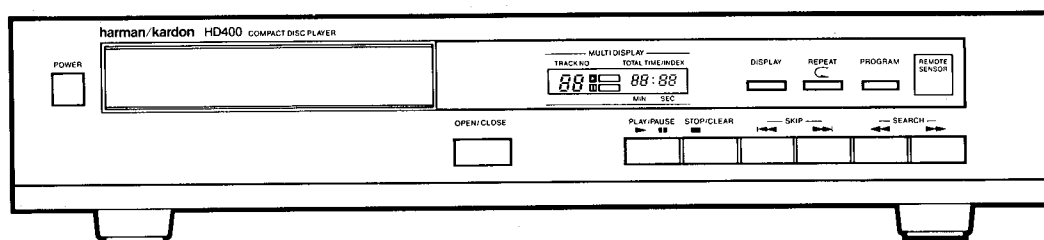


The Harman Kardon Model HD400 COMPACT DISC PLAYER

Manual 127A

Technical Manual



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

- UA : North America area model
- BK : North America area model Black version
- G : General model
- GB : General model Black version

harman/kardon

240 Crossways Park West, Woodbury, N. Y. 11797
1112-3152127A1 P-078801 1500 Printed in Japan

CLASS 1 LASER PRODUCT

Product complies with DHHS rules CFR subchapter J part 1040.10 at date of manufacture.

DANGER—invisible laser radiation when 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**

SPECIFICATIONS

System	: Compact Disc Digital Audio
Signal Detection	: 3-Beam Semiconductor Laser
Error Correction	: CIRC System
Sampling Frequency	: 88.2kHz
Quantization	: 16-bit
Channels	: 2 Channel Stereo
Frequency Response	: 4Hz—20kHz ± 0.5 dB
Total Harmonic Distortion	: 0.03% (1kHz)
Dynamic Range	: 96dB
Signal-to-Noise Ratio	: 103dB

Channel Separation	: 83dB (1kHz)
Wow & Flutter	: Immeasurable
Line Output Level/Load Impedance	: 2.0V/10k Ohms
Power Supply	
U.S.A. and Canada models	: AC 120V, 60Hz
General model	: AC 220/240V, 50/60Hz
Power Consumption	: 15 Watts
Dimensions (W x H x D)	: 17-3/8" x 3-3/4" x 10-1/8" (443 x 95 x 257 mm)
Weight	: 8.5lbs. (3.9kg)

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

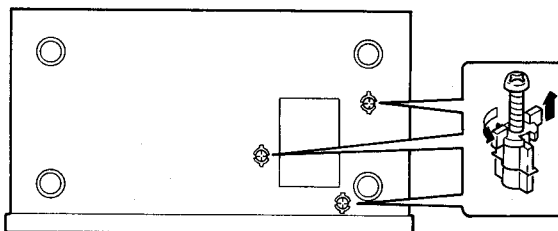
Adjustment of this unit requires following measuring instruments and jigs.

- Oscilloscope (3 or more modes, 100MHz, X-Y input possible) 1740A
- Distortion Meter 339A
- Test Disc:
EIAJ CD-1

IMPORTANT

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

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



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

SAFETY PRECAUTIONS

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

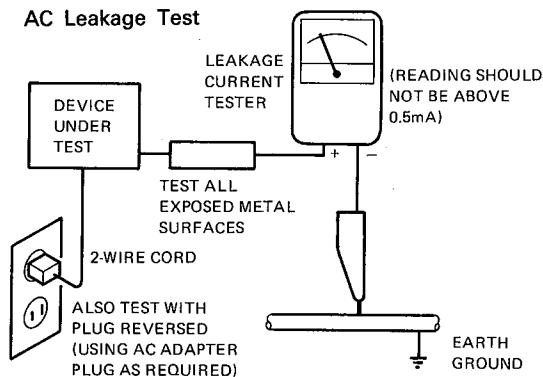
- a. Be sure that no built-in protective devices are defective and/or have been defeated during servicing.
 - (1) Protective shields are provided to protect both the technician and the customer. Correctly replace all missing protective shields, including any removed for servicing convenience.
 - (2) When reinstalling the chassis and/or other assembly in the cabinet, be sure to put back in place all protective devices, including, but not limited to, nonmetallic control knobs, insulating fishpapers, adjustment and compartment covers/shields, and isolation resistor/capacitor networks.

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

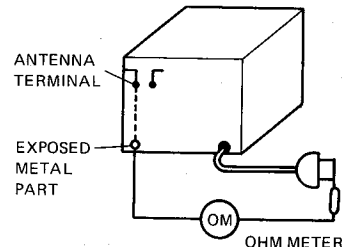


d. Insulation Resistance Test

- (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.

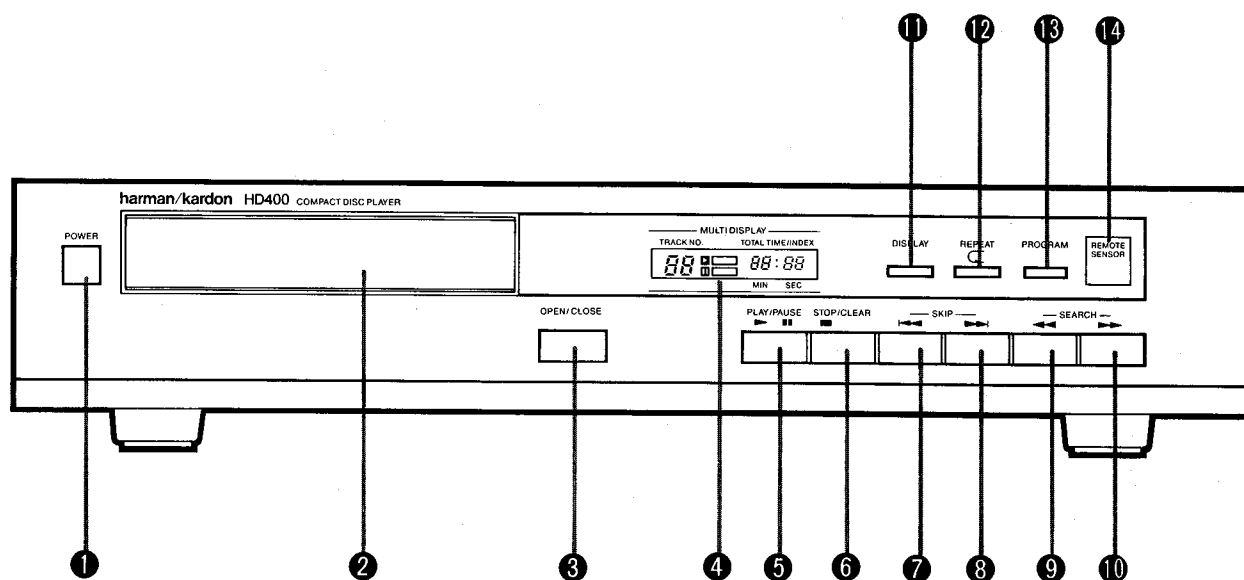
Note 1: Accessible Conductive Parts including Metal panels, Output jacks, etc.

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 field-effect transistors and semiconductor "chip" components. The following techniques should be used to help reduce the incidence of component damage caused by static electricity.

1. Immediately before handling any semiconductor component or semiconductor-equipped assembly, drain off any electrostatic charge on your body by touching a known earth ground. Alternatively, obtain and wear a commercially available discharging wrist strap device, which should be removed for potential shock reasons prior to applying power to the unit under test.
2. After removing an electrical assembly equipped with ES devices, place the assembly on a conductive surface such as aluminum foil, to prevent electrostatic charge buildup or exposure of the assembly.
3. Use only a grounded-tip soldering iron to solder or unsolder ES devices.
4. Use only an anti-static solder removal device. Some solder removal devices not classified as "anti-static" can generate electrical charges sufficient to damage ES devices.
5. Do not use freon-propelled chemicals. These can generate electrical charge sufficient to damage ES devices.
6. Do not remove a replacement ES device from its protective package until immediately before you are ready to install it. (Most replacement ES devices are packaged with leads electrically shorted together by conductive foam, aluminum foil or comparable conductive material).
7. Immediately before removing the protective material from the leads of a replacement ES device, touch the protective material to the chassis or circuit assembly into which the device will be installed.
CAUTION: Be sure no power is applied to the chassis or circuit, and observe all other safety precautions.
8. Minimize bodily motions when handling unpackaged replacement ES devices. (Otherwise harmless motion such as the brushing together of your clothes fabric or the lifting of your foot from a carpeted floor can generate static electricity sufficient to damage an ES device).

CONTROLS AND FUNCTIONS

**① POWER SWITCH**

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

② DISC TRAY

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

③ OPEN/CLOSE BUTTON

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

④ 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 ⏮ ⏪ 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 skips it to the beginning of the program before that, and so on.

⑧ ⏩ ⏭ 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. 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 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 DISPLAY BUTTON

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.

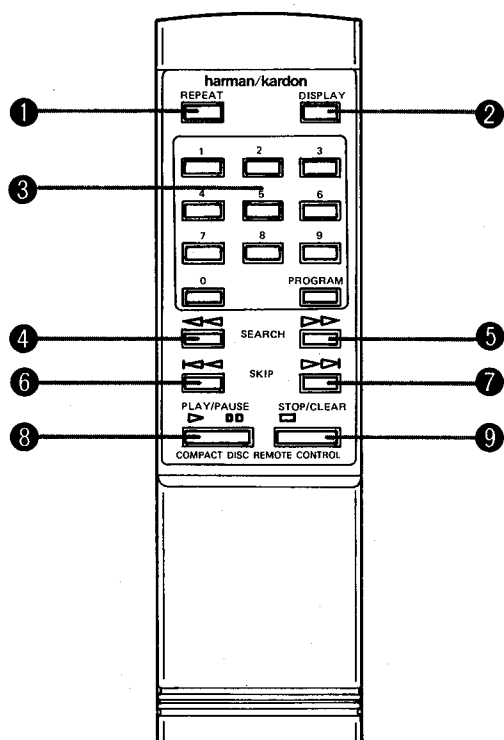
⑬ PROGRAM BUTTON

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

⑭ REMOTE CONTROL SENSOR

Receives signals from the supplied remote control unit.

REMOTE CONTROL

**1 REPEAT BUTTON**

Refer to the main unit's Repeat Button section.

2 DISPLAY BUTTON

Refer to the main unit's Display Button section.

3 10-KEY INPUT BUTTONS

Press these buttons to facilitate programming and track access.

4 << BUTTON (REVERSE)

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

5 >> BUTTON (FAST-FORWARD)

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

6 |<< BUTTON (PROGRAM SELECTION)

Refer to the main unit's |<< Button section.

7 >>| BUTTON (PROGRAM SELECTION)

Refer to the main unit's >>| Button section.

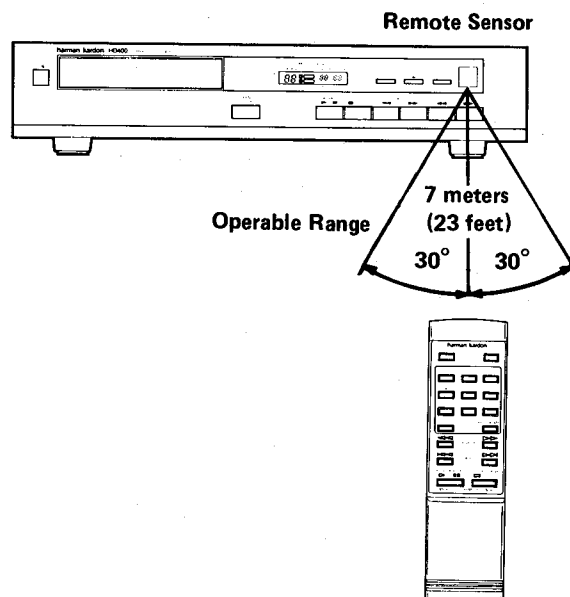
8 PLAY/PAUSE BUTTON

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

9 STOP/CLEAR BUTTON

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

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



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

DISASSEMBLY PROCEDURES (REFER TO PAGES 29 through 32 and 34)**1 CABINET TOP (122) REMOVAL**

Remove 7 screws (A) and then remove the Cabinet Top (122).

2 FRONT PANEL ASS'Y (AC) REMOVAL

1. Remove the Cabinet Top (122), referring to the previous step 1.
2. Pull off Power button (139).
3. Remove 7 screws (B) and then remove the Front Panel Ass'y (AC) with the Front P.C. Board (PCB-2).
4. Remove 4 screws (C) and then remove the Front P.C. Board (PCB-2) from the Front Panel Ass'y (AC).

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

1. Remove the Front Panel Ass'y (AC), referring to the previous step 2.
2. Unsolder the jumper leads (JL101, JL102, JL103, JL104 and JL105) from Front P.C. Board (PCB-2) and then remove the Front P.C. Board (PCB-2).
3. Open the lid of connectors (CN101, CN102 and CN105) on the Main P.C. Board (PCB-1) and then disconnect the lead wires.

4. Remove 2 screws (D) and then remove the Pickup Drive P.C. Board (PCB-4).
5. Open the lid of connectors (CN103 and CN104) on the Main P.C. Board (PCB-1) and then disconnect the lead wires.
6. Remove 4 screws (E) and then remove the Main P.C. Board (PCB-1).
If necessary, unsolder the lead wires connected to the PCB-1.

4 CD PLAYER MECHANICAL ASSEMBLY REMOVAL

1. Remove the Front Panel Ass'y (AC), referring to the previous step 2.
2. Open the lid of connectors (CN103 and CN104) on the Main P.C. Board (PCB-1) and connector (CN502) on the Pickup Drive P.C. Board (PCB-4) and then disconnect the lead wires.
3. Remove 2 screws (D) and then remove the Pickup Drive P.C. Board (PCB-4).
4. Remove 3 screws (F) and then remove the CD Player Mechanical Assembly (103).

DISASSEMBLING THE CD PLAYER MECHANICAL ASSEMBLY**5 DISC TRAY REMOVAL**

1. Remove the Cabinet Top (122), 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 (6) by pressing the Open/Close button.
4. With the Disc Tray (6) opened as it is, pull out the power plug.
5. Push the Disc Tray (6) by hand to slide it in once and then slide it out again.
6. Pull out the Disc Tray while disengaging the Tray Lock Pawl (Shown in Adjustment Points location on next page) in the direction of arrow with screwdriver or the like.

6 OPTICAL PICK-UP REMOVAL

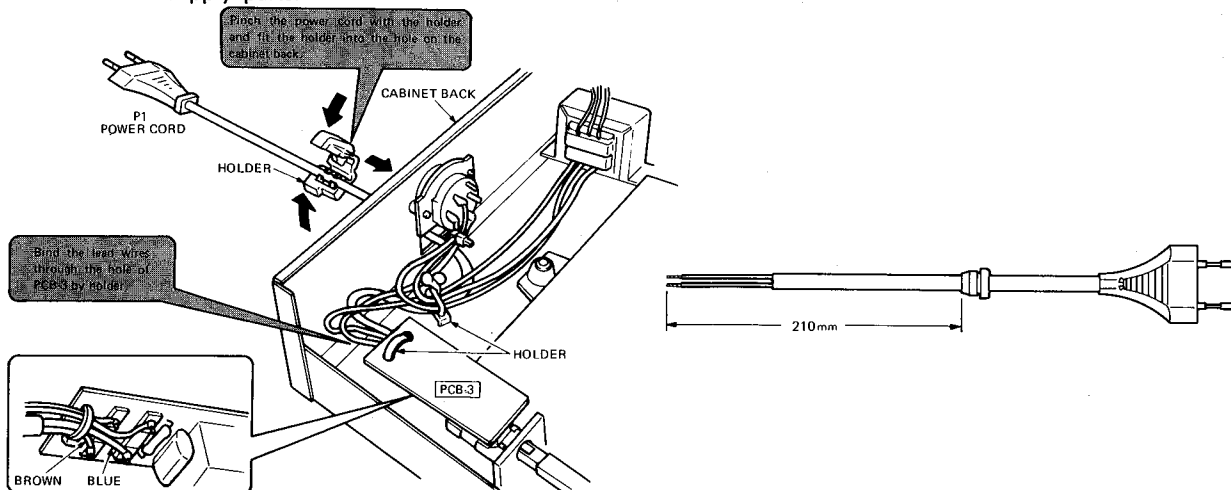
1. Remove the CD Player Mechanical Assembly (CA), referring to the previous step 4.
2. Remove 4 screws (G), then remove the Optical Pick-Up Base Assembly (2).
3. Remove 1 screw (H) and Pick-Up Base Shaft Holder (5), then remove the Pick-Up (32).

7 SPINDLE MOTOR ASSEMBLY REMOVAL

1. Remove the CD Player Mechanical Assembly (103), referring to the previous step 4.
2. Remove the Chuck Arm Spring (22).
3. Undo 2 catches fixing the Chuck Arm (10) to the right and left and remove the Chuck Arm (10).
4. Remove 2 screws (I) fixing the Spindle Motor Assembly (48) and then remove the Spindle Motor Assembly (48). Align the holes in the Spindle Table to the screw (I) positions for the screw removal.

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

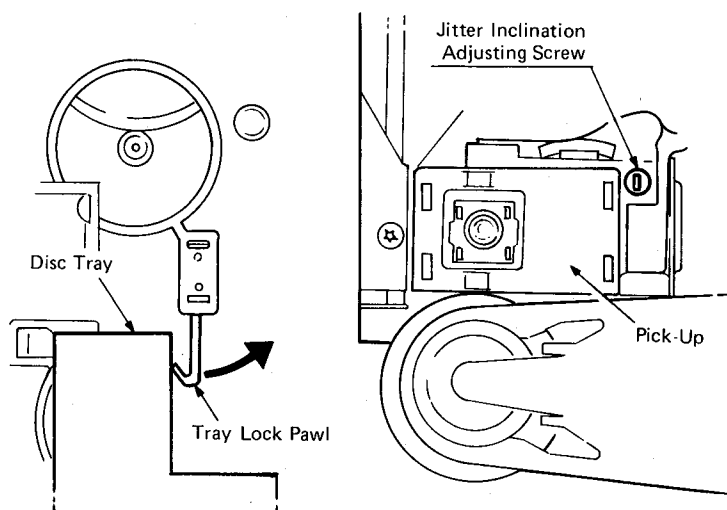
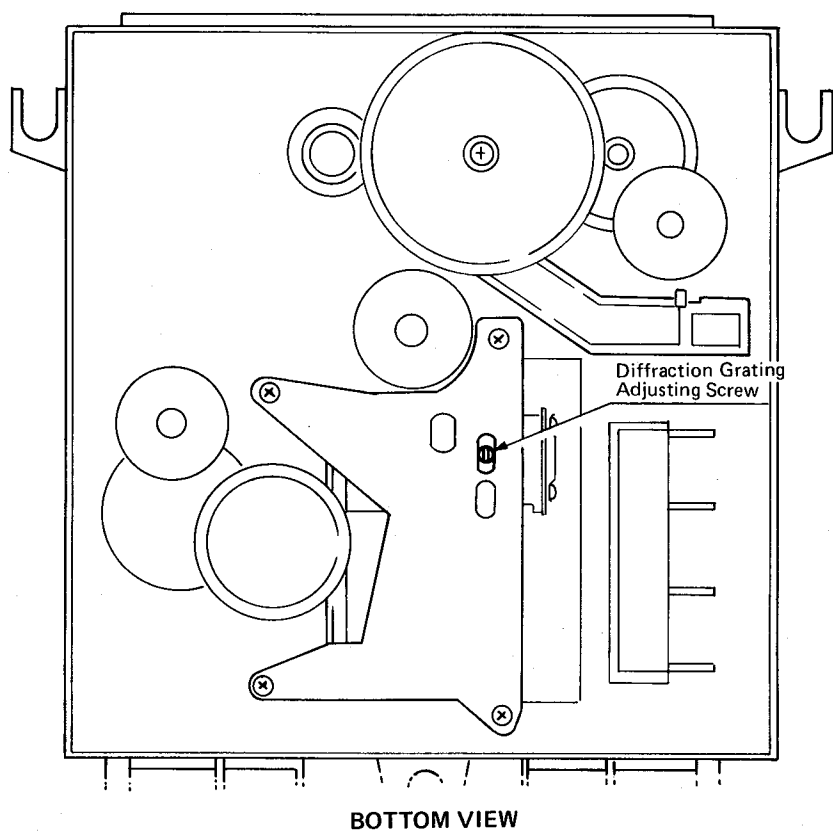
1. Meters and Jigs

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

- Test Disc
EIAJ CD-1

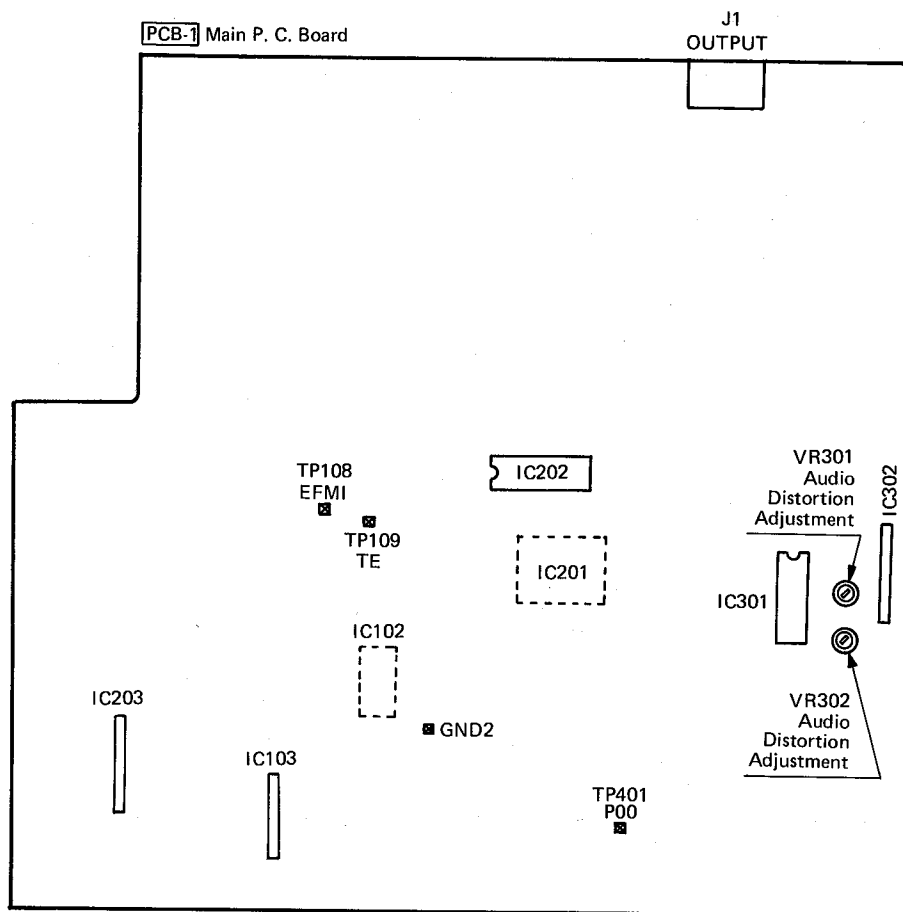
2. Adjustment Points

2-1 Adjusting Screw Layout for CD Player Mechanical Assembly

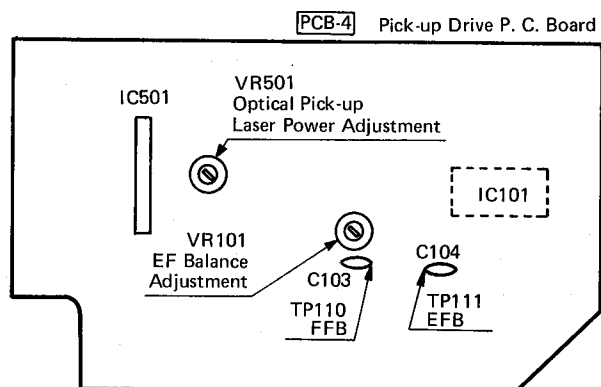


TOP VIEW AROUND PICK-UP

2-2 VR and TP Layout for Main P.C. Board



2-3 VR and TP Layout for Pick-up Drive P.C. Board



3. Test Mode

- Short-circuit TP401 and GND located on the Main P.C. Board.

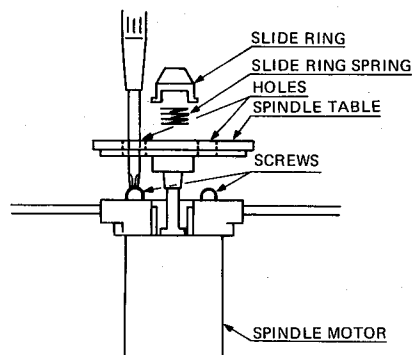
Push the power switch button. (Test Mode)

Press buttons in sequence below	Test mode number	Display	Operation
POWER	0	0 RE:57	LD OFF All servo OFF
PLAY	1	1 RE:57	LD ON
PLAY	2	2 RE:57	FS ON (Focus search)
PLAY (Disc must be in tray)	3	3 RE:57	FS ON (focus ON) Disc motor rotate Mute OFF
FORWARD SKIP	4	4 RE:57	TS (Tracking servo) ON SS (Slide servo) ON
FORWARD SKIP	5	12 3:21	Displays the track number and playback time.
REVERSE SKIP	6	3 RE:57	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. Replace the Spindle Motor Assembly

- (1) Remove the CD Player Mechanical Assembly.
- (2) Remove the Spindle Motor Assembly. (Refer to page 7, "Disassembling the CD Player Mechanical Assembly [7]").) To remove this, align the holes in the Spindle Table to the screw positions for the screw removal.
- (3) Attach the new Spindle Motor Assembly to CD Player Mechanical Assembly.

NOTE: Don't adjust the height of Spindle Table. Because its height has been already adjusted.



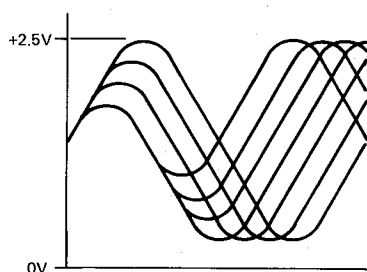
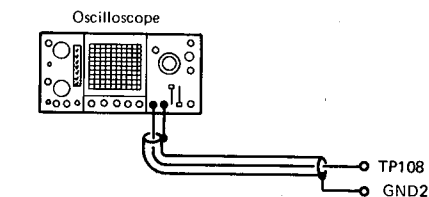
5. Adjustment of P.C. Boards

5-1 Initial Setting of Adjustment Potentiometers

Before adjusting, preset adjustment potentiometers VR101, 301, 302 and 501 for mechanical center.

5-2 Optical Pick-up Laser Power Adjustment

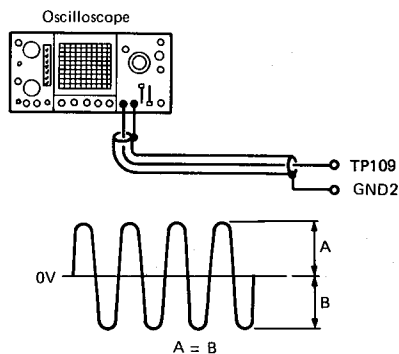
- (1) Connect the oscilloscope to TP108 and GND2.
- (2) Insert EIAJ CD-1 test disc and place the unit in the Test Mode 1.
- (3) Adjust VR501 so that the voltage becomes DC +2.5V.



5-3 EF Balance Adjustment

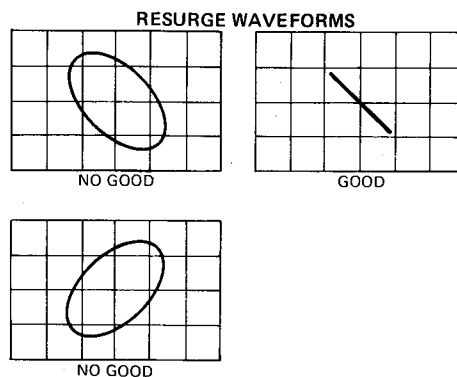
- (1) Connect the oscilloscope to TP109 and GND2.
- (2) Insert the EIAJ CD-1 test disc and place the unit in the Test Mode 3.
- (3) Adjust VR101 so that the amplitude above and below the zero DC line becomes equal. (Amplitude A = Amplitude B)

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

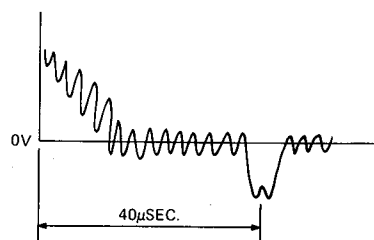


5-4 Diffraction Grating Adjustment

- (1) Connect the oscilloscope to TP110, GND (X input) and TP111, GND (Y input).
- (2) Insert the EIAJ CD-1 test disc and place the unit in the Test Mode 3.
- (3) Observe the resurge waveforms on the oscilloscope, and adjust the diffraction grating screw so that the phase difference of outputs X and Y is 180°.



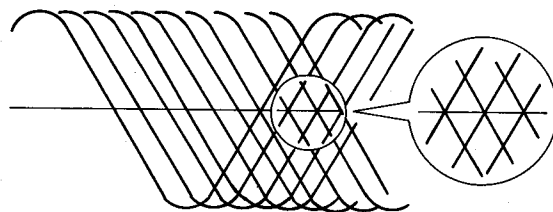
- (4) Connect the oscilloscope to TP109 and GND.
- (5) Place the unit in the Test Mode 4.
- (6) Confirm the waveform on the oscilloscope.



- (7) Repeat steps 1 through 6 for optimum sensitivity.

5-5 Jitter Inclination Adjustment

- (1) Remove the Disc Tray. (Refer to "Disassembling The CD Player Mechanical Assembly" on page 7)
- (2) Connect the oscilloscope to TP108 and GND2.
- (3) Insert the EIAJ CD-1 test disc and place the unit in the Test Mode 4.
- (4) Moving the pick-up assembly to adjustment the jitter inclination adjustment Screw.
- (5) Adjust the jitter inclination screw until the signal waveform (eye pattern) is distinct and clear.



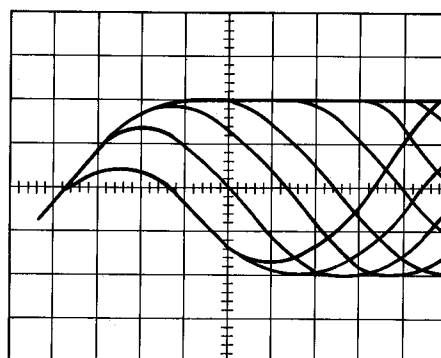
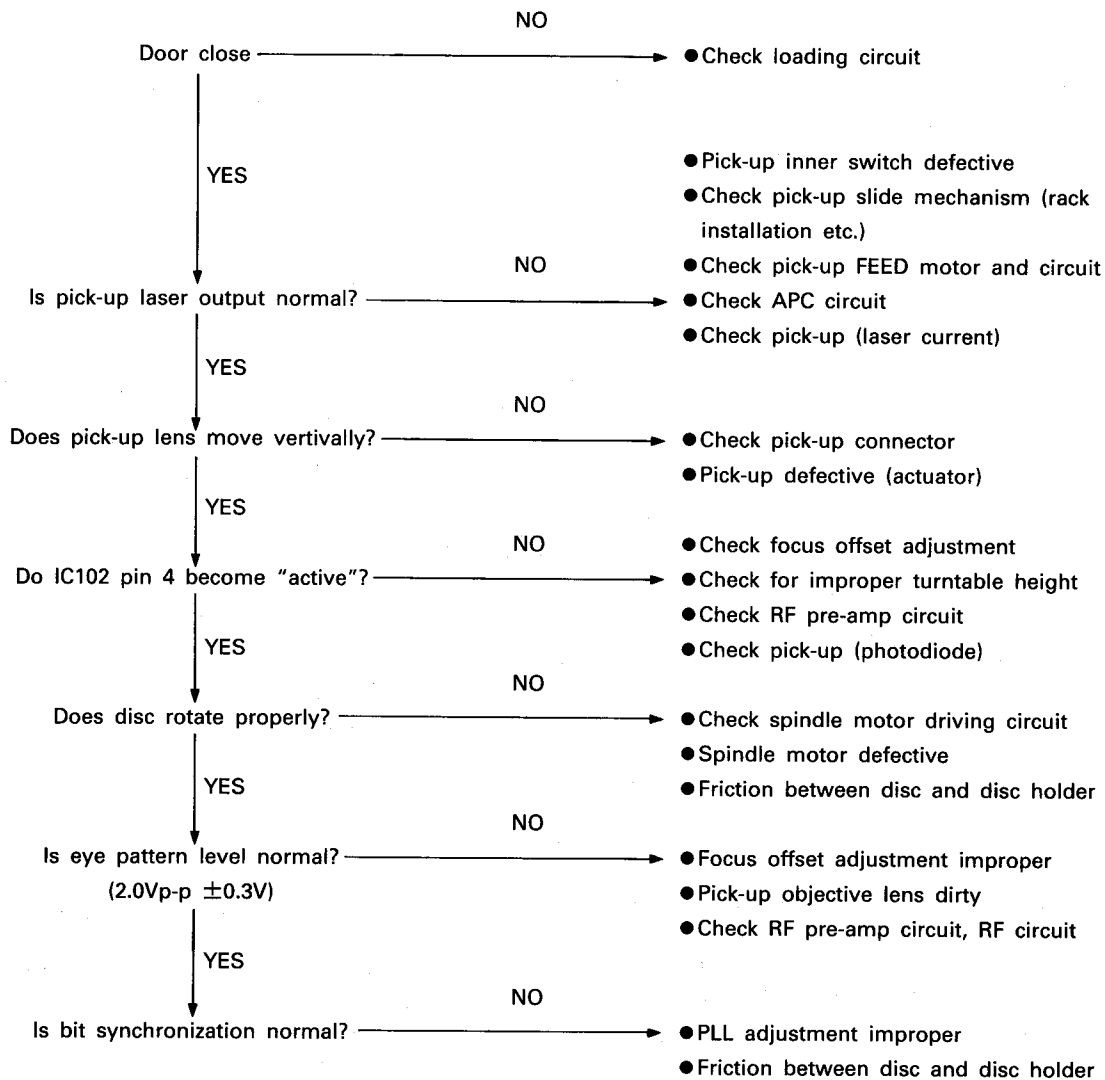
NOTE: Repeat Diffraction Grating Adjustment and Jitter Inclination Adjustment for optimum sensitivity.

5-6 Audio Distortion Adjustment

- (1) Connect the distortion meter to Output jacks (J1).
- (2) Insert the EIAJ CD-1 test disc and place the unit in the play mode on track number 1.
- (3) Adjust VR301 and VR302 each so that the distortion is minimized.

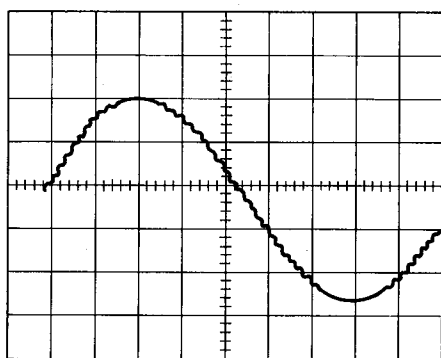
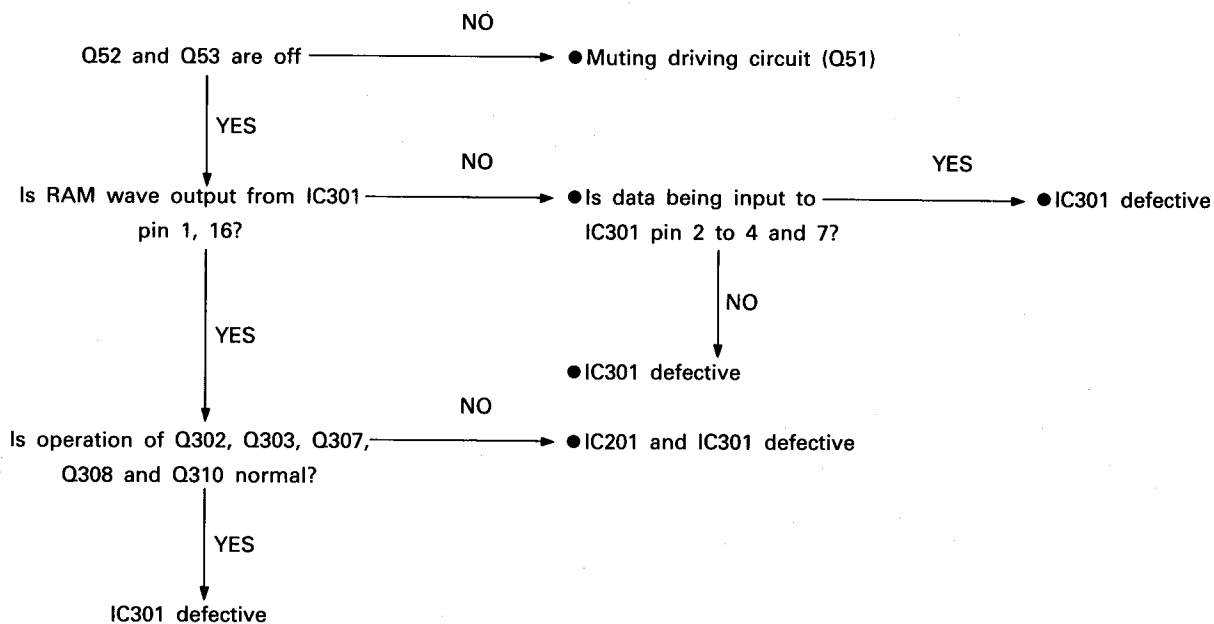
TROUBLE SHOOTING

1. Does not initialize

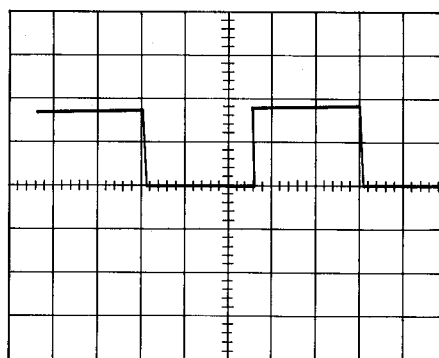


Eye Pattern (TP108)

2. No sound is produced



RAM Waveform (Pin 1 and 16 of IC301)
(Test Disc: EIAJ CD-1, 1st selection)



IC301 Pin 4 Waveform
(Test Disc: EIAJ CD-1, 1st selection)

3. IC Terminal Functions

IC number	Terminal number	Port name	Terminal code	I/O	Outline of functions
IC102	1	TE IN	Pre. amp. input	I	Tracking error signal input terminal
	2	TC IN	Pre. amp. input	I	Track cross signal input terminal
	3	SHOCK IN	Pre. amp. input	I	Shock detection circuit input terminal
	4	HF OK	Pre. amp. input	I	HF OK signal input
	5	MR	Pre. amp. input	I	Disc mirror surface detection signal input signal terminal
	6	Jump Flag	Mi-com I/O	O	Outputs "1" in jump mode, e.g. TS OFF, JFJR, BRAKE.
	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	DATAOUT	Mi-com I/O	O	Outputs internal state corresponding to microcomputer command.
	10	$\overline{\text{JP1}}$	Mi-com I/O	I	1 track jump control signal. Normally "1".
	11	MSD	Mi-com I/O	I	Microcomputer serial data. Transfers serial data from microcomputer to servo IC. LSB forced. 8-bit data.
	12	$\overline{\text{MLA}}$	Mi-com I/O	I	Latches serial data from microcomputer to servo IC. Transfers data on trailing edge.
	13	MCK	Mi-com I/O	I	Clock for transferring serial data from microcomputer to servo IC. Receives data on leading edge.
	14	$\overline{\text{ACLR}}$	Mi-com I/O	I	All clear. Clears all internal register flip-flops. Resets when "0" signal is given.
	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	V _{EE}	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

IC number	Terminal number	Port name	Terminal code	I/O	Outline of functions
IC102	21	SS ⊕	Slide servo	I	Operation amplifier SS non-reverse input
	22	TS OUT	Track servo	O	Operation amplifier TA output
	23	TS ⊖	Track servo	I	Operation amplifier TA reverse input
	24	TG2	Track servo	—	Track gain select switch TG2 output. Set to open or common level.
	25	TS ⊕	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 ⊖	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 ⊖	Focus servo	I	Operation amplifier FA reverse input
	32	FS ⊕	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
IC201	1	DWDCK		O	D-A converter mode 3 word clock
	2	NC		—	
	3	EMP		O	Emphasis code output. "1" indicates emphasis.
	4	PWM ₁		O	Disc motor drive PWM output 1. —
	5	PWM ₂		O	Disc motor drive PWM output 2. +
	6	TEST		I	Test mode select input. Normally "0" indicates play.

IC number	Terminal number	Port name	Terminal code	I/O	Outline of functions
IC201	7	DASEL ₁		I	D-A interface control input 1
	8	DFPAS		I	Digital filter control input. "1" indicates digital filter pass.
	9	DASEL ₂		I	D-A interface control input 2
	10	MSD		I	Microcomputer interface serial data input
	11	MCK		I	Microcomputer interface shift clock input
	12	$\overline{\text{MLA}}$		I	Microcomputer interface data latch clock input
	13	$\overline{\text{ACLR}}$		I	Microcomputer interface register clear input. "0" indicates that register has been cleared and MUTE, S/S, BCON set to "0".
	14	$\overline{\text{HFD}}$		I	Play signal absence signal input
	15	HF		I	Play signal input
	16	IREF		I	Detection/PLL circuit reference current input
	17	TLC		O	Slice level control output
	18	LPF		I/O	PLL loop filter connection terminal
	19	SYCLK		O	Frame synchronous state output. "1" indicates synchronization.
	20	V _{DD2}		I	5V power supply used for detection/PLL circuit analog area only
	21	NC		—	
	22	DRD		O	Low disc circuit state output
	23	EFFK		O	EFM frame clock output. Duty = approx. 50%.
	24	SCOR		O	Sub-code synchronous signal output. S0 + S1.
	25	CRCF		O	Sub-code Q CRC check result output. "1" indicates CRCOK.
	26	SCCK		I	Shift clock input for sub-code serial output
	27	SCOE ₂		I	Sub-code parallel output channel P to S enable input. "0" indicates high impedance.
	28	SCOE ₁		I	Sub-code parallel output channel T to W enable input. "0" indicates high impedance.
	29	V _{SS2}		I	GND. Same potential as VSS1.
	30	SBCW		O	Sub-code channel W output
	31	SBCV		O	Sub-code channel V output
	32	SBCU		O	Sub-code channel U output
	33	SBCT		O	Sub-code channel T output

IC number	Terminal number	Port name	Terminal code	I/O	Outline of functions
IC201	34	SBCS		O	Sub-code channel S output
	35	SBCR		O	Sub-code channel R output
	36	SBCQ		O	Sub-code channel Q output
	37	SBCP		O	Sub-code channel P output
	38	$\overline{\text{RAS}}$		O	Row address strobe signal output
	39	NC		—	
	40	RDB ₂		I/O	External memory data I/O 2
	41	NC		—	
	42	RDB ₁		I/O	External memory data I/O 1
	43	RDB ₄		I/O	External memory data I/O 4
	44	$\overline{\text{CAS}}$		O	Column address strobe signal output
	45	RDB ₃		I/O	External memory data I/O 3
	46	$\overline{\text{WE}}$		O	Write enable signal output
	47	NC		—	
	48	RAD ₁		O	External memory address output 1
	49	RAD ₂		O	External memory address output 2
	50	RAD ₃		O	External memory address output 3
	51	RAD ₇		O	External memory address output 7
	52	RAD ₄		O	External memory address output 4
	53	RAD ₅		O	External memory address output 5
	54	RAD ₆		O	External memory address output 6
	55	RAD ₀		O	External memory address output 0
	56	V _{DD1}		I	5V power supply
	57	EST ₂		O	Error status 2. "1" indicates detection of data which cannot be corrected by C2 decoder.
	58	EST ₁		O	Error status 1. "1" indicates detection of C1 decoder error.
	59	C846		O	Clock output. 8.4672MHz.
	60	C423		O	Clock output. 4.2336MHz. Duty = 50%.
	61	C16MI		I	1/2 divider input. With built-in feedback resistor for generating 1/2 VDD bias voltage.

IC number	Terminal number	Port name	Terminal code	I/O	Outline of functions
IC201	62	C8MO		O	1/2 divider output
	63	X _i		I	Quartz oscillator input. External clock may be input. With built-in feedback resistor.
	64	X _o		O	Quartz oscillator output
	65	V _{SS1}		I	GND. Same potential as VSS2.
	66	DOFK		O	OSC frame clock output. 7.35kHz. Duty = 50%.
	67	DO		O	D-A converter serial data output
	68	NC		—	
	69	WDCK		O	D-A converter word clock or APTL
	70	LRCK		O	D-A converter left/right clock or APTR
	71	NC		—	
	72	DSCK		O	D-A converter data shift clock
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 designation 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	V _{CC}		—	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)
	15	DQ3		I/O	Data I/O
	16	$\overline{\text{CAS}}$		I	Column address strobe input
	17	DQ4		I/O	Data I/O
	18	V _{SS}		—	Power supply (0V)

IC number	Terminal number	Port name	Terminal code	I/O	Outline of functions
IC301	1	CH1	V _{OUT} CH1	O	Sample hold analog switch output for CH1
	2	SMP1	SMP1	I	Interval "1" becomes sampling time for CH1. Interval "1" becomes sampling time for CH2. The internal signal for latching serial data is produced by using SMP1 and SMP2 fall. The longer the SMP1 and SMP2 time is, the more improved the level frequency response is.
	3	SMP2	SMP2	I	
	4	SD	SD	I	Serial input of digital signal to be converted
	5	FORM SELECT	FORM SELECT	I	Capable of processing binary input format at "1" and 2's complement input format at "0".
	6	V _{SS}	V _{SS}	—	Low electric potential side power source (GND)
	7	CLOCK	CLOCK	I	Clock to operate shift register and timing generator (φ 4)
	8	V _{DD}	V _{DD}	—	High electric potential side standard power source
	9	V _{SS}	V _{SS}	—	Low electric potential side standard power source (GND)
	10	RBH	RBH	O	As the same resistor is used between the RBH pin and internal V _{DD} power source and between the RBL pin and internal V _{SS} (GND) power source, connecting both pins will provide highly accurate 1/2 V _{DD} voltage. The voltage is applied to the MP pin through the buffer operational amplifier.
	11	RBL	RBL	O	
	12	MP	MP	I	Exponential analog shift is carried out with the electric potential applied to the MP as a standard. Normally it is biased to the 1/2 V _{DD} .
	13	To BUFF	To BUFF	O	DAC analog output, input to the buffer operational amplifier
	14	COM	COM	I	Common input to analog switches for CH1 and CH2
	15	ICL	ICL	I	The signal "1" - normal operation and "0" - zero signal operation regardless of the signal SD.
	16	CH2	CH2	O	Sample hold analog switch output for CH2
IC401	1	P27	OPEN	I/O	Disc tray opening direction driving output
	2	P26	CLOSE	I/O	Disc tray closing direction driving output
	3	P25	JP1	I/O	
	4	P24	MSD	I/O	Serial data output
	5	P23	MCK	I/O	Shift clock output
	6	P22	MLA	I/O	Data latch clock output
	7	P21	MUTE	I/O	Mute output
	8	P20	ACK	I/O	

IC number	Terminal number	Port name	Terminal code	I/O	Outline of functions
IC401	9	NC	NC	—	
	10	P07	DATA IN	I/O	Serial data input
	11	P06	SYCLK	I/O	Frame synchronization signal output
	12	P05	DRD	I/O	
	13	P04	SCOR	I/O	Sub code synchronization signal output S0 + S1
	14	P03	CRCF	I/O	Sub code Q CRCOK = 1
	15	P02	SUBQ	I/O	Sub code Q Channel output
	16	P01	KD4	I/O	
	17	P00	TEST	I/O	
	18	$\overline{\text{INT2}}$	STB	I	
	19	$\overline{\text{INT1}}$	EFFK	I	EFM frame clock output
	20	NC	NC	—	
	21	CNVss	GND	—	CNVss input
	22	$\overline{\text{RESET}}$	RESET	I	Reset input
	23	XIN	XIN	I	Clock input
	24	XOUTF	XOUTF	O	Clock output F
	25	XOUTS	XOUTS	O	Clock output S
	26	Vss	GND	—	Power supply
	27	XCIN	DATA IN	I	Serial data input
	28	XCOUT	—	O	Clock output for timer
	29	R3	KD3	I	Key input 3
	30	R2	KD2	I	Key input 2
	31	R1	KD1	I	Key input 1
	32	R0	KD0	I	Key input 0
	33	ϕ	—	O	Timing output
	34	VP	VP	—	Pull down voltage input
	35	P17	LD ON	O	Laser diode control output
	36	P16	G7	O	Figure output 7
	37	P15	G6	O	Figure output 6

IC number	Terminal number	Port name	Terminal code	I/O	Outline of functions
IC401	38	P14	G5	O	Figure output 5
	39	P13	G4	O	Figure output 4
	40	P12	G3	O	Figure output 3
	41	P11	G2	O	Figure output 2
	42	P10	G1	O	Figure output 1
	43	P37	i	O	Segment output i
	44	P36	g	O	Segment output g
	45	P35	f	O	Segment output f
	46	P34	e	O	Segment output e
	47	P33	d	O	Segment output d
	48	P32	c	O	Segment output c
	49	P31	b	O	Segment output b
	50	P30	a	O	Segment output a
	51	Vcc	Vcc	—	Power supply
	52	Vcc	Vcc	—	Power supply
IC402	1	I/O PORT D	D3	I/O	9-bit terminal having output function on an independent bit basis. Output is open drain circuit for N channel transistor. Port D0 to D3 terminals have 4-bit input function. Programming output latch to "1" sets the output to floating (high impedance) state so that the terminals may be used as input port.
	17		D0	I/O	
	18		D1	I/O	
	19		D2	I/O	
	2	OUT PORT D	D4	O	
	3		D5	O	
	6		D6	O	
	7		D7	O	
	8		D8	O	
	4	CNV _{ss} (0V)	CNV _{ss}	—	Connect to VSS. Low input (0V) must be applied.
	5	V _{ss} (0V)	V _{ss}	—	GND terminal

CIRCUIT DESCRIPTION

1. APC CIRCUIT

A semiconductor laser is used as the light source for the optical pickup. As the output from the semiconductor laser changes radically with changes in temperature, a circuit must be provided to stabilize this output. For this purpose, a monitor diode which detects the optical output of the laser diode is used in the semiconductor laser.

As the laser diode emits light from its bonded surface, light is emitted both in front and behind. The light emitted from the rear is monitored with the monitor diode installed on its rear surface, and the optical output is thus controlled. The light emitted from the 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 current (I_S) decreases, the electric potential of IC501 pin 1 rises, the base current of the driving transistor increases, and the laser current increases. This causes the reduced optical power to return to its former level.

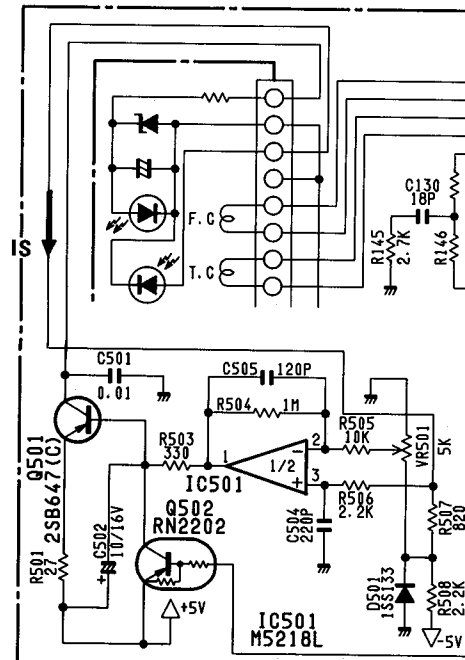
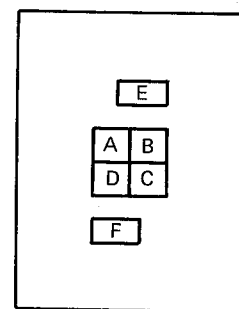


Fig. 1

2. FOCUS SERVO

2-1. Optical pickup

This set employs a three-spot optical pickup comprised of six division photodiodes, A through F. The four photodiodes at the center, i.e., (A + C) and (B + D), provide both focus error detection by means of a main beam spot and main signal pickup. The remaining two diodes, (E and F), provide tracking error detection by means of sub-beam spots.



Three spotted (six-division) photo diodes

Fig. 2-1

2-2. Focus error detecting operation

The reflected laser beam from a disc is polarized 90° with the beam-splitter and sent to the photodiodes via the cylindrical lens. The beam passed through this cylindrical lens gradually varies its shape along its path - as an oval in a longitudinal direction, then as a circle, and finally as an oval in a transverse direction. (See Fig. 2-2)

The beam shape varies with the distance from the disc, and when "just-focus" the photosensor (photo-diodes) is positioned at the center of the circular beam. The photodiode is divided into four sections, all of which provide outputs when in focus. However, when the disc is too close the longitudinal direction oval beam rays on the upper and lower photodiodes, causing only these two diodes to provide outputs, and if, on the other hand, the disc is too far only the left and right diodes provide outputs. Therefore, by amplifying the difference in output derived from these four-division diodes a focus error signal can be obtained. The focus error signal is amplified and fed to the objective lens for focus correction, thereby always maintaining an in-focus state. The focus correction is performed in the focus servo control circuit.

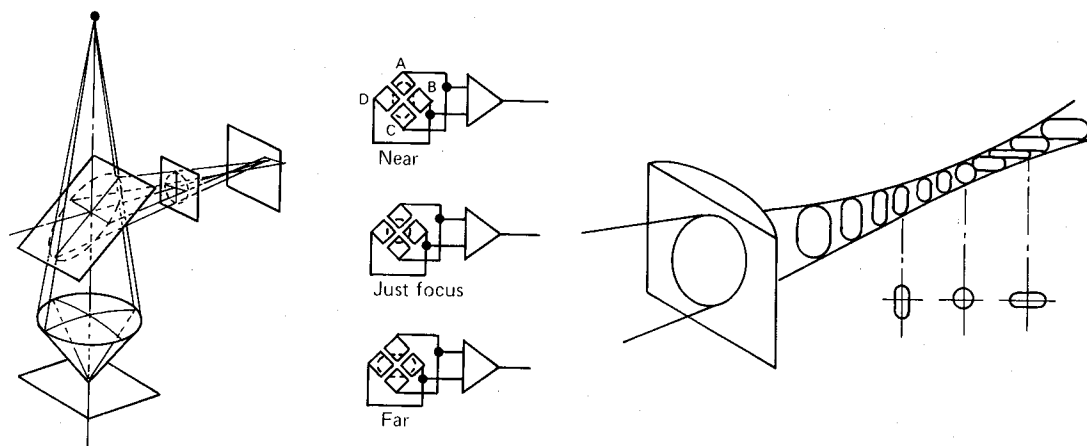


Fig. 2-2

2-3. Focus servo control operation

The optical pickup outputs, $(A + C)$ and $(B + D)$, are input to pin 5 and pin 6 of IC101, where the photodiode current is converted to voltage by RF-V Amplifier. The difference between $(A + C)$ and $(B + D)$ is derived and a focus error signal is output from pin 16 of IC101 (detection amplifier stage) in such a manner that if $(A + C) > (B + D)$ the focus error is positive (focus too close), and if $(A + C) < (B + D)$ the focus error is negative (focus too far).

If "near-focus" then output to pin 16 of IC101 is + voltage. And if "far focus" then output to pin 16 of IC101 is - voltage. This focus error signal input to pin 32 of IC102, after being amplified by the preamplifier (IC102). Output to pin 30. Output signal of + voltage or - voltage (pin 30 of IC102) input to pin 2 of IC103 and output to pin 8 of IC103, drives the objective lens for automatic focus correction (adjustment). (Fig. 2-3)

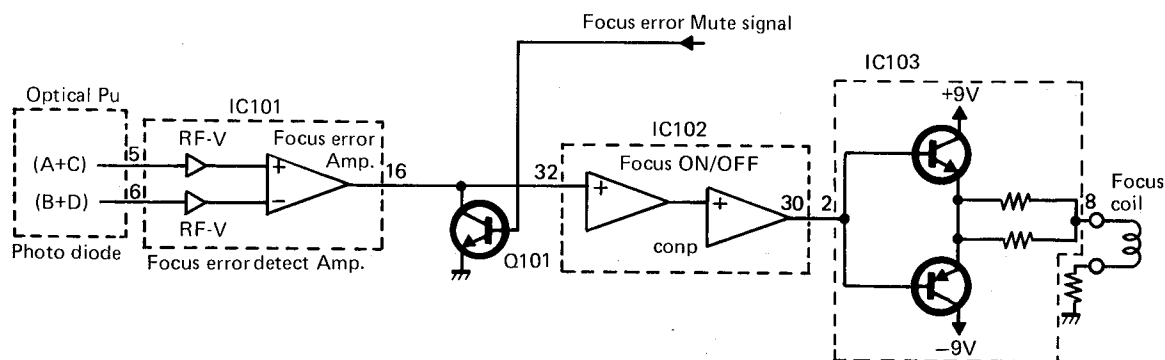


Fig. 2-3

2-4. The Tracking Error Detection System

The laser beam must follow the spiral path of the disc. The detection system employs the 3 beam system.

Fig. 2-4 illustrates the 3 beam system. Fig. 2-4-A depicts the condition under which the tracking is deemed to be correct. Two additional lights detectors (E and F), also a part of the Pick-Up Assembly, are used in the Auto Tracking circuit. When tracking is correct the amount of light reflected from the Disc for both outer beams is equal, therefore, the same amount of light is sensed by both the E and F light detectors and both detectors develop equal amplitude output voltages. The output of the E detector applied to the (-) input of an OP-AMP, and the output of the F detector is directed to the (+) input of the same OP-AMP. Since the (+) and (-) inputs are equal, the output of OP-AMP, when tracking is correct, is 0v.

Fig. 2-4-B illustrates a tracking error in one direction. In this case the E detector receiving reflected light from the mirrored surface of the Disc, receives more reflected light than the F detector, therefore, the (-) OP-AMP input receives a higher voltage than the (+) input. The OP-AMP outputs a negative Tracking Error voltage which is directed to the Tracking Servo circuit in order to make the adjustments necessary to achieve optimum tracking. Fig. 2-4-C illustrates tracking error in the opposite direction. Now the F detector receives more reflected light, the positive input of the OP-AMP is higher than the (-) input, resulting in a positive Tracking Error voltage from the OP-AMP.

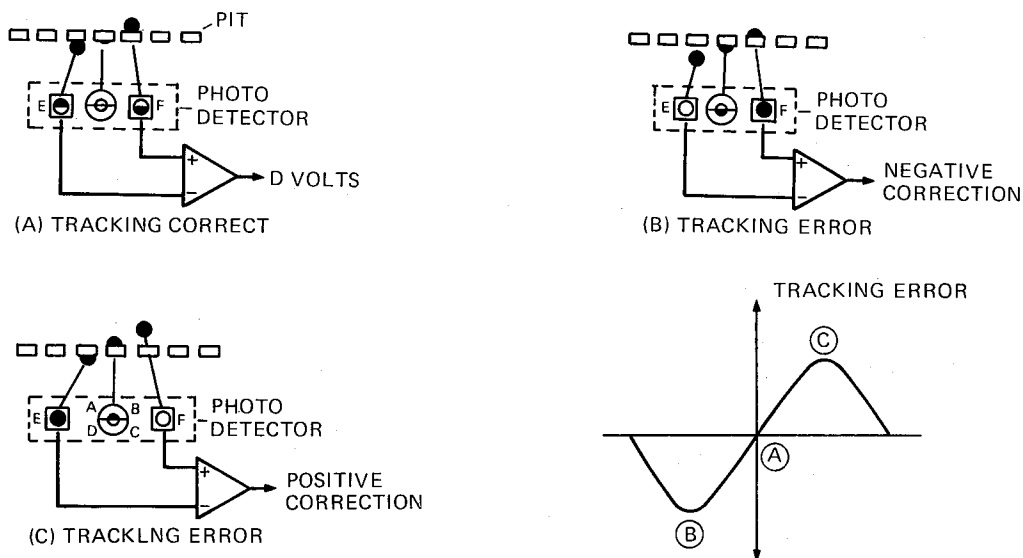
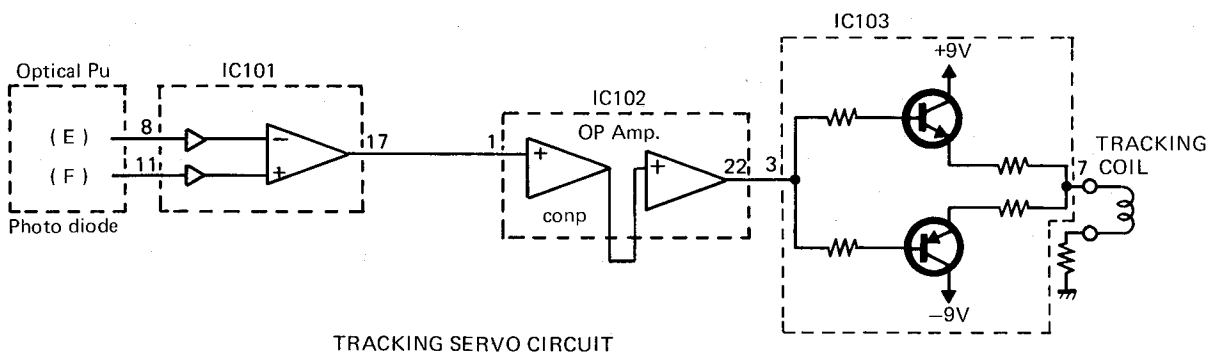


Fig. 2-4



3. REGENERATIVE CIRCUIT

3-1. RF circuit

Photo diode current input to Pin 5 (PD1) and Pin 6 (PD2) of IC101 is converted from current to voltage by RF I-V amplifiers. Next, (A + C) and (B + D) signals are mixed in and output from pin 4 of IC101.

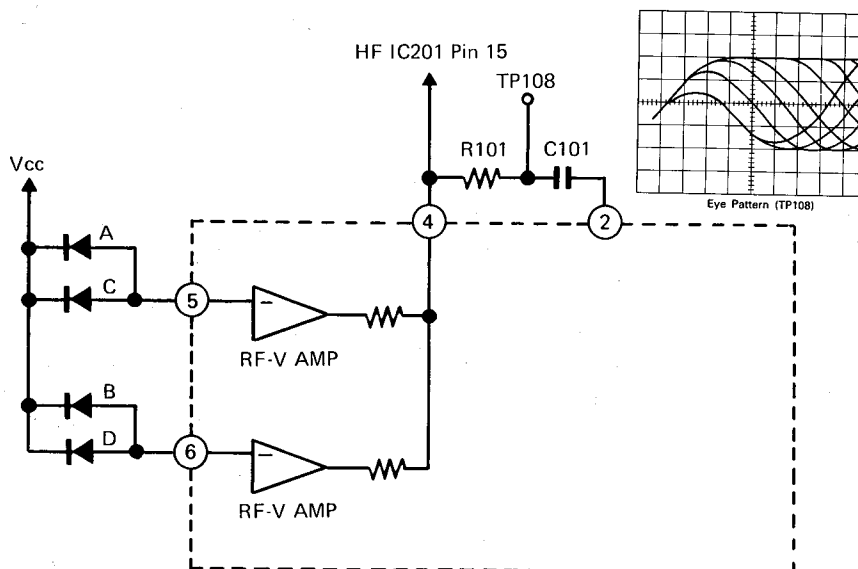


Fig. 3-1

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

EFM demodulation, error correction and serial/parallel conversion are performed by internal circuitry of IC201. The eye-pattern signals from Pin 4 of IC101 are sent to Pin 15 of IC201, then demodulated from 14 bit into 8 bit by EFM readjustment.

If an error occurs at this point, it undergoes error correction (CIRC). The signals are then output as serial signals.

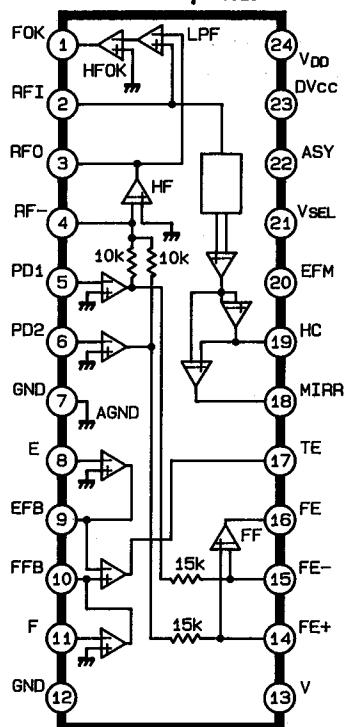
The digital signal of the CD is decoded by IC201 and then enters D/A converter (IC301), and converted from digital to analog by IC301.

Q301, Q302, Q303 and Q304 configure a buffer circuit which prevents the D/A converter from interfering with the next LPF. Q311 and Q312 comprise a switch driver that drives the deemphasis switch of Q309 and Q310 if an emphasis is given to the CD software by IC201.

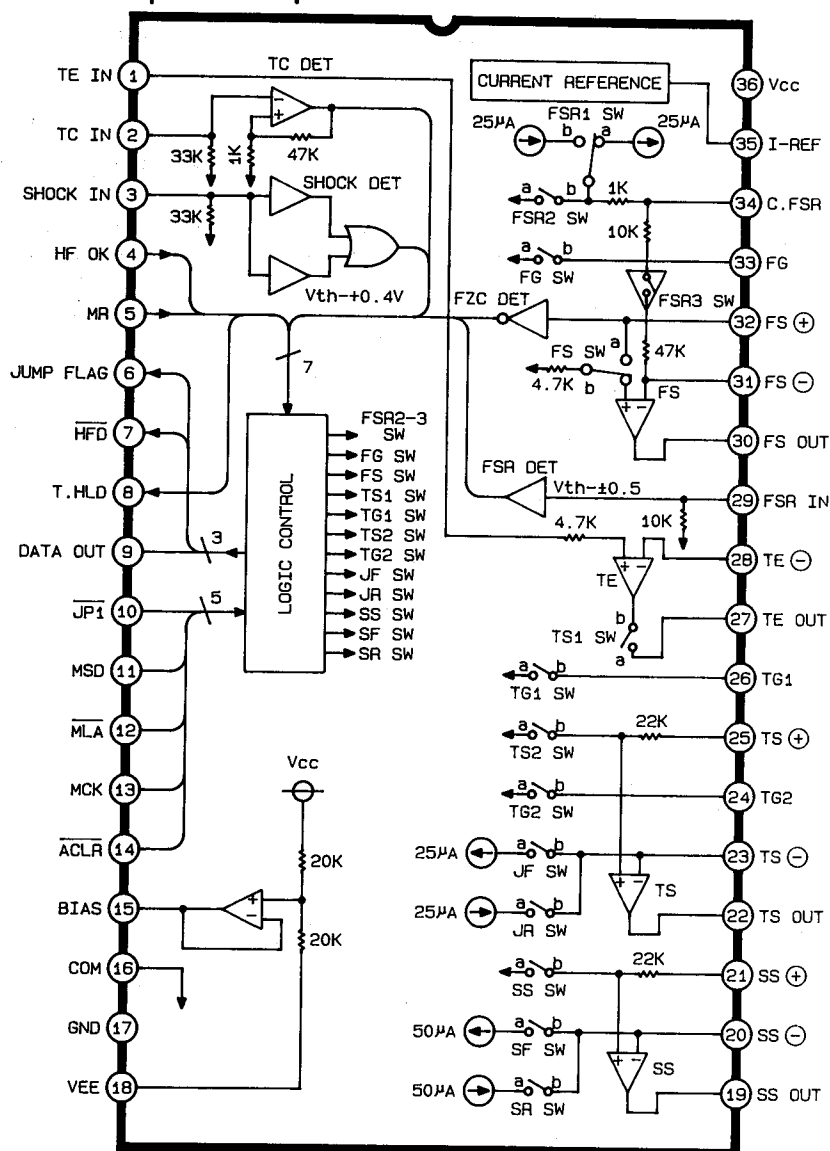
Q52 and Q53 make up a muting switch used when the power circuit is switched on.

IC BLOCK DIAGRAM

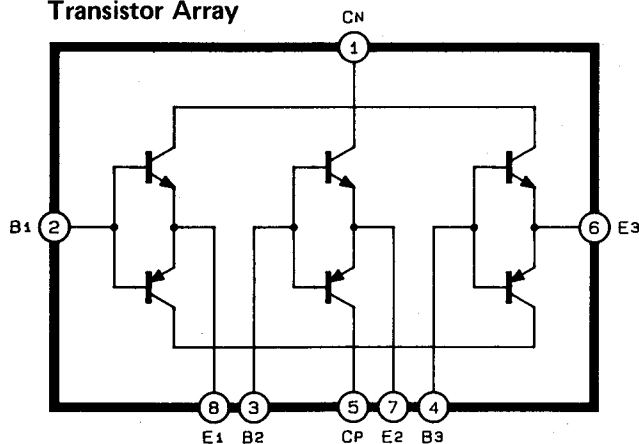
**IC101
CX20109
RF Pre Amplifier**



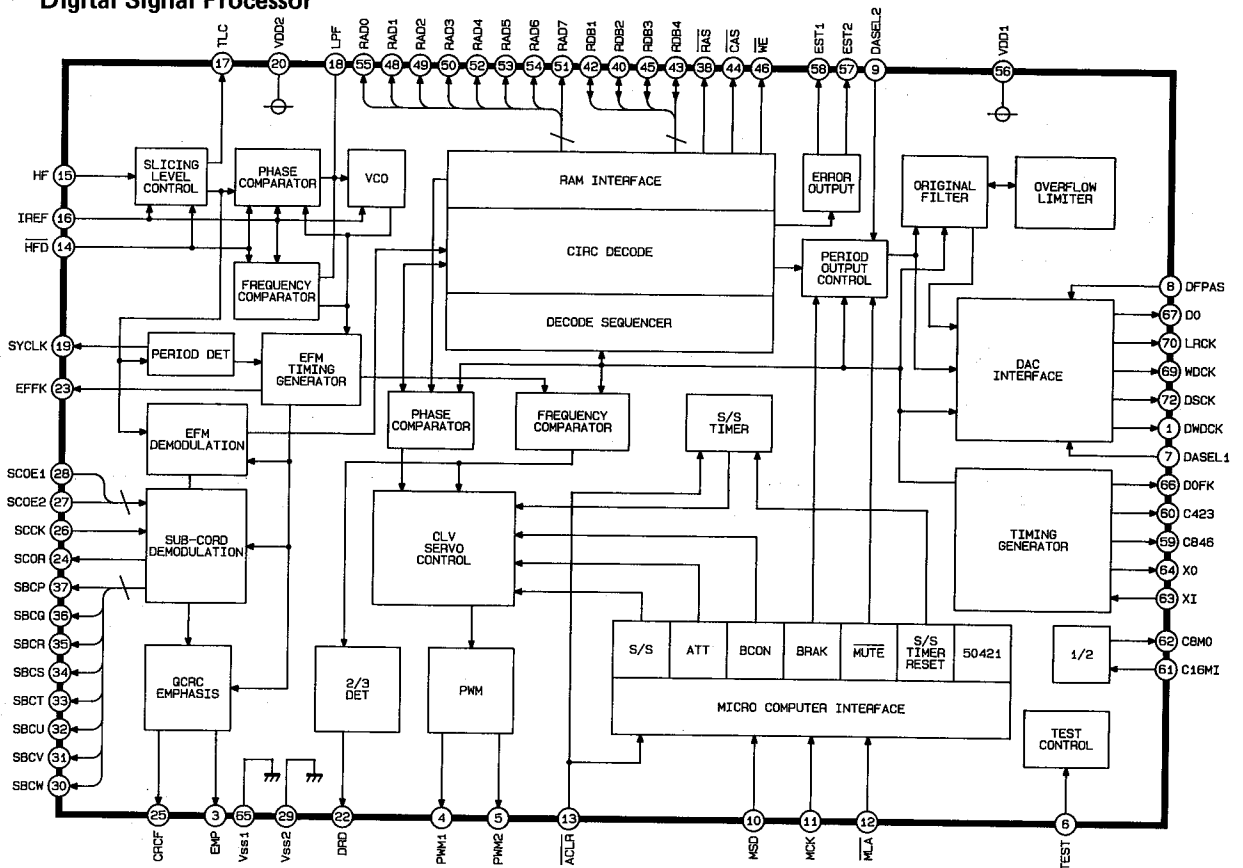
**IC102
M51564P
Optical Pick-up Servo Control**



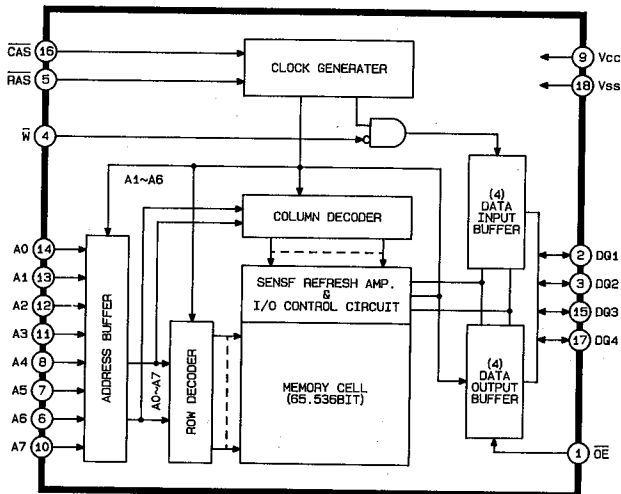
**IC103
STA341M
Transistor Array**



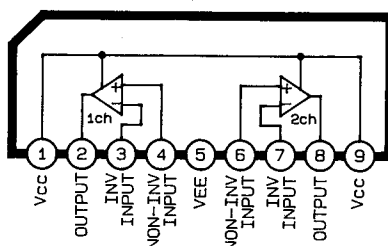
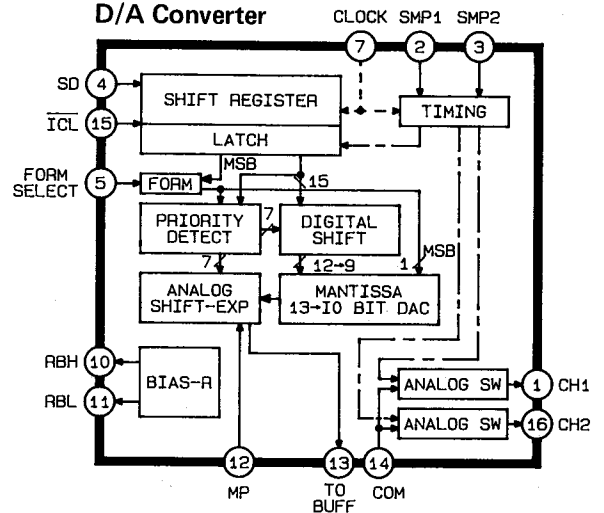
IC201
M50422P
Digital Signal Processor



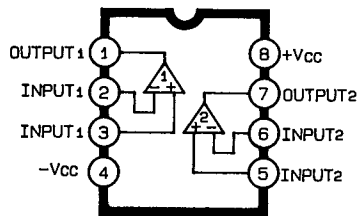
IC202
M5M4416P
65636-Bit (16384-Word by 4-Bit)
Dynamic RAM



IC301
YM3020
D/A Converter

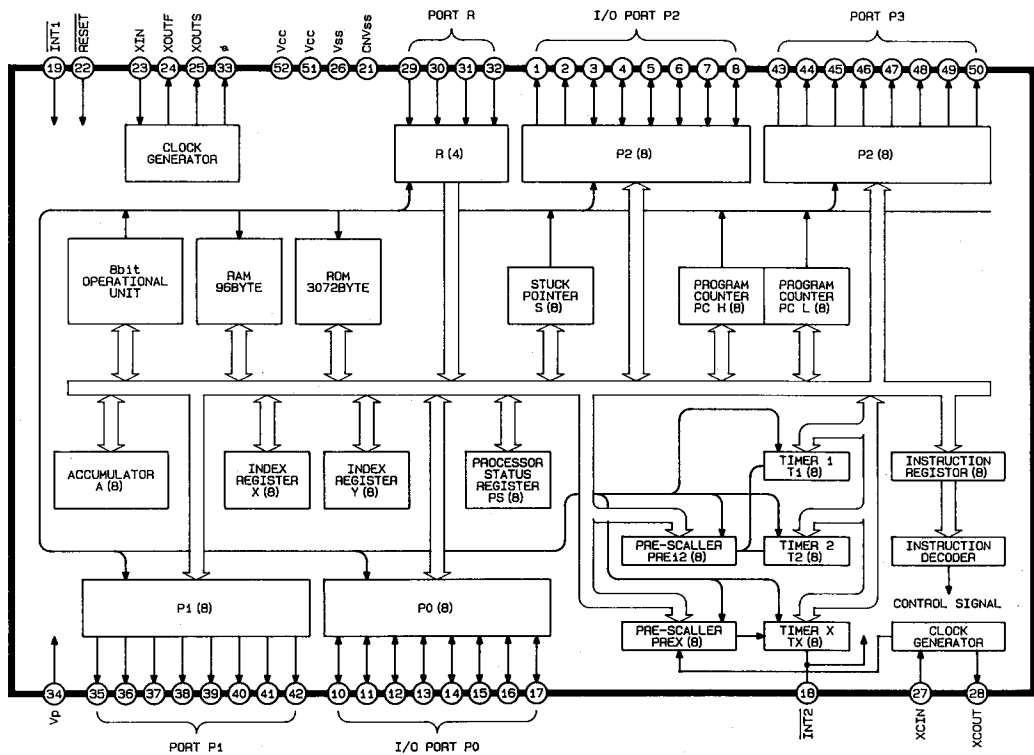


IC203
BA715
Dual Operation Amplifier

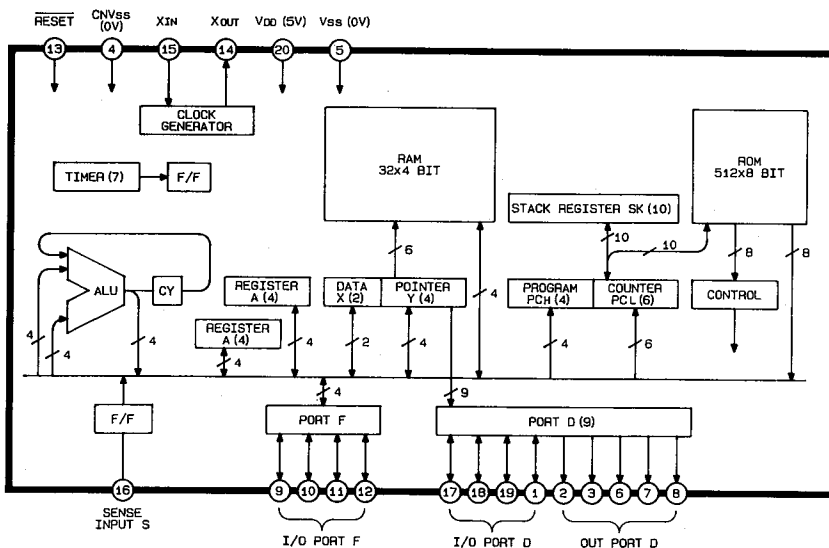


IC302
NJM4560SB
Dual Operational Amplifier

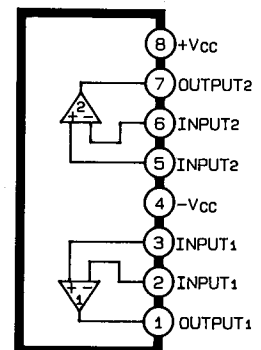
IC401
M50752-402SP
Microcomputer



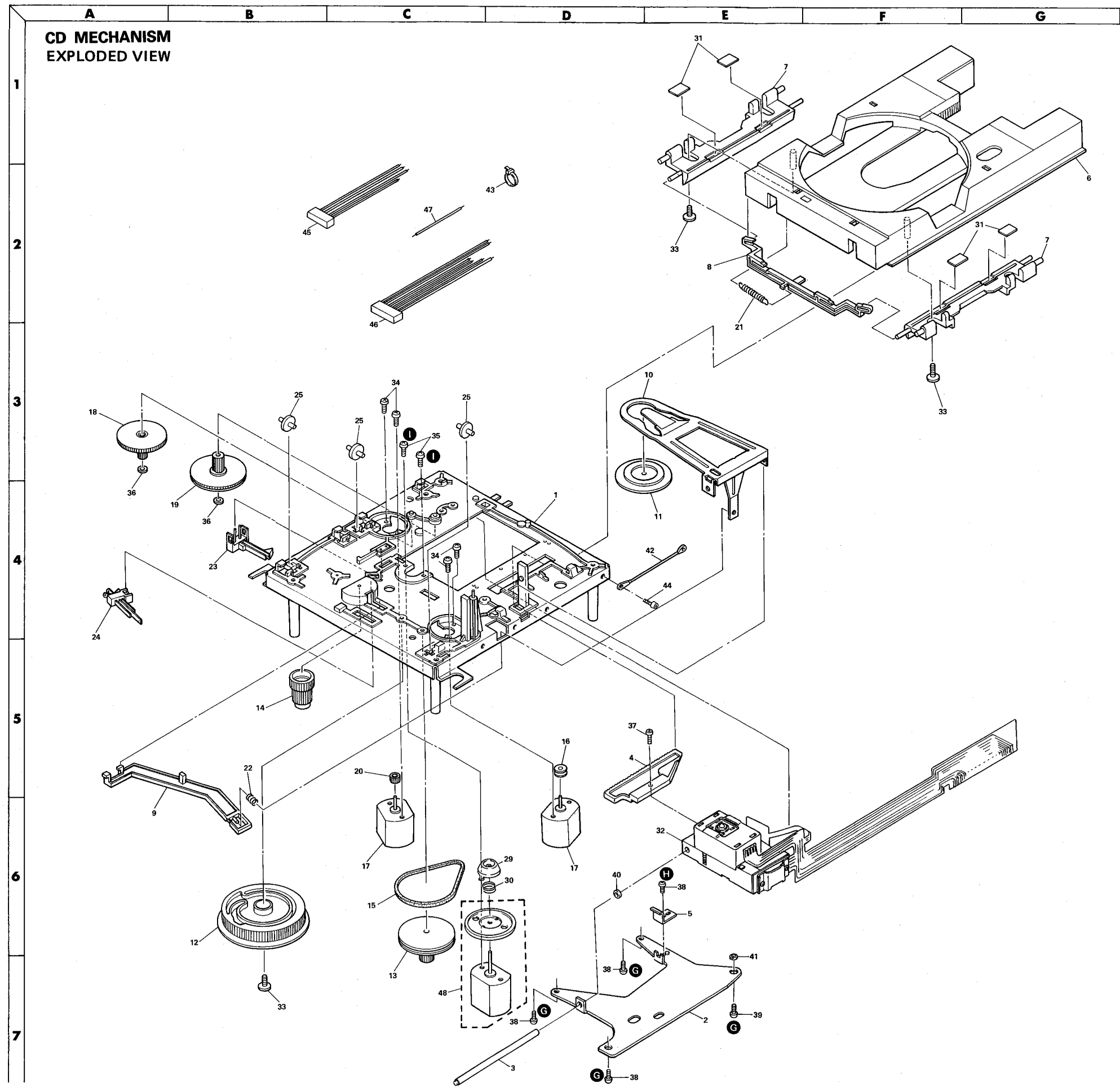
IC402
M50761-430P
Microcomputer



IC501
M5218L
Dual Operational Amplifier



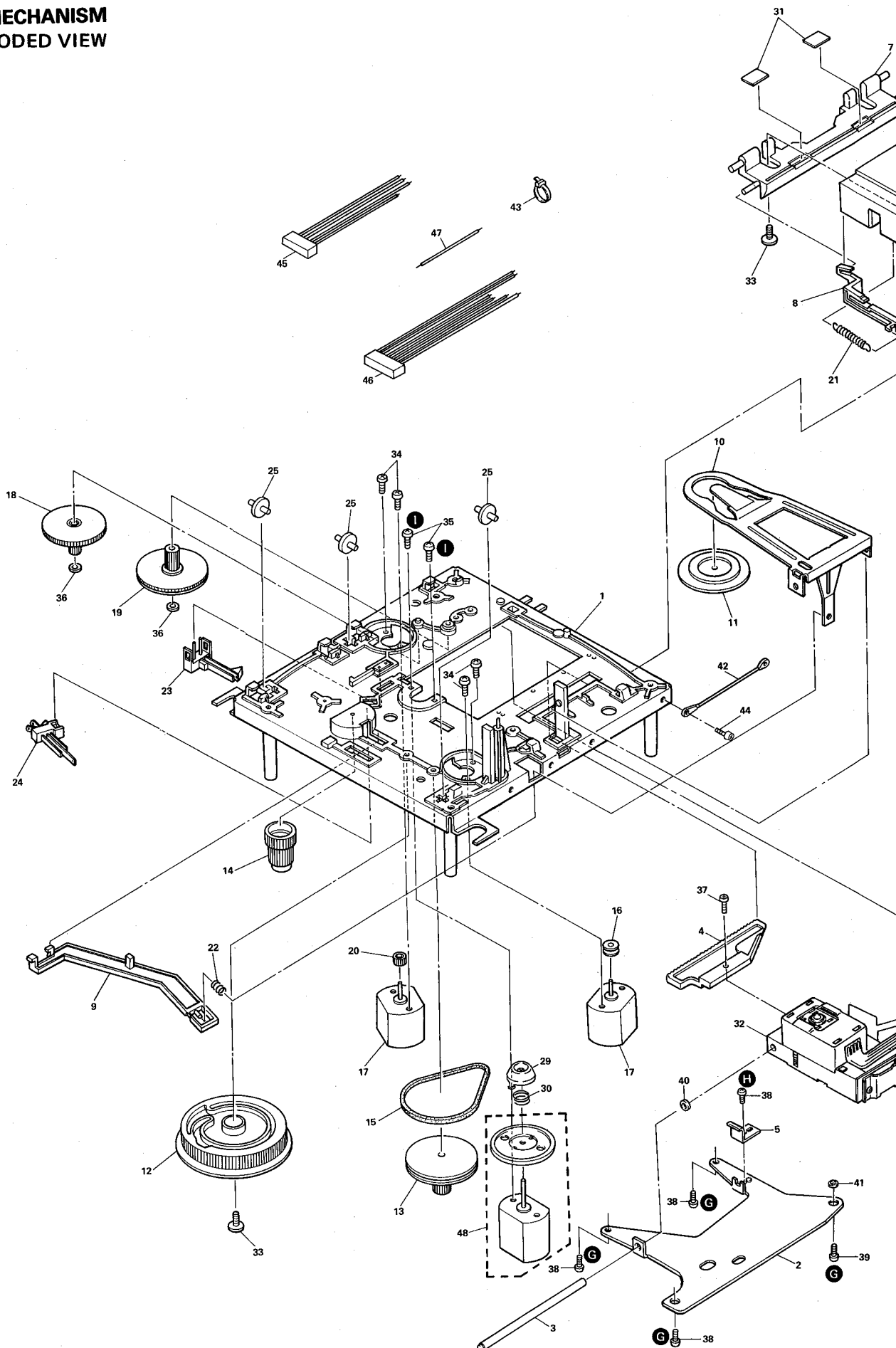
CD MECHANISM
EXPLODED VIEW



PARTS LIST

Ref. No.	Part No.	Description
1	A81A189	CHASSIS ASS'Y
2	A81P203	PICK-UP BASE ASS'Y
3	A81H023	PICK-UP BASE SHAFT
4	A81G079	PICK-UP GEAR
5	A81P018	PICK-UP BASE SHAFT HOLDER
6	A81G236	DISC TRAY
7	A81G002	TABLE
8	A81G003	SLIDER
9	A81G507	LOCK LEVER
10	A81P004	CHUCK ARM
11	A81G004	DISK HOLDER
12	A81G005	LOADING CAM
13	A81G006	LOADING GEAR A
14	A81G007	LOADING GEAR B
15	A81G070	LOADING BELT
16	A81G235	MOTOR PULLEY
17	M01T061	MOTOR, LOADING SLIDER
18	A81G008	PICK-UP GEAR A
19	A81G009	PICK-UP GEAR B
20	A81G010	MOTOR GEAR
21	A81S001	TABLE UP SPRING
22	A81S002	CHUCK ARM SPRING
23	S01W050	LEAF SWITCH
24	S01W051	LEAF SWITCH
25	A81G023	GUIDE ROLLER
29	A81G012	SLIDE RING
30	A81S013	SLIDE RING SPRING
31	A81P051	DISK GUARD
32	A81G576	PICK-UP
33	A81H005	SCREW (M3 x 8 mm)
34	M20B003	SCREW (M2 x 3 mm)
35	M20S006	SCREW (M2 x 6 mm)
36	P16C325	WASHER (1.6 ϕ x 3.2 ϕ x 0.25 mm)
37	B20B004	SCREW (M2 x 4 mm)
38	B26T005	SCREW (M2.6 x 5 mm)
39	P26B005	SCREW (M2.6 x 6 mm)
40	P31W805	WASHER (3.1 ϕ x 8 ϕ x 0.5 mm)
41	P41W825	WASHER (4.1 ϕ x 8 ϕ x 0.25 mm)
42	A81B395	EARTH LEAD WIRE (W/LUG 3)
43	M01N035	BAND
44	M30T005	SCREW (M3 x 5 mm)
45	A81G327	CONNECTOR WITH LEAD WIRE
46	A81G328	CONNECTOR WITH LEAD WIRE
47	A81G317	LEAD WIRE
48	A81A214	SPINDLE MOTOR ASS'Y

CD MECHANISM EXPLODED VIEW



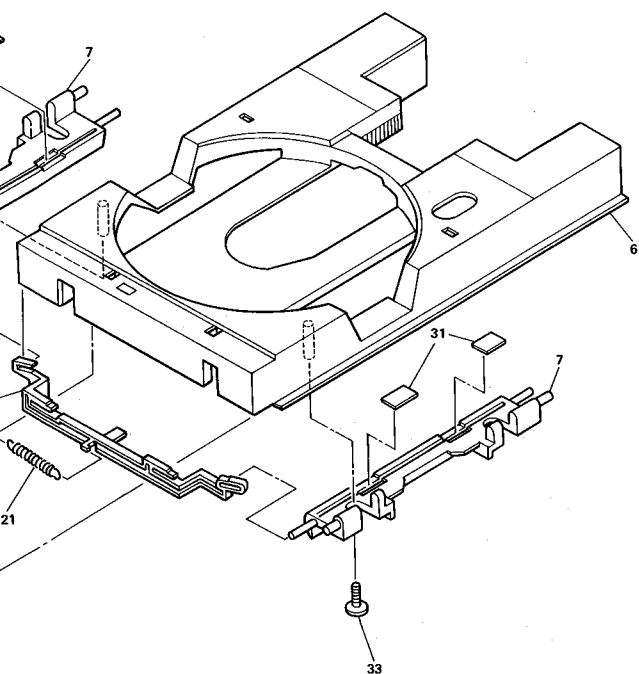
F

G

H

I

J

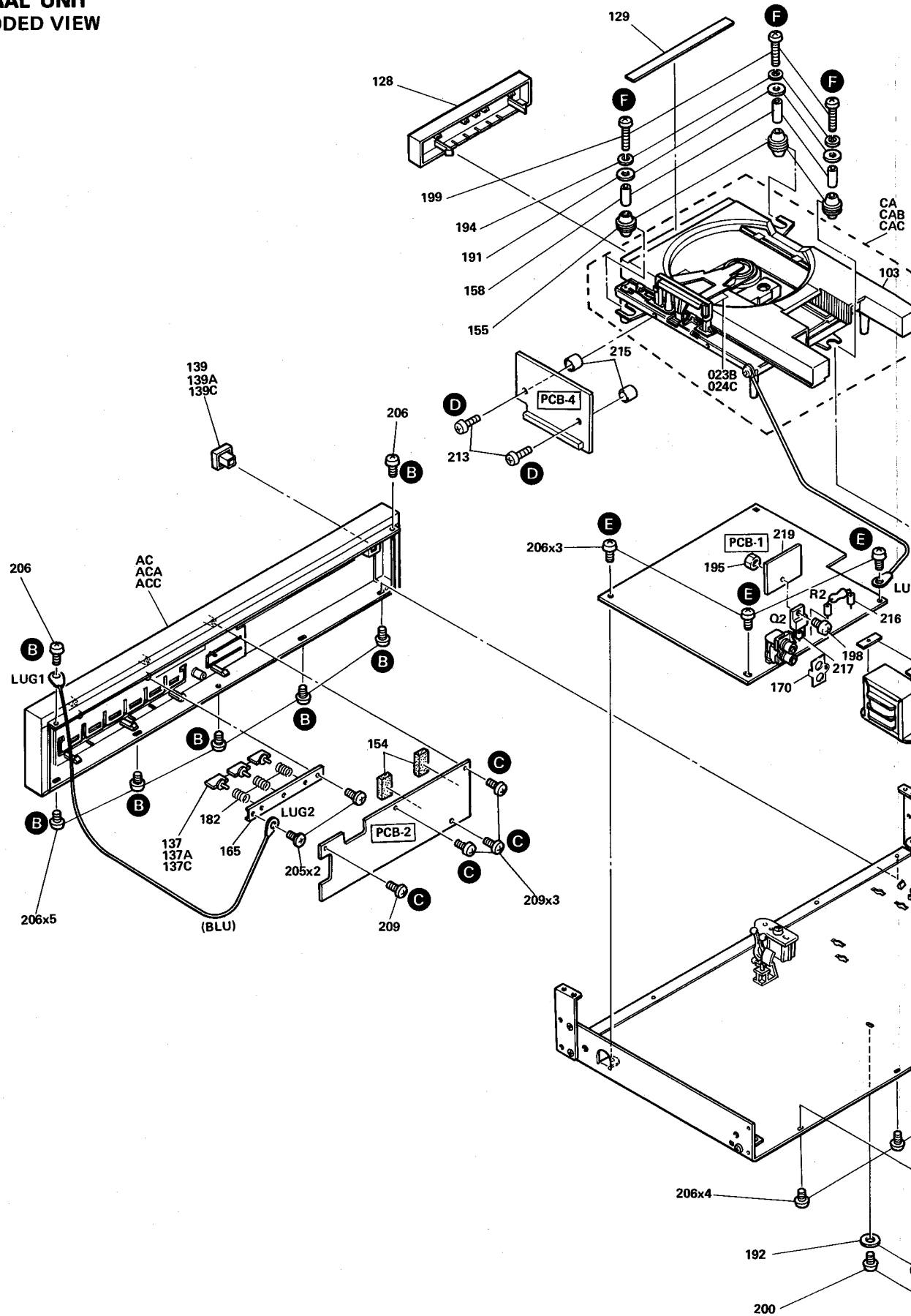


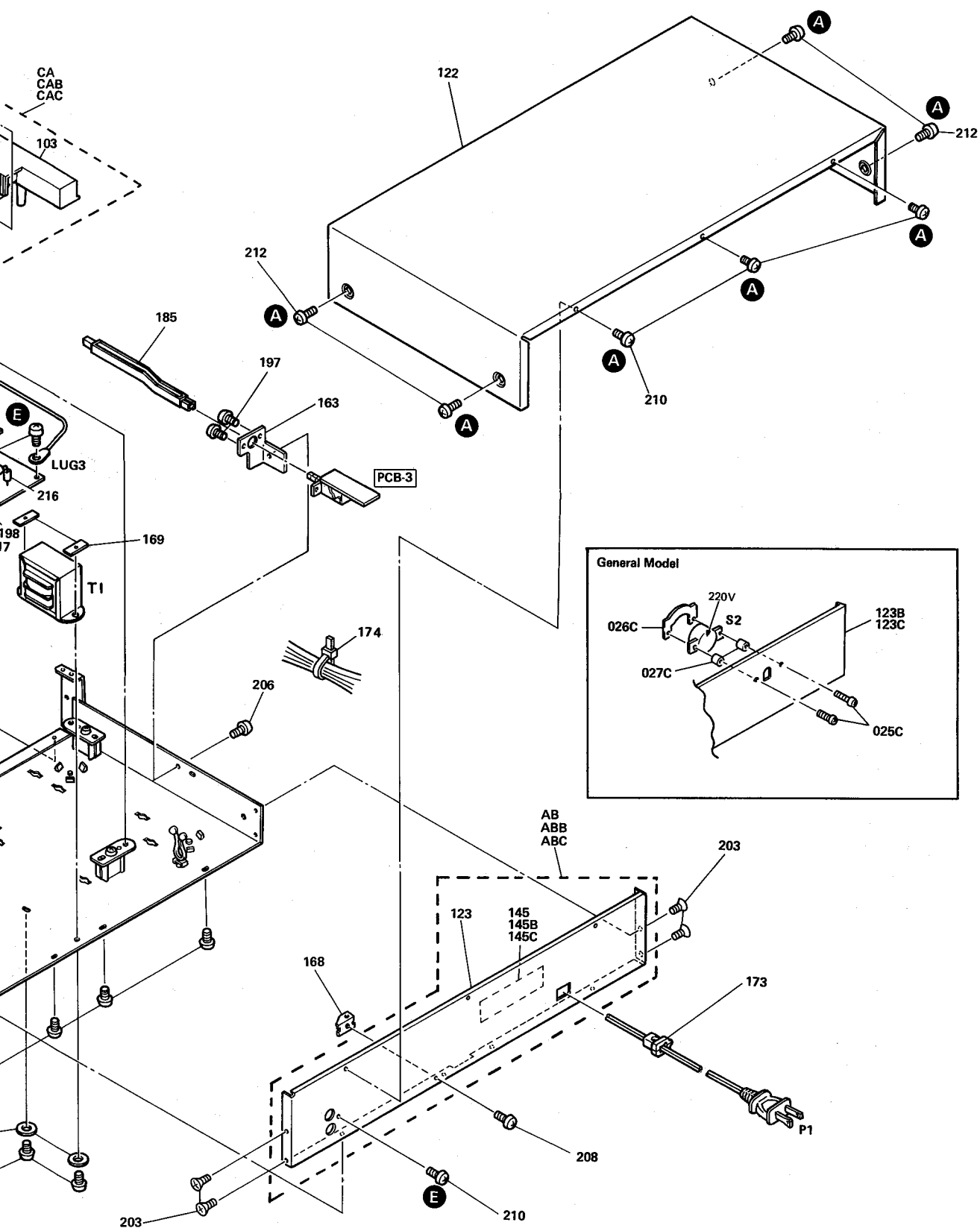
PARTS LIST

Ref. No.	Part No.	Description
1	A81A189	CHASSIS ASS'Y
2	A81P203	PICK-UP BASE ASS'Y
3	A81H023	PICK-UP BASE SHAFT
4	A81G079	PICK-UP GEAR
5	A81P018	PICK-UP BASE SHAFT HOLDER
6	A81G236	DISC TRAY
7	A81G002	TABLE
8	A81G003	SLIDER
9	A81G507	LOCK LEVER
10	A81P004	CHUCK ARM
11	A81G004	DISK HOLDER
12	A81G005	LOADING CAM
13	A81G006	LOADING GEAR A
14	A81G007	LOADING GEAR B
15	A81G070	LOADING BELT
16	A81G235	MOTOR PULLEY
17	M01T061	MOTOR, LOADING SLIDER
18	A81G008	PICK-UP GEAR A
19	A81G009	PICK-UP GEAR B
20	A81G010	MOTOR GEAR
21	A81S001	TABLE UP SPRING
22	A81S002	CHUCK ARM SPRING
23	S01W050	LEAF SWITCH
24	S01W051	LEAF SWITCH
25	A81G023	GUIDE ROLLER
29	A81G012	SLIDE RING
30	A81S013	SLIDE RING SPRING
31	A81P051	DISK GUARD
32	A81G576	PICK-UP
33	A81H005	SCREW (M3 x 8 mm)
34	M20B003	SCREW (M2 x 3 mm)
35	M20S006	SCREW (M2 x 6 mm)
36	P16C325	WASHER (1.6 ϕ x 3.2 ϕ x 0.25 mm)
37	B20B004	SCREW (M2 x 4 mm)
38	B26T005	SCREW (M2.6 x 5 mm)
39	P26B005	SCREW (M2.6 x 6 mm)
40	P31W805	WASHER (3.1 ϕ x 8 ϕ x 0.5 mm)
41	P41W825	WASHER (4.1 ϕ x 8 ϕ x 0.25 mm)
42	A81B395	EARTH LEAD WIRE (W/LUG 3)
43	M01N035	BAND
44	M30T005	SCREW (M3 x 5 mm)
45	A81G327	CONNECTOR WITH LEAD WIRE
46	A81G328	CONNECTOR WITH LEAD WIRE
47	A81G317	LEAD WIRE
48	A81A214	SPINDLE MOTOR ASS'Y

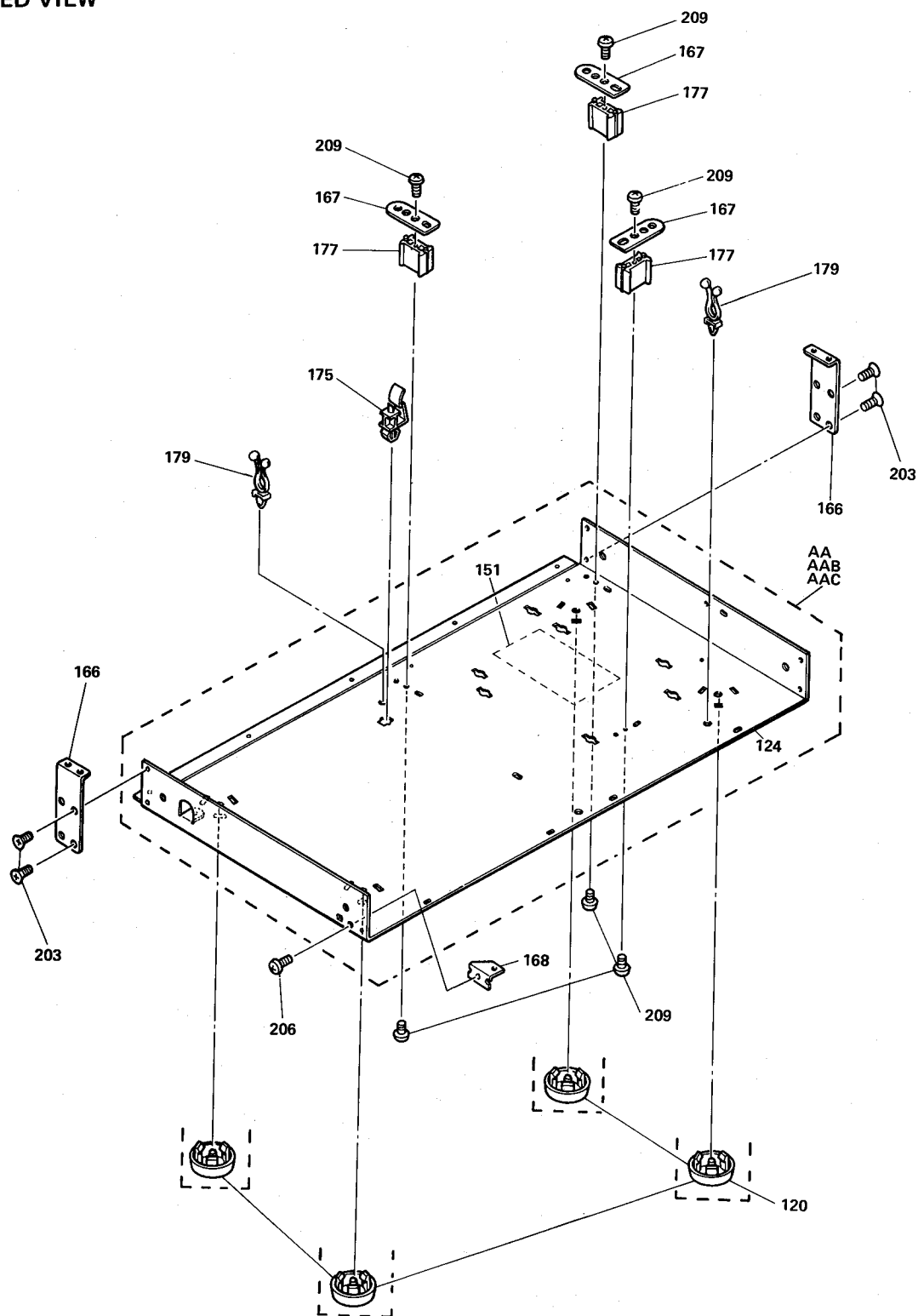


**GENERAL UNIT
EXPLODED VIEW**





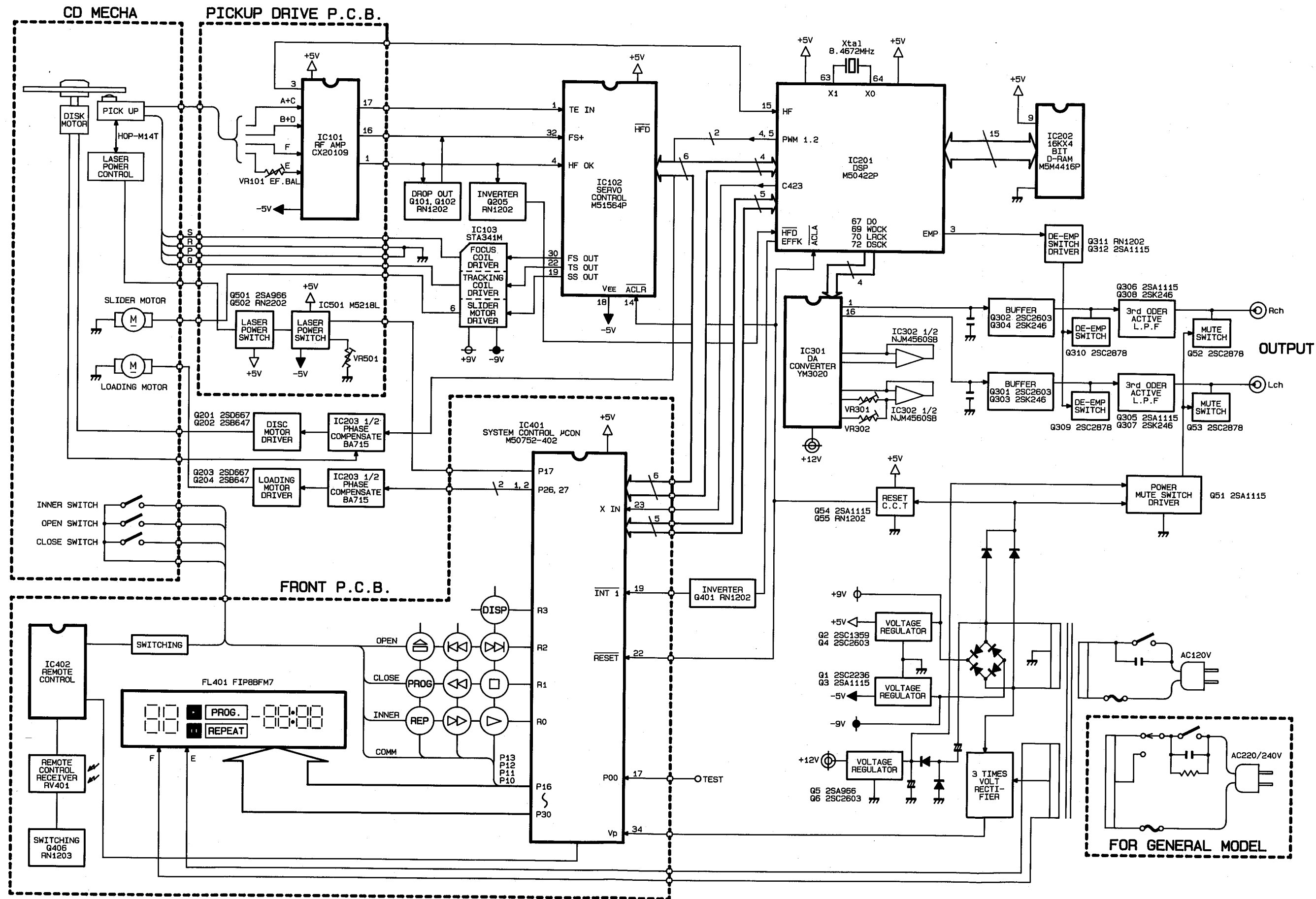
EXPLODED VIEW



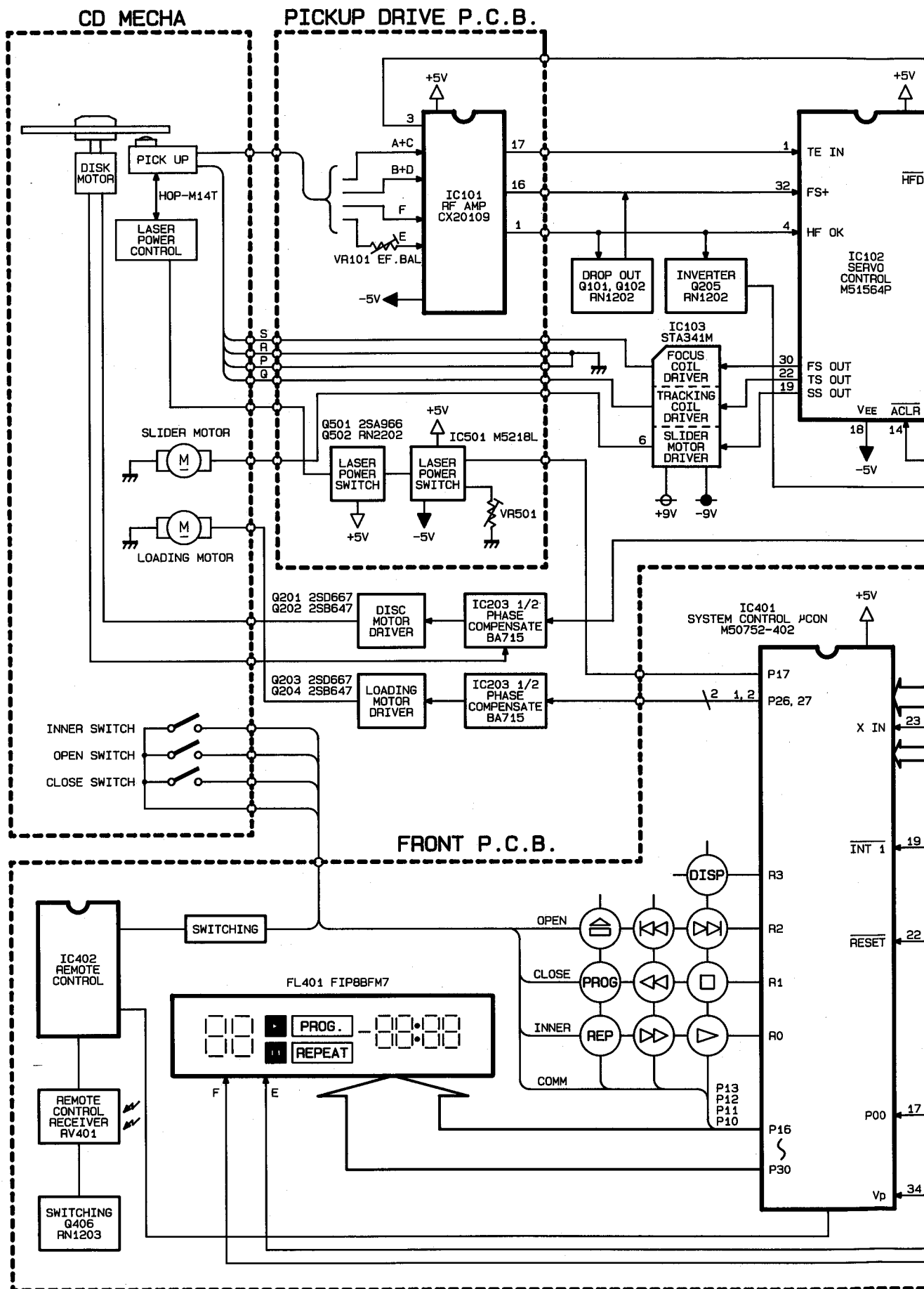
PARTS LIST

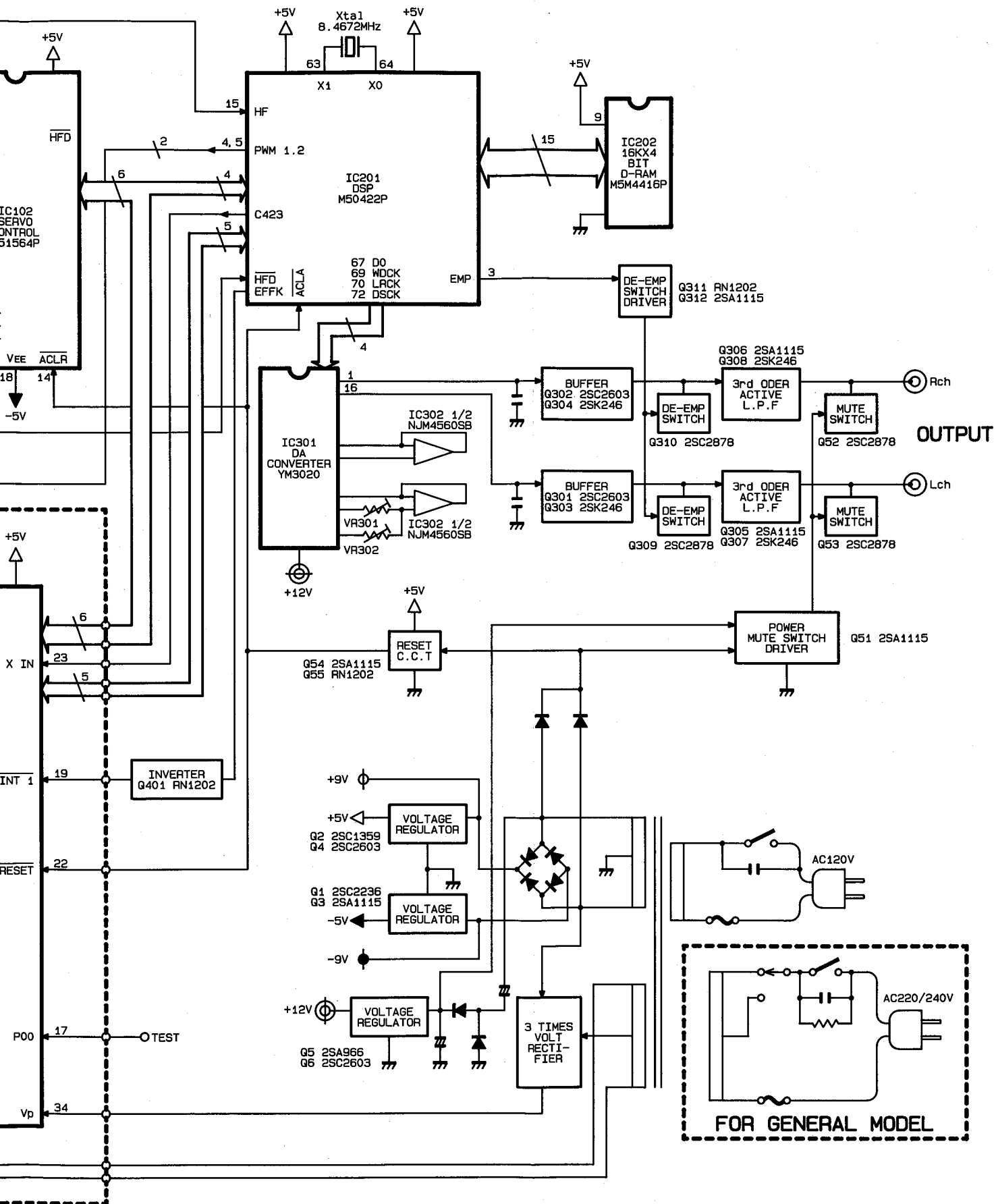
Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
AA	A424-HD400A	CABI BACK, BOTTOM ASS'Y UA BK	167	2219-8142	METAL FITTG, MECHA
AAB	A424-HD400C	CABI BACK, BOTTOM ASS'Y G	168	2219-8096	METAL FITTG, P.C.B.
AAC	A424-HD400E	CABI BACK, BOTTOM ASS'Y GB	175	2240-7264	HOLDER, P.C. BOARD
120	1319-0139	LEG	177	2240-7285	HOLDER, MECHA
124	1424-21101	CABI BACK, BOTTOM	179	2240-7049	HOLDER, LEAD CRAMP
151	1756-11111	LABEL	203	2343-300627	SCREW CSK T+
166	2219-8141	METAL FITTG, SIDE	206	2347-R0130062	SCREW BND T+
			209	2347-R0130102	SCREW BND T+

BLOCK DIAGRAM

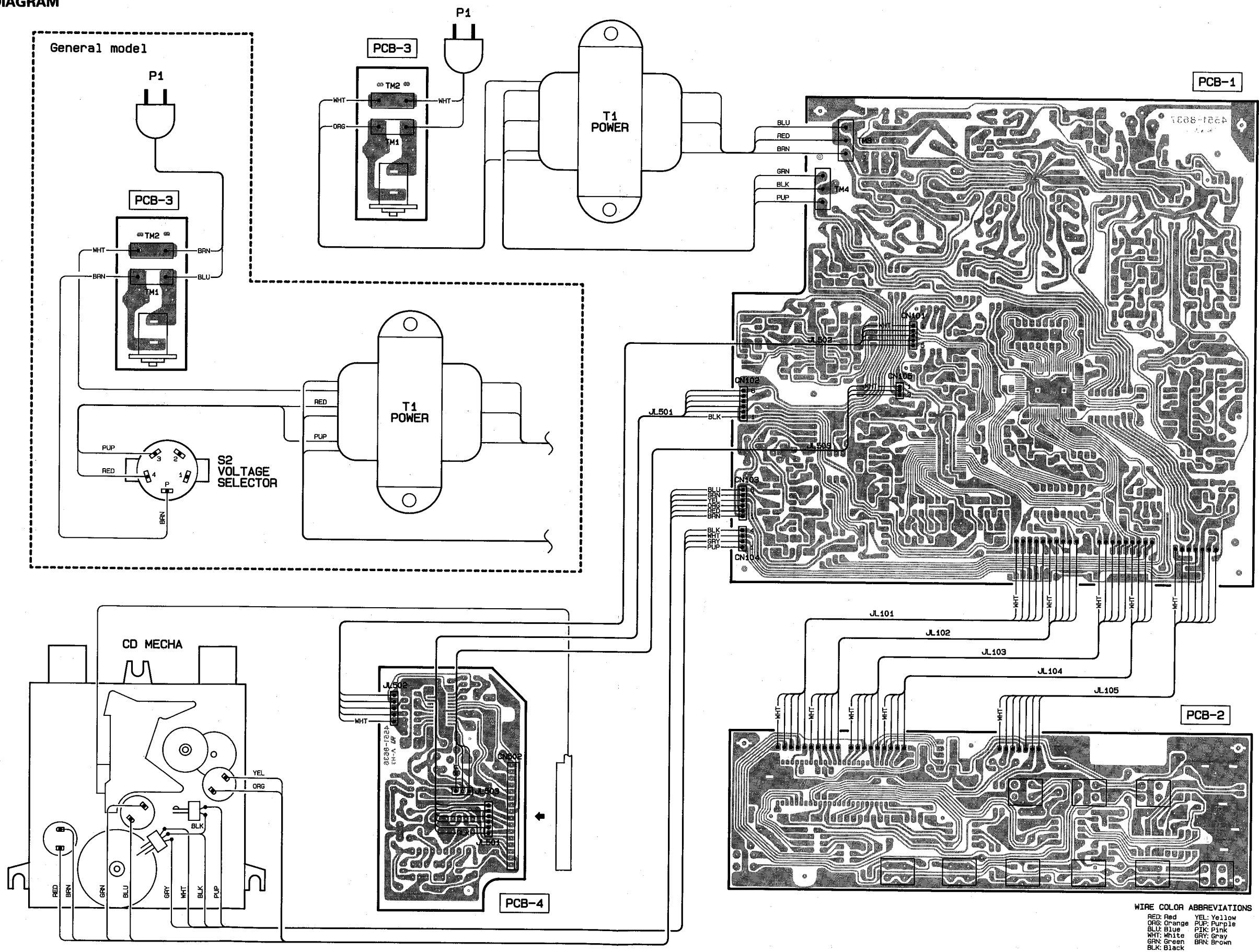


BLOCK DIAGRAM



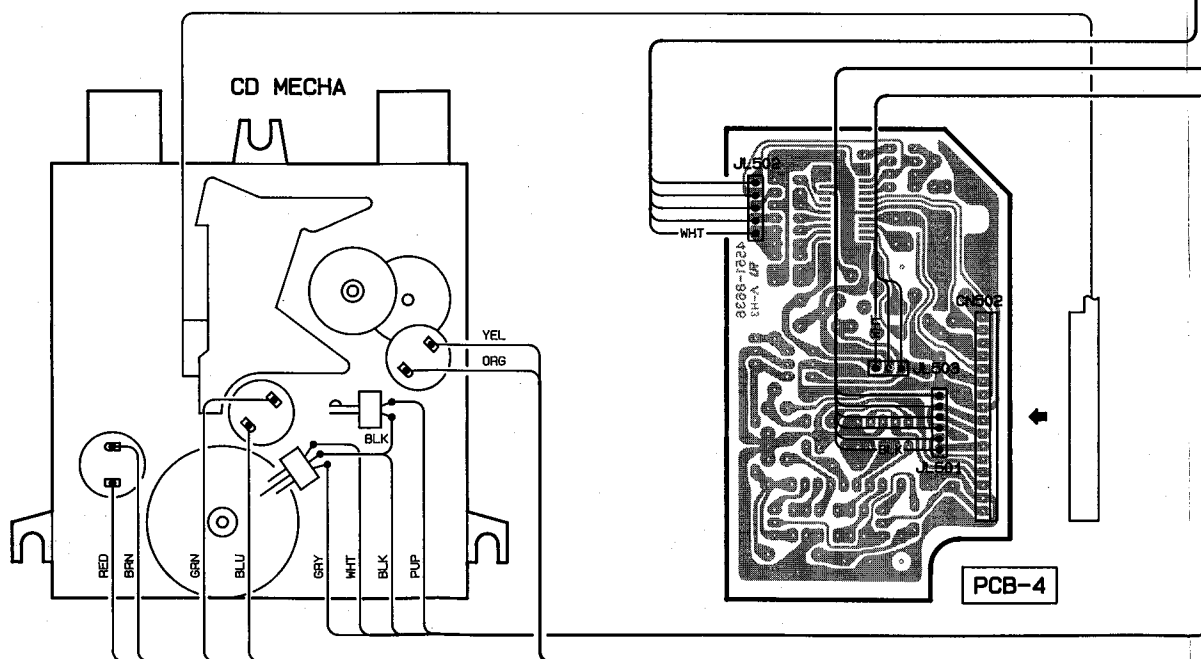
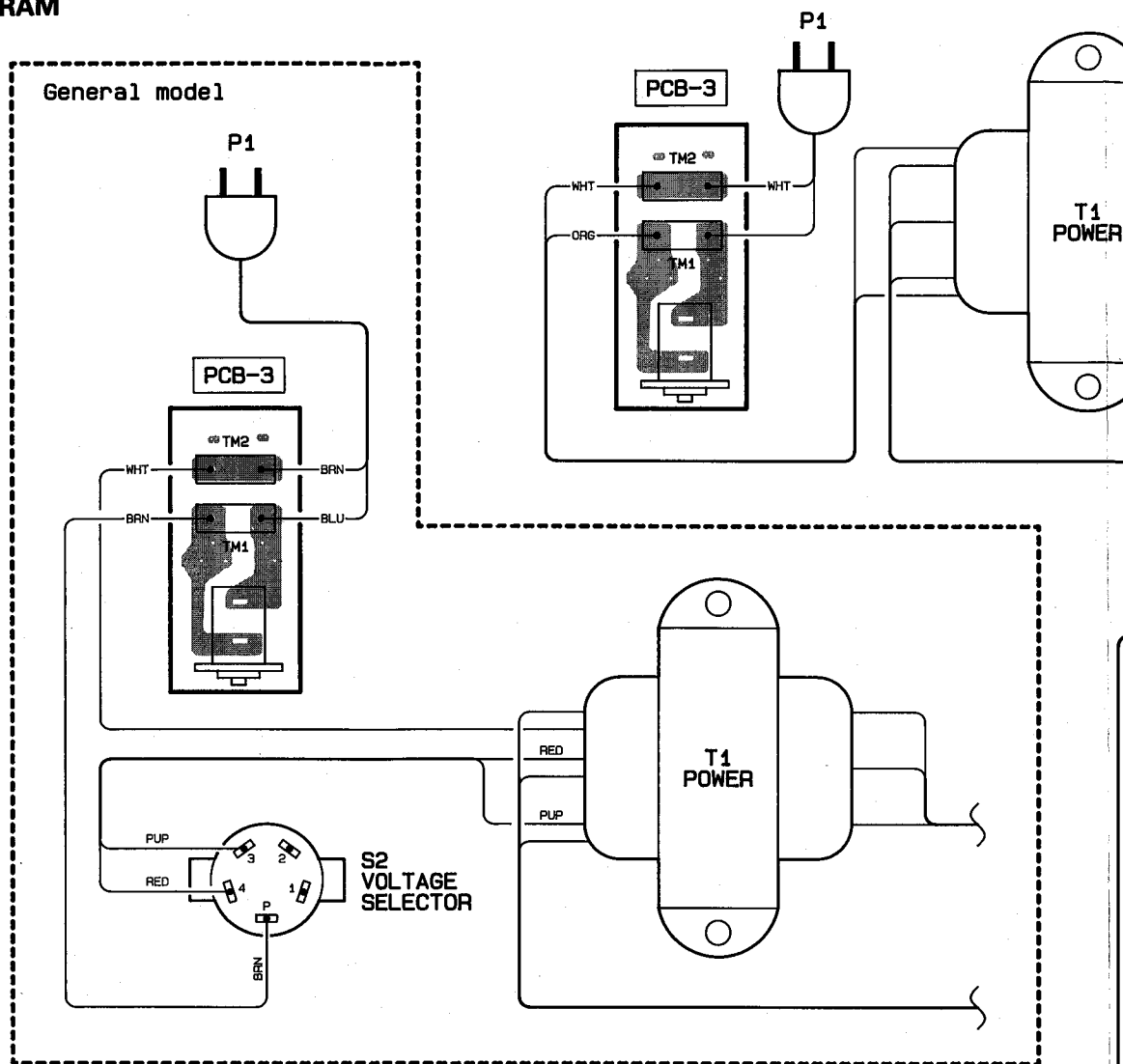


WIRING DIAGRAM



WIRING DIAGRAM

General model



F

G

H

I

J

PCB-1

T1
POWER

BLU

RED

BRN

GRN

BLK

PUP

TM4

CN101

JL502

CN102

CN103

CN104

JL501

BLK

JL503

JL101

JL102

JL103

JL104

JL105

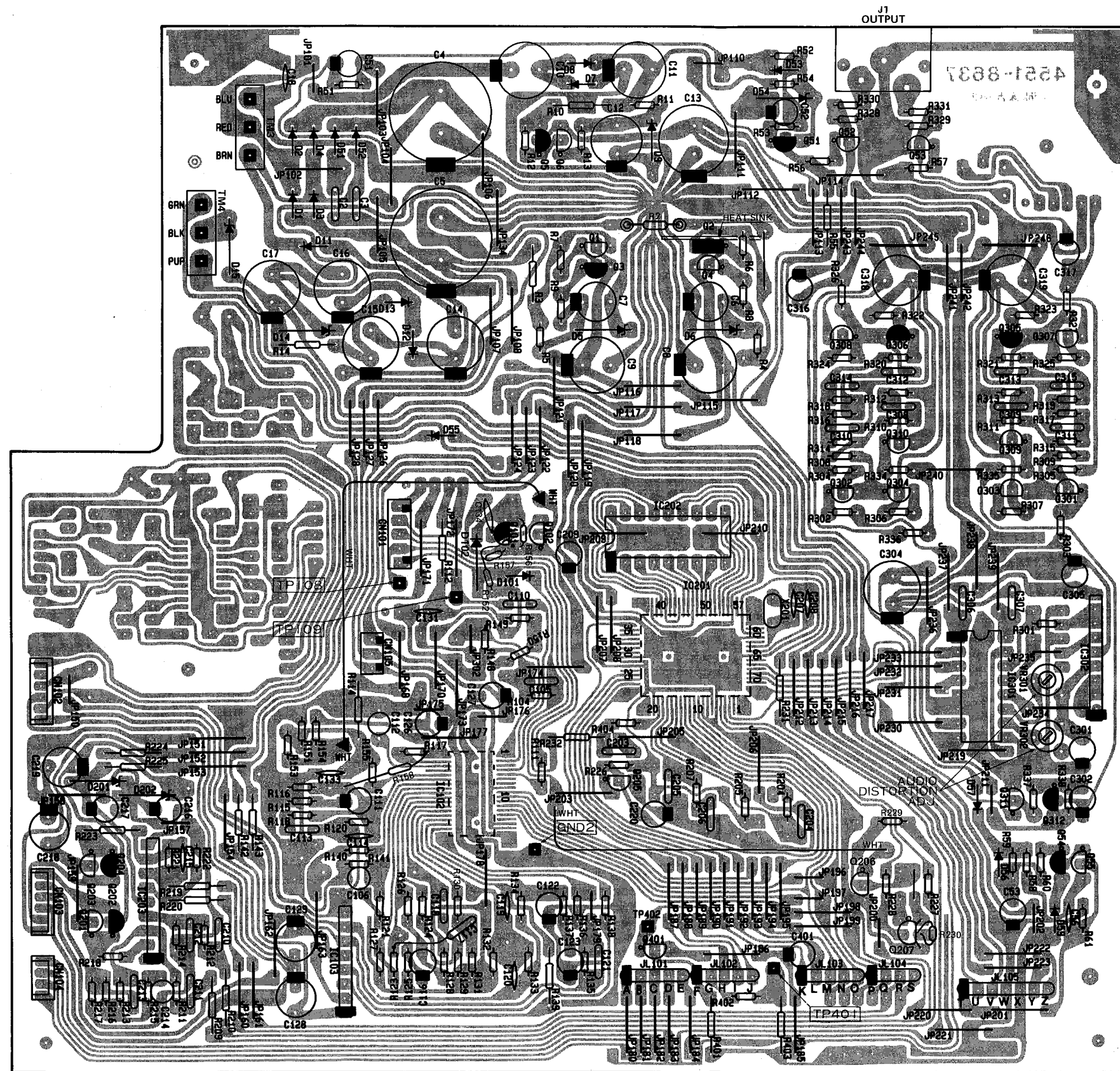
PCB-2

WIRE COLOR ABBREVIATIONS

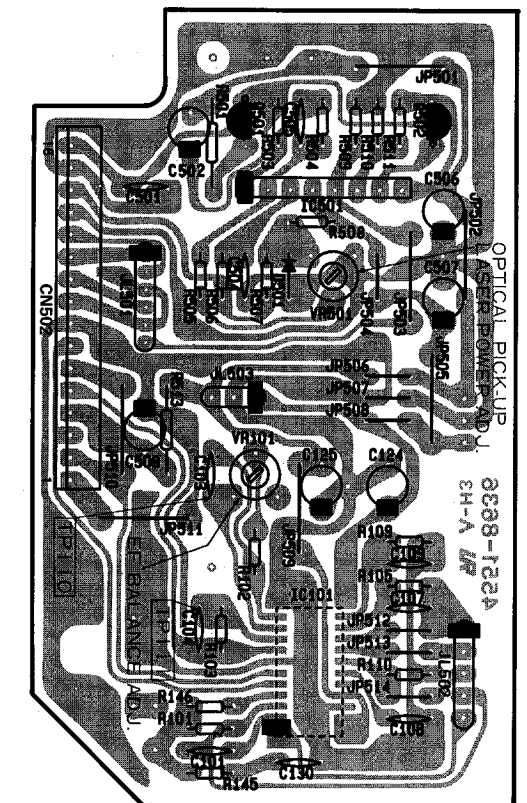
RED: Red	YEL: Yellow
ORG: Orange	PUP: Purple
BLU: Blue	PIK: Pink
WHT: White	GRY: Gray
GRN: Green	BRN: Brown
BLK: Black	

P.C. BOARDS (1)

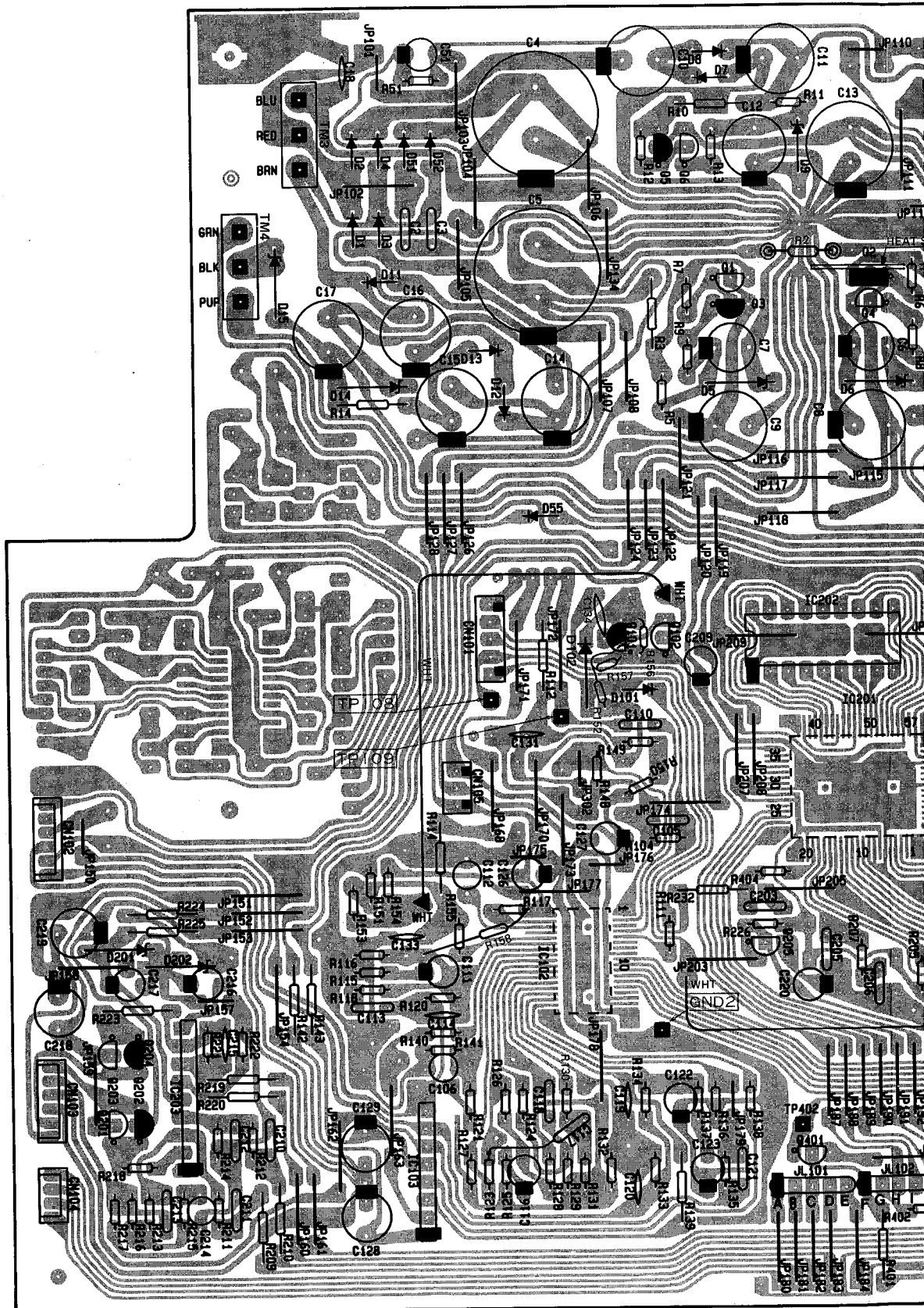
PCB-1 Main P. C. Board

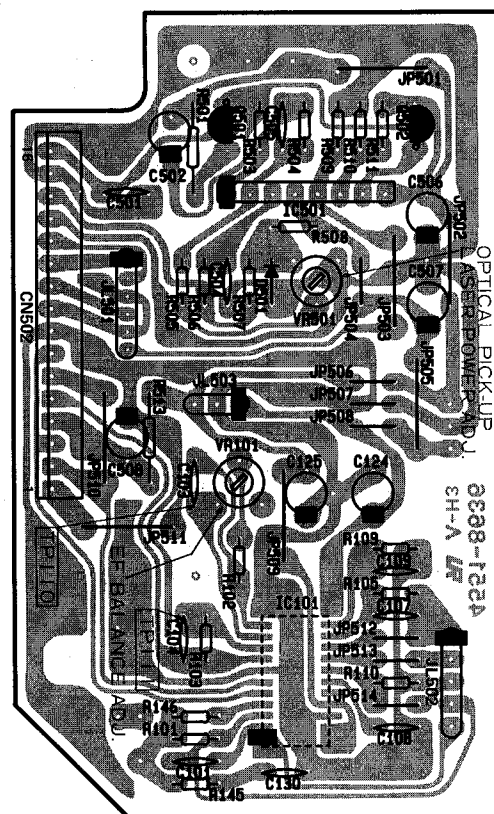
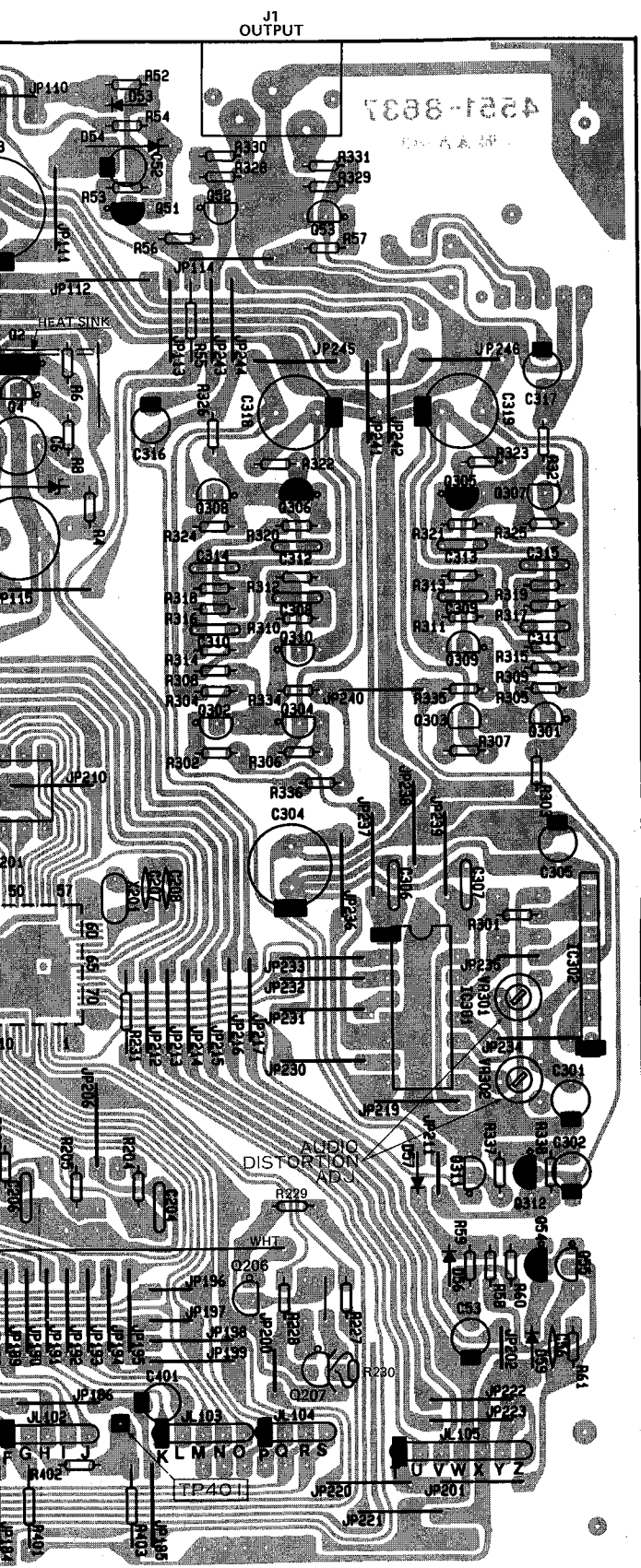


PCB-4 Pick-up Drive P. C. Board

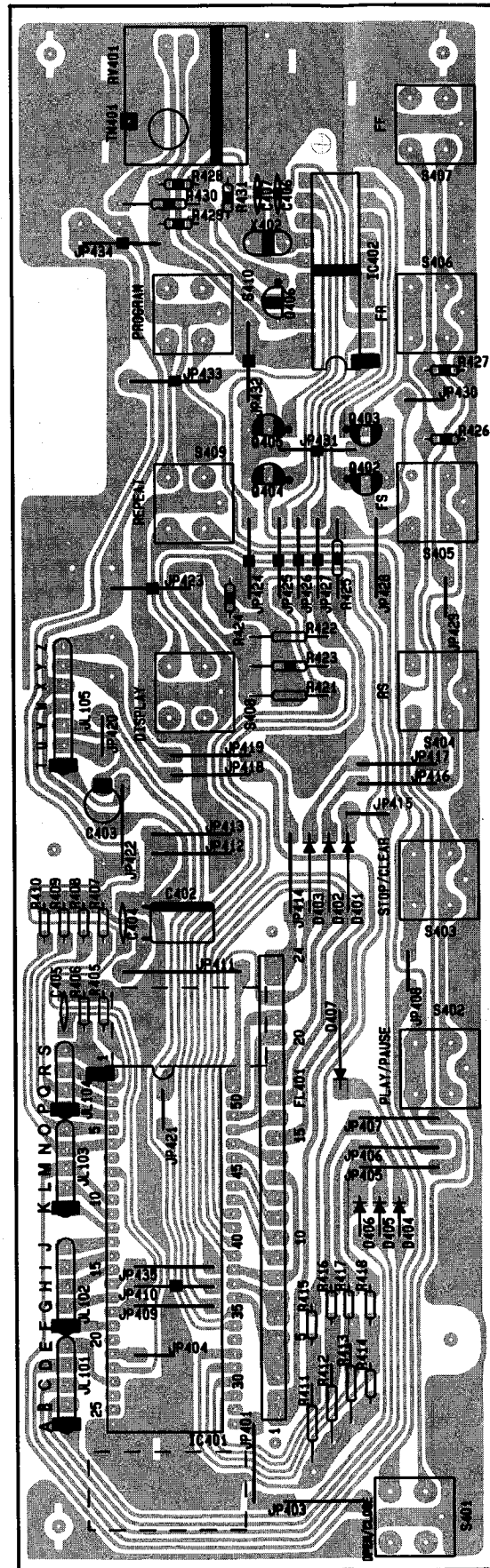


PCB-1

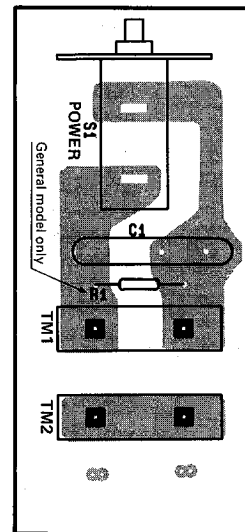




PCB-2 Front P. C. Board



PCB-3
Power Switch P. C. Board

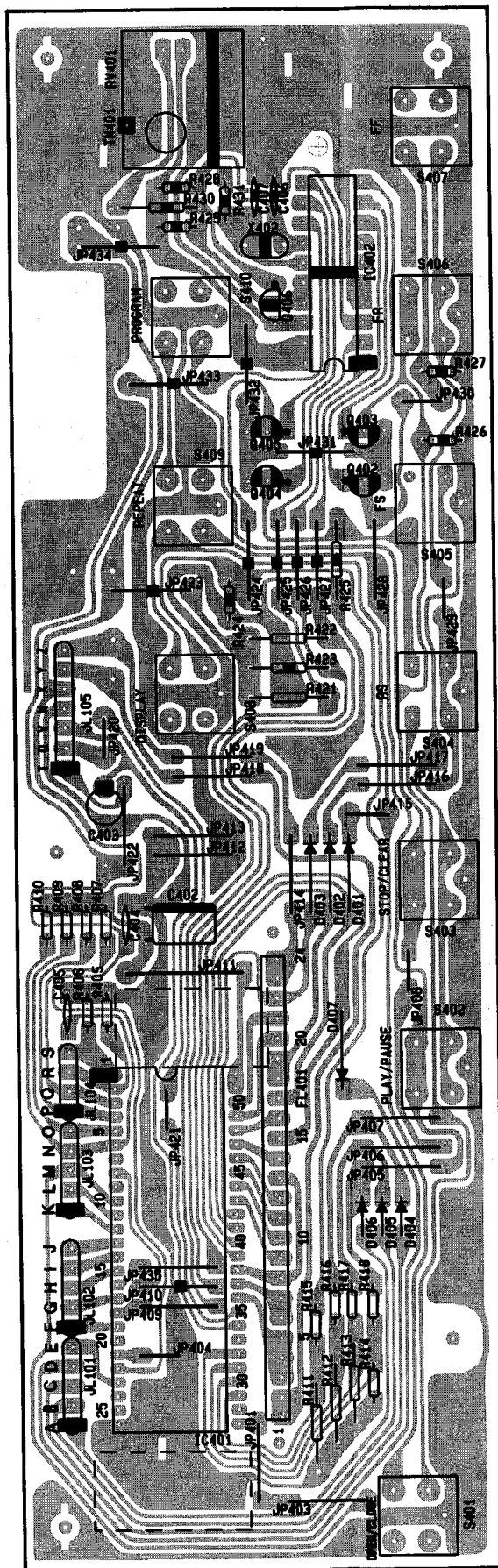


<u>Ser. No.</u>	<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
-----------------	-----------------	-----------------	--------------------

Ser. No.	Ref. No.	Part No.	Description	Ser. No.	Ref. No.	Part No.	Description
PCB-1 MAIN P.C. BOARD				588	C312	5359-S010J392	CAP, PPP 3900p
CAPACITORS				588	C313	5359-S010J392	CAP, PPP 3900p
571	C2	5354-104593	CAP, MYL .1 μ	584	C314	5359-2215851	CAP, PPP 220p
571	C3	5354-104593	CAP, MYL .1 μ	584	C315	5359-2215851	CAP, PPP 220p
544	C4	5345-478C0351	CAP, MINI ELE 4700 μ /16V	553	C316	5345-476C0951	CAP, MINI ELE 47 μ /16V
544	C5	5345-478C0351	CAP, MINI ELE 4700 μ /16V	553	C317	5345-476C0951	CAP, MINI ELE 47 μ /16V
549	C6	5345-227A041	CAP, MINI ELE 220 μ /6.3V	561	C318	5345-107C041	CAP, MINI ELE 100 μ /16V
549	C7	5345-227A041	CAP, MINI ELE 220 μ /6.3V	561	C319	5345-107C041	CAP, MINI ELE 100 μ /16V
545	C8	5345-477A041	CAP, MINI ELE 470 μ /6.3V	557	C401	5345-105F041	CAP, MINI ELE 1 μ /50V
545	C9	5345-477A041	CAP, MINI ELE 470 μ /6.3V	RESISTORS			
548	C10	5345-227C041	CAP, MINI ELE 220 μ /16V	600	Δ R2	5102-4R74715	RES, FUSE 4.7
546	C11	5345-227D041	CAP, MINI ELE 220 μ /25V	600	Δ R3	5102-4R74715	RES, FUSE 4.7
547	C12	5345-227C041	CAP, MINI ELE 220 μ /16V	614	R4	5232-152J16P	RES, CBN 1/6P 1.5K
547	C13	5345-227C041	CAP, MINI ELE 220 μ /16V	614	R5	5232-152J16P	RES, CBN 1/6P 1.5K
548	C14	5345-227C041	CAP, MINI ELE 220 μ /16V	610	R6	5232-471J16P	RES, CBN 1/6P 470
550	C15	5345-107E041	CAP, MINI ELE 100 μ /35V	610	R7	5232-471J16P	RES, CBN 1/6P 470
550	C16	5345-107E041	CAP, MINI ELE 100 μ /35V	606	R8	5232-101J16P	RES, CBN 1/6P 100
550	C17	5345-107E041	CAP, MINI ELE 100 μ /35V	606	R9	5232-101J16P	RES, CBN 1/6P 100
565	C18	5361-223ZF	CAP, CER .022 μ	601	Δ R10	5102-1004715	RES, FUSE 10
554	C51	5345-226C041	CAP, MINI ELE 22 μ /16V	617	R11	5232-332J16P	RES, CBN 1/6P 3.3K
556	C52	5345-106C041	CAP, MINI ELE 10 μ /16V	610	R12	5232-471J16P	RES, CBN 1/6P 470
556	C53	5345-106C041	CAP, MINI ELE 10 μ /16V	606	R13	5232-101J16P	RES, CBN 1/6P 100
578	C56	5361-103ZF	CAP, CER .01 μ	603	Δ R14	5102-1514715	RES, FUSE 150
571	C105	5354-104593	CAP, MYL .1 μ	614	R51	5232-152J16P	RES, CBN 1/6P 1.5K
582	C106	5342-336C041	CAP, ELE BP 33 μ /16V	637	R52	5232-564J16P	RES, CBN 1/6P 560K
579	C110	5361-472KB	CAP, CER 4700p	633	R53	5232-104J16P	RES, CBN 1/6P 100K
572	C111	5345-684F0951	CAP, MINI ELE .68 μ /50V	614	R54	5232-152J16P	RES, CBN 1/6P 1.5K
564	C112	5342-226B041	CAP, ELE BP 22 μ /10V	649	R55	5135-154522	RES, CBN 1/2P 150K
574	C113	5354-274593	CAP, MYL .27 μ	615	R56	5232-182J16P	RES, CBN 1/6P 1.8K
591	C114	5359-S010J822	CAP, PPP 8200p	615	R57	5232-182J16P	RES, CBN 1/6P 1.8K
572	C116	5345-684F0951	CAP, MINI ELE .68 μ /50V	622	R58	5232-103J16P	RES, CBN 1/6P 10K
575	C117	5359-S010J273	CAP, PPP .027 μ	634	R59	5232-274J16P	RES, CBN 1/6P 270K
562	C118	5354-124593	CAP, MYL .12 μ	633	R60	5232-104J16P	RES, CBN 1/6P 100K
567	C119	5361-470KSL	CAP, CER 47p	622	R61	5232-103J16P	RES, CBN 1/6P 10K
583	C120	5361-151KSL	CAP, CER 150p	633	R104	5232-104J16P	RES, CBN 1/6P 100K
577	C121	5361-473ZF	CAP, CER .047 μ	611	R111	5232-102J16P	RES, CBN 1/6P 1K
557	C122	5345-105F041	CAP, MINI ELE 1 μ /50V	620	R112	5135-183522	RES, CBN 1/2P 18K
556	C123	5345-106C041	CAP, MINI ELE 10 μ /16V	644	R114	5135-822522	RES, CBN 1/

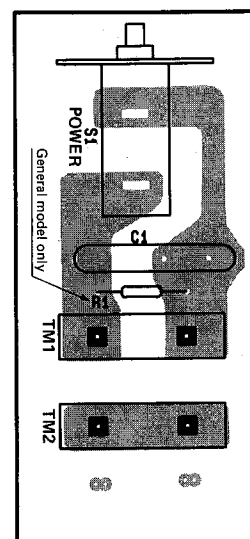
P.C. BOARDS (2)

PCB-2 Front P. C. Board



PCB-3

Power Switch P. C. Board



ELECTRICAL PARTS LIST

Ser. No. Ref. No. Part No. Description

PCB-1 MAIN P.C. BOARD

CAPACITORS

571	C2	5354-104593	CAP, MYL .1 μ
571	C3	5354-104593	CAP, MYL .1 μ
544	C4	5345-478C0351	CAP, MINI ELE 4700 μ /16V
544	C5	5345-478C0351	CAP, MINI ELE 4700 μ /16V
549	C6	5345-227A041	CAP, MINI ELE 220 μ /6.3V
549	C7	5345-227A041	CAP, MINI ELE 220 μ /6.3V
545	C8	5345-477A041	CAP, MINI ELE 470 μ /6.3V
545	C9	5345-477A041	CAP, MINI ELE 470 μ /6.3V
548	C10	5345-227C041	CAP, MINI ELE 220 μ /16V
546	C11	5345-227D041	CAP, MINI ELE 220 μ /25V
547	C12	5345-227C041	CAP, MINI ELE 220 μ /16V
547	C13	5345-227C041	CAP, MINI ELE 220 μ /16V
548	C14	5345-227C041	CAP, MINI ELE 220 μ /16V
550	C15	5345-107E041	CAP, MINI ELE 100 μ /35V
550	C16	5345-107E041	CAP, MINI ELE 100 μ /35V
550	C17	5345-107E041	CAP, MINI ELE 100 μ /35V
565	C18	5361-223ZF	CAP, CER .022 μ
554	C51	5345-226C041	CAP, MINI ELE 22 μ /16V
556	C52	5345-106C041	CAP, MINI ELE 10 μ /16V
556	C53	5345-106C041	CAP, MINI ELE 10 μ /16V
578	C56	5361-103ZF	CAP, CER .01 μ
571	C105	5354-104593	CAP, MYL .1 μ
582	C106	5342-336C041	CAP, ELE BP 33 μ /16V
579	C110	5361-472KB	CAP, CER 4700p
572	C111	5345-684F0951	CAP, MINI ELE .68 μ /50V
564	C112	5342-226B041	CAP, ELE BP 22 μ /10V
574	C113	5354-274593	CAP, MYL .27 μ
591	C114	5359-S010J822	CAP, PPP 8200p
572	C116	5345-684F0951	CAP, MINI ELE .68 μ /50V
575	C117	5359-S010J273	CAP, PPP .027 μ
562	C118	5354-124593	CAP, MYL .12 μ
567	C119	5361-470KSL	CAP, CER 47p
583	C120	5361-151KSL	CAP, CER 150p
577	C121	5361-473ZF	CAP, CER .047 μ
557	C122	5345-105F041	CAP, MINI ELE 1 μ /50V
556	C123	5345-106C041	CAP, MINI ELE 10 μ /16V
551	C126	5345-107B041	CAP, MINI ELE 100 μ /10V
551	C127	5345-107B041	CAP, MINI ELE 100 μ /10V
561	C128	5345-107C041	CAP, MINI ELE 100 μ /16V
561	C129	5345-107C041	CAP, MINI ELE 100 μ /16V
599	C131	5361-122KB	CAP, CER 1200p
594	C133	5361-182KB	CAP, CER 1800p
577	C134	5361-473ZF	CAP, CER .047 μ
586	C203	5359-S010J182	CAP, PPP 1800p
576	C204	5359-S010J103	CAP, PPP .01 μ
585	C205	5359-S010J561	CAP, PPP 560p
573	C206	5354-334593	CAP, MYL .33 μ
566	C207	5361-300JCH	CAP, CER 30p
566	C208	5361-300JCH	CAP, CER 30p
555	C209	5345-476B041	CAP, MINI ELE 47 μ /10V
578	C210	5361-103ZF	CAP, CER .01 μ
578	C211	5361-103ZF	CAP, CER .01 μ
578	C212	5361-103ZF	CAP, CER .01 μ
580	C213	5361-152KB	CAP, CER 1500p
563	C214	5342-105F041	CAP, ELE BP 1 μ /50V
569	C215	5361-220KSL	CAP, CER 22p
552	C216	5345-227B041	CAP, MINI ELE 220 μ /10V
552	C217	5345-227B041	CAP, MINI ELE 220 μ /10V
543	C218	5345-107C041	CAP, MINI ELE 100 μ /16V
543	C219	5345-107C041	CAP, MINI ELE 100 μ /16V
581	C220	5345-336B041	CAP, MINI ELE 33 μ /10V
556	C301	5345-106C041	CAP, MINI ELE 10 μ /16V
558	C302	5345-335D041	CAP, MINI ELE 3.3 μ /25V
547	C304	5345-227C041	CAP, MINI ELE 220 μ /16V
554	C305	5345-226C041	CAP, MINI ELE 22 μ /16V
587	C306	5359-3325851	CAP, PPP 3300p
587	C307	5359-3325851	CAP, PPP 3300p
590	C308	5359-S010J223	CAP, PPP .022 μ
590	C309	5359-S010J223	CAP, PPP .022 μ
589	C310	5359-S010J152	CAP, PPP 1500p
589	C311	5359-S010J152	CAP, PPP 1500p

Ser. No. Ref. No. Part No.

588	C312	5359-S010J392
588	C313	5359-S010J392
584	C314	5359-2215851
584	C315	5359-2215851
553	C316	5345-476C0951
553	C317	5345-476C0951
561	C318	5345-107C041
561	C319	5345-107C041
557	C401	5345-105F041

RESISTORS

600	Δ R2	5102-4R74715
600	Δ R3	5102-4R74715
614	R4	5232-152J16P
614	R5	5232-152J16P
610	R6	5232-471J16P
610	R7	5232-471J16P
606	R8	5232-101J16P
606	R9	5232-101J16P
601	Δ R10	5102-1004715
617	R11	5232-332J16P
610	R12	5232-471J16P
606	R13	5232-101J16P
603	Δ R14	5102-1514715
614	R51	5232-152J16P
637	R52	5232-564J16P
633	R53	5232-104J16P
614	R54	5232-152J16P
649	R55	5135-154522
615	R56	5232-182J16P
615	R57	5232-182J16P
622	R58	5232-103J16P
634	R59	5232-274J16P
633	R60	5232-104J16P
622	R61	5232-103J16P
633	R104	5232-104J16P
611	R111	5232-102J16P
620	R112	5135-183522
644	R114	5135-822522
605	R115	5232-470J16P
657	R116	5232-562J16P
629	R117	5232-473J16P
615	R118	5232-182J16P
632	R120	5232-823J16P
614	R121	5232-152J16P
629	R123	5232-473J16P
643	R124	5232-183J16P
624	R125	5232-153J16P
624	R126	5232-153J16P
623	R127	5232-123J16P
629	R128	5232-473J16P
630	R129	5232-563J16P
611	R130	5232-102J16P
611	R131	5232-102J16P
626	R132	5232-273J16P
627	R133	5232-333J16P
628	R134	5232-153J16P
629	R135	5232-473J16P
623	R136	5232-123J16P
622	R137	5232-223J16P
605	R138	5232-470J16P
640	R139	5135-470522
605	R140	5232-470J16P
611	R141	5232-102J16P
600	Δ R142	5102-4R74715
600	Δ R143	5102-4R74715
625	R148	5232-822J16P
641	R149	5232-335J16P
641	R150	5232-335J16P
622	R151	5232-103J16P
619	R152	5232-102J16P
618	R153	5232-472J16P
634	R154	5232-274J16P
629	R155	5232-223J16P
636	R156	5232-223J16P

Description

CAP, PPP	3900p
CAP, PPP	3900p
CAP, PPP	220p
CAP, PPP	220p
CAP, MINI ELE	47 μ /16V
CAP, MINI ELE	47 μ /16V
CAP, MINI ELE	100 μ /16V
CAP, MINI ELE	100 μ /16V
CAP, MINI ELE	1 μ /50V
RES, FUSE	4.7
RES, FUSE	4.7
RES, CBN	1/6P 1.5K
RES, CBN	1/6P 1.5K
RES, CBN	1/6P 470
RES, CBN	1/6P 470
RES, CBN	1/6P 100
RES, CBN	1/6P 100
RES, FUSE	10
RES, CBN	1/6P 3.3K
RES, CBN	1/6P 470
RES, CBN	1/6P 100
RES, FUSE	150
RES, CBN	1/6P 1.5K
RES, CBN	1/6P 560K
RES, CBN	1/6P 100K
RES, CBN	1/6P 1.5K
RES, CBN	1/2P 150K
RES, CBN	1/6P 1.8K
RES, CBN	1/6P 1.8K
RES, CBN	1/6P 10K
RES, CBN	1/6P 270K
RES, CBN	1/6P 100K
RES, CBN	1/6P 10K
RES, CBN	1/6P 100K
RES, CBN	1/6P 1K
RES, CBN	1/2P 18K
RES, CBN	1/2P 8.2K
RES, CBN	1/6P 47
RES, CBN	1/6P 5.6K
RES, CBN	1/6P 47K
RES, CBN	1/6P 1.8K
RES, CBN	1/6P 82K
RES, CBN	1/6P 1.5K
RES, CBN	1/6P 47K
RES, CBN	1/6P 18K
RES, CBN	1/6P 15K
RES, CBN	1/6P 15K
RES, CBN	1/6P 12K
RES, CBN	1/6P 47K
RES, CBN	1/6P 56K
RES, CBN	1/6P 1K
RES, CBN	1/6P 1K
RES, CBN	1/6P 27K
RES, CBN	1/6P 33K
RES, CBN	1/6P 15K
RES, CBN	1/6P 47K
RES, CBN	1/6P 12K
RES, CBN	1/6P 22K
RES, CBN	1/6P 47
RES, CBN	1/2P 47
RES, CBN	1/6P 47
RES, CBN	1/6P 1K
RES, FUSE	4.7
RES, FUSE	4.7
RES, CBN	1/6P 8.2K
RES, CBN	1/6P 3.3M
RES, CBN	1/6P 3.3M
RES, CBN	1/6P 10K
RES, CBN	1/6P 1K
RES, CBN	1/6P 4.7K
RES, CBN	1/6P 270K
RES, CBN	1/6P 22K
RES, CBN	1/6P 22K

Ser. No.	Ref. No.	Part No.	Description	Ser. No.	Ref. No.	Part No.	Description
598	R157	5232-332J16P	RES, CBN 1/6P 3.3K	511	IC203	5653-BA715	IC, LINEAR
708	R158	5232-225J16P	RES, CBN 1/6P 2.2M	505	IC301	5654-YM3020	IC, DIGITAL
627	R204	5232-333J16P	RES, CBN 1/6P 33K	509	IC302	5653-NU4560SB	IC, LINEAR
639	R205	5232-124J16P	RES, CBN 1/6P 120K	TRANSISTORS			
607	R207	5232-392J16P	RES, CBN 1/6P 3.9K	520	Q1	5614-667 (C)	XISTOR, NPN A
648	R209	5135-823522	RES, CBN 1/2P 82K	514	Q2	5612-1375	XISTOR, PNP A
648	R210	5135-823522	RES, CBN 1/2P 82K	513	Q3	5611-1115 (F) or (E)	XISTOR, PNP R
637	R211	5232-564J16P	RES, CBN 1/6P 560K	519	Q4	5613-2603 (F) or (E)	XISTOR, NPN R
637	R212	5232-564J16P	RES, CBN 1/6P 560K	515	Q5	5612-647 (C)	XISTOR, PNP A
630	R213	5232-563J16P	RES, CBN 1/6P 56K	519	Q6	5613-2603 (F) or (E)	XISTOR, NPN R
631	R214	5232-683J16P	RES, CBN 1/6P 68K	513	Q51	5611-1115 (F) or (E)	XISTOR, PNP R
626	R215	5232-273J16P	RES, CBN 1/6P 27K	522	Q52	5613-2878 (B)	XISTOR, NPN R
623	R216	5232-123J16P	RES, CBN 1/6P 12K	522	Q53	5613-2878 (B)	XISTOR, NPN R
604	R217	5232-2R2J16P	RES, CBN 1/6P 2.2	513	Q54	5611-1115 (F) or (E)	XISTOR, PNP R
605	R218	5232-470J16P	RES, CBN 1/6P 47	521	Q55	5613-RN1202	XISTOR, NPN R
647	R219	5135-104522	RES, CBN 1/2P 100K	530	Q101	5611-1115 (F)	XISTOR, PNP R
647	R220	5135-104522	RES, CBN 1/2P 100K	525	Q102	5613-RN1203	XISTOR, NPN R
639	R221	5232-124J16P	RES, CBN 1/6P 120K	524	Q201	5614-667 (C)	XISTOR, NPN A
639	R222	5232-124J16P	RES, CBN 1/6P 120K	518	Q202	5612-647 (C)	XISTOR, PNP A
640	R223	5135-470522	RES, CBN 1/2P 47	524	Q203	5614-667 (C)	XISTOR, NPN A
602	△R224	5102-1014715	RES, FUSE 100	518	Q204	5612-647 (C)	XISTOR, PNP A
602	△R225	5102-1014715	RES, FUSE 100	521	Q205	5613-RN1202	XISTOR, NPN R
627	R226	5232-333J16P	RES, CBN 1/6P 33K	703	Q206	5613-RN1203	XISTOR, NPN R
643	R227	5232-183J16P	RES, CBN 1/6P 18K	704	Q207	5613-RN1203	XISTOR, NPN R
643	R228	5232-183J16P	RES, CBN 1/6P 18K	519	Q301	5613-2603 (F) or (E)	XISTOR, NPN R
706	R229	5232-183J16P	RES, CBN 1/6P 18K	519	Q302	5613-2603 (F) or (E)	XISTOR, NPN R
707	R230	5232-183J16P	RES, CBN 1/6P 18K	526	Q303	5616-2SK246 (Y)	FET, N-CH
646	R231	5135-471522	RES, CBN 1/2P 470	526	Q304	5616-2SK246 (Y)	FET, N-CH
650	R232	5135-102522	RES, CBN 1/2P 1K	513	Q305	5611-1115 (F) or (E)	XISTOR, PNP R
609	R301	5232-181J16P	RES, CBN 1/6P 180	513	Q306	5611-1115 (F) or (E)	XISTOR, PNP R
610	R302	5232-471J16P	RES, CBN 1/6P 470	527	Q307	5616-SK246GR1	FET, N-CH
610	R303	5232-471J16P	RES, CBN 1/6P 470	527	Q308	5616-SK246GR1	FET, N-CH
608	R304	5232-221J16P	RES, CBN 1/6P 220	522	Q309	5613-2878 (B)	XISTOR, NPN R
608	R305	5232-221J16P	RES, CBN 1/6P 220	522	Q310	5613-2878 (B)	XISTOR, NPN R
606	R306	5232-101J16P	RES, CBN 1/6P 100	521	Q311	5613-RN1202	XISTOR, NPN R
606	R307	5232-101J16P	RES, CBN 1/6P 100	513	Q312	5611-1115 (F) or (E)	XISTOR, PNP R
612	R308	5232-122J16P	RES, CBN 1/6P 1.2K	521	Q401	5613-RN1202	XISTOR, NPN R
612	R309	5232-122J16P	RES, CBN 1/6P 1.2K	DIODES			
621	R310	5232-391J16P	RES, CBN 1/6P 390	531	△D1	5632-S5566B	DIODE, RECT
621	R311	5232-391J16P	RES, CBN 1/6P 390	531	△D2	5632-S5566B	DIODE, RECT
638	R312	5232-105J16P	RES, CBN 1/6P 1M	531	△D3	5632-S5566B	DIODE, RECT
638	R313	5232-105J16P	RES, CBN 1/6P 1M	531	△D4	5632-S5566B	DIODE, RECT
616	R314	5232-222J16P	RES, CBN 1/6P 2.2K	540	D5	5635-HZ6B1L	DIODE, ZENER
616	R315	5232-222J16P	RES, CBN 1/6P 2.2K	540	D6	5635-HZ6B1L	DIODE, ZENER
618	R316	5232-472J16P	RES, CBN 1/6P 4.7K	531	△D7	5632-S5566B	DIODE, RECT
618	R317	5232-472J16P	RES, CBN 1/6P 4.7K	531	△D8	5632-S5566B	DIODE, RECT
618	R318	5232-472J16P	RES, CBN 1/6P 4.7K	539	D9	5635-HZ12B3L	DIODE, ZENER
618	R319	5232-472J16P	RES, CBN 1/6P 4.7K	531	△D11	5632-S5566B	DIODE, RECT
613	R320	5232-331J16P	RES, CBN 1/6P 330	531	△D12	5632-S5566B	DIODE, RECT
613	R321	5232-331J16P	RES, CBN 1/6P 330	531	△D13	5632-S5566B	DIODE, RECT
608	R322	5232-221J16P	RES, CBN 1/6P 220	537	D14	5635-HZ27-2	DIODE, ZENER
608	R323	5232-221J16P	RES, CBN 1/6P 220	538	D15	5635-HZ5B-2	DIODE, ZENER
606	R324	5232-101J16P	RES, CBN 1/6P 100	531	△D51	5632-S5566B	DIODE, RECT
606	R325	5232-101J16P	RES, CBN 1/6P 100	531	△D52	5632-S5566B	DIODE, RECT
608	R326	5232-221J16P	RES, CBN 1/6P 220	533	D53	5631-1SS133	DIODE, DET
608	R327	5232-221J16P	RES, CBN 1/6P 220	541	D54	5635-HZ6A1L	DIODE, ZENER
622	R328	5232-103J16P	RES, CBN 1/6P 10K	533	D55	5631-1SS133	DIODE, DET
622	R329	5232-103J16P	RES, CBN 1/6P 10K	533	D56	5631-1SS133	DIODE, DET
606	R330	5232-101J16P	RES, CBN 1/6P 100	533	D57	5631-1SS133	DIODE, DET
606	R331	5232-101J16P	RES, CBN 1/6P 100	533	D59	5631-1SS133	DIODE, DET
618	R334	5232-472J16P	RES, CBN 1/6P 4.7K	533	D101	5631-1SS133	DIODE, DET
618	R335	5232-472J16P	RES, CBN 1/6P 4.7K	536	D102	5631-1S2473	DIODE, DET
635	R336	5232-154J16P	RES, CBN 1/6P 150K	542	D201	5635-HZ9A1L	DIODE, ZENER
632	R337	5232-823J16P	RES, CBN 1/6P 82K	542	D202	5635-HZ9A1L	DIODE, ZENER
627	R338	5232-333J16P	RES, CBN 1/6P 33K	CONTROLS			
642	R401	5135-103522	RES, CBN 1/2P 10K	595	VR301	5101-20101937	RES, SEMI FIX 200
606	R402	5232-101J16P	RES, CBN 1/6P 100	595	VR302	5101-20101937	RES, SEMI FIX 200
645	R403	5135-473522	RES, CBN 1/2P 47K	MISCELLANEOUS			
629	R404	5232-473J16P	RES, CBN 1/6P 47K	664	J1	4482-0131	PIN JACK, 2P
INTEGRATED CIRCUITS				528	X201	5691-00846731	XTAL, OSC
502	IC102	5654-M51564P	IC, DIGITAL	672	CN101	4443-0501102	CONNECTOR
508	IC103	5653-STA341M	IC, LINEAR	671	CN102	4443-0601140	CONNECTOR
503	IC201	5654-M50422P	IC, DIGITAL	671	CN103	4443-0601140	CONNECTOR
504	IC202	5654-M5M4416P	IC, DIGITAL				

Ser. No.	Ref. No.	Part No.	Description
670	CN104	4443-0401140	CONNECTOR
669	CN105	4443-0301102	CONNECTOR
687	TM3	4214-11031	TERMINAL
687	TM4	4214-11031	TERMINAL
686	TP1	4214-132	TERMINAL
686	TP101	4214-132	TERMINAL
686	TP102	4214-132	TERMINAL
686	TP103	4214-132	TERMINAL
686	TP104	4214-132	TERMINAL
686	TP105	4214-132	TERMINAL
686	TP106	4214-132	TERMINAL
686	TP107	4214-132	TERMINAL
686	TP108	4214-132	TERMINAL
686	TP109	4214-132	TERMINAL
686	TP401	4214-132	TERMINAL
686	TP402	4214-132	TERMINAL

Ser. No.	Ref. No.	Part No.	Description
660	S403	4431-A017240	SWITCH, PUSH
660	S404	4431-A017240	SWITCH, PUSH
660	S405	4431-A017240	SWITCH, PUSH
660	S406	4431-A017240	SWITCH, PUSH
660	S407	4431-A017240	SWITCH, PUSH
661	S408	4431-A010196	SWITCH, PUSH
661	S409	4431-A010196	SWITCH, PUSH
661	S410	4431-A010196	SWITCH, PUSH
529	X402	5693-CSB400P	OSC, CER
658	FL401	5722-26	TUBE DISPLAY
680	JL101	4242-R0105181	JUMPER LEAD
680	JL102	4242-R0105181	JUMPER LEAD
680	JL103	4242-R0105181	JUMPER LEAD
681	JL104	4242-R0104181	JUMPER LEAD
679	JL105	4242-R0107181	JUMPER LEAD
663	RU401	6143-00301	RECEIVE UNIT

PCB-2 FRONT P.C. BOARD

CAPACITORS			
559	C402	5345-226A0961	CAP, MINI ELE 22 μ /6.3V
560	C403	5345-226E0961	CAP, MINI ELE 22 μ /35V
592	C404	5361-103ZF	CAP, CER .01 μ
570	C405	5361-102KB	CAP, CER 1000p
711	C406	5361-101JCH	CAP, CER 100p
711	C407	5361-101JCH	CAP, CER 100p

RESISTORS			
652	R405	5232-103J16P	RES, CBN 1/6P 10K
652	R406	5232-103J16P	RES, CBN 1/6P 10K
652	R407	5232-103J16P	RES, CBN 1/6P 10K
652	R408	5232-103J16P	RES, CBN 1/6P 10K
652	R409	5232-103J16P	RES, CBN 1/6P 10K
652	R410	5232-103J16P	RES, CBN 1/6P 10K
654	R411	5135-103522	RES, CBN 1/2P 10K
654	R412	5135-103522	RES, CBN 1/2P 10K
654	R413	5135-103522	RES, CBN 1/2P 10K
652	R414	5232-103J16P	RES, CBN 1/6P 10K
651	R415	5232-101J16P	RES, CBN 1/6P 100
651	R416	5232-101J16P	RES, CBN 1/6P 100
651	R417	5232-101J16P	RES, CBN 1/6P 100
651	R418	5232-101J16P	RES, CBN 1/6P 100
655	R421	5135-473522	RES, CBN 1/2P 47K
655	R422	5135-473522	RES, CBN 1/2P 47K
655	R423	5135-473522	RES, CBN 1/2P 47K
652	R424	5232-103J16P	RES, CBN 1/6P 10K
654	R425	5135-103522	RES, CBN 1/2P 10K
652	R426	5232-103J16P	RES, CBN 1/6P 10K
652	R427	5232-103J16P	RES, CBN 1/6P 10K
656	R428	5232-473J16P	RES, CBN 1/6P 47K
652	R429	5232-103J16P	RES, CBN 1/6P 10K
654	R430	5135-103522	RES, CBN 1/2P 10K
653	R431	5232-105J16P	RES, CBN 1/6P 1M

INTEGRATED CIRCUITS			
501	IC401	5654-M752-402	IC, DIGITAL
506	IC402	5654-M761-430	IC, DIGITAL

TRANSISTORS			
516	Q402	5611-RN2202	XISTOR, PNP R
516	Q403	5611-RN2202	XISTOR, PNP R
516	Q404	5611-RN2202	XISTOR, PNP R
516	Q405	5611-RN2202	XISTOR, PNP R
523	Q406	5613-RN1203	XISTOR, NPN R

DIODES			
535	D401	5631-1S2473	DIODE, DET
535	D402	5631-1S2473	DIODE, DET
535	D403	5631-1S2473	DIODE, DET
534	D404	5631-1SS133	DIODE, DET
534	D405	5631-1SS133	DIODE, DET
534	D406	5631-1SS133	DIODE, DET
535	D407	5631-1S2473	DIODE, DET

MISCELLANEOUS			
660	S401	4431-A017240	SWITCH, PUSH
660	S402	4431-A017240	SWITCH, PUSH

PCB-3 POWER SWITCH P.C. BOARD

CAPACITOR			
593	Δ C1	5352-S010M103	CAP, MTL .01 μ
RESISTORS			
042B	Δ R1	5135-335J50P	RES, CBN 1/2P 3.3M G
042C	Δ R1	5135-335J50P	RES, CBN 1/2P 3.3M GB
MISCELLANEOUS			
662	Δ S1	4433-00702	SWITCH, POWER
685	TM1	4214-11024	TERMINAL
685	TM2	4214-11024	TERMINAL

PCB-4 PICKUP DRIVE P.C. BOARD

CAPACITORS			
733	C101	5361-103ZF	CAP, CER .01 μ
734	C103	5361-101KSL	CAP, CER 100p
734	C104	5361-101KSL	CAP, CER 100p
712	C107	5361-680KSL	CAP, CER 68p
713	C108	5361-333ZF	CAP, CER .033 μ
712	C109	5361-680KSL	CAP, CER 68p
729	C124	5345-107B041	CAP, MINI ELE 100 μ /10V
729	C125	5345-107B041	CAP, MINI ELE 100 μ /10V
714	C130	5361-180JCH	CAP, CER 18p
733	C501	5361-103ZF	CAP, CER .01 μ
728	C502	5345-106C041	CAP, MINI ELE 10 μ /16V
731	C504	5361-221KSL	CAP, CER 220p
732	C505	5361-121KSL	CAP, CER 120p
729	C506	5345-107B041	CAP, MINI ELE 100 μ /10V
729	C507	5345-107B041	CAP, MINI ELE 100 μ /10V
729	C508	5345-107B041	CAP, MINI ELE 100 μ /10V

RESISTORS			
715	R101	5232-183J16P	RES, CBN 1/6P 18K
716	R102	5232-563J16P	RES, CBN 1/6P 56K
726	R103	5232-104J16P	RES, CBN 1/6P 100K
739	R105	5232-683J16P	RES, CBN 1/6P 68K
739	R109	5232-683J16P	RES, CBN 1/6P 68K
722	R110	5232-103J16P	RES, CBN 1/6P 10K
717	R145	5232-272J16P	RES, CBN 1/6P 2.7K
725	R146	5232-562J16P	RES, CBN 1/6P 5.6K
727	R501	5135-270522	RES, CBN 1/2P 27
718	R503	5232-331J16P	RES, CBN 1/6P 330
724	R504	5232-105J16P	RES, CBN 1/6P 1M
722	R505	5232-103J16P	RES, CBN 1/6P 10K
719	R506	5232-222J16P	RES, CBN 1/6P 2.2K
720	R507	5232-821J16P	RES, CBN 1/6P 820
719	R508	5232-222J16P	RES, CBN 1/6P 2.2K
726	R509	5232-104J16P	RES, CBN 1/6P 100K
721	R510	5232-332J16P	RES, CBN 1/6P 3.3K
722	R511	5232-103J16P	RES, CBN 1/6P 10K
723	R513	5135-103522	RES, CBN 1/2P 10K

INTEGRATED CIRCUIT			
507	IC101	5653-CX20109	IC, LINEAR
510	IC501	5653-M5218L	IC, LINEAR

Ser. No.	Ref. No.	Part No.	Description
TRANSISTORS			
517	Q501	5612-647 (C)	XISTOR, PNP A
512	Q502	5611-RN2202	XISTOR, PNP R
DIODES			
737	D501	5631-1SS133	DIODE, DET
CONTROLS			
597	VR101	5101-10401933	RES, SEMI FIX 100K
735	VR501	5101-50201933	RES, SEMI FIX 5K
MISCELLANEOUS			
676	CN502	4443-01301016	CONNECTOR
677	JL501	4163-01409006	CONNECTOR W/W
673	JL502	4163-01701005	CONNECTOR W/W
674	JL503	4163-01702003	CONNECTOR W/W

ABBREVIATIONS IN PARTS LIST**CAPACITORS**

CAP, MINI ELE : Electrolytic
 CAP, CER : Ceramic
 CAP, PPP : Polypropylene
 CAP, MYL : Mylar
 CAP, MCA : Mica
 CAP, MINI BP : Bipolar
 CAP, ELE BP : Electrolytic Bipolar
 470 μ : 470 μ F
 6800p : 6800pF
 .047 μ : 0.047 μ F

RESISTORS

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

TRANSISTORS

XISTOR : Transistor
 FET : Field Effect Transistor

CONTROLS

RES, SEMI FIX : Semi-fixed Resistor

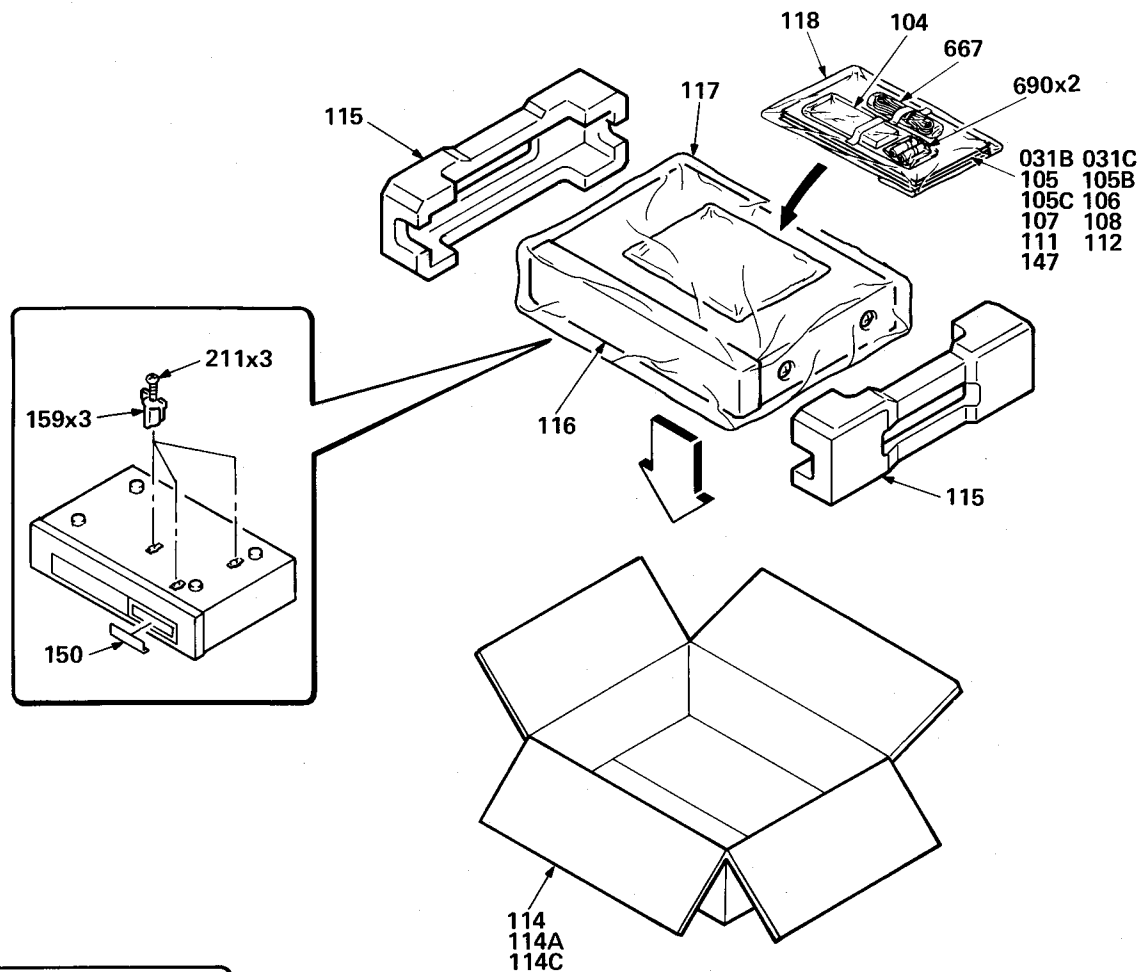
CHASSIS MISCELLANEOUS PARTS LIST

666	Δ P1	4161-01401232	CORD W/PLUG UA BK
666B	Δ P1	4161-7256	CORD W/PLUG G
666C	Δ P1	4161-7256	CORD W/PLUG GB
041B	Δ S2	4411-102729	SWITCH, ROTARY G
041C	Δ S2	4411-102729	SWITCH, ROTARY GB
683	Δ T1	5584-701548	XFORMER, POWER UA BK
683B	Δ T1	5584-702548	XFORMER, POWER G
683C	Δ T1	5584-702548	XFORMER, POWER GB
678	W-1	4162-00201800	LUG W/WIRE (W/LUG 1, LUG 2)

NOTE

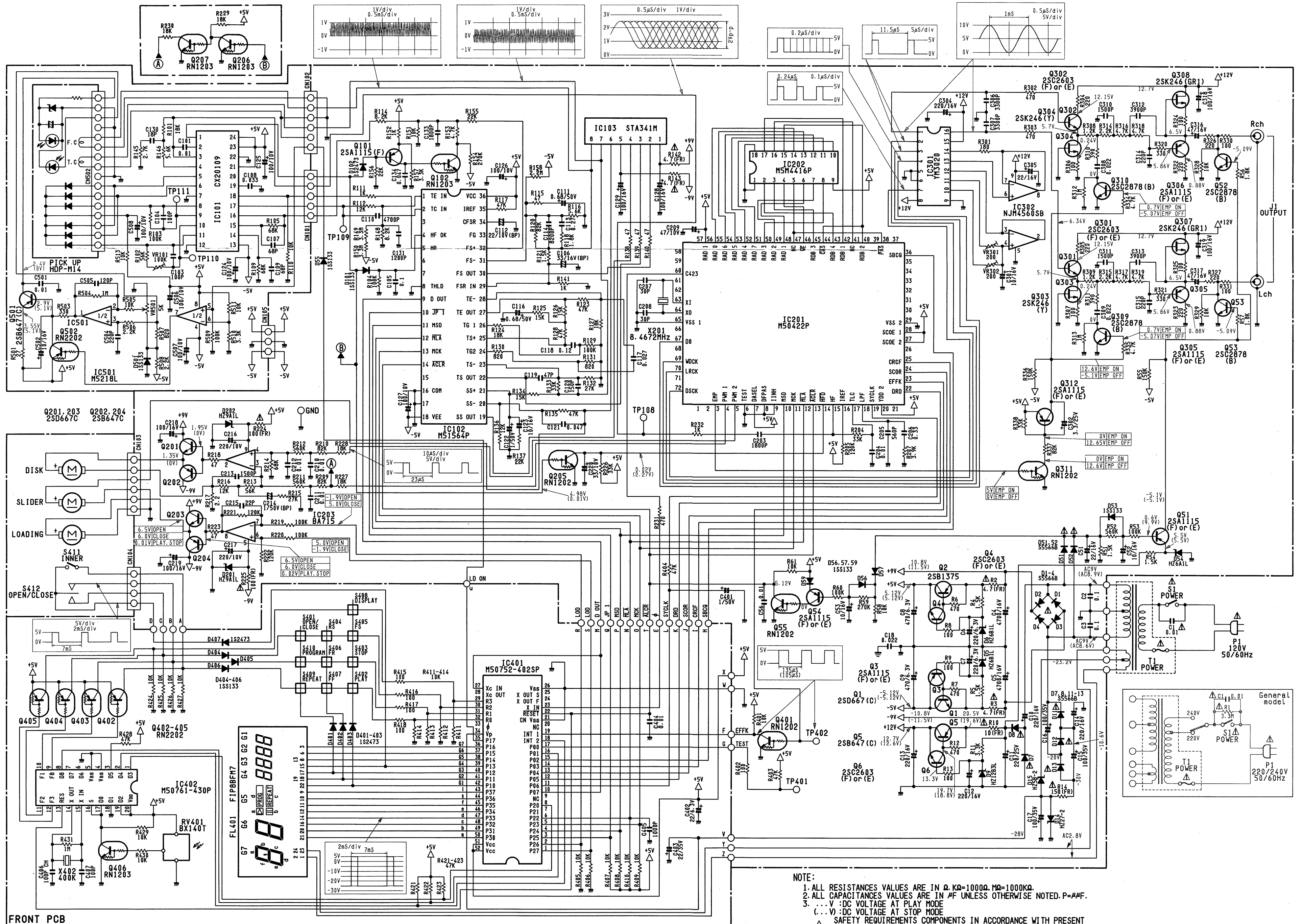
SAFETY RELATED COMPONENT. USE ONLY EXACT REPLACEMENT PART AS SPECIFIED.

PACKAGE

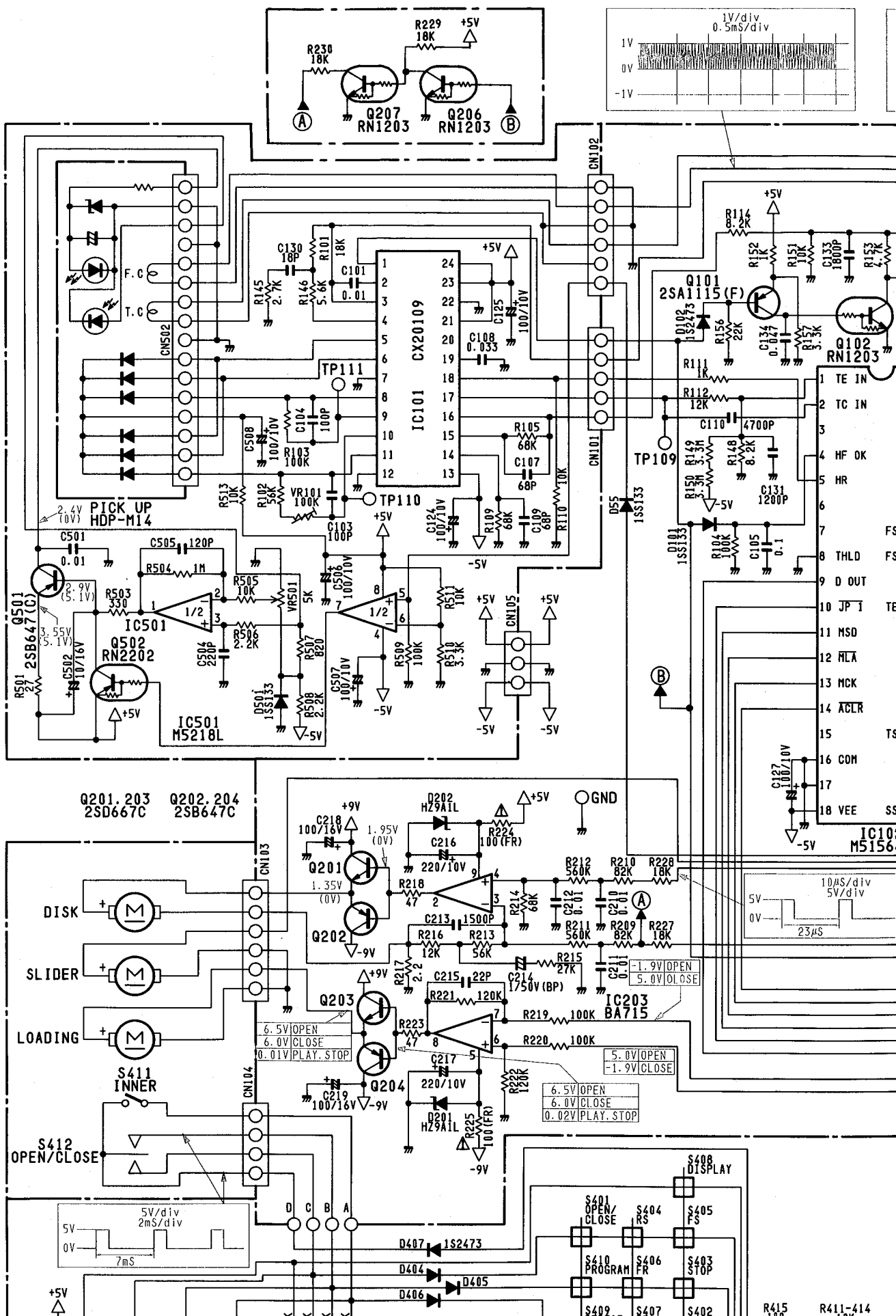


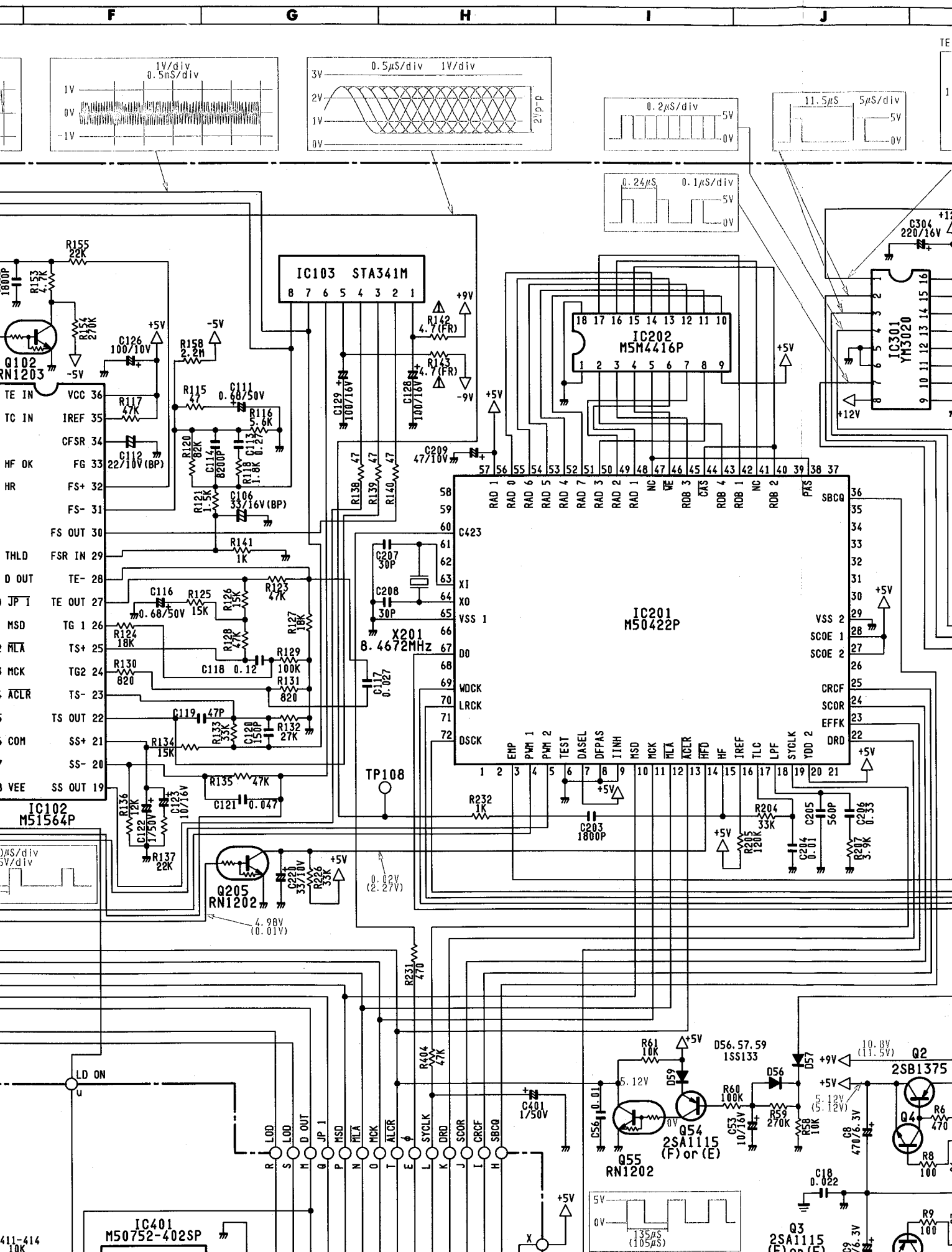
Ref. No.	Part No.	Description
022B	1756-06303	LABEL G
022C	1756-03124	LABEL GB
023C	1756-06303	LABEL GB
031B	1111-J30253	OWNER GUIDE G
031C	1111-J30253	OWNER GUIDE GB
104	6142-01102	REMOTE CONTROL UNIT
105	1111-J30285	OWNER GUIDE UA BK
105B	1111-J30286	OWNER GUIDE G
105C	1111-J30286	OWNER GUIDE GB
106	1111-J90195	UL SAFETY GUIDE UA BK
107	1113-717004	OWNER CARD UA BK
108	1111-J30254	OWNER GUIDE UA BK
111	1119-047	GUARANTY CARD UA BK
112	1119-0137	GUARANTY GUIDE UA BK
114	1221-777194	CARTON BOX UA G
114A	1221-767194	CARTON BOX BK
114C	1221-767194	CARTON BOX GB
115	1222-7306	CUSHION
116	1223-R0220055	SOFT SHEET
117	1241-R0155500	POLYETHY BAG, SET
118	1241-R0123350	POLYETHY BAG, IB
147	1756-11601	LABEL UA BK
148	1756-11701	LABEL UA BK
150	1756-12001	TRANSPORTATION CAUTION FOR LID
159	2132-7148	SPACER, TRANSPORTATION
211	2347-R0130252	SCREW BND T+, TRANSPORTATION
667	4161-71184	CORD W/PLUG, CONNECTION
690	4191-0355	BATTERY

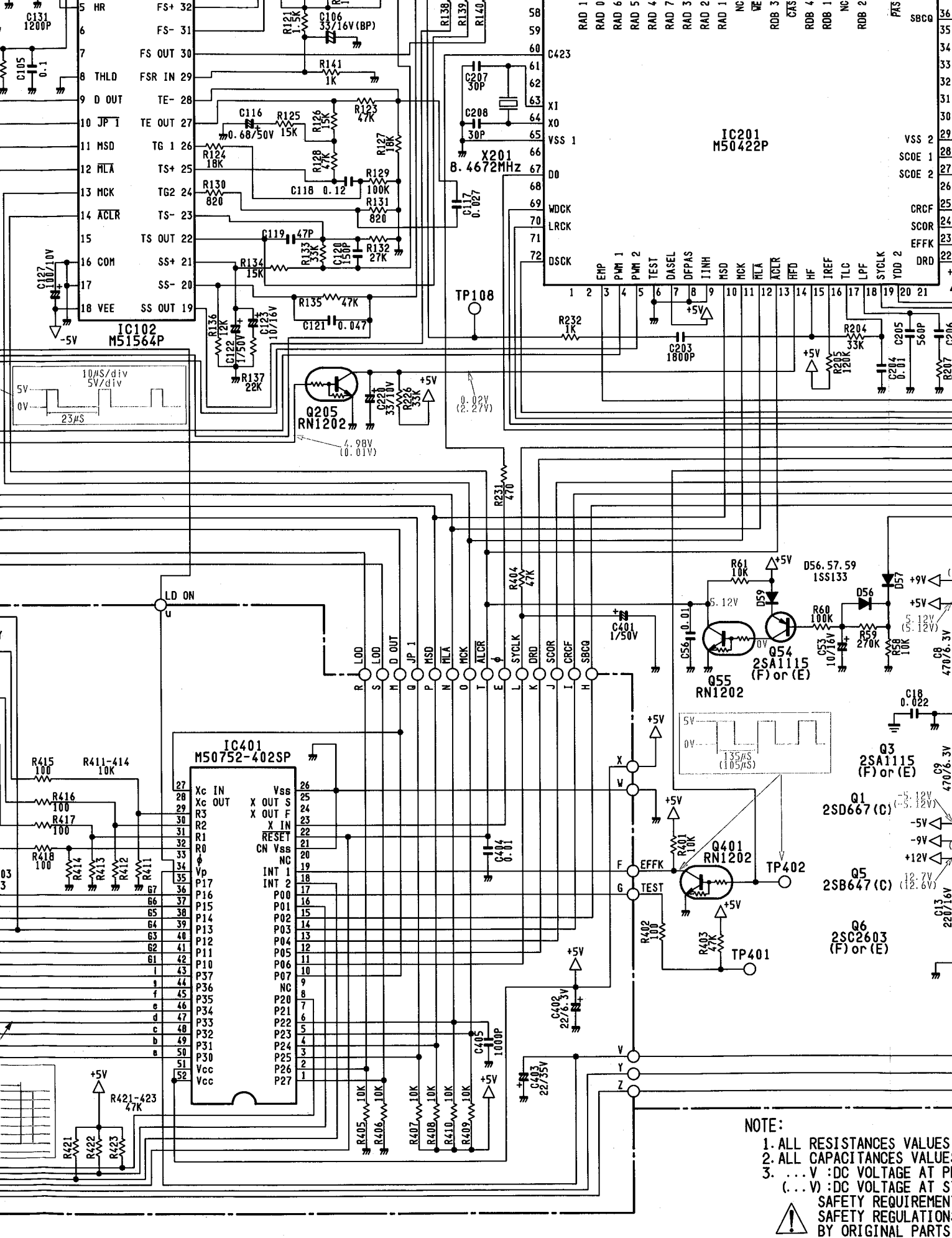
SCHEMATIC DIAGRAM

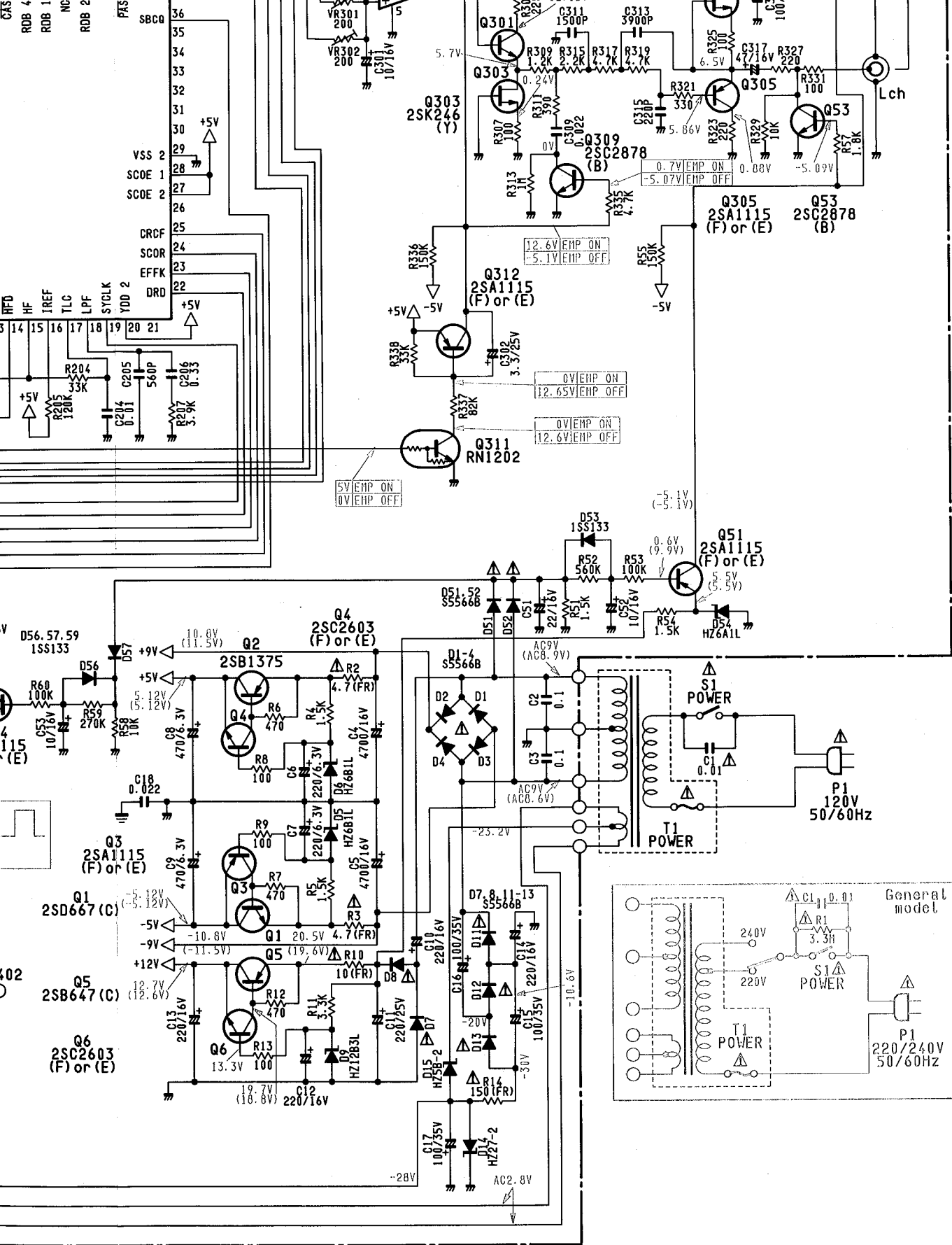


SCHEMATIC DIAGRAM









ALL RESISTANCES VALUES ARE IN Ω , K Ω =1000 Ω , M Ω =1000K Ω .
 ALL CAPACITANCES VALUES ARE IN μ F UNLESS OTHERWISE NOTED. P=#F.
 ...V :DC VOLTAGE AT PLAY MODE
 ...V) :DC VOLTAGE AT STOP MODE
 SAFETY REQUIREMENTS COMPONENTS IN ACCORDANCE WITH PRESENT
 SAFETY REGULATIONS. THESE COMPONENTS MUST ONLY BE REPLACED
 BY ORIGINAL PARTS.