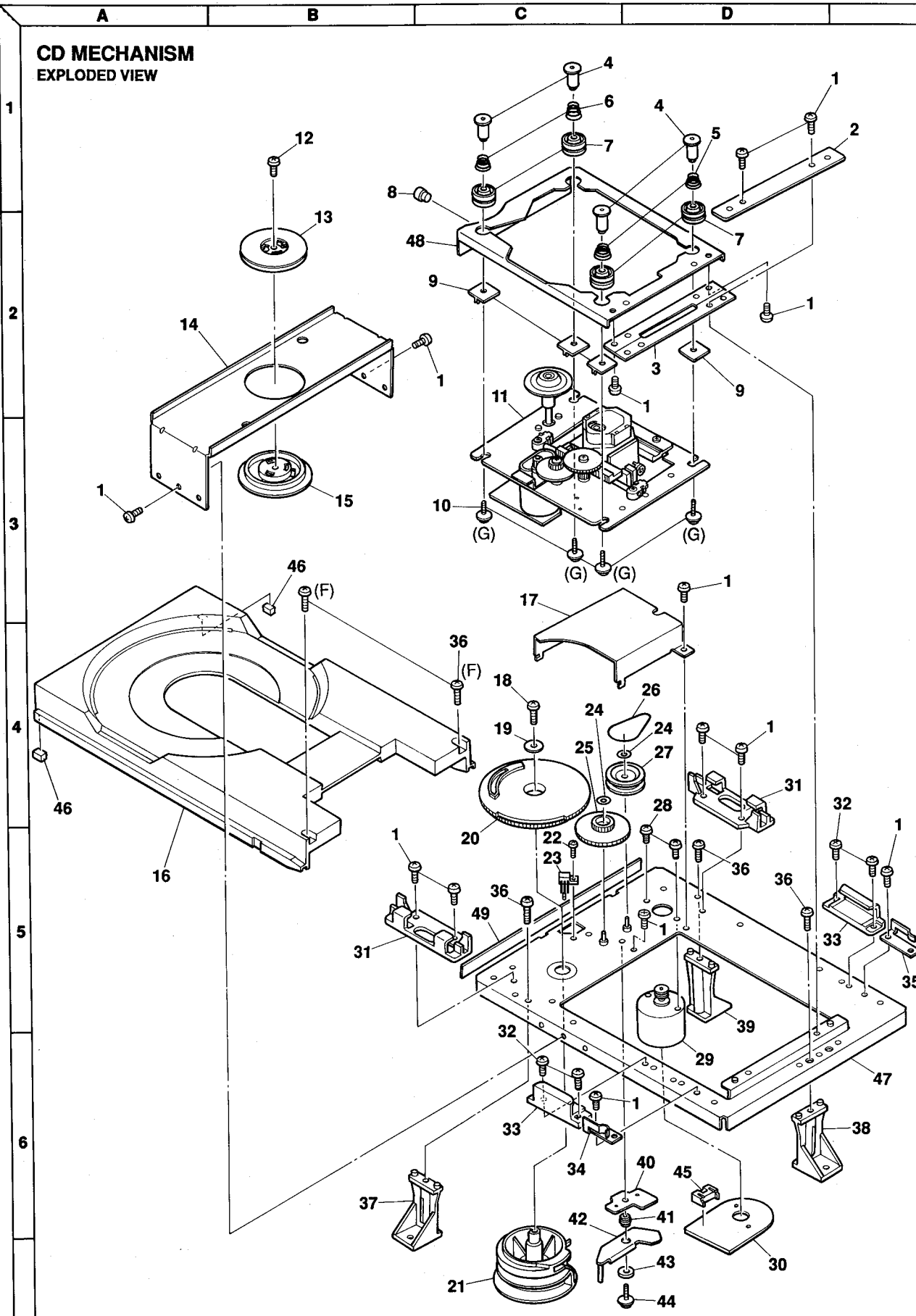
PARTS LIST

| Ref. No. | Part No. | Description |
|----------|----------------|--|
| 1 | 7-685-862-(01) | SCREW (+)(2.6x6mm) |
| 2 | 2-642-170-(01) | HINGE HOLDER |
| 3 | 2-642-164-(01) | HINGE |
| 4 | 2-642-160-(01) | SHAFT |
| 5 | 2-642-137-(02) | COIL SPRING (B) |
| 6 | 2-642-139-(02) | COIL SPRING (A) |
| 7 | 2-642-158-(01) | INSULATOR (C) |
| 8 | 2-642-169-(01) | ROLLER |
| 9 | 2-642-159-(01) | PLATE (T) |
| 10 | 2-642-142-(01) | SCREW |
| 11 | 8-848-097-(01) | CD PLAYER SUB UNIT ASS'Y |
| 12 | 7-685-532-(19) | SCREW (+)(2.6x5mm) |
| 13 | X-2642-108-(1) | MAGNET ASS'Y |
| 14 | 2-642-165-(01) | CHACK CHASSIS |
| 15 | 2-642-432-(01) | CHACKING PULLEY |
| 16 | 2-642-156-(01) | TRAY |
| 17 | 2-642-149-(02) | GEAR COVER |
| 18 | 7-685-535-(19) | SCREW (+)(2.6x10mm) |
| 19 | 4-812-554-(01) | WASHER |
| 20 | 2-642-154-(02) | DRIVE GEAR |
| 21 | 2-642-153-(01) | CONTROL CAM |
| 22 | 7-685-851-(01) | SCREW (+)(2x4mm) |
| 23 | 1-571-312-(11) | LEAF SWITCH |
| 24 | 3-558-708-(21) | LOCK WASHER |
| 25 | 2-642-148-(01) | CENTER GEAR |
| 26 | 3-653-387-(01) | LM BELT |
| 27 | 4-913-731-(01) | LOADING PULLEY |
| 28 | 7-621-775-(00) | SCREW (+)(2.6x3mm) |
| 29 | X-2641-336-(1) | MOTOR ASS'Y |
| 30 | 1-624-793-(21) | MOTOR P. C. BOARD |
| 31 | 2-642-161-(01) | TRAY HOLDER, FRONT |
| 32 | 7-685-781-(01) | SCREW (+)(2x4mm) |
| 33 | 2-642-162-(02) | TRAY HOLDER, REAR |
| 34 | 2-642-146-(01) | TRAY GUIDE, RIGHT |
| 35 | 2-642-147-(01) | TRAY GUIDE, LEFT |
| 36 | 7-685-547-(19) | SCREW (+)(3x10mm) |
| 37 | 2-642-178-(01) | HOLDER, RIGHT |
| 38 | 2-642-177-(01) | HOLDER, REAR |
| 39 | 2-642-176-(01) | HOLDER, LEFT |
| 40 | 2-642-173-(01) | LINK PLATE |
| 41 | 2-642-133-(02) | BOSS |
| 42 | X-2642-107-(1) | STOPPER LINK ASS'Y |
| 43 | 2-642-172-(01) | SPACER |
| 44 | 3-319-501-(11) | SCREW (+)(2.6x8mm) |
| 45 | 1-564-721-(11) | CONNECTOR, 5 PIN |
| 46 | 2-642-125-(01) | DAMPER |
| 47 | X-2642-106-(1) | MAIN CHASSIS ASS'Y |
| 48 | X-2642-105-(1) | SUB CHASSIS ASS'Y |
| 49 | 2-642-157-(03) | FRONT TAPE |
| 51 | 4-910-431-(02) | SLIDE SHAFT |
| 52 | 8-848-046-(51) | PICK-UP ASS'Y |
| 53 | 2-641-386-(01) | SPECIAL SCREW (2x5mm) |
| 54 | 2-641-443-(02) | SLIDE HOLDER |
| 55 | 7-621-255-(35) | SCREW (+)(2x5mm) |
| 56 | 2-641-434-(01) | GEAR COVER |
| 57 | X-2640-770-(1) | SLIDE MOTOR ASS'Y (*See Note below.) -for type RF-310T-11400 MOTOR made by Mabuchi |
| | X-2641-344-(1) | -for type MDN-4RA3___ MOTOR made by Matsushita |
| 58 | 3-303-809-(31) | SPECIAL SCREW (M1.7x3mm) |
| 59 | 2-641-404-(02) | GEAR (A) |
| 60 | 2-641-403-(06) | GEAR (B) |
| 61 | 2-641-447-(01) | SCREW (+)(2.6x8mm) |
| 62 | 2-641-448-(02) | SHAFT CLAMP |
| 63 | X-2641-337-(1) | DISC MOTOR ASS'Y (*See Note below.) -for type RF-310T-11400 MOTOR made by Mabuchi |
| | X-2641-348-(1) | -for type MDN-4RA3___ MOTOR made by Matsushita |
| 64 | 1-570-822-(22) | LEAF SWITCH |
| 65 | | MOTOR P. C. BOARD (*See Note below.) |
| | 1-625-848-(11) | MOTOR P. C. BOARD made by Mabuchi |
| | 1-628-263-(11) | MOTOR P. C. BOARD made by Matsushita |
| 66 | 1-564-720-(11) | CONNECTOR, 4 PIN |
| 67 | 2-641-371-(01) | STOPPER |

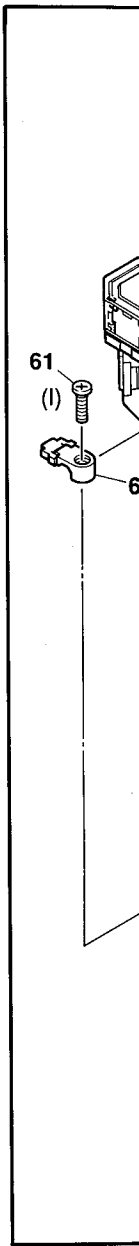
* Note: When replacing Ref. No. 57 SLIDE MOTOR ASS'Y, Ref. No. 63 DISC MOTOR ASS'Y, or Ref. No. 65 MOTOR P. C. BOARD, be certain to check the motor type number marked on the side of each of the motors, and then order an appropriate part number which corresponds with each of the motors.



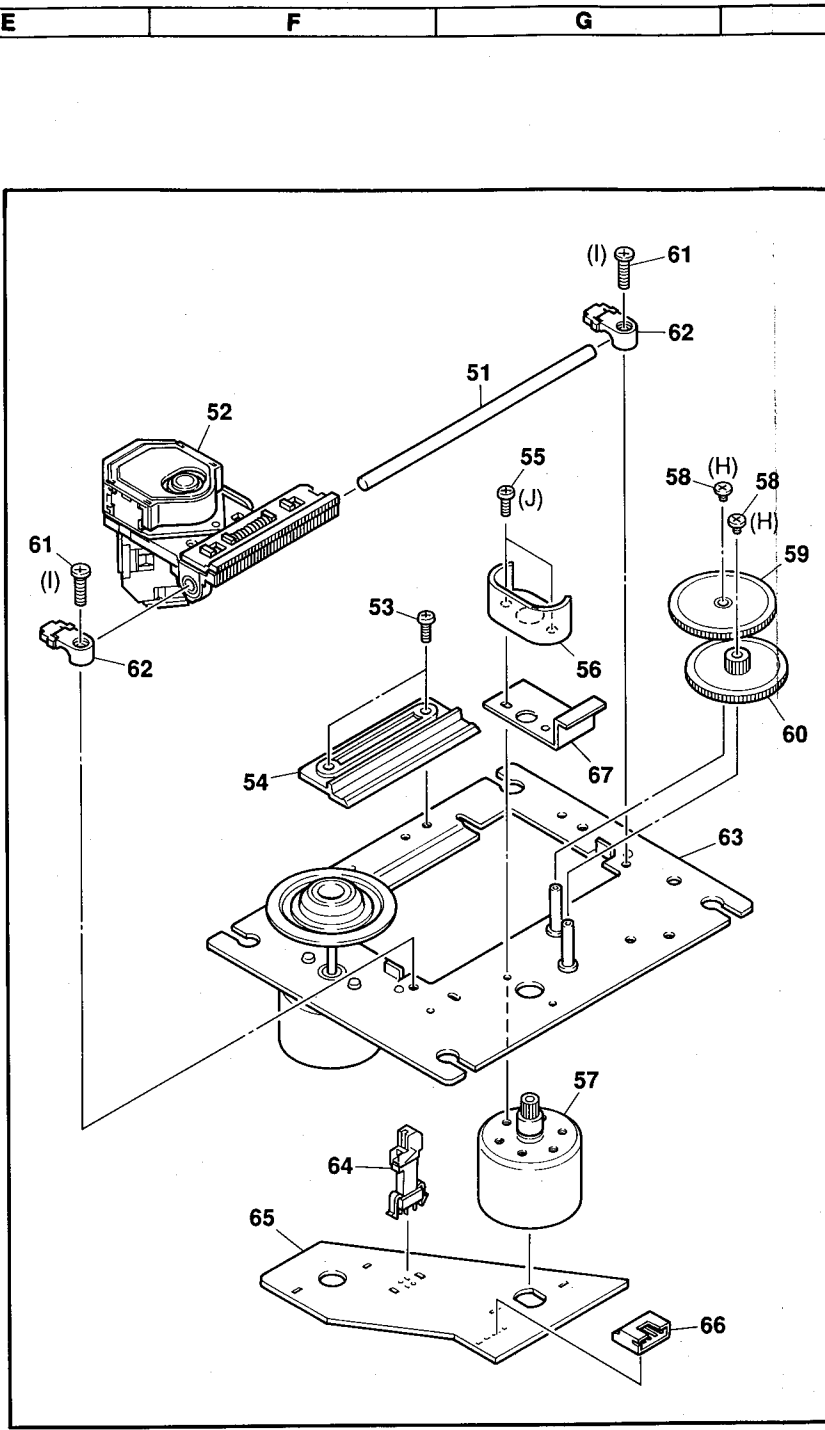
**CD MECHANISM
EXPLODED VIEW**



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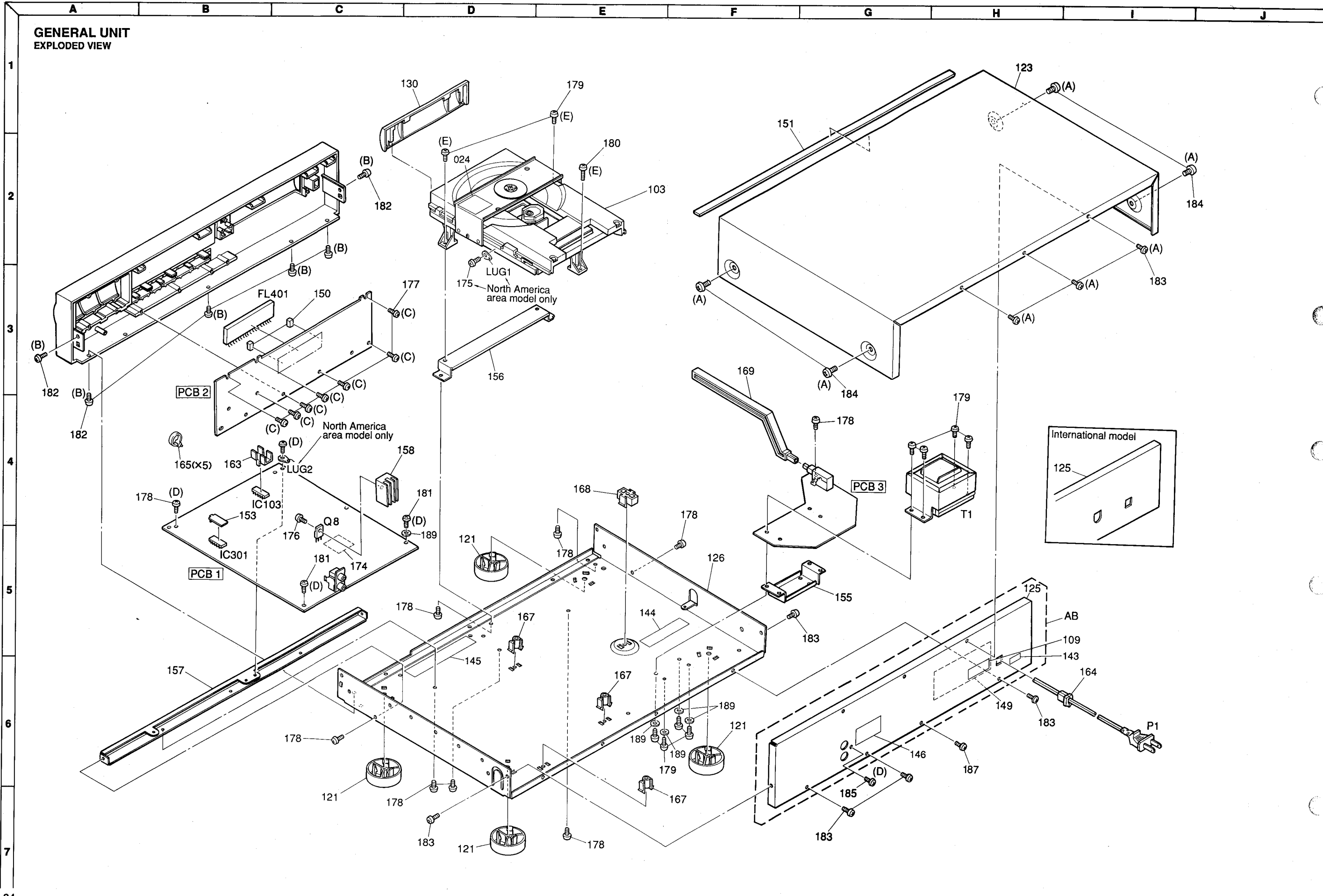
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| 3 | 2-642-164-(01) | HINGE |
| 4 | 2-642-160-(01) | SHAFT |
| 5 | 2-642-137-(02) | COIL SPRING (B) |
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| 8 | 2-642-169-(01) | ROLLER |
| 9 | 2-642-159-(01) | PLATE (T) |
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| 11 | 8-848-097-(01) | CD PLAYER SUB UNIT ASSY |
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| 15 | 2-642-432-(01) | CHACKING PULLEY |
| 16 | 2-642-156-(01) | TRAY |
| 17 | 2-642-149-(02) | GEAR COVER |
| 18 | 7-685-535-(19) | SCREW (+)(2.6x10mm) |
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| 21 | 2-642-153-(01) | CONTROL CAM |
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| 27 | 4-913-731-(01) | LOADING PULLEY |
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| 35 | 2-642-147-(01) | TRAY GUIDE, LEFT |
| 36 | 7-685-547-(19) | SCREW (+)(3x10mm) |
| 37 | 2-642-178-(01) | HOLDER, RIGHT |
| 38 | 2-642-177-(01) | HOLDER, REAR |
| 39 | 2-642-176-(01) | HOLDER, LEFT |
| 40 | 2-642-173-(01) | LINK PLATE |
| 41 | 2-642-133-(02) | BOSS |
| 42 | X-2642-107-(1) | STOPPER LINK ASSY |
| 43 | 2-642-172-(01) | SPACER |
| 44 | 3-319-501-(11) | SCREW (+)(2.6x8mm) |
| 45 | 1-564-721-(11) | CONNECTOR, 5 PIN |
| 46 | 2-642-125-(01) | DAMPER |
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| 48 | X-2642-105-(1) | SUB CHASSIS ASSY |
| 49 | 2-642-157-(03) | FRONT TAPE |
| 50 | 4-910-431-(02) | SLIDE SHAFT |
| 51 | 4-910-431-(02) | SLIDE SHAFT |
| 52 | 8-848-046-(51) | PICK-UP ASSY |
| 53 | 2-641-386-(01) | SPECIAL SCREW (2x5mm) |
| 54 | 2-641-443-(02) | SLIDE HOLDER |
| 55 | 7-621-255-(35) | SCREW (+)(2x5mm) |
| 56 | 2-641-434-(01) | GEAR COVER |
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| | X-2641-344-(1) | -for type MDN-4RA3___ MOTOR made by Matsushita |
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| 59 | 2-641-404-(02) | GEAR (A) |
| 60 | 2-641-403-(06) | GEAR (B) |
| 61 | 2-641-447-(01) | SCREW (+)(2.6x8mm) |
| 62 | 2-641-448-(02) | SHAFT CLAMP |
| 63 | X-2641-337-(1) | DISC MOTOR ASSY (* See Note below) |
| | X-2641-348-(1) | -for type RF-310T-11400 MOTOR made by Mabuchi |
| | X-2641-348-(1) | -for type MDN-4RA3___ MOTOR made by Matsushita |
| 64 | 1-570-822-(22) | LEAF SWITCH |
| 65 | 1-625-848-(11) | MOTOR P. C. BOARD (* See Note below) |
| | 1-628-263-(11) | MOTOR P. C. BOARD made by Mabuchi |
| | 1-564-720-(11) | MOTOR P. C. BOARD made by Matsushita |
| 66 | 1-564-720-(11) | CONNECTOR, 4 PIN |
| 67 | 2-641-371-(01) | STOPPER |

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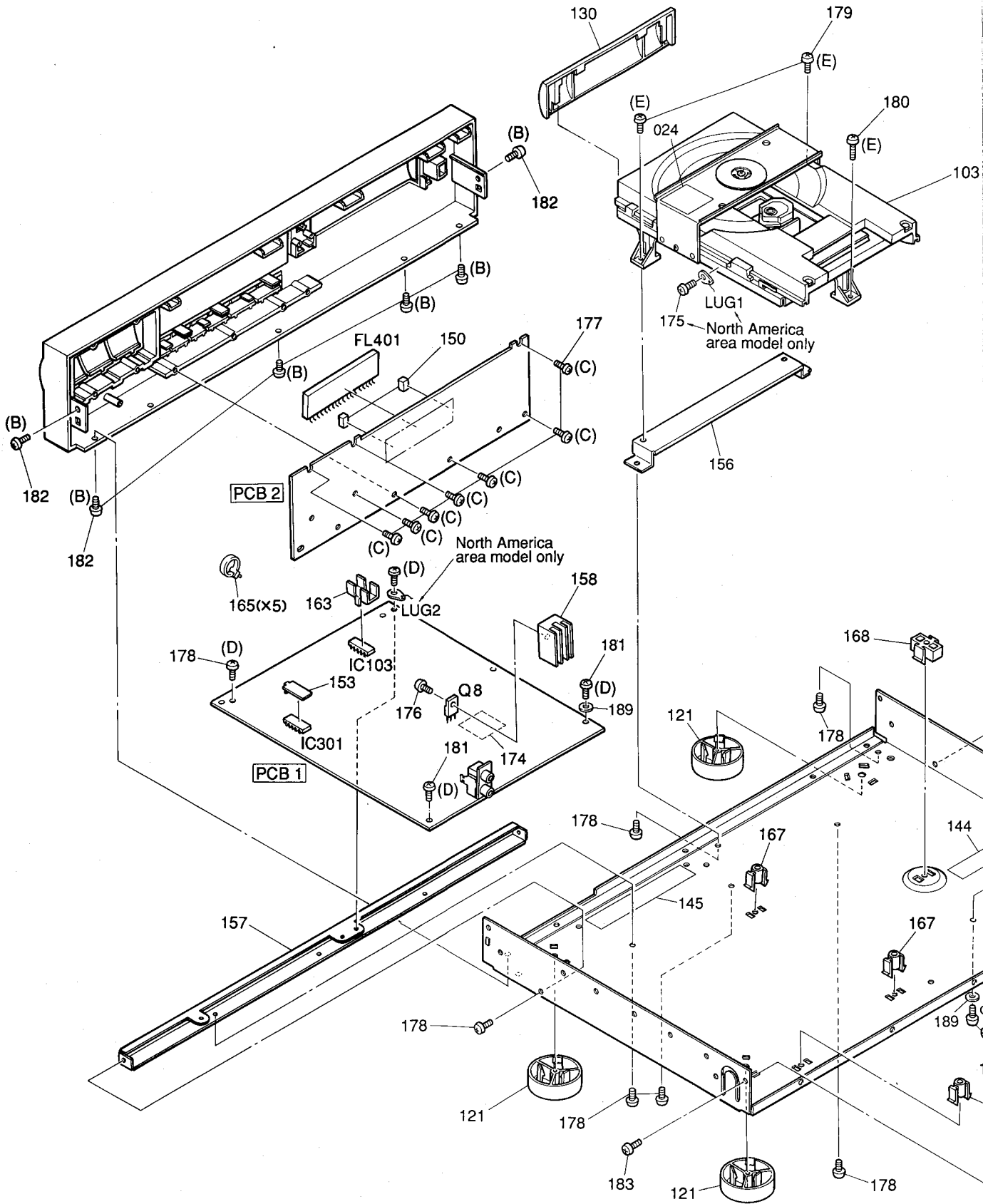
GENERAL UNIT
EXPLODED VIEW



**GENERAL UNIT
EXPLODED VIEW**

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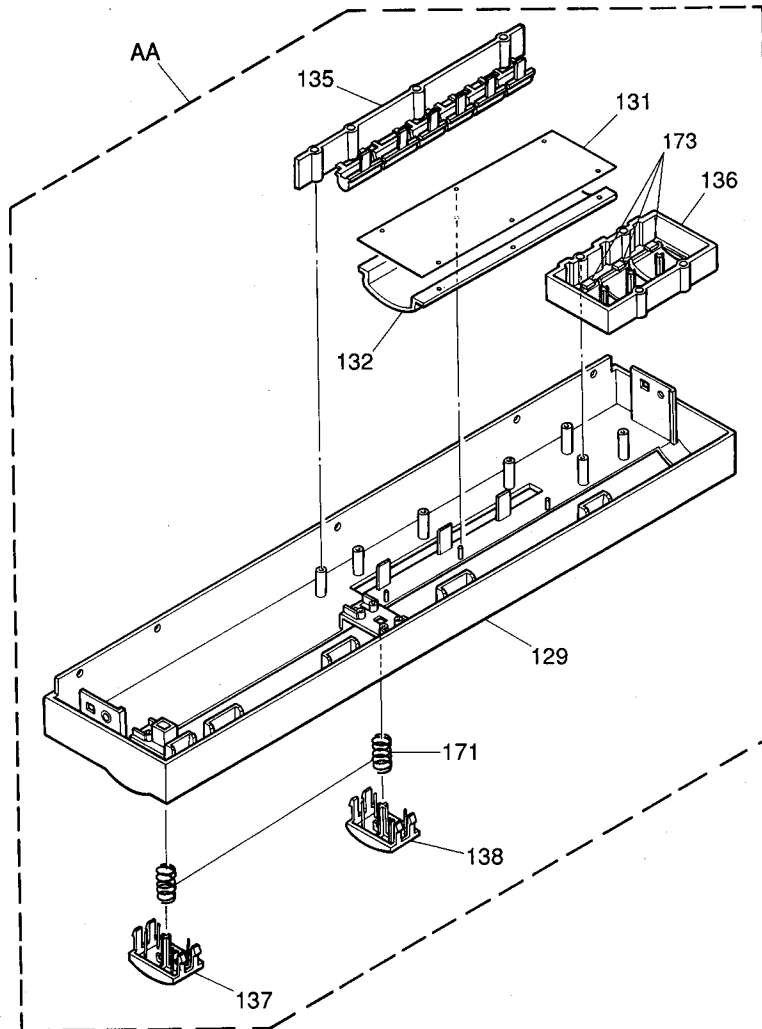
A B C D E



PARTS LIST

| Ref. No. | Part No. | Description | Ref. No. | Part No. | Description |
|----------|--------------|--|----------|---------------|--|
| AA | A442-HD7300A | PANEL, FRONT ASSY | 153 | 2216-7181 | SHIELD PLATE, IC301 |
| AB | A424-HD7300A | CABI BACK, REAR ASSY (BK) | 155 | 2219-8260 | METAL FITTG, TRANS |
| AB | A424-HD7300B | CABI BACK, REAR ASSY (IB) | 156 | 2219-8261 | METAL FITTG, CD MECHA |
| AB | A424-HD7300C | CABI BACK, REAR ASSY (BB) | 157 | 2219-8275 | METAL FITTG |
| 024 | 1756-11802 | LABEL (IB) (BB) | 158 | 2222-7217 | HEAT SINK, Q8 |
| 103 | 3119-01201 | CD MECHA | 163 | 2222-7264 | HEAT SINK, IC103 |
| 109 | 1117-78 | SERIAL LABEL | 164 | 2240-364 | HOLDER, AC CORD |
| 121 | 1319-02201 | LEG (x4) | 165 | 2240-R0101 | HOLDER (x5) |
| 123 | 1414-14501 | CABINET, TOP | 167 | 2360-7021 | BOSS, SPECIAL (x3) |
| 125 | 1424-29501 | CABI BACK, REAR (BK) | 168 | 2360-7018 | BOSS, SPECIAL |
| 125 | 1424-29504 | CABI BACK, REAR (IB) (BB) | 169 | 2601-7187 | SHAFT, POWER SWITCH |
| 126 | 1424-29601 | CABI BACK, BOTTOM | 171 | 2651-2101732 | SPRING (x2) |
| 129 | 1442-21901 | PANEL, FRONT | 173 | 2112-11799 | SPONGE (x3) |
| 130 | 1452-08301 | LID, MECHA | 174 | 2112-11801 | SPONGE |
| 131 | 1511-19801 | PLATE, FL FILTER | 175 | 2347-R0131162 | SCREW, BNT0 T+ (BK) |
| 132 | 1532-17501 | WINDOW, FRONT | 176 | 2327-R0130082 | SCREW (+)(3x8mm) |
| 135 | 1662-51801 | PUSH BUTTON, PLAY/PAUSE, STOP/CLEAR, SKIP, SEARCH | 177 | 2347-R0126082 | SELF-TAPPING SCREW (+)(x7)(2.6x8mm) |
| 136 | 1662-51901 | PUSH BUTTON, TIME, REPEAT, PROGRAM | 178 | 2347-R0130062 | SELF-TAPPING SCREW (+)(x11)(3x6mm) |
| 137 | 1662-52001 | PUSH BUTTON, POWER | 179 | 2347-R0130082 | SELF-TAPPING SCREW (+)(x10)(3x8mm) |
| 138 | 1662-52002 | PUSH BUTTON, OPEN/CLOSE | 180 | 2347-R0130162 | SELF-TAPPING SCREW (+)(3x16mm) |
| 143 | 1341-5568 | NAME PLATE (BK) | 181 | 2347-R0130202 | SELF-TAPPING SCREW (+)(x2)(3x20mm) |
| 144 | 1756-03305 | LABEL | 182 | 2347-R0130084 | SELF-TAPPING SCREW (+)(x6)(3x8mm) |
| 145 | 1756-09602 | LABEL (BK) | 183 | 2347-R0130084 | SELF-TAPPING SCREW (+)(x8)(3x8mm) |
| 145 | 1756-12101 | LABEL (IB) (BB) | 184 | 2347-R0140064 | SELF-TAPPING SCREW (+)(x4)(4x6mm) |
| 146 | 1756-CSA | LABEL (BK) | 185 | 2347-R0130104 | SELF-TAPPING SCREW (+)(3x10mm) |
| 147 | 1756-11601 | LABEL (BK) | 187 | 2459-3003511 | RIVET, PLASTIC |
| 149 | 1756-11801 | LABEL | 189 | 2401-035 | WASHR, METAL (x5) |
| 150 | 2114-85143 | BUSHING (x2) | △ P1 | 4161-03601202 | CORD W/PLUG (BK) |
| 151 | 2111-11769 | FELT | △ P1 | 4161-03701220 | CORD W/PLUG (IB) |
| | | | △ P1 | 4161-04100 | CORD W/PLUG (BB) |
| | | | △ T1 | 5584-S6201 | XFORMER, POWER (BK) |
| | | | △ T1 | 5584-S6202 | XFORMER, POWER (IB) (BB) |

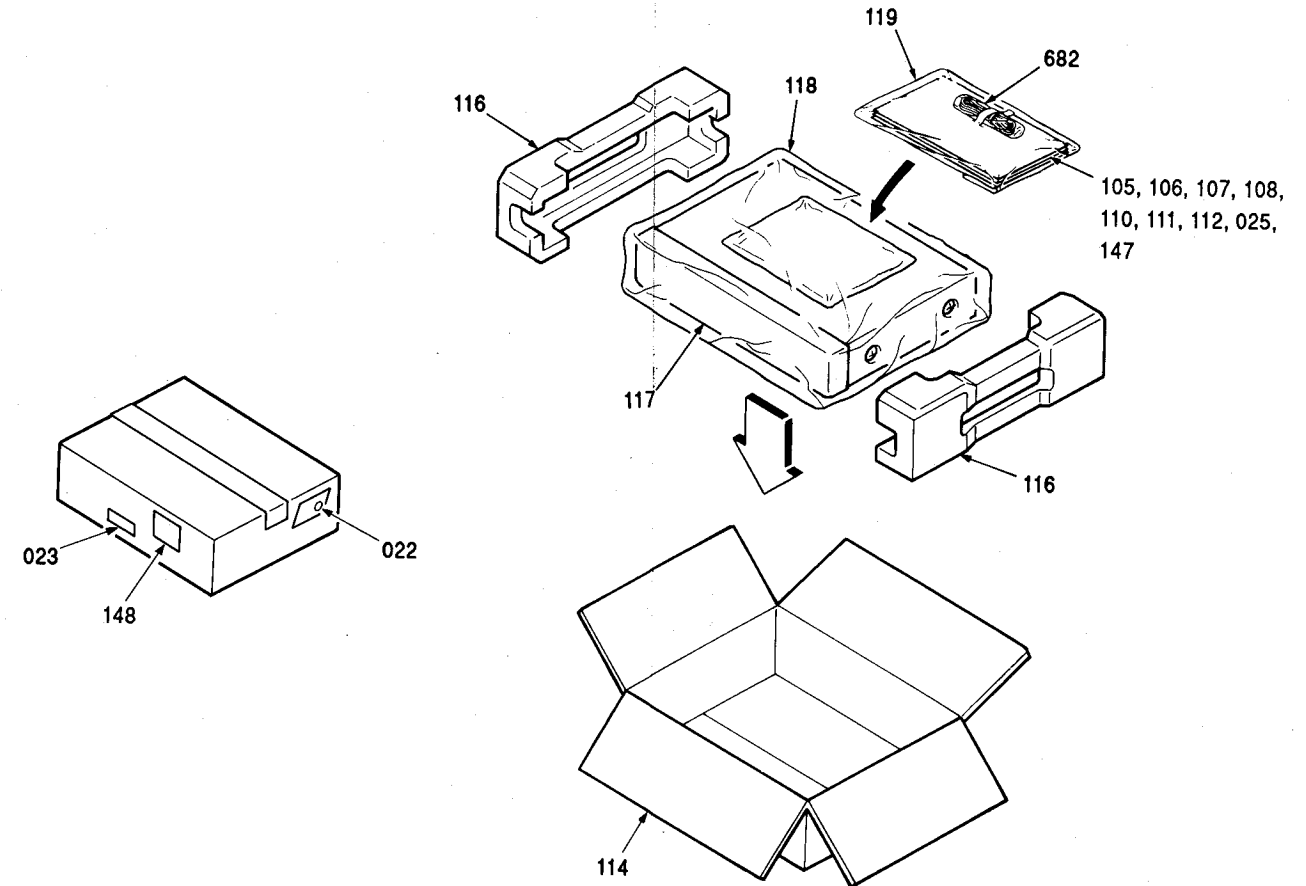
EXPLODED VIEW



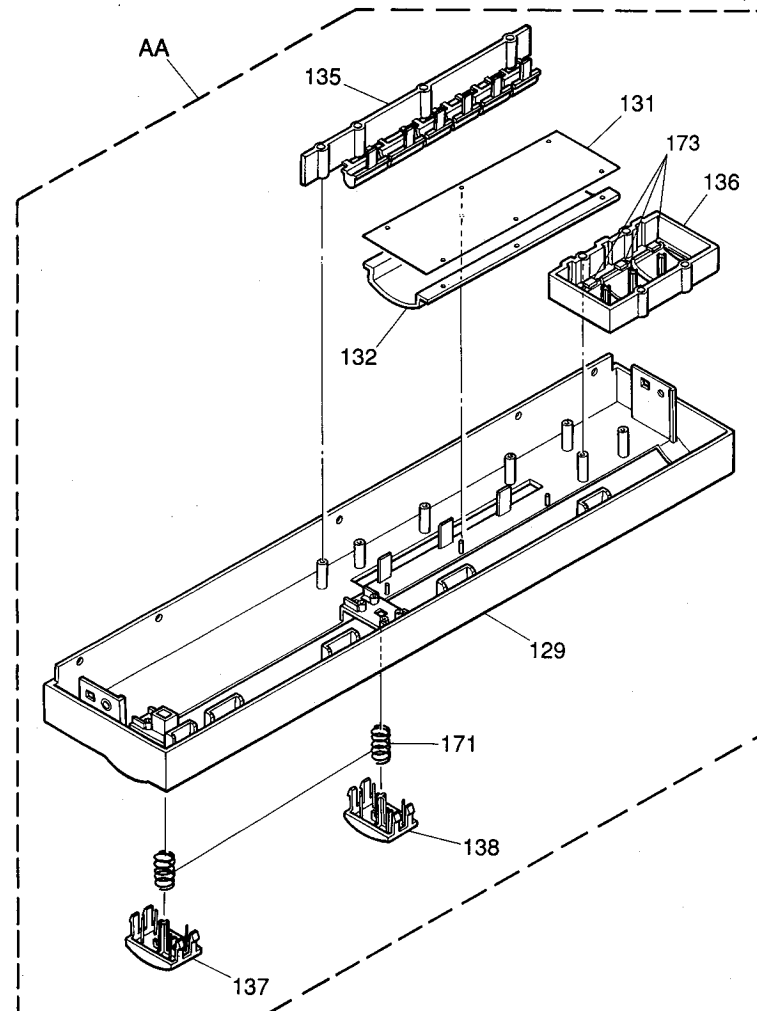
PARTS LIST

| Ref. No. | Part No. | Description | Ref. No. | Part No. | Description |
|----------|--------------|---|----------|---------------|--|
| AA | A442-HD7300A | PANEL, FRONT ASSY | 153 | 2216-7181 | SHIELD PLATE, IC301 |
| AB | A424-HD7300A | CABI BACK, REAR ASSY (BK) | 155 | 2219-8260 | METAL FITTG, TRANS |
| AB | A424-HD7300B | CABI BACK, REAR ASSY (IB) | 156 | 2219-8261 | METAL FITTG, CD MECHA |
| AB | A424-HD7300C | CABI BACK, REAR ASSY (BB) | 157 | 2219-8275 | METAL FITTG |
| 024 | 1756-11802 | LABEL (IB) (BB) | 158 | 2222-7217 | HEAT SINK, Q8 |
| 103 | 3119-01201 | CD MECHA | 163 | 2222-7264 | HEAT SINK, IC103 |
| 109 | 1117-78 | SERIAL LABEL | 164 | 2240-364 | HOLDER, AC CORD |
| 121 | 1319-02201 | LEG (x4) | 165 | 2240-R0101 | HOLDER (x5) |
| 123 | 1414-14501 | CABINET, TOP | 167 | 2360-7021 | BOSS, SPECIAL (x3) |
| 125 | 1424-29501 | CABI BACK, REAR (BK) | 168 | 2360-7018 | BOSS, SPECIAL |
| 125 | 1424-29504 | CABI BACK, REAR (IB) (BB) | 169 | 2601-7187 | SHAFT, POWER SWITCH |
| 126 | 1424-29601 | CABI BACK, BOTTOM | 171 | 2651-2101732 | SPRING (x2) |
| 129 | 1442-21901 | PANEL, FRONT | 173 | 2112-11799 | SPONGE (x3) |
| 130 | 1452-08301 | LID, MECHA | 174 | 2112-11801 | SPONGE |
| 131 | 1511-19801 | PLATE, FL FILTER | 175 | 2347-R0131162 | SCREW, BNTO T + (BK) |
| 132 | 1532-17501 | WINDOW, FRONT | 176 | 2327-R0130082 | SCREW (+)(3x8mm) |
| 135 | 1662-51801 | PUSH BUTTON, PLAY/PAUSE, STOP/CLEAR, SKIP, SEARCH | 177 | 2347-R0126082 | SELF-TAPPING SCREW (+)(x7)(2.6x8mm) |
| 136 | 1662-51901 | PUSH BUTTON, TIME, REPEAT, PROGRAM | 178 | 2347-R0130062 | SELF-TAPPING SCREW (+)(x11)(3x6mm) |
| 137 | 1662-52001 | PUSH BUTTON, POWER | 179 | 2347-R0130082 | SELF-TAPPING SCREW (+)(x10)(3x8mm) |
| 138 | 1662-52002 | PUSH BUTTON, OPEN/CLOSE | 180 | 2347-R0130162 | SELF-TAPPING SCREW (+)(3x16mm) |
| 143 | 1341-568 | NAME PLATE (BK) | 181 | 2347-R0130202 | SELF-TAPPING SCREW (+)(x2)(3x20mm) |
| 144 | 1756-03305 | LABEL | 182 | 2347-R0130084 | SELF-TAPPING SCREW (+)(x6)(3x8mm) |
| 145 | 1756-09602 | LABEL (BK) | 183 | 2347-R0130084 | SELF-TAPPING SCREW (+)(x8)(3x8mm) |
| 145 | 1756-12101 | LABEL (IB) (BB) | 184 | 2347-R0140064 | SELF-TAPPING SCREW (+)(x4)(4x6mm) |
| 146 | 1756-CSA | LABEL (BK) | 185 | 2347-R0130104 | SELF-TAPPING SCREW (+)(3x10mm) |
| 147 | 1756-11601 | LABEL (BK) | 187 | 2459-3003511 | RIVET, PLASTIC |
| 149 | 1756-11801 | LABEL | 189 | 2401-035 | WASHR, METAL (x5) |
| 150 | 2114-85143 | BUSHING (x2) | ▲ P1 | 4161-03601202 | CORD W/PLUG (BK) |
| 151 | 2111-11769 | FELT | ▲ P1 | 4161-03701220 | CORD W/PLUG (IB) |
| | | | ▲ P1 | 4161-04100 | CORD W/PLUG (BB) |
| | | | ▲ T1 | 5584-S6201 | XFORMER, POWER (BK) |
| | | | ▲ T1 | 5584-S6202 | XFORMER, POWER (IB) (BB) |

PACKAGE



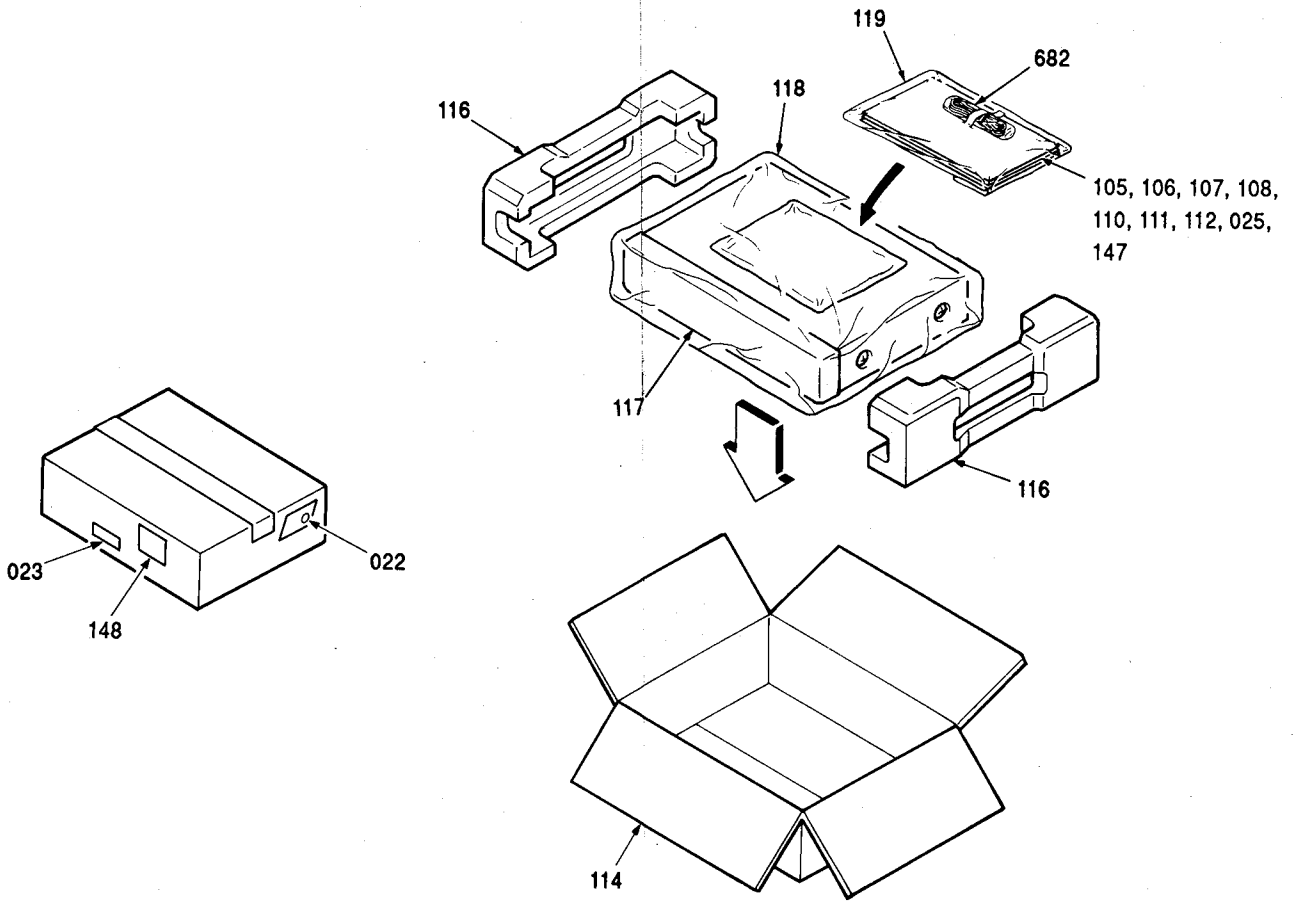
EXPLODED VIEW



| Ref. No. | Part No. | Description |
|----------|-------------|--------------------------------------|
| 022 | 1756-03108 | LABEL (x2) (IB) |
| 022 | 1756-03111 | LABEL (x2) (BB) |
| 023 | 1756-06303 | LABEL (IB) (BB) |
| 025 | 1111-F30253 | OWNER GUIDE (IB) |
| 105 | 1111-J30307 | OWNER GUIDE (BB) |
| 105 | 1111-F30308 | OWNER GUIDE (BK) |
| 106 | 1119-01201 | ATTACH SHEET (IB) (BB) |
| 107 | 1113-717004 | OWNER CARD (BK) |
| 108 | 1111-J30254 | OWNER GUIDE (BK) |
| 110 | 1111-J30297 | OWNER GUIDE (BK) |
| 111 | 1119-047 | ATTACH SHEET (BK) |

| Ref. No. | Part No. | Description |
|----------|---------------|--------------------------|
| 112 | 1119-0137 | ATTACH SHEET (BK) |
| 114 | 1221-7017144 | CARTON BOX |
| 116 | 1222-7216 | CUSHION (x2) |
| 117 | 1223-11729 | SOFT SHEET |
| 118 | 1241-C1491 | POLYETHY BAG |
| 119 | 1241-R0123350 | POLYETHY BAG |
| 147 | 1756-11601 | LABEL (BK) |
| 148 | 1756-11701 | LABEL (BK) |
| 682 | 4161-71184 | CORD W/PLUG (ACCESSORY) |

PACKAGE

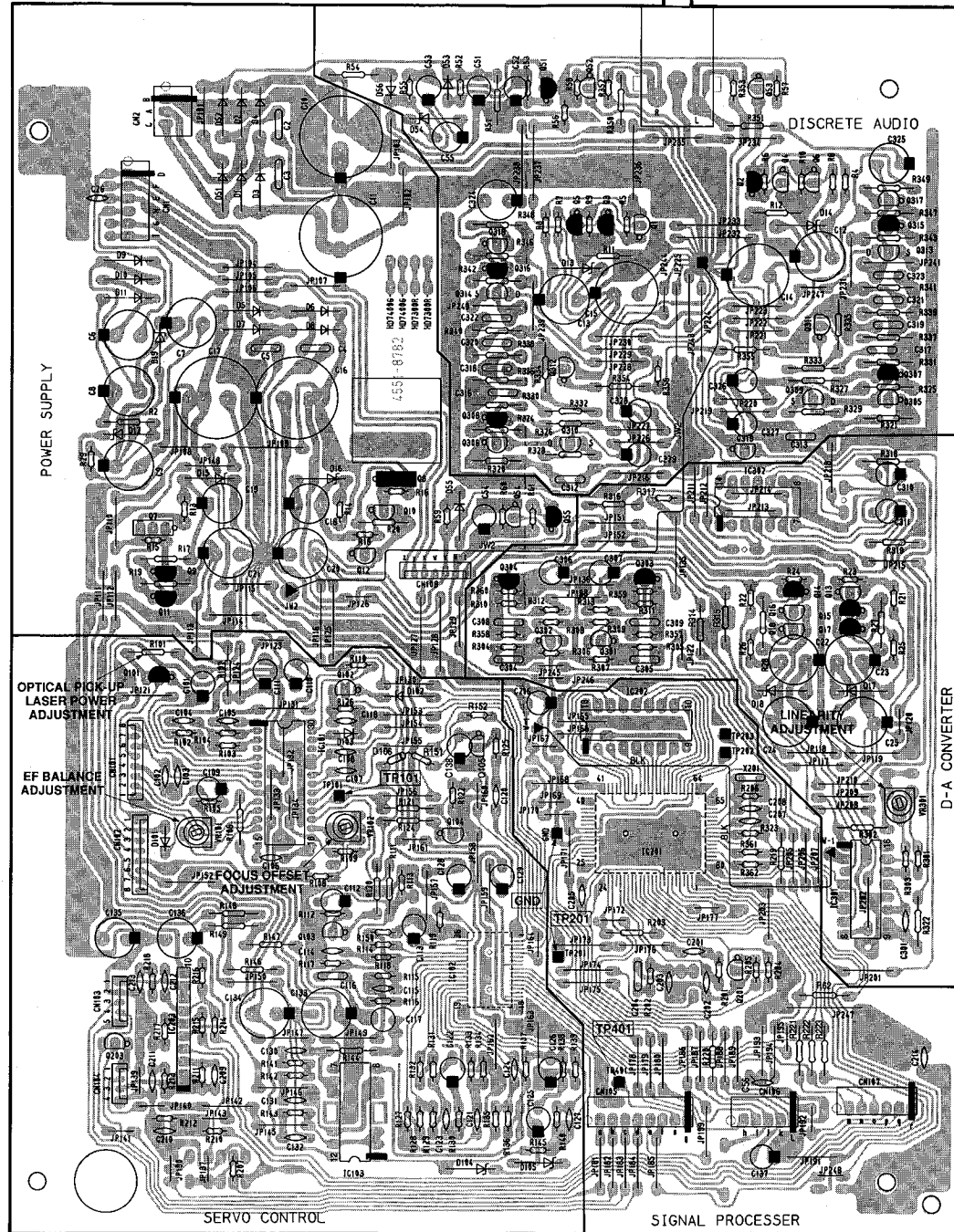


| Ref. No. | Part No. | Description |
|----------|-------------|----------------------------------|
| 022 | 1756-03108 | LABEL (x2) IB |
| 022 | 1756-03111 | LABEL (x2) BB |
| 023 | 1756-06303 | LABEL IB BB |
| 025 | 1111-F30253 | OWNER GUIDE IB |
| 105 | 1111-J30307 | OWNER GUIDE BB |
| 105 | 1111-F30308 | OWNER GUIDE BK |
| 106 | 1119-01201 | ATTACH SHEET IB BB |
| 107 | 1113-717004 | OWNER CARD BK |
| 108 | 1111-J30254 | OWNER GUIDE BK |
| 110 | 1111-J30297 | OWNER GUIDE BK |
| 111 | 1119-047 | ATTACH SHEET BK |

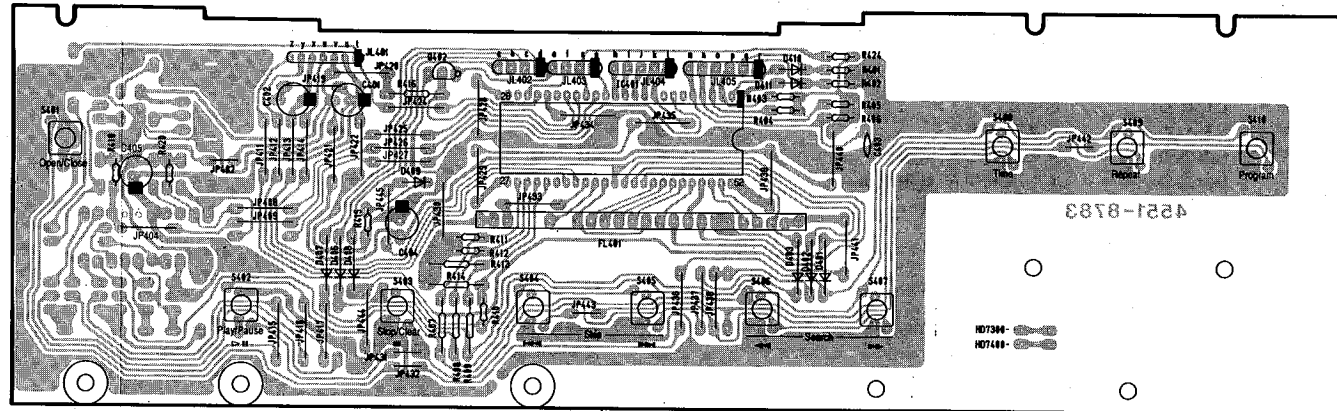
| Ref. No. | Part No. | Description |
|----------|---------------|-------------------------|
| 112 | 1119-0137 | ATTACH SHEET BK |
| 114 | 1221-7017144 | CARTON BOX |
| 116 | 1222-7216 | CUSHION (x2) |
| 117 | 1223-11729 | SOFT SHEET |
| 118 | 1241-C1491 | POLYETHY BAG |
| 119 | 1241-R0123350 | POLYETHY BAG |
| 147 | 1756-11601 | LABEL BK |
| 148 | 1756-11701 | LABEL BK |
| 682 | 4161-71184 | CORD W/PLUG (ACCESSORY) |

P. C. BOARDS

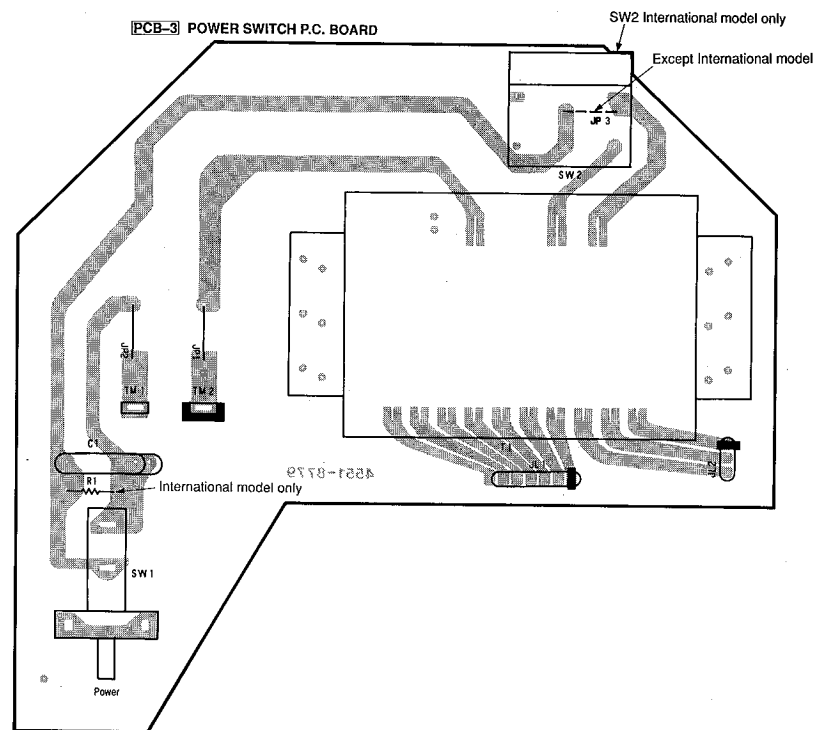
PCB-1 MAIN P.C. BOARD



PCB-2 FRONT P.C. BOARD

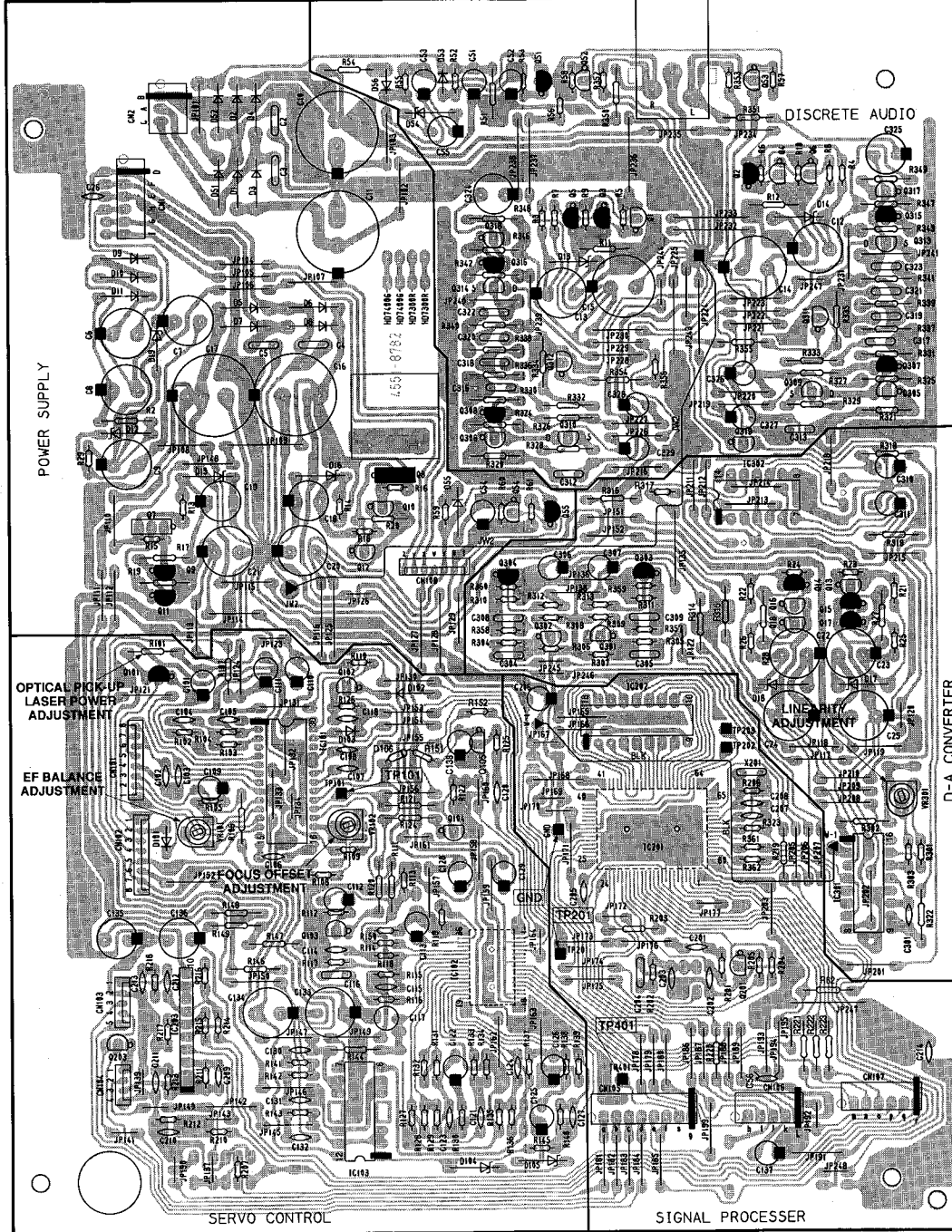


PCB-3 POWER SWITCH P.C. BOARD

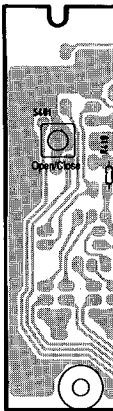


P. C. BOARDS

PCB-1 MAIN P.C. BOARD



PCB-2 FRONT



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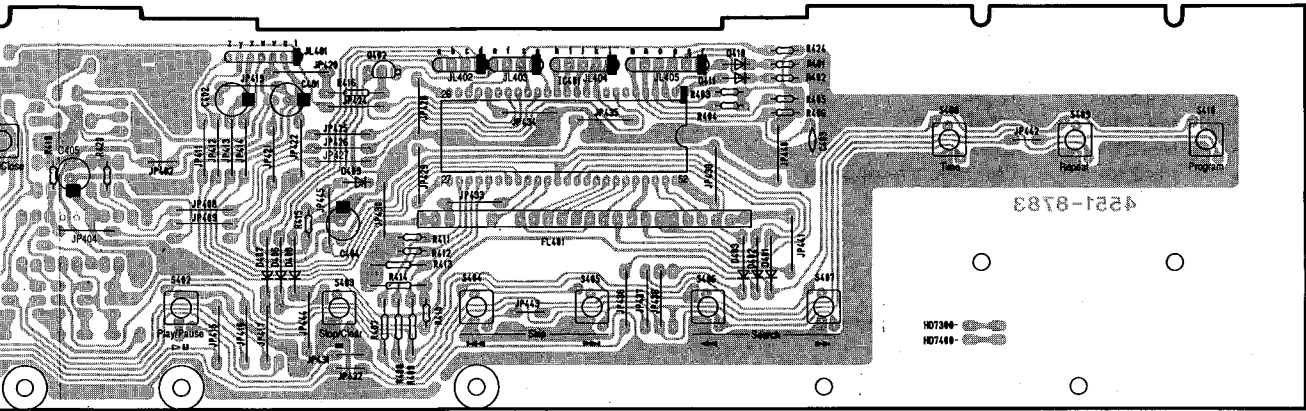
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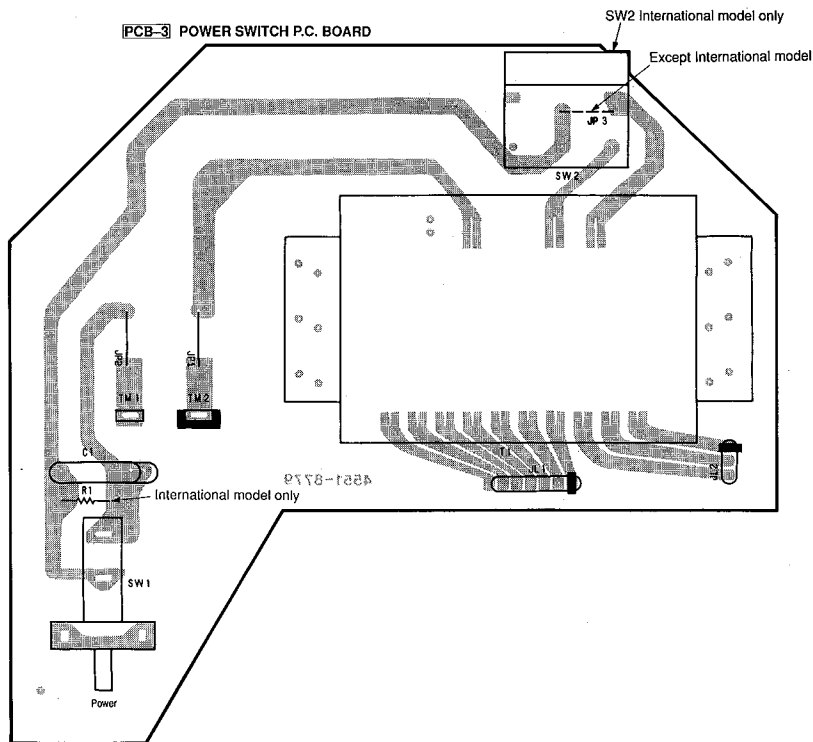
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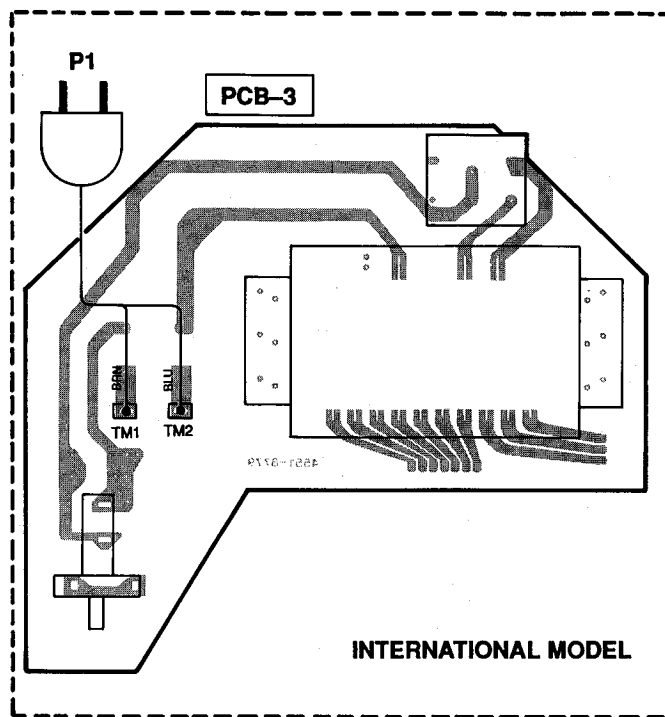
FRONT P.C. BOARD



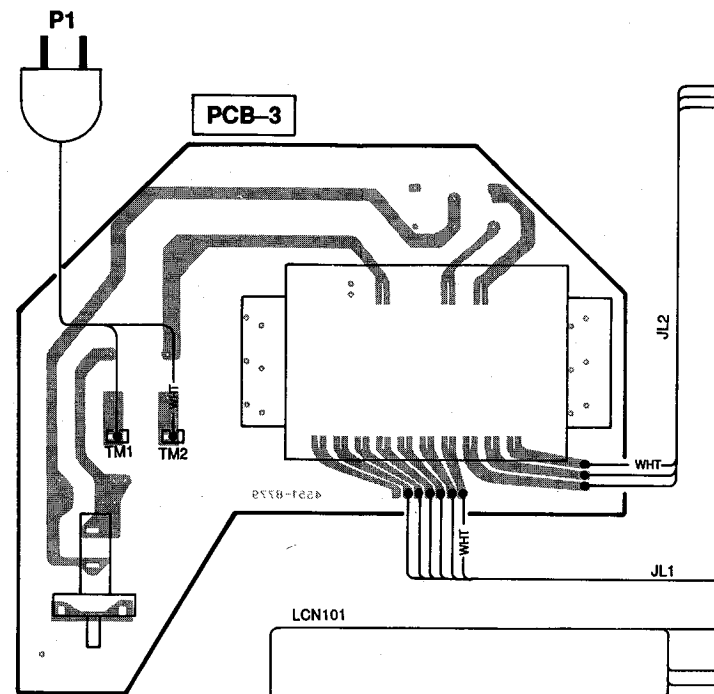
PCB-3 POWER SWITCH P.C. BOARD



WIRING DIAGRAM



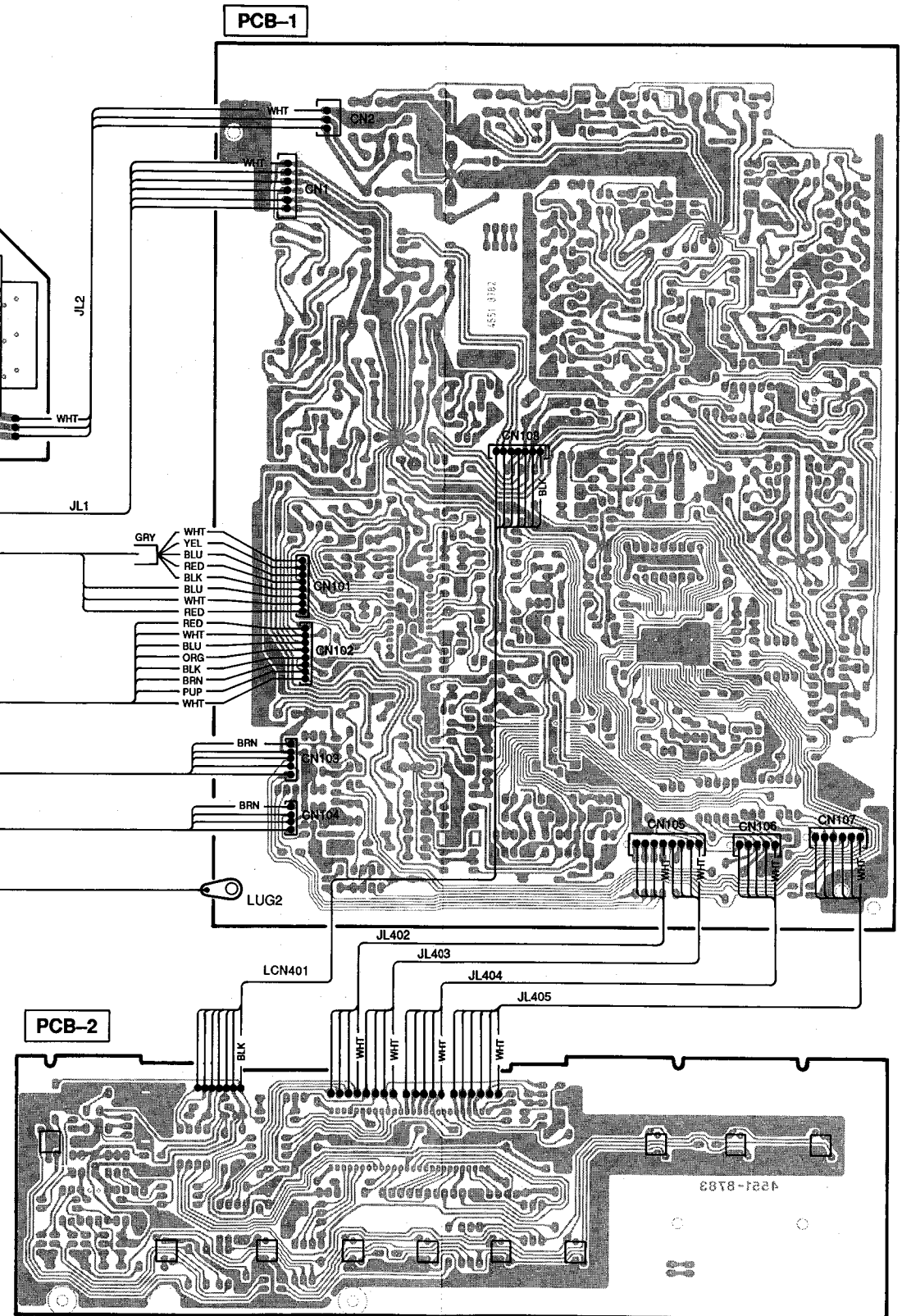
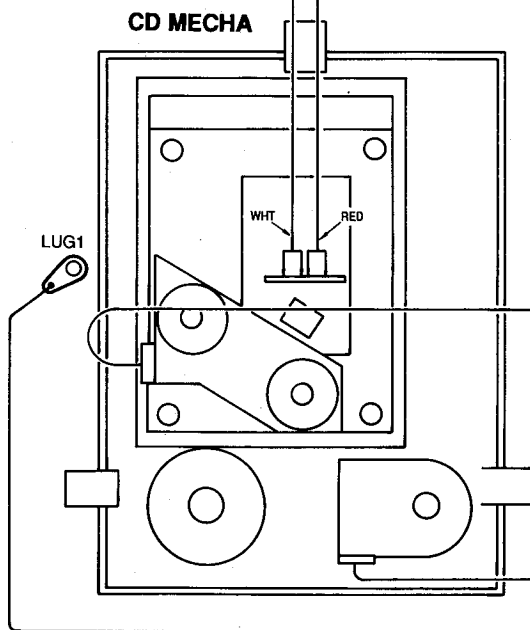
INTERNATIONAL MODEL



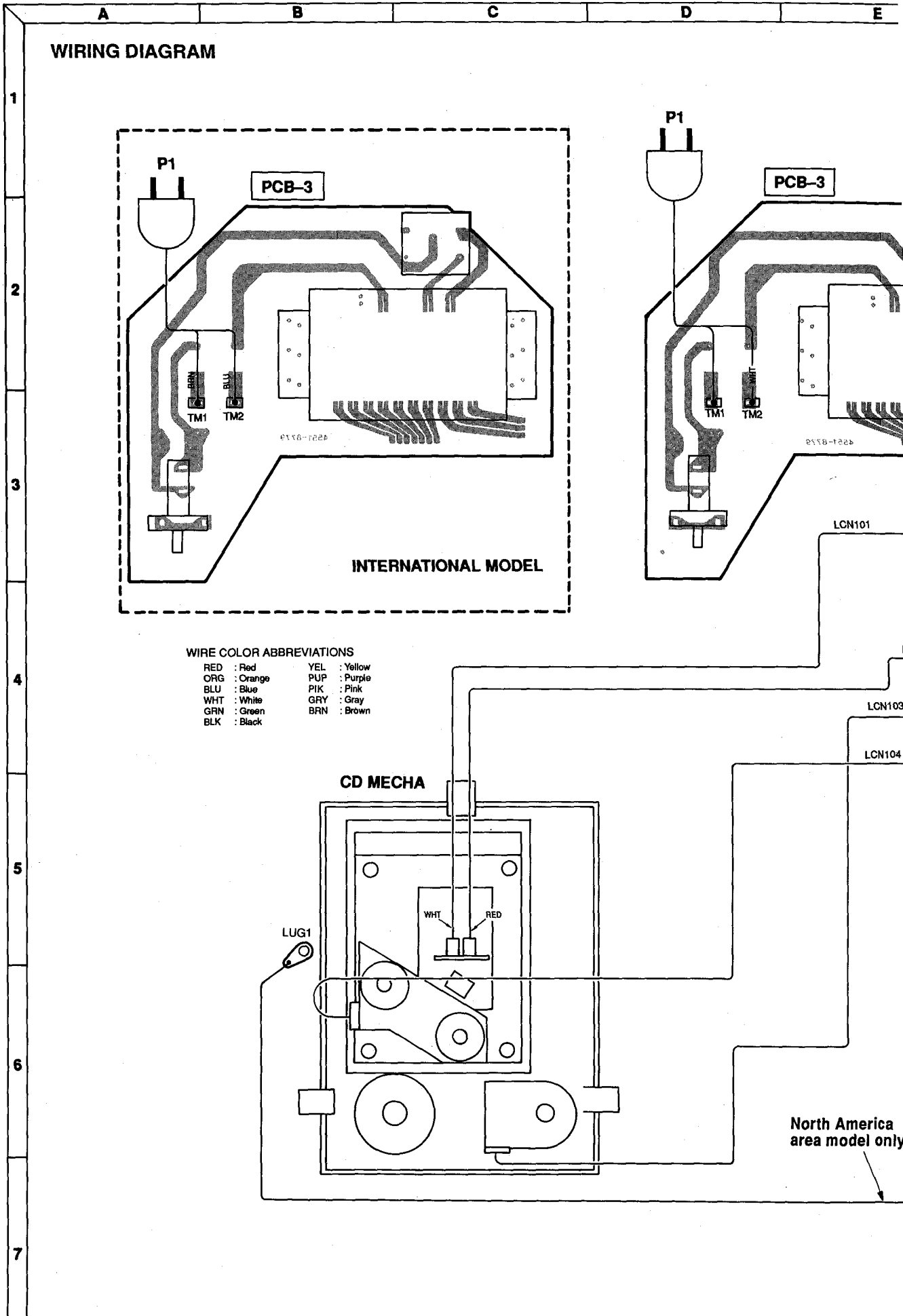
North America area model only

WIRE COLOR ABBREVIATIONS

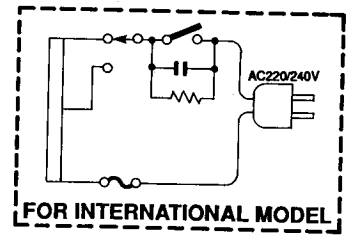
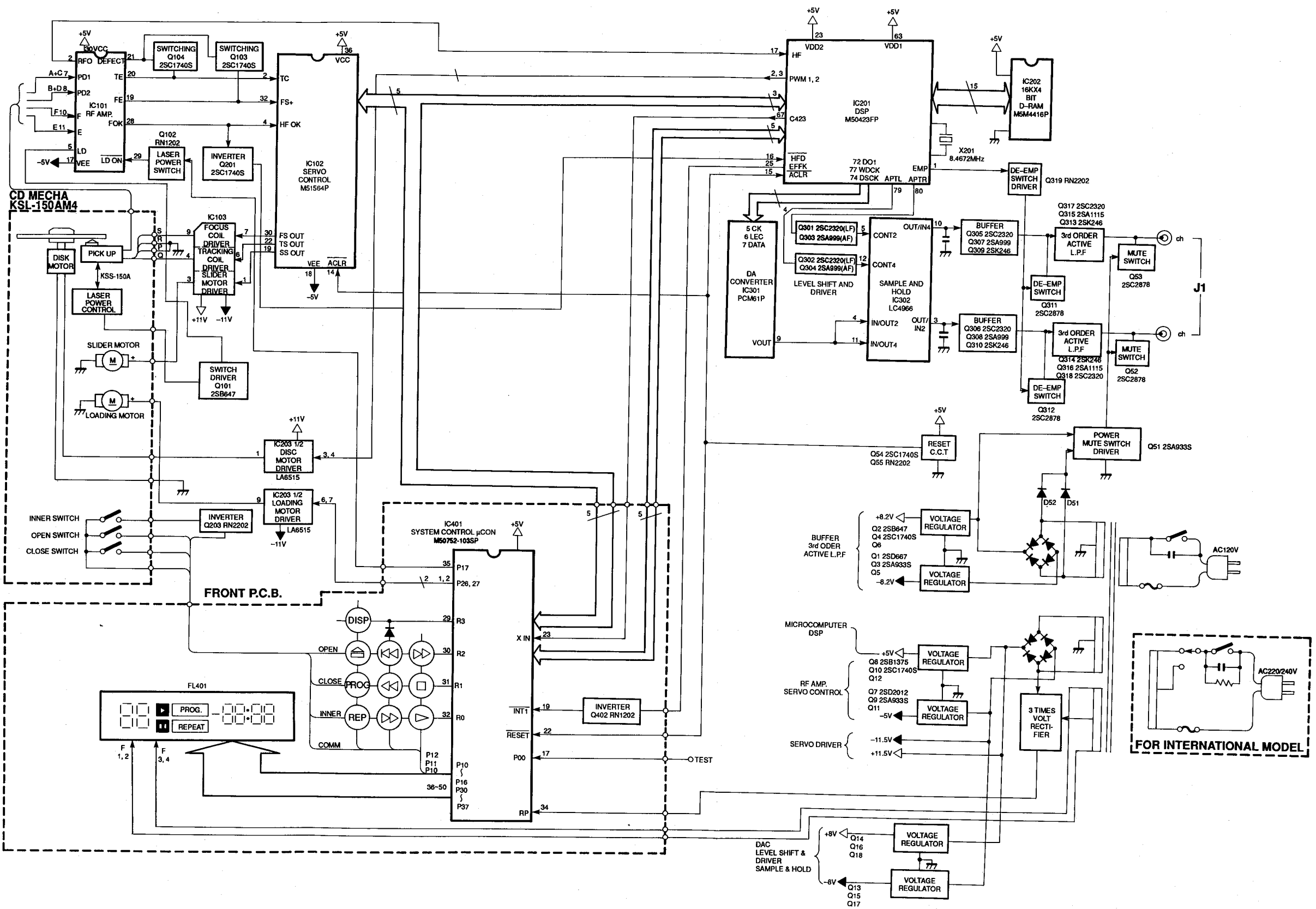
| | |
|--------------|--------------|
| RED : Red | YEL : Yellow |
| ORG : Orange | PUP : Purple |
| BLU : Blue | PIK : Pink |
| WHT : White | GRY : Gray |
| GRN : Green | BRN : Brown |
| BLK : Black | |



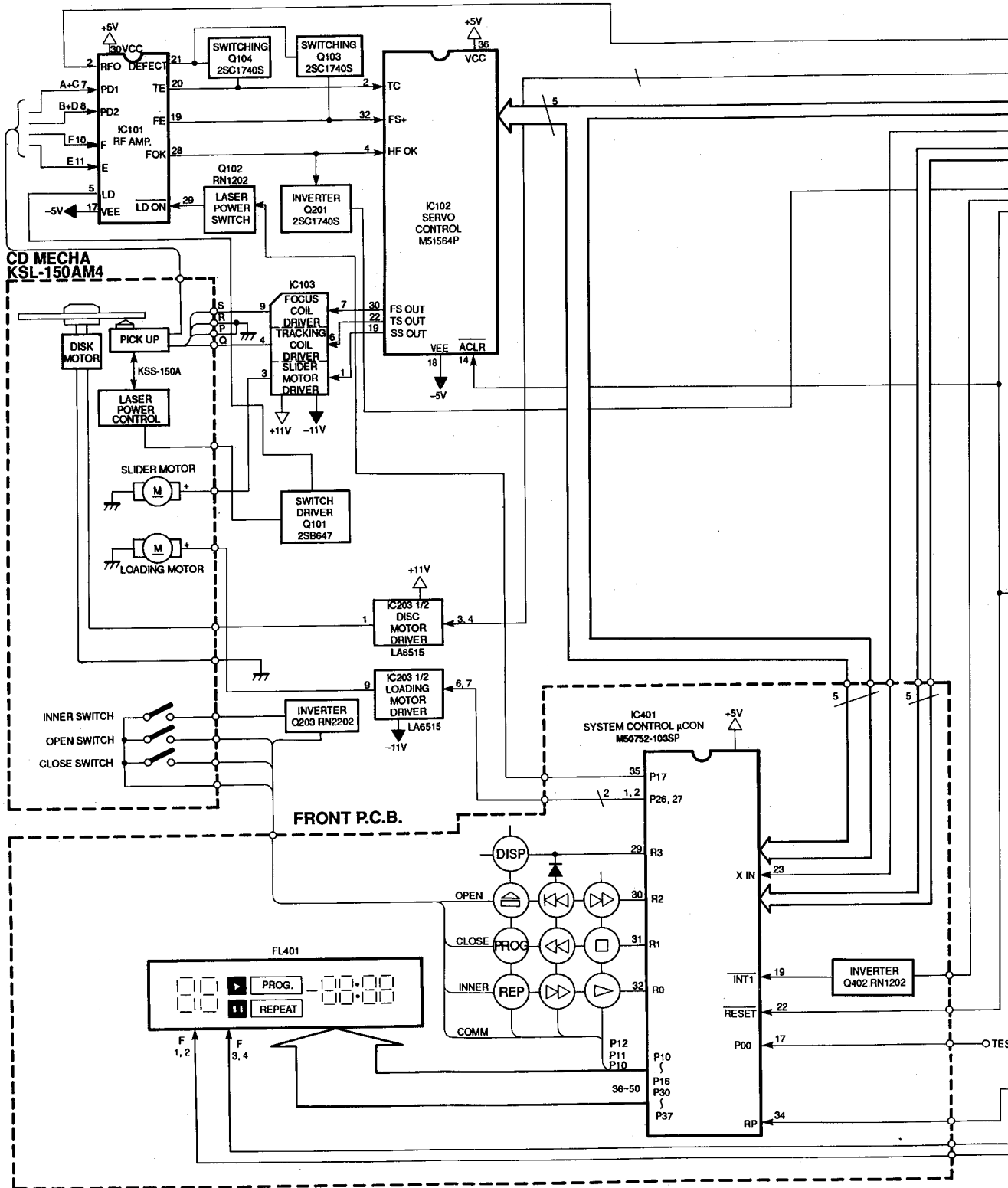
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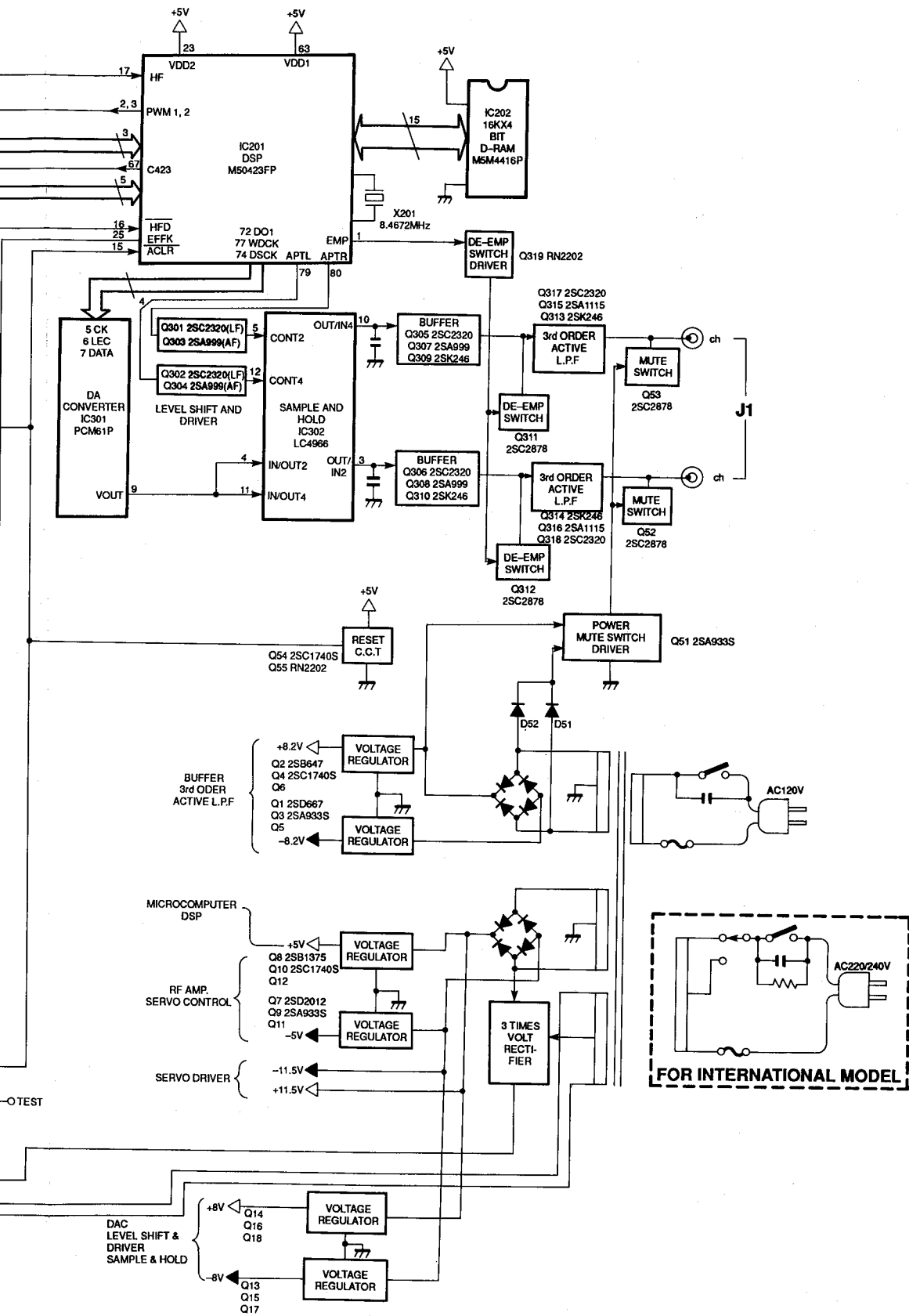


BLOCK DIAGRAM



BLOCK DIAGRAM





PARTS LIST

| Ser. No. | Ref. No. | Part No. | Description | Ser. No. | Ref. No. | Part No. | Description |
|------------------------------|----------|---------------|-------------------------------|------------------|----------|---------------|------------------------------|
| PCB-1 MAIN P.C. BOARD | | | | | | | |
| CAPACITORS | | | | | | | |
| 569 | C2 | 5354-104593 | CAP, MYL .1 μ | 580 | C203 | 5361-471KSL | CAP, CER 470p |
| 569 | C3 | 5354-104593 | CAP, MYL .1 μ | 568 | C204 | 5354-154593 | CAP, MYL .15 μ |
| 569 | C4 | 5354-104593 | CAP, MYL .1 μ | 571 | C205 | 5369-104144 | CAP, SCD .1 μ |
| 569 | C5 | 5354-104593 | CAP, MYL .1 μ | 561 | C206 | 5345-47680951 | CAP, MINI ELE 47 μ /10V |
| 545 | C6 | 5345-107E041 | CAP, MINI ELE 100 μ /35V | 587 | C207 | 5361-330JCH | CAP, CER 33p |
| 549 | C7 | 5345-227C041 | CAP, MINI ELE 220 μ /16V | 587 | C208 | 5361-330JCH | CAP, CER 33p |
| 545 | C8 | 5345-107E041 | CAP, MINI ELE 100 μ /35V | 580 | C209 | 5361-471KSL | CAP, CER 470p |
| 545 | C9 | 5345-107E041 | CAP, MINI ELE 100 μ /35V | 580 | C210 | 5361-471KSL | CAP, CER 470p |
| 546 | C10 | 5345-228C041 | CAP, MINI ELE 220 μ /16V | 571 | C211 | 5369-104144 | CAP, SCD .1 μ |
| 546 | C11 | 5345-228C041 | CAP, MINI ELE 220 μ /16V | 578 | C212 | 5361-220KSL | CAP, CER 22p |
| 549 | C12 | 5345-227C041 | CAP, MINI ELE 220 μ /16V | 571 | C213 | 5369-104144 | CAP, SCD .1 μ |
| 549 | C13 | 5345-227C041 | CAP, MINI ELE 220 μ /16V | 590 | C214 | 5361-223ZF | CAP, CER 0.022 μ |
| 547 | C14 | 5345-108C041 | CAP, MINI ELE 100 μ /16V | 591 | C301 | 5353-030934 | CAP, MCA 3p |
| 547 | C15 | 5345-108C041 | CAP, MINI ELE 100 μ /16V | 598 | C304 | 5359-S010J681 | CAP, PPP 680p |
| 546 | C16 | 5345-228C041 | CAP, MINI ELE 220 μ /16V | 598 | C305 | 5359-S010J681 | CAP, PPP 680p |
| 546 | C17 | 5345-228C041 | CAP, MINI ELE 220 μ /16V | 552 | C306 | 5345-107B041 | CAP, MINI ELE 100 μ /10V |
| 551 | C18 | 5345-227B041 | CAP, MINI ELE 220 μ /10V | 552 | C307 | 5345-107B041 | CAP, MINI ELE 100 μ /10V |
| 551 | C19 | 5345-227B041 | CAP, MINI ELE 220 μ /10V | 592 | C308 | 5359-S010J102 | CAP, PPP 1000P |
| 548 | C20 | 5345-108A041 | CAP, MINI ELE 100 μ /6.3V | 592 | C309 | 5359-S010J102 | CAP, PPP 1000P |
| 548 | C21 | 5345-108A041 | CAP, MINI ELE 100 μ /6.3V | 552 | C310 | 5345-107B041 | CAP, MINI ELE 100 μ /10V |
| 551 | C22 | 5345-107D041 | CAP, MINI ELE 100 μ /25V | 552 | C311 | 5345-107B041 | CAP, MINI ELE 100 μ /10V |
| 551 | C23 | 5345-107D041 | CAP, MINI ELE 100 μ /25V | 594 | C312 | 5359-5625851 | CAP, PPP 5600p |
| 549 | C24 | 5345-227C041 | CAP, MINI ELE 220 μ /16V | 594 | C313 | 5359-5625851 | CAP, PPP 5600p |
| 549 | C25 | 5345-227C041 | CAP, MINI ELE 220 μ /16V | 597 | C316 | 5359-2735851 | CAP, PPP .027 μ |
| 588 | C26 | 5361-223ZF | CAP, CER 0.022 μ | 597 | C317 | 5359-2735851 | CAP, PPP .027 μ |
| 556 | C51 | 5345-226D041 | CAP, MINI ELE 22 μ /25V | 595 | C318 | 5359-5115851 | CAP, PPP 510p |
| 556 | C52 | 5345-226D041 | CAP, MINI ELE 22 μ /25V | 595 | C319 | 5359-5115851 | CAP, PPP 510p |
| 552 | C53 | 5345-107B041 | CAP, MINI ELE 100 μ /10V | 595 | C320 | 5359-5115851 | CAP, PPP 510p |
| 552 | C54 | 5345-107B041 | CAP, MINI ELE 100 μ /10V | 595 | C321 | 5359-5115851 | CAP, PPP 510p |
| 557 | C55 | 5345-106F041 | CAP, MINI ELE 10 μ /50V | 596 | C322 | 5359-1825851 | CAP, PPP 1800p |
| 593 | C56 | 5361-103ZF | CAP, CER 0.01 μ | 596 | C323 | 5359-1825851 | CAP, PPP 1800p |
| 577 | C102 | 5361-100DSL | CAP, CER 10p | 564 | C324 | 5345-476C0951 | CAP, MINI ELE 47 μ /16V |
| 577 | C103 | 5361-100DSL | CAP, CER 10p | 564 | C325 | 5345-476C0951 | CAP, MINI ELE 47 μ /16V |
| 586 | C104 | 5361-100DCH | CAP, CER 10p | 564 | C326 | 5345-476C041 | CAP, MINI ELE 47 μ /16V |
| 583 | C105 | 5361-332KB | CAP, CER 3300p | 564 | C327 | 5345-476C041 | CAP, MINI ELE 47 μ /16V |
| 574 | C106 | 5369-333144 | CAP, SCD .033 μ | 564 | C328 | 5345-476C041 | CAP, MINI ELE 47 μ /16V |
| 574 | C107 | 5369-333144 | CAP, SCD .033 μ | 564 | C329 | 5345-476C041 | CAP, MINI ELE 47 μ /16V |
| 575 | C108 | 5369-103144 | CAP, SCD .01 μ | RESISTORS | | | |
| 555 | C109 | 5345-476B041 | CAP, MINI ELE 47 μ /10V | 609 | R2 | 5135-151522 | RES, CBN 1/2P 150 |
| 555 | C110 | 5345-476B041 | CAP, MINI ELE 47 μ /10V | 633 | R3 | 5232-222J16P | RES, CBN 1/6P 2.2K |
| 555 | C111 | 5345-476B041 | CAP, MINI ELE 47 μ /10V | 633 | R4 | 5232-222J16P | RES, CBN 1/6P 2.2K |
| 558 | C112 | 5345-474F041 | CAP, MINI ELE .47 μ /50V | 628 | R5 | 5232-471J16P | RES, CBN 1/6P 470 |
| 556 | C113 | 5345-226C0951 | CAP, MINI ELE 22 μ /16V | 628 | R6 | 5232-471J16P | RES, CBN 1/6P 470 |
| 572 | C114 | 5369-683144 | CAP, SCD .068 μ | 626 | R7 | 5232-101J16P | RES, CBN 1/6P 100 |
| 581 | C115 | 5361-681KSL | CAP, CER 680p | 626 | R8 | 5232-101J16P | RES, CBN 1/6P 100 |
| 567 | C116 | 5354-274593 | CAP, MYL .27 μ | 625 | R9 | 5232-100J16P | RES, CBN 1/6P 10 |
| 560 | C117 | 5342-105F041 | CAP, ELE BP 1 μ /50V | 625 | R10 | 5232-100J16P | RES, CBN 1/6P 10 |
| 571 | C118 | 5369-104144 | CAP, SCD .1 μ | 612 | R11 | 5135-152522 | RES, CBN 1/2P 1.5K |
| 582 | C120 | 5361-472KB | CAP, CER 4700p | 612 | R12 | 5135-152522 | RES, CBN 1/2P 1.5K |
| 575 | C121 | 5369-103144 | CAP, SCD .01 μ | 631 | R13 | 5232-152J16P | RES, CBN 1/6P 1.5K |
| 562 | C122 | 5345-684F0951 | CAP, MINI ELE 0.68 μ /50V | 631 | R14 | 5232-152J16P | RES, CBN 1/6P 1.5K |
| 584 | C123 | 5361-392KB | CAP, CER 3900p | 628 | R15 | 5232-471J16P | RES, CBN 1/6P 470 |
| 579 | C124 | 5361-151KSL | CAP, CER 150p | 628 | R16 | 5232-471J16P | RES, CBN 1/6P 470 |
| 557 | C125 | 5345-106F041 | CAP, MINI ELE 10 μ /50V | 606 | R17 | 5135-101522 | RES, CBN 1/2P 100 |
| 558 | C126 | 5345-474F041 | CAP, MINI ELE .47 μ /50V | 626 | R18 | 5232-101J16P | RES, CBN 1/6P 100 |
| 573 | C127 | 5369-563144 | CAP, SCD .056 μ | 601 | R19 | 5135-6R8522 | RES, CBN 1/2P 6.8 |
| 555 | C128 | 5345-476B041 | CAP, MINI ELE 47 μ /10V | 600 | R20 | 5135-2R2522 | RES, CBN 1/2P 2.2 |
| 555 | C129 | 5345-476B041 | CAP, MINI ELE 47 μ /10V | 633 | R21 | 5232-222J16P | RES, CBN 1/6P 2.2K |
| 571 | C130 | 5369-104144 | CAP, SCD .1 μ | 633 | R22 | 5232-222J16P | RES, CBN 1/6P 2.2K |
| 571 | C131 | 5369-104144 | CAP, SCD .1 μ | 628 | R23 | 5232-471J16P | RES, CBN 1/6P 470 |
| 571 | C132 | 5369-104144 | CAP, SCD .1 μ | 628 | R24 | 5232-471J16P | RES, CBN 1/6P 470 |
| 549 | C133 | 5345-227C041 | CAP, MINI ELE 220 μ /16V | 626 | R25 | 5232-101J16P | RES, CBN 1/6P 100 |
| 549 | C134 | 5345-227C041 | CAP, MINI ELE 220 μ /16V | 626 | R26 | 5232-101J16P | RES, CBN 1/6P 100 |
| 550 | C135 | 5345-107D041 | CAP, MINI ELE 100 μ /25V | 602 | R27 | 5135-100522 | RES, CBN 1/2P 10 |
| 550 | C136 | 5345-107D041 | CAP, MINI ELE 100 μ /25V | 602 | R28 | 5135-100522 | RES, CBN 1/2P 10 |
| 559 | C137 | 5345-105F041 | CAP, MINI ELE 1 μ /50V | 621 | R29 | 5232-273J16P | RES, CBN 1/6P 27K |
| 559 | C138 | 5345-105F041 | CAP, MINI ELE 1 μ /50V | 599 | R51 | 5135-821522 | RES, CBN 1/2P 820 |
| 583 | C201 | 5361-332KB | CAP, CER 3300p | 651 | R52 | 5232-224J16P | RES, CBN 1/6P 220K |
| 584 | C202 | 5361-562KB | CAP, CER 5600p | 643 | R53 | 5232-223J16P | RES, CBN 1/6P 22K |
| | | | | 631 | R54 | 5135-102522 | RES, CBN 1/2P 1K |
| | | | | 626 | R55 | 5232-101J16P | RES, CBN 1/6P 100 |

| Ser. No. | Ref. No. | Part No. | Description |
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| 654 | R56 | 5232-154J16P | RES, CBN 1/6P 150K |
| 632 | R57 | 5232-182J16P | RES, CBN 1/6P 1.8K |
| 632 | R58 | 5232-182J16P | RES, CBN 1/6P 1.8K |
| 629 | R59 | 5232-102J16P | RES, CBN 1/6P 1K |
| 628 | R60 | 5232-471J16P | RES, CBN 1/6P 470 |
| 639 | R61 | 5232-103J16P | RES, CBN 1/6P 10K |
| 610 | R62 | 5135-102522 | RES, CBN 1/2P 1K |
| 603 | R101 | 5135-220522 | RES, CBN 1/2P 22 |
| 633 | R102 | 5232-222J16P | RES, CBN 1/6P 2.2K |
| 641 | R103 | 5232-163J16P | RES, CBN 1/6P 16K |
| 638 | R104 | 5232-822J16P | RES, CBN 1/6P 8.2K |
| 643 | R105 | 5232-223J16P | RES, CBN 1/6P 22K |
| 610 | R106 | 5135-102522 | RES, CBN 1/2P 1K |
| 605 | R107 | 5135-910522 | RES, CBN 1/2P 91 |
| 642 | R108 | 5232-183J16P | RES, CBN 1/6P 18K |
| 642 | R109 | 5232-183J16P | RES, CBN 1/6P 18K |
| 639 | R110 | 5232-103J16P | RES, CBN 1/6P 10K |
| 615 | R111 | 5135-103522 | RES, CBN 1/2P 10K |
| 650 | R112 | 5232-104J16P | RES, CBN 1/6P 100K |
| 644 | R113 | 5232-273J16P | RES, CBN 1/6P 27K |
| 643 | R114 | 5232-223J16P | RES, CBN 1/6P 22K |
| 648 | R115 | 5232-683J16P | RES, CBN 1/6P 68K |
| 640 | R116 | 5232-153J16P | RES, CBN 1/6P 15K |
| 636 | R117 | 5232-682J16P | RES, CBN 1/6P 6.8K |
| 627 | R118 | 5232-221J16P | RES, CBN 1/6P 220 |
| 647 | R119 | 5232-473J16P | RES, CBN 1/6P 47K |
| 615 | R120 | 5135-103522 | RES, CBN 1/2P 10K |
| 615 | R121 | 5135-103522 | RES, CBN 1/2P 10K |
| 644 | R122 | 5232-273J16P | RES, CBN 1/6P 27K |
| 615 | R124 | 5135-103522 | RES, CBN 1/2P 10K |
| 639 | R125 | 5232-472J16P | RES, CBN 1/6P 4.7K |
| 650 | R126 | 5232-104J16P | RES, CBN 1/6P 100K |
| 650 | R127 | 5232-104J16P | RES, CBN 1/6P 100K |
| 647 | R128 | 5232-473J16P | RES, CBN 1/6P 47K |
| 639 | R129 | 5232-103J16P | RES, CBN 1/6P 10K |
| 637 | R130 | 5232-822J16P | RES, CBN 1/6P 8.2K |
| 650 | R131 | 5232-104J16P | RES, CBN 1/6P 100K |
| 650 | R132 | 5232-104J16P | RES, CBN 1/6P 100K |
| 635 | R133 | 5232-562J16P | RES, CBN 1/6P 5.6K |
| 634 | R134 | 5232-332J16P | RES, CBN 1/6P 3.3K |
| 639 | R135 | 5232-153J16P | RES, CBN 1/6P 15K |
| 645 | R136 | 5232-333J16P | RES, CBN 1/6P 33K |
| 646 | R137 | 5232-393J16P | RES, CBN 1/6P 39K |
| 643 | R138 | 5232-223J16P | RES, CBN 1/6P 22K |
| 634 | R139 | 5232-332J16P | RES, CBN 1/6P 3.3K |
| 644 | R140 | 5232-273J16P | RES, CBN 1/6P 27K |
| 625 | R141 | 5232-100J16P | RES, CBN 1/6P 10 |
| 625 | R142 | 5232-100J16P | RES, CBN 1/6P 10 |
| 625 | R143 | 5232-100J16P | RES, CBN 1/6P 10 |
| 616 | R144 | 5135-223522 | RES, CBN 1/2P 22K |
| 629 | R145 | 5232-102J16P | RES, CBN 1/6P 1K |
| 663 | △ R146 | 5102-4R75116 | RES, FUSE 4.7 |
| 663 | △ R147 | 5102-4R75116 | RES, FUSE 4.7 |
| 663 | △ R148 | 5102-4R75116 | RES, FUSE 4.7 |
| 663 | △ R149 | 5102-4R75116 | RES, FUSE 4.7 |
| 659 | R150 | 5232-225J16P | RES, CBN 1/6P 2.2M |
| 664 | R151 | 5232-103J16P | RES, CBN 1/6P 10K |
| 639 | R152 | 5232-103J16P | RES, CBN 1/6P 10K |
| 643 | R201 | 5232-223J16P | RES, CBN 1/6P 22K |
| 633 | R202 | 5232-222J16P | RES, CBN 1/6P 2.2K |
| 617 | R203 | 5135-124522 | RES, CBN 1/2P 120K |
| 647 | R204 | 5232-473J16P | RES, CBN 1/6P 47K |
| 647 | R205 | 5232-473J16P | RES, CBN 1/6P 47K |
| 653 | R206 | 5232-105J16P | RES, CBN 1/6P 1M |
| 642 | R207 | 5232-104J16P | RES, CBN 1/6P 100K |
| 650 | R210 | 5232-104J16P | RES, CBN 1/6P 100K |
| 652 | R211 | 5232-474J16P | RES, CBN 1/6P 470K |
| 652 | R212 | 5232-474J16P | RES, CBN 1/6P 470K |
| 625 | R213 | 5232-100J16P | RES, CBN 1/6P 10 |
| 650 | R214 | 5232-104J16P | RES, CBN 1/6P 100K |
| 650 | R215 | 5232-104J16P | RES, CBN 1/6P 100K |
| 650 | R216 | 5232-104J16P | RES, CBN 1/6P 100K |
| 650 | R217 | 5232-104J16P | RES, CBN 1/6P 100K |
| 625 | R218 | 5232-100J16P | RES, CBN 1/6P 10 |

| Ser. No. | Ref. No. | Part No. | Description |
|----------|----------|--------------|--------------------|
| 607 | R219 | 5135-471522 | RES, CBN 1/2P 470 |
| 624 | R220 | 5135-473522 | RES, CBN 1/2P 47K |
| 614 | R221 | 5135-472522 | RES, CBN 1/2P 4.7K |
| 614 | R222 | 5135-472522 | RES, CBN 1/2P 4.7K |
| 614 | R223 | 5135-472522 | RES, CBN 1/2P 4.7K |
| 652 | R301 | 5232-105J16P | RES, CBN 1/6P 1M |
| 619 | R302 | 5135-394522 | RES, CBN 1/2P 390K |
| 653 | R303 | 5232-105J16P | RES, CBN 1/6P 1M |
| 643 | R304 | 5232-223J16P | RES, CBN 1/6P 22K |
| 643 | R305 | 5232-223J16P | RES, CBN 1/6P 22K |
| 638 | R306 | 5232-822J16P | RES, CBN 1/6P 8.2K |
| 638 | R307 | 5232-822J16P | RES, CBN 1/6P 8.2K |
| 627 | R308 | 5232-331J16P | RES, CBN 1/6P 330 |
| 627 | R309 | 5232-331J16P | RES, CBN 1/6P 330 |
| 626 | R310 | 5232-101J16P | RES, CBN 1/6P 100 |
| 626 | R311 | 5232-101J16P | RES, CBN 1/6P 100 |
| 630 | R312 | 5232-102J16P | RES, CBN 1/6P 1K |
| 630 | R313 | 5232-102J16P | RES, CBN 1/6P 1K |
| 606 | R314 | 5135-101522 | RES, CBN 1/2P 100 |
| 606 | R315 | 5135-101522 | RES, CBN 1/2P 100 |
| 606 | R316 | 5135-101522 | RES, CBN 1/2P 100 |
| 606 | R317 | 5232-101J16P | RES, CBN 1/6P 100 |
| 602 | R318 | 5135-100522 | RES, CBN 1/2P 10 |
| 602 | R319 | 5135-100522 | RES, CBN 1/2P 10 |
| 603 | R320 | 5135-220522 | RES, CBN 1/2P 22 |
| 603 | R321 | 5135-220522 | RES, CBN 1/2P 22 |
| 606 | R322 | 5135-101522 | RES, CBN 1/2P 100 |
| 655 | R323 | 5232-151J16P | RES, CBN 1/6P 150 |
| 610 | R324 | 5135-102522 | RES, CBN 1/2P 1K |
| 610 | R325 | 5135-102522 | RES, CBN 1/2P 1K |
| 604 | R326 | 5135-470522 | RES, CBN 1/2P 47 |
| 604 | R327 | 5135-470522 | RES, CBN 1/2P 47 |
| 604 | R328 | 5135-470522 | RES, CBN 1/2P 47 |
| 604 | R329 | 5135-470522 | RES, CBN 1/2P 47 |
| 611 | R330 | 5135-122522 | RES, CBN 1/2P 1.2K |
| 611 | R331 | 5135-122522 | RES, CBN 1/2P 1.2K |
| 608 | R332 | 5135-561522 | RES, CBN 1/2P 560 |
| 608 | R333 | 5135-561522 | RES, CBN 1/2P 560 |
| 620 | R334 | 5135-105522 | RES, CBN 1/2P 1M |
| 620 | R335 | 5135-105522 | RES, CBN 1/2P 1M |
| 612 | R336 | 5135-152522 | RES, CBN 1/2P 1.5K |
| 612 | R337 | 5135-152522 | RES, CBN 1/2P 1.5K |
| 613 | R338 | 5135-332522 | RES, CBN 1/2P 3.3K |
| 613 | R339 | 5135-332522 | RES, CBN 1/2P 3.3K |
| 613 | R340 | 5135-332522 | RES, CBN 1/2P 3.3K |
| 613 | R341 | 5135-332522 | RES, CBN 1/2P 3.3K |
| 606 | R342 | 5135-101522 | RES, CBN 1/2P 100 |
| 606 | R343 | 5135-101522 | RES, CBN 1/2P 100 |
| 610 | R346 | 5135-102522 | RES, CBN 1/2P 1K |
| 610 | R347 | 5135-102522 | RES, CBN 1/2P 1K |
| 606 | R348 | 5135-101522 | RES, CBN 1/2P 100 |
| 606 | R349 | 5135-101522 | RES, CBN 1/2P 100 |
| 606 | R350 | 5135-101522 | RES, CBN 1/2P 100 |
| 606 | R351 | 5135-101522 | RES, CBN 1/2P 100 |
| 650 | R352 | 5232-104J16P | RES, CBN 1/6P 100K |
| 650 | R353 | 5232-104J16P | RES, CBN 1/6P 100K |
| 614 | R354 | 5135-472522 | RES, CBN 1/2P 4.7K |
| 614 | R355 | 5135-472522 | RES, CBN 1/2P 4.7K |
| 618 | R356 | 5232-154J16P | RES, CBN 1/6P 150K |
| 627 | R357 | 5232-331J16P | RES, CBN 1/6P 330 |
| 627 | R358 | 5232-331J16P | RES, CBN 1/6P 330 |
| 656 | R359 | 5232-681J16P | RES, CBN 1/6P 680 |
| 656 | R360 | 5232-681J16P | RES, CBN 1/6P 680 |
| 655 | R361 | 5232-151J16P | RES, CBN 1/6P 150 |
| 655 | R362 | 5232-151J16P | RES, CBN 1/6P 150 |

INTEGRATED CIRCUITS

| Ser. No. | Ref. No. | Part No. | Description |
|----------|----------|---------------|-------------|
| 509 | IC101 | 5653-CXA1081S | IC, LINEAR |
| 502 | IC102 | 5654-M51564P | IC, DIGITAL |
| 510 | IC103 | 5653-LA6520 | IC, LINEAR |
| 501 | IC201 | 5654-M50423FP | IC, DIGITAL |
| 505 | IC202 | 5654-M5M4416P | IC, DIGITAL |
| 511 | IC203 | 5653-LA6515 | IC, LINEAR |
| 503 | IC301 | 5654-PCM61P | IC, DIGITAL |

| Ser. No. | Ref. No. | Part No. | Description |
|--------------------|----------|---------------|---------------|
| 504 | IC302 | 5654-LC4966 | IC, DIGITAL |
| TRANSISTORS | | | |
| 521 | Q1 | 5614-667(C) | XISTOR, NPN A |
| 514 | Q2 | 5612-647(C) | XISTOR, PNP A |
| 515 | Q3 | 5611-933S(S) | XISTOR, PNP R |
| 522 | Q4 | 5613-1740S(S) | XISTOR, NPN R |
| 515 | Q5 | 5611-933S(S) | XISTOR, PNP R |
| 522 | Q6 | 5613-1740S(S) | XISTOR, NPN R |
| 520 | Q7 | 5614-2012 | XISTOR, NPN A |
| 513 | Q8 | 5612-1375 | XISTOR, PNP A |
| 515 | Q9 | 5611-933S(S) | XISTOR, PNP R |
| 522 | Q10 | 5613-1740S(S) | XISTOR, NPN R |
| 515 | Q11 | 5611-933S(S) | XISTOR, PNP R |
| 522 | Q12 | 5613-1740S(S) | XISTOR, NPN R |
| 521 | Q13 | 5614-667(C) | XISTOR, NPN A |
| 514 | Q14 | 5612-647(C) | XISTOR, PNP A |
| 515 | Q15 | 5611-933S(S) | XISTOR, PNP R |
| 522 | Q16 | 5613-1740S(S) | XISTOR, NPN R |
| 515 | Q17 | 5611-933S(S) | XISTOR, PNP R |
| 522 | Q18 | 5613-1740S(S) | XISTOR, NPN R |
| 515 | Q51 | 5611-933S(S) | XISTOR, PNP R |
| 524 | Q52 | 5613-2878(B) | XISTOR, NPN R |
| 524 | Q53 | 5613-2878(B) | XISTOR, NPN R |
| 522 | Q54 | 5613-1740S(S) | XISTOR, NPN R |
| 517 | Q55 | 5611-RN2202 | XISTOR, PNP R |
| 514 | Q101 | 5612-647(C) | XISTOR, PNP A |
| 525 | Q102 | 5613-RN1202 | XISTOR, NPN R |
| 522 | Q103 | 5613-1740S(S) | XISTOR, NPN R |
| 522 | Q104 | 5613-1740S(S) | XISTOR, NPN R |
| 522 | Q105 | 5613-1740S(S) | XISTOR, NPN R |
| 522 | Q201 | 5613-1740S(S) | XISTOR, NPN R |
| 525 | Q202 | 5613-RN1202 | XISTOR, NPN R |
| 517 | Q203 | 5611-RN2202 | XISTOR, PNP R |
| 528 | Q301 | 5613-2320L(F) | XISTOR, NPN R |
| 528 | Q302 | 5613-2320L(F) | XISTOR, NPN R |
| 516 | Q303 | 5611-999L(F) | XISTOR, PNP R |
| 516 | Q304 | 5611-999L(F) | XISTOR, PNP R |
| 528 | Q305 | 5613-2320L(F) | XISTOR, NPN R |
| 528 | Q306 | 5613-2320L(F) | XISTOR, NPN R |
| 516 | Q307 | 5611-999L(F) | XISTOR, PNP R |
| 516 | Q308 | 5611-999L(F) | XISTOR, PNP R |
| 529 | Q309 | 5616-SK246GR2 | FET, N-CH |
| 529 | Q310 | 5616-SK246GR2 | FET, N-CH |
| 524 | Q311 | 5613-2878(B) | XISTOR, NPN R |
| 524 | Q312 | 5613-2878(B) | XISTOR, NPN R |
| 529 | Q313 | 5616-SK246GR2 | FET, N-CH |
| 529 | Q314 | 5616-SK246GR2 | FET, N-CH |
| 516 | Q315 | 5611-999L(F) | XISTOR, PNP R |
| 516 | Q316 | 5611-999L(F) | XISTOR, PNP R |
| 528 | Q317 | 5613-2320L(F) | XISTOR, NPN R |
| 528 | Q318 | 5613-2320L(F) | XISTOR, NPN R |
| 517 | Q319 | 5611-RN2202 | XISTOR, PNP R |

| Ser. No. | Ref. No. | Part No. | Description |
|---------------|----------|-------------|--------------|
| DIODES | | | |
| 531 | △ D1 | 5632-GP10E | DIODE, RECT |
| 531 | △ D2 | 5632-GP10E | DIODE, RECT |
| 531 | △ D3 | 5632-GP10E | DIODE, RECT |
| 531 | △ D4 | 5632-GP10E | DIODE, RECT |
| 531 | △ D5 | 5632-GP10E | DIODE, RECT |
| 531 | △ D6 | 5632-GP10E | DIODE, RECT |
| 531 | △ D7 | 5632-GP10E | DIODE, RECT |
| 531 | △ D8 | 5632-GP10E | DIODE, RECT |
| 531 | △ D9 | 5632-GP10E | DIODE, RECT |
| 531 | △ D10 | 5632-GP10E | DIODE, RECT |
| 531 | △ D11 | 5632-GP10E | DIODE, RECT |
| 543 | D12 | 5635-HZ27-2 | DIODE, ZENER |
| 541 | D13 | 5635-HZ9B2L | DIODE, ZENER |
| 541 | D14 | 5635-HZ9B2L | DIODE, ZENER |
| 540 | D15 | 5635-HZ6B1L | DIODE, ZENER |
| 540 | D16 | 5635-HZ6B1L | DIODE, ZENER |
| 544 | D17 | 5635-HZ9A1L | DIODE, ZENER |
| 544 | D18 | 5635-HZ9A1L | DIODE, ZENER |
| 542 | D19 | 5635-HZ5B-2 | DIODE, ZENER |

| Ser. No. | Ref. No. | Part No. | Description |
|----------|----------|-------------|--------------|
| 531 | △ D51 | 5632-GP10E | DIODE, RECT |
| 531 | △ D52 | 5632-GP10E | DIODE, RECT |
| 532 | D53 | 5631-1SS133 | DIODE, DET |
| 540 | D54 | 5635-HZ6B1L | DIODE, ZENER |
| 539 | D55 | 5635-HZ3B-2 | DIODE, ZENER |
| 534 | D56 | 5631-1SS133 | DIODE, DET |
| 532 | D101 | 5631-1SS133 | DIODE, DET |
| 534 | D102 | 5631-1SS133 | DIODE, DET |
| 532 | D103 | 5631-1SS133 | DIODE, DET |
| 538 | D104 | 5635-HZ3A-3 | DIODE, ZENER |
| 538 | D105 | 5635-HZ3A-3 | DIODE, ZENER |
| 536 | D106 | 5631-1SS133 | DIODE, DET |

| CONTROLS | | | |
|-----------------|-------|---------------|--------------------|
| 667 | VR101 | 5101-22301934 | RES, SEMI FIX 22K |
| 666 | VR102 | 5101-50201934 | RES, SEMI FIX 5K |
| 665 | VR301 | 5101-10401934 | RES, SEMI FIX 100K |

| MISCELLANEOUS | | | |
|----------------------|-------|---------------|---------------|
| 702 | CN1 | 4443-030185 | CONNECTOR |
| 704 | CN2 | 4443-060185 | CONNECTOR |
| 696 | CN101 | 4443-0801140 | CONNECTOR |
| 697 | CN102 | 4443-03901008 | CONNECTOR |
| 698 | CN103 | 4443-0501140 | CONNECTOR |
| 699 | CN104 | 4443-0401140 | CONNECTOR |
| 705 | CN105 | 4443-080185 | CONNECTOR |
| 703 | CN106 | 4443-050185 | CONNECTOR |
| 704 | CN107 | 4443-060185 | CONNECTOR |
| 700 | CN108 | 4443-0701140 | CONNECTOR |
| 692 | GND1 | 4214-132 | TERMINAL |
| 679 | △ J1 | 4489-02501002 | PIN JACK, 2P |
| 716 | JW2 | 4163-0118024 | CONNECTOR W/W |
| 692 | TP101 | 4214-132 | TERMINAL |
| 692 | TP201 | 4214-132 | TERMINAL |
| 692 | TP202 | 4214-132 | TERMINAL |
| 692 | TP203 | 4214-132 | TERMINAL |
| 692 | TP401 | 4214-132 | TERMINAL |
| 670 | X201 | 5691-00846731 | XTAL. OSC |

PCB-2 FRONT P. C. BOARD

| CAPACITORS | | | |
|-------------------|------|---------------|-----------------------|
| 554 | C401 | 5345-336D0951 | CAP, MINI ELE 33μ25V |
| 553 | C402 | 5345-107E041 | CAP, MINI ELE 100μ35V |
| 589 | C403 | 5361-102KB | CAP, CER 1000p |
| 554 | C404 | 5345-336D0951 | CAP, MINI ELE 33μ25V |
| 554 | C405 | 5345-336D0951 | CAP, MINI ELE 33μ25V |
| 554 | C406 | 5345-336D0951 | CAP, MINI ELE 33μ25V |

| RESISTORS | | | |
|------------------|------|---------------|-------------------|
| 658 | R401 | 5232-103J16P | RES, CBN 1/6P 10K |
| 658 | R402 | 5232-103J16P | RES, CBN 1/6P 10K |
| 658 | R403 | 5232-103J16P | RES, CBN 1/6P 10K |
| 658 | R404 | 5232-103J16P | RES, CBN 1/6P 10K |
| 658 | R405 | 5232-103J16P | RES, CBN 1/6P 10K |
| 658 | R406 | 5232-103J16P | RES, CBN 1/6P 10K |
| 622 | R407 | 5135-101522 | RES, CBN 1/2P 100 |
| 622 | R408 | 5135-101522 | RES, CBN 1/2P 100 |
| 622 | R409 | 5135-101522 | RES, CBN 1/2P 100 |
| 657 | R410 | 5232-101J16P | RES, CBN 1/6P 100 |
| 657 | R411 | 5232-103J16P | RES, CBN 1/6P 10K |
| 657 | R412 | 5232-103J16P | RES, CBN 1/6P 10K |
| 623 | R413 | 5135-103522 | RES, CBN 1/2P 10K |
| 623 | R414 | 5135-103522 | RES, CBN 1/2P 10K |
| 658 | R415 | 5232-103J16P | RES, CBN 1/6P 10K |
| 661 | R416 | 5135-103522 | RES, CBN 1/2P 10K |
| 658 | R419 | 5232-IROJ 16P | RES, CBN 1/6P 1K |
| 658 | R420 | 5232-IROJ 16P | RES, CBN 1/6P 1K |
| 658 | R424 | 5232-103J16P | RES, CBN 1/6P 10K |

| INTEGRATED CIRCUIT | | | |
|---------------------------|-------|---------------|-------------|
| 506 | IC401 | 5654-M752-103 | IC, DIGITAL |

| Ser. No. | Ref. No. | Part No. | Description |
|-------------------|----------|-------------|---------------|
| TRANSISTOR | | | |
| 526 | Q402 | 5613-RN1202 | XISTOR, NPN R |
| DIODES | | | |
| 535 | D401 | 5631-1SS133 | DIODE, DET |
| 535 | D402 | 5631-1SS133 | DIODE, DET |
| 535 | D403 | 5631-1SS133 | DIODE, DET |
| 535 | D406 | 5631-1SS133 | DIODE, DET |
| 535 | D407 | 5631-1SS133 | DIODE, DET |
| 535 | D408 | 5631-1SS133 | DIODE, DET |
| 535 | D409 | 5631-1SS133 | DIODE, DET |
| 533 | D410 | 5631-1SS133 | DIODE, DET |
| 533 | D411 | 5631-1SS133 | DIODE, DET |

| MISCELLANEOUS | | | |
|----------------------|--------|---------------|---------------|
| 673 | FL401 | 5722-26 | TUBE DISPLAY |
| 720 | JL402 | 4242-R0204151 | JUMPER LEAD |
| 720 | JL403 | 4242-R0204151 | JUMPER LEAD |
| 718 | JL404 | 4242-R0205151 | JUMPER LEAD |
| 719 | JL405 | 4242-R0206151 | JUMPER LEAD |
| 715 | LCN401 | 4163-S0107251 | CONNECTOR W/W |
| 686 | S401 | 4437-00604 | SWITCH, PUSH |
| 686 | S402 | 4437-00604 | SWITCH, PUSH |
| 686 | S403 | 4437-00604 | SWITCH, PUSH |
| 686 | S404 | 4437-00604 | SWITCH, PUSH |
| 686 | S405 | 4437-00604 | SWITCH, PUSH |
| 686 | S406 | 4437-00604 | SWITCH, PUSH |
| 686 | S407 | 4437-00604 | SWITCH, PUSH |
| 686 | S408 | 4437-00604 | SWITCH, PUSH |
| 686 | S409 | 4437-00604 | SWITCH, PUSH |
| 686 | S410 | 4437-00604 | SWITCH, PUSH |

ABBREVIATIONS IN PARTS LIST

| | |
|------------------------------------|-------------------------------------|
| CAPACITORS | RESISTORS |
| CAP, MINI ELE : Electrolytic | RES, CBN 1/6P : Carbon 1/6W |
| CAP, CER : Ceramic | RES, FUSE : Fuse |
| CAP, PPP : Polypropylene | RES, CEM 5P : Cement 5W |
| CAP, MYL : Mylar | RES, MTL 1P : Metal 1W |
| CAP, MCA : Mica | 2.2K : 2.2kΩ |
| CAP, MINI BP : Bipolar | 220 : 220Ω |
| CAP, ELE BP : Electrolytic Bipolar | TRANSISTORS |
| 470 μ : 470 μ F | XISTOR : Transistor |
| 6800p : 6800pF | FET : Field Effect Transistor |
| .047 μ : 0.047 μ F | CONTROLS |
| | RES, SEMI FIX : Semi-fixed Resistor |

NOTE



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

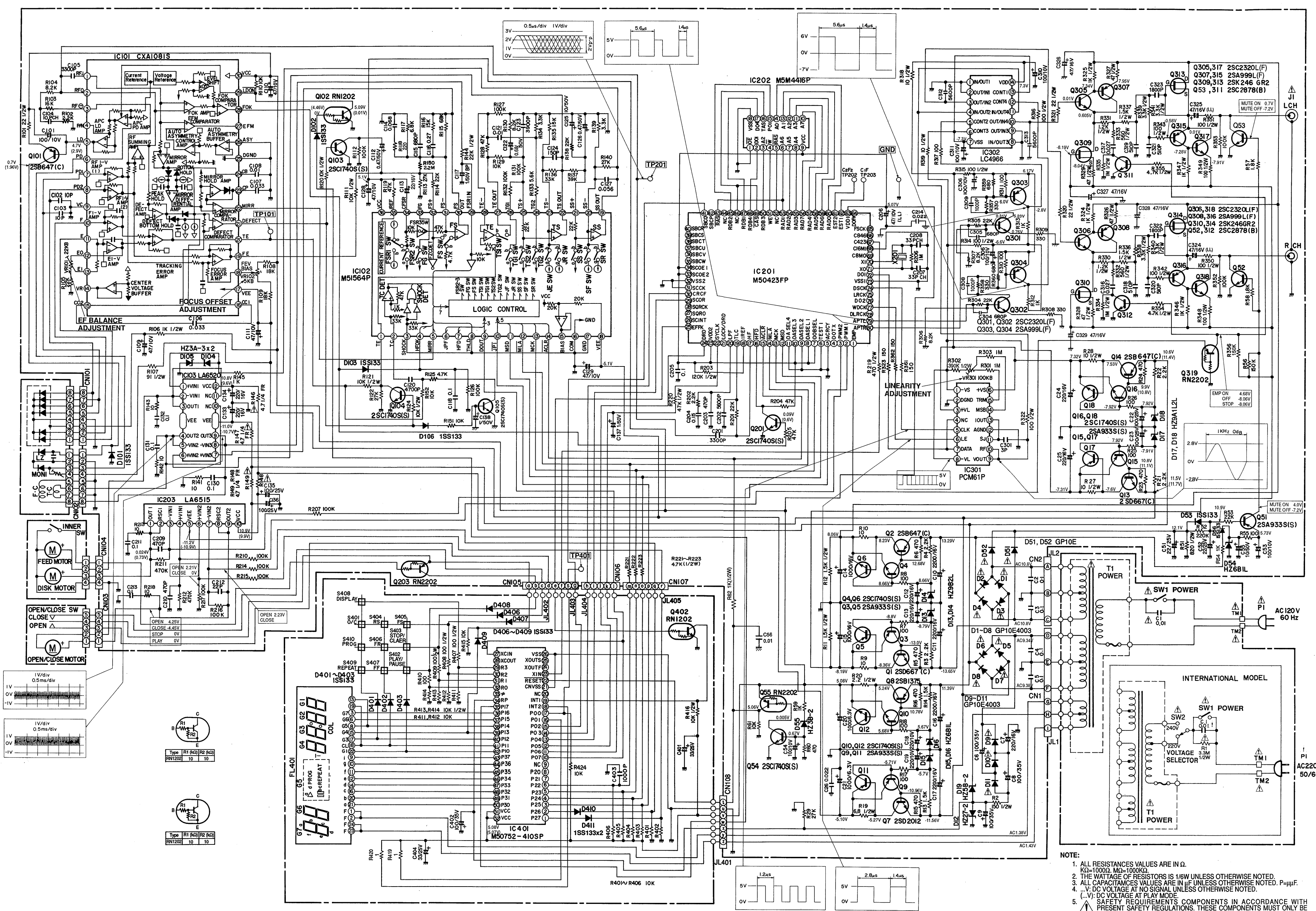
PCB-3 POWER SWITCH P. C. BOARD

| CAPACITORS | | | |
|----------------------|-------|---------------|--|
| 566 | △ C1 | 5352-S010M103 | CAP, MTL .01μ |
| 566B | △ C1 | 5352-1030958 | CAP, MTL .01μ IB BB |
| RESISTOR | | | |
| 027B | △ R1 | 5135-335J50P | RES, CBN 1/2P 3.3M IB BB |
| TRANSFORMERS | | | |
| 688 | △ T1 | 5584-S6201 | XFORMER, POWER |
| 688B | △ T1 | 5584-S6202 | XFORMER, POWER IB BB |
| MISCELLANEOUS | | | |
| 721 | JL1 | 4242-R0203161 | JUMPER LEAD |
| 722 | JL2 | 4242-R0206161 | JUMPER LEAD |
| 685 | △ SW1 | 4431-A017191 | SWITCH, PUSH |
| 026B | △ SW2 | 4411-1047111 | SWITCH, ROTARY IB BB |
| 693 | △ TM1 | 4214-122 | TERMINAL |
| 693 | △ TM2 | 4214-122 | TERMINAL |

CHASSIS MISCELLANEOUS PARTS LIST

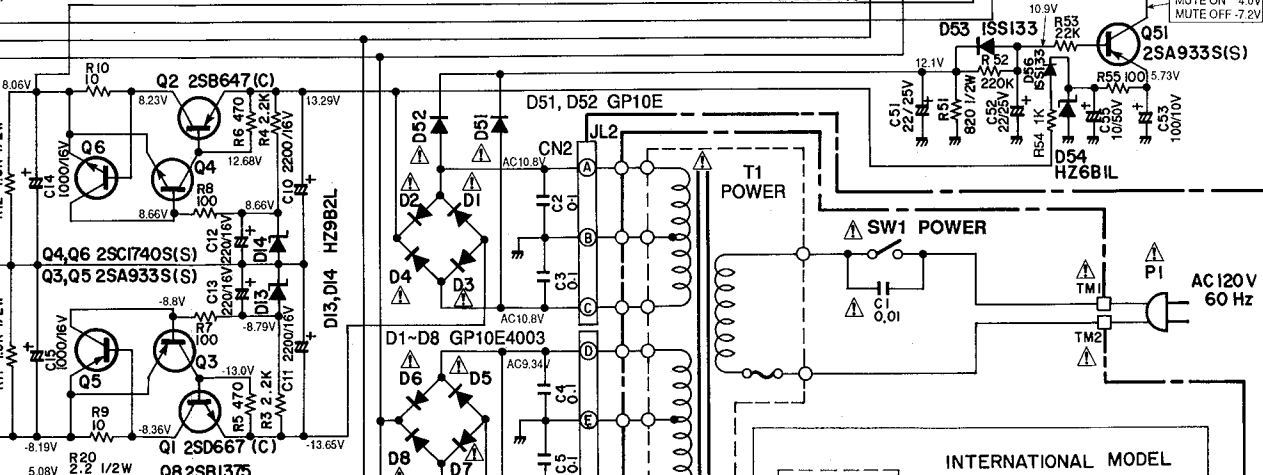
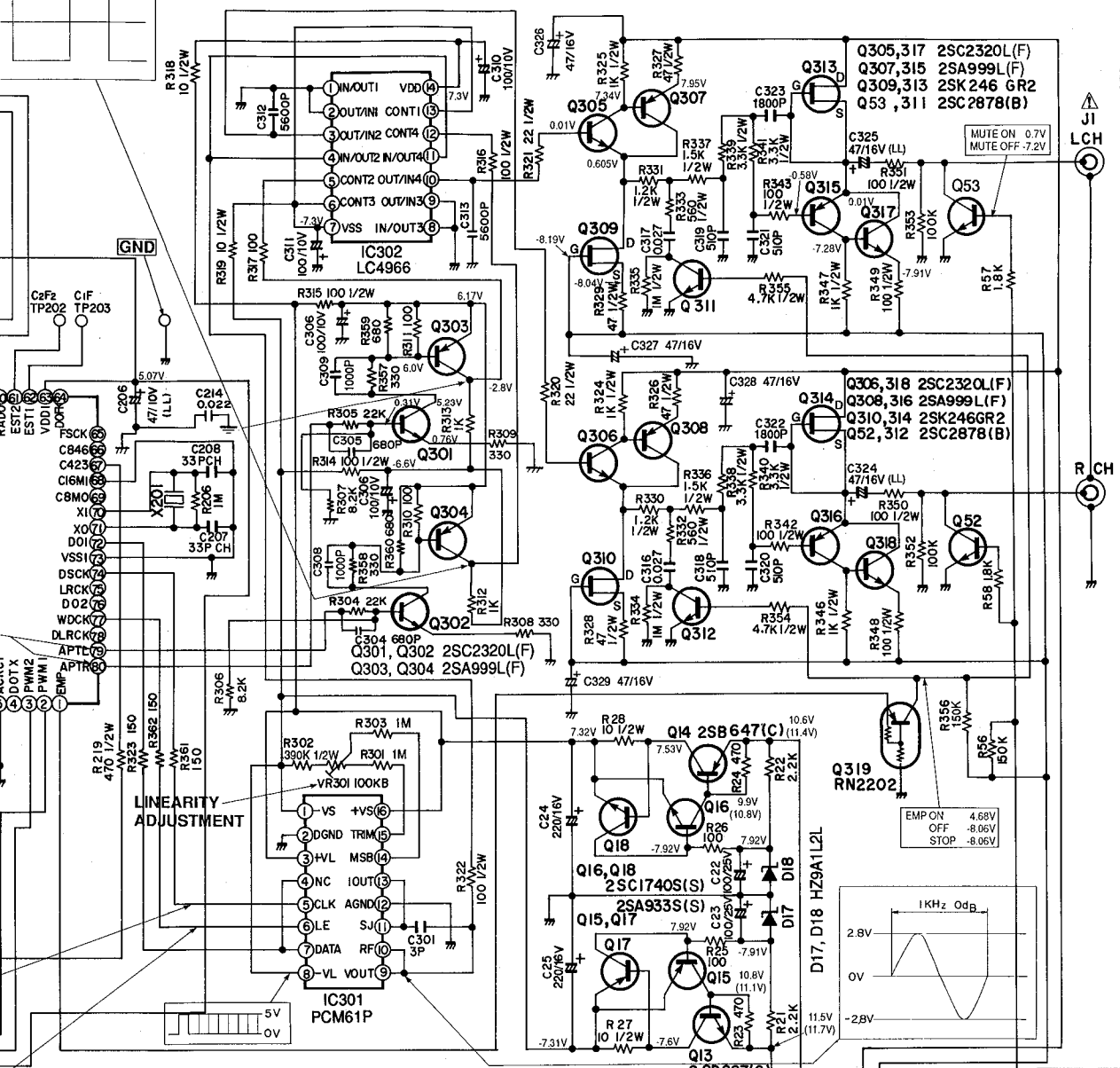
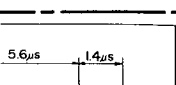
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|------|--------|---------------|--------------------------------------|
| 711 | LCN101 | 4163-03211008 | CONNECTOR W/W |
| 712 | LCN102 | 4163-03210008 | CONNECTOR W/W |
| 713 | LCN103 | 4163-03212005 | CONNECTOR W/W |
| 714 | LCN104 | 4163-03207004 | CONNECTOR W/W |
| 724 | LUG1/2 | 4162-00201800 | LUG W/WIRE BK |
| 681 | △ P1 | 4161-03601202 | CORD W/PLUG BK |
| 681B | △ P1 | 4161-03701220 | CORD W/PLUG IB |
| 681C | △ P1 | 4161-04100 | CORD W/PLUG BB |
| 682 | | 4161-71184 | CORD W/PLUG, RCA TYPE (ACCESSORY) |

SCHEMATIC DIAGRAM



NOTE:

1. ALL RESISTANCE VALUES ARE IN Ω .
2. 1K=1000, 1M=1000K.
3. THE WATTAGE OF RESISTORS IS 1/8W UNLESS OTHERWISE NOTED.
4. ALL CAPACITANCE VALUES ARE IN μF UNLESS OTHERWISE NOTED. P=PF.
5. V=DC VOLTAGE AT PLAY MODE.
6. SAFETY REQUIREMENTS COMPONENTS IN ACCORDANCE WITH PRESENT SAFETY REGULATIONS. THESE COMPONENTS MUST ONLY BE REPLACED BY ORIGINAL PARTS.



INTERNATIONAL MODEL

4

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