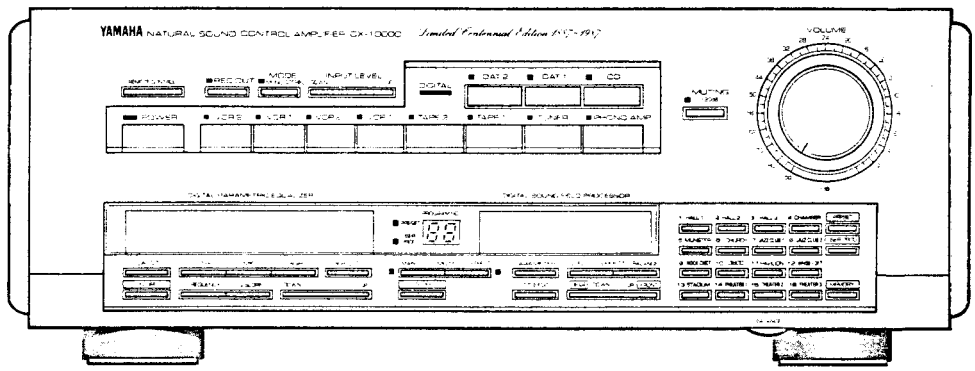
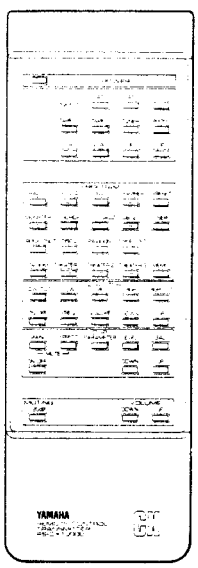
STEREO CONTROL AMPLIFIER

CX-10000

SERVICE MANUAL



- RS-CX10000



IMPORTANT NOTICE

This manual has been provided for the use of authorized Yamaha Retailers and their service personnel. It has been assumed that basic service procedures inherant to the industry, and more specifically Yamaha Products, are already known and understood by the users, and have therefore not been restated.

WARNING: Failure to follow appropriate service and safety procedures when servicing this product may result in personal injury, destruction of expensive components and failure of the product to perform as specified. For these reasons, we advise all Yamaha product owners that all service required should be performed by an authorized Yamaha Retailer or the appointed service representative.

IMPORTANT: The presentation or sale of this manual to any individual or firm does not constitute authorization, certification or recognition of any applicable technical capabilities, or establish a principle-agent relationship of any form.

The data provided is believed to be accurate and applicable to the unit(s) indicated on the cover. The research, engineering, and service departments of Yamaha are continually striving to improve Yamaha products. Modifications are, therefore, inevitable and specifications are subject to change without notice or obligation to retrofit. Should any discrepancy appear to exist, please contact the distributor's Service Division.

WARNING: Static discharges can destroy expensive components. Discharge any static electricity your body may have accumulated by grounding yourself to the ground buss in the unit (heavy gauge black wires connect to this buss).

IMPORTANT: Turn the unit OFF during disassembly and parts replacement. Recheck all work before you apply power to the unit.

CX-10000

CONTENTS

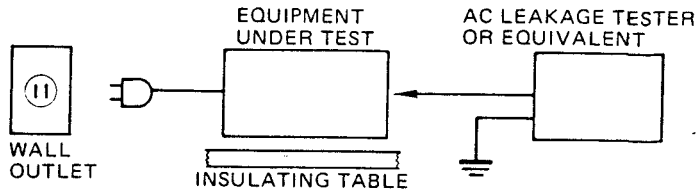
100125

SINCE 1887 YAMAHA
NIPPON GAKKI CO., LTD. HAMAMATSU, JAPAN
3.2K-077 Printed in Japan '87.6

TO SERVICE PERSONNEL

1. Critical Components Information.
   Components having special characteristics are marked ⚠ and must be replaced with parts having specifications equal to those originally installed.
2. Leakage Current Measurement (For 120V Model Only).
   When service has been completed, it is imperative that you verify that all exposed conductive surfaces are properly insulated from supply circuits.

- Meter impedance should be equivalent to 1500 ohm shunted by 0.15μF.
- Leakage current must not exceed 0.5mA.
- Be sure to test for leakage with the AC plug in both polarities.



- **POLARIZATION (U model only)**
  This amplifier product is equipped with a polarized alternating-current line plug (a plug having one blade wider than the other). This plug will fit into the power outlet only one way. This is a safety feature.

LITHIUM BATTERY

This product uses a lithium battery for memory back-up.
WARNING: Lithium batteries are dangerous because they can be exploded by improper handling. Observe the following precautions when handling or replacing lithium batteries.

- Leave lithium battery replacement to qualified service personnel.
- Always replace with batteries of the same type.
- When installing on the PC board, solder using the connection terminals provided on the battery cells. Never solder directly to the cells. Perform the soldering as quickly as possible.
- Never reverse the battery polarities when installing.
- Do not short the batteries.
- Do not attempt to recharge these batteries.
- Do not disassemble the batteries.
- Never heat batteries or throw them into fire.

English

WARNING!
Lithium batteries. Explosion danger.
Change of batteries must only be done by qualified personnel and as described in the service manual.

Swedish

LITIUMBATTERI.
Bör endast bytas av servicepersonal.
Explosionsfara vid felaktig hantering.

Danish

ADVARSEL!
Lithiumbatterier. Eksplosionsfare.
Udskiftning må kun foretages af en sagkyndig og som beskrevet i servicemanualen.

Finnish

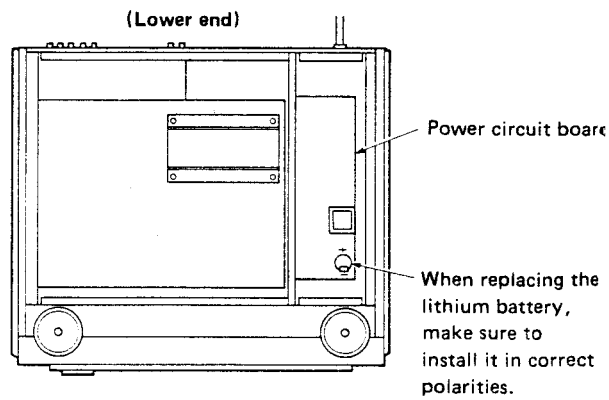
VAROITUS!
Lithiumparisto. Räjähdysvaara.
Pariston saa vaihtaa ainoastaan alan ammattimies.

• LITHIUM BATTERY REPLACEMENT

Note) Due to the danger of explosion it is only allowed to use a battery of the same type and manufacturer when it has to be shifted.

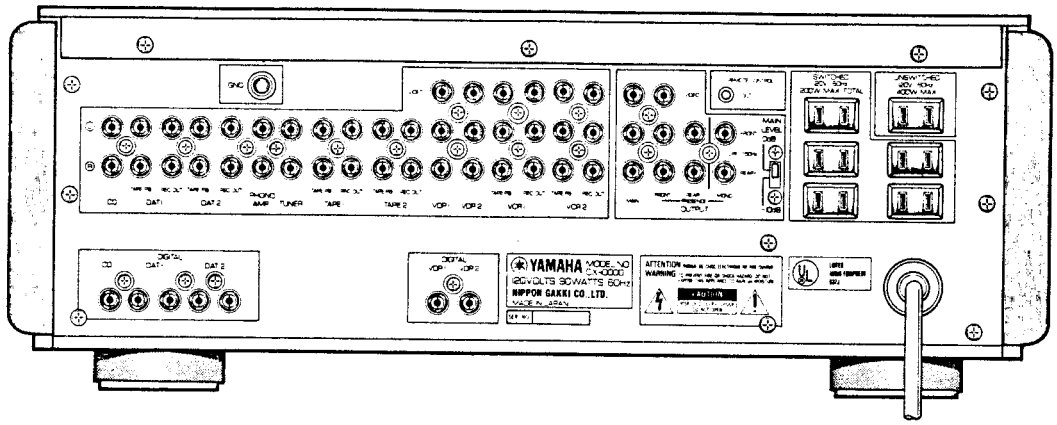
1. Remove the bottom cover according to the disassembly procedure (page 3).
2. Remove 7 screws fixing the power circuit board.
3. Unsolder the lithium battery from the pattern side of the circuit board and replace it.

* When replacing the lithium battery, be sure to carry out the procedures described under "Step 6. Maker preset" of [3 Test program] section. (If the program is not maker preset, "USER MEM. ERROR" is displayed on the DSP LCD when the power is turned ON in the normal operation.)

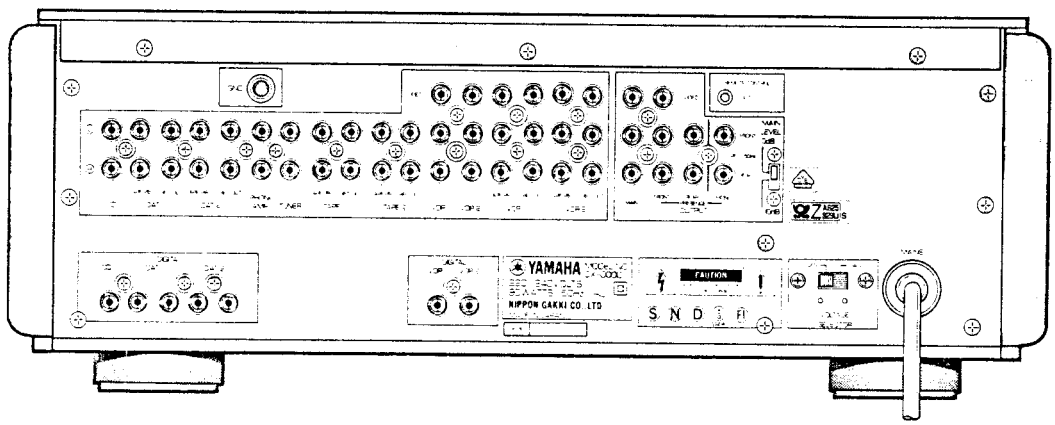


REAR PANELS

▼U model



▼G model



DISASSEMBLY PROCEDURES

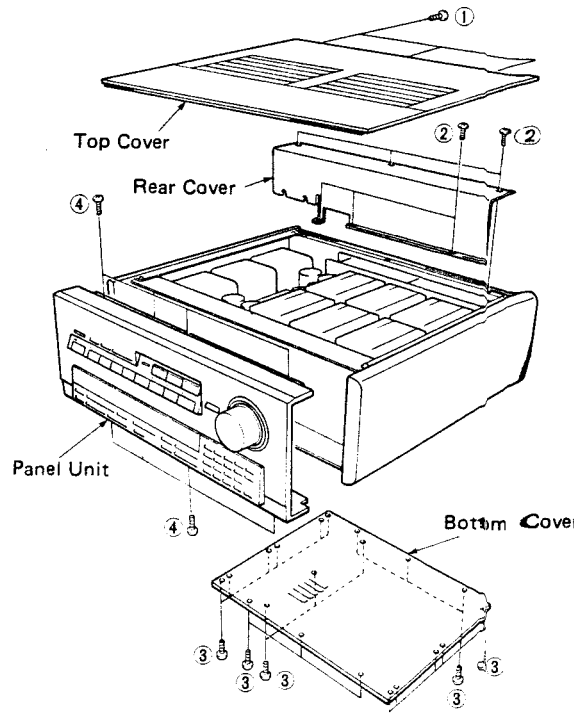
(Remove parts in disassembly order as numbered)

1. **Removal of Top Cover**
   Remove 3 screws (①).

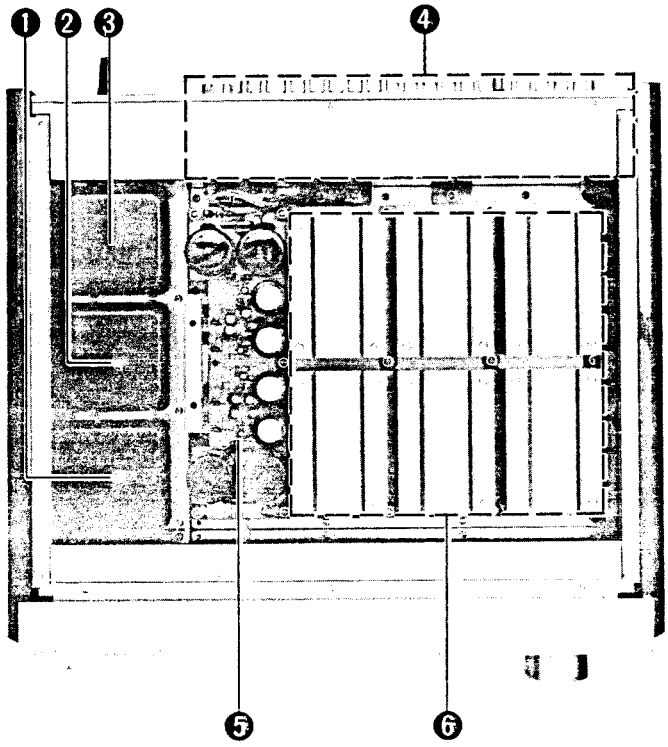
2. **Removal of Rear Cover**
   Remove 6 screws (②).

3. **Removal of Bottom Cover**
   Remove 21 screws (③).

4. **Removal of Panel Unit**
   a. Remove 6 screws (④).
   b. Remove the Panel Unit toward the front, being cautions of the connector.

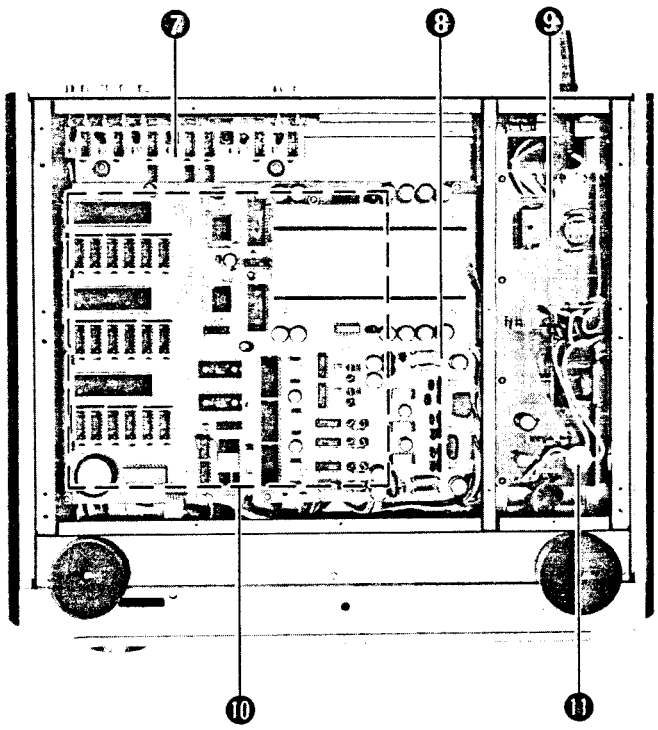


INTERNAL VIEW



Upper end

❶ Power Transformer (Analog)
U model: XC336002
G model: XC338002
❷ Power Transformer (Digital)
U model: XC341001
G model: XC343001
❸ Power Transformer (Visual)
U model: XC346001
G model: XC348001
❹ Analog PJ Circuit Board
❺ Mother Circuit Board
❻ Unit Amp Circuit Board



Lower end

❼ Digital PJ Circuit Board
❽ DSP Circuit Board
❾ Power Circuit Board
❿ Digital Circuit Board
⓫ Lithium Battery: VB750000
or
VB822400

SPECIFICATIONS

• Inputs/outputs	
Analog Inputs	
Input Jacks	11 systems, each with L and R (CD, DAT1, DAT2, PHONO AMP, TUNER, TAPE 1, TAPE 2, VDP 1, VDP 2, VCR 1, VCR 2)
Input Sensitivity/Impedance	150mV/47k-ohms
Digital Inputs	
Input Jacks	5 systems (CD, DAT 1, DAT 2, VDP1, VDP 2)
Sampling Frequencies	44.1kHz/48kHz
Input Sensitivity/Impedance	0.5Vp-p/75 ohms
Video Inputs	
Input Jacks	4 systems (VDP 1, VDP 2, VCR 1, VCR 2)
Input Sensitivity/Impedance	1 Vp-p/75 ohms
Analog REC OUT	
Output Jacks	6 systems (DAT 1, DAT 2, TAPE 1, TAPE 2, VCR 1, VCR 2)
Output Voltage/Impedance	150mV/470 ohms
Digital REC OUT	
Output Jacks	2 systems (DAT 1, DAT 2)
Output Voltage/Impedance	0.5 Vp-p/75 ohms
Video REC OUT	
Output Jacks	2 systems (VCR 1, VCR 2)
Output Voltage/Impedance	1Vp-p/75 ohms
Analog Outputs	
Output Jacks	MAIN OUTPUT L, R PRESENCE OUTPUT (FRONT L/R, REAR L/R) MONO PRESENCE OUT (LPF fc = 150Hz, FRONT, REAR)
Output Voltage/Impedance	1.5V/600 ohms (MAIN)
Video Outputs	
Output Jacks	2 systems (VIDEO OUTPUT)
Output Voltage/Impedance	1 Vp-p/75 ohms
Digital Input Priority	Digital inputs are accepted in priority to analog inputs.
• A/D Converter	
Resolution	16-bit linear
Sampling	48 kHz
• D/A Converter	
Resolution	18-bit operation (MAIN) 16-bit linear (PRESENCE)
Sampling	4-fold over sampling of 44.1kHz/48kHz
• DEQ (Digital Parametric Equalizer)	
LOW	
Center Frequency fo	20 to 500Hz, 1/6 octave steps
Variation Range	−12 to +6dB
Q	0.7/1.4/3.0/6.0
MID	
Center Frequency fo	22Hz to 18kHz, 1/6 octave steps
Variation Range	−12 to +6dB
HIGH	
Center Frequency fo	2 to 20kHz, 1/6 octave steps
Variation Range	−12 to +6dB
Q	0.7/1.4/3.0/6.0
LOW CUT	
Cutoff Frequency fc	14 to 900Hz, 1/6 octave steps
SLOPE	6db/oct, 12dB/oct, 18dB/oct
HIGH CUT	
Cutoff Frequency fc	1 to 19kHz, 1kHz steps
SLOPE	6dB/oct, 12dB/oct, 18dB/oct

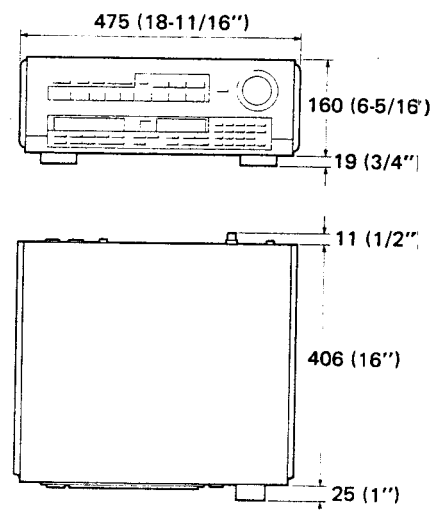
• DSP (Digital Sound-field Processor)	
Preset Programs	16 programs
User Memory	16 user programs *User memories store DEQ data together with DSP data.
• General	
Muting	−20dB
Input Level	
Variation Range	0 to −6dB, 0.1dB steps *Can be set separately for each input source.
Volume	
Gain Tracking Error	±0.2dB (0 to −60dB)
Frequency Response	
Analog Input (DEQ OFF)	15Hz to 100kHz, +0/−3dB
Digital Input (DEQ OFF)	15Hz to 20kHz, +0.5/−3dB
Total Harmonic Distortion	
Analog Input (DEQ OFF)	
−MAIN OUT (2.5V OUTPUT)	0.003% at 20Hz to 20kHz
Digital Input (DEQ OFF)	
−MAIN OUT (DIGITAL 0dB)	0.003% at 1kHz
Input Sensitivity (New IHF)	
Analog Input (DEQ OFF)	50mV
Signal-to-Noise Ratio (New IHF)	
Analog Input (Vol. −20dB, Input shorted, DEQ OFF)	89dB
Residual Noise (IHF-A-NETWORK)	5μV
Channel Separation (1kHz)	
Analog Input (Vol. −30dB, Input shorted, DEQ OFF)	90dB
Power Requirement	
U.S.A. model	AC120V, 60Hz
Europe model	AC220/240V, 50/60Hz
Power Consumption	90W
AC Outlets	
SWITCHED x 5	Total 200W max.
UNSWITCHED x 1	400W max.
Dimensions (W x H x D)	475 x 179 x 442 mm (18-11/16" x 7-1/16" x 17-3/8")
Weight	25 kg (55 lbs. 2 oz.)

Design and specifications subject to change without notice.

U · · · USA model

G · · · European model

• DIMENSIONS



Unit : mm (inch)

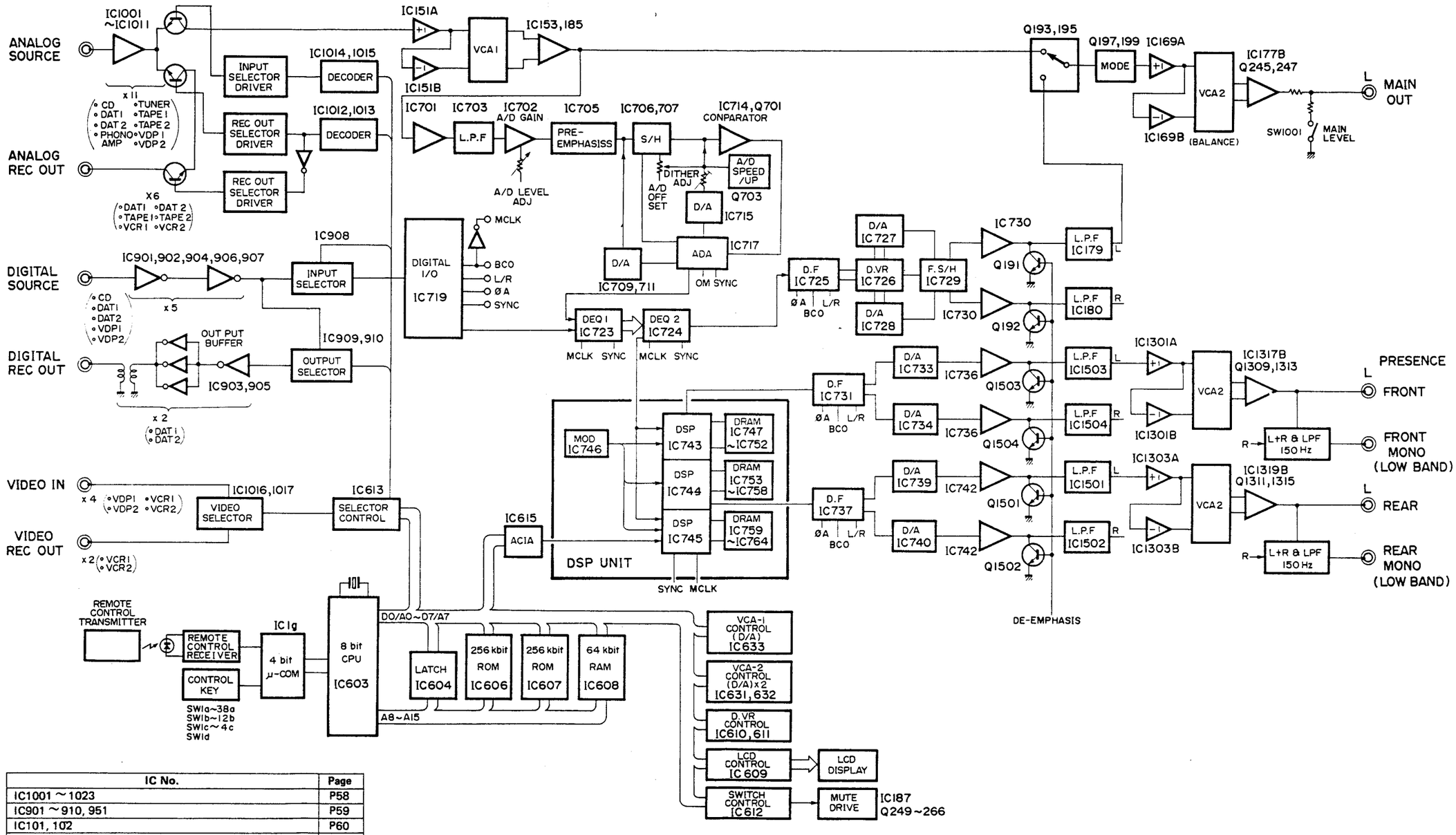
PRESET PROGRAM LIST

Program No.	Program Name	Parameters					
		1	2	3	4	5	6
1	HALL 1	TYPE A (A, B)	ROOM SIZE 1.0 (0.1 ~ 4.0)	LIVENESS 5 (0 ~ 10)	INIT DLY 30ms (5ms ~ 150ms)	HPF THRU (THRU, 32Hz ~ 1.0kHz)	LPF 7.0kHz (1.0kHz ~ 16kHz, THRU)
2	HALL 2	TYPE C (C, D)	ROOM SIZE 1.0 (0.1 ~ 4.0)	LIVENESS 5 (0 ~ 10)	INIT DLY 30ms (5ms ~ 150ms)	HPF THRU (THRU, 32Hz ~ 1.0kHz)	LPF 7.0kHz (1.0kHz ~ 16kHz, THRU)
3	HALL 3	TYPE LIVE CONCERT (LIVE CONCERT, ON STAGE)	ROOM SIZE 2.0 (0.1 ~ 4.0)	LIVENESS 5 (0 ~ 10)	INIT DLY 45ms (5ms ~ 150ms)	HPF THRU (THRU, 32Hz ~ 1.0kHz)	LPF 4.0kHz (1.0kHz ~ 16kHz, THRU)
4	CHAMBER	REV TIME 1.1s (0.3s ~ 10.0s)	HIGH 0.7 (0.1 ~ 1.0)	INIT DLY 15ms (5ms ~ 150ms)	HPF THRU (THRU, 32Hz ~ 1.0kHz)	LPF 10kHz (1.0kHz ~ 16kHz, THRU)	REV LVL 50% (0% ~ 100%)
5	Münster	REV TIME 4.0s (0.3s ~ 10.0s)	HIGH 0.8 (0.1 ~ 1.0)	INIT DLY 95ms (5ms ~ 150ms)	HPF THRU (THRU, 32Hz ~ 1.0kHz)	LPF 7.0kHz (1.0kHz ~ 16kHz, THRU)	REV LVL 100% (0% ~ 100%)
6	CHURCH	REV TIME 2.5s (0.3s ~ 10.0s)	HIGH 0.9 (0.1 ~ 1.0)	INIT DLY 40ms (5ms ~ 150ms)	HPF THRU (THRU, 32Hz ~ 1.0kHz)	LPF 8.0kHz (1.0kHz ~ 16kHz, THRU)	REV LVL 100% (0% ~ 100%)
7	JAZZ CLUB 1	TYPE LIVE (LIVE, DYNAMITE! / REVERSE, SPACIOUS)	ROOM SIZE 1.0 (0.1 ~ 4.0)	LIVENESS 5 (0 ~ 10)	INIT DLY 20ms (5ms ~ 150ms)	HPF THRU (THRU, 32Hz ~ 1.0kHz)	LPF THRU (1.0kHz ~ 16kHz, THRU)
8	JAZZ CLUB 2	TYPE LIVE (LIVE, DYNAMITE! / REVERSE, SPACIOUS)	ROOM SIZE 1.2 (0.1 ~ 4.0)	LIVENESS 7 (0 ~ 10)	INIT DLY 20ms (5ms ~ 150ms)	HPF THRU (THRU, 32Hz ~ 1.0kHz)	LPF THRU (1.0kHz ~ 16kHz, THRU)
9	ROCK CONCERT	TYPE DYNAMITE! (DYNAMITE! REVERSE / SPACIOUS, LIVE)	ROOM SIZE 4.0 (0.1 ~ 4.0)	LIVENESS 9 (0 ~ 10)	INIT DLY 15ms (5ms ~ 150ms)	HPF THRU (THRU, 32Hz ~ 1.0kHz)	LPF THRU (1.0kHz ~ 16kHz, THRU)
10	DISCO	TYPE DYNAMITE! (DYNAMITE REVERSE / SPACIOUS LIVE)	ROOM SIZE 1.0 (0.1 ~ 4.0)	LIVENESS 6 (0 ~ 10)	INIT DLY 10ms (5ms ~ 150ms)	HPF THRU (THRU, 32Hz ~ 1.0kHz)	LPF THRU (1.0kHz ~ 16kHz, THRU)
11	PAVILION	REV TIME 1.9s (0.3s ~ 10.0s)	HIGH 0.9 (0.1 ~ 1.0)	INIT DLY 5ms (5ms ~ 150ms)	HPF 56Hz (THRU, 32Hz ~ 1.0kHz)	LPF 2.5kHz (1.0kHz ~ 16kHz, THRU)	REV LVL 100% (0% ~ 100%)
12	WAREHOUSE LOFT	REV TIME 1.0s (0.3s ~ 10.0s)	HIGH 0.7 (0.1 ~ 1.0)	INIT DLY 20ms (5ms ~ 150ms)	HPF THRU (THRU, 32Hz ~ 1.0kHz)	LPF 9.0kHz (1.0kHz ~ 16kHz, THRU)	REV LVL 100% (0% ~ 100%)
13	STADIUM	TYPE SPACIOUS (SPACIOUS, LIVE, / DYNAMITE! REVERSE)	ROOM SIZE 4.0 (0.1 ~ 4.0)	LIVENESS 5 (0 ~ 10)	INIT DLY 85ms (5ms ~ 150ms)	HPF THRU (THRU, 32Hz ~ 1.0kHz)	LPF 3.6kHz (1.0kHz ~ 16kHz, THRU)
14	THEATER 1	TYPE LIVE CONCERT (LIVE CONCERT ON STAGE / HALL TYPE A, HALL TYPE B)	ROOM SIZE 1.0 (0.1 ~ 4.0)	LIVENESS 5 (0 ~ 10)	INIT DLY 30ms (5ms ~ 150ms)	HPF THRU (THRU, 32Hz ~ 1.0kHz)	LPF 5.0kHz (1.0kHz ~ 16kHz, THRU)
15	THEATER 2	TYPE LIVE (LIVE, DYNAMITE! / REVERSE, SPACIOUS)	ROOM SIZE 1.0 (0.1 ~ 4.0)	LIVENESS 5 (0 ~ 10)	INIT DLY 20ms (5ms ~ 150ms)	HPF THRU (THRU, 32Hz ~ 1.0kHz)	LPF 7.0kHz (1.0kHz ~ 16kHz, THRU)
16	THEATER 3	MOVIE TYPE A (A, B, C, D)	ROOM SIZE 1.0 (0.1 ~ 4.0)	LIVENESS 5 (0 ~ 10)	INIT DLY 20ms (5ms ~ 150ms)	HPF THRU (THRU, 32Hz ~ 1.0kHz)	LPF 7.0kHz (1.0kHz ~ 16kHz, THRU)

* In each space of the parameter section, the parameter name is given at the top, the preset value in the middle and the variable range at the bottom in the parenthesis ( ).

* If the THEATER 1, 2 or 3 accept a monaural source, effect sound does not appear.

BLOCK DIAGRAM



IC No.	Page
IC1001 ~ 1023	P58
IC901 ~ 910, 951	P59
IC101, 102	P60
IC151 ~ 168, 185, 186	P61
IC169 ~ 178, 181, 182, 1301 ~ 1324	P62
IC179, 180, 187, 1501 ~ 1504	P63
IC701 ~ 731, 733, 734, 736, 737, 739, 740, 742 ~ 764	P64
IC601 ~ 619, 621 ~ 633	P65

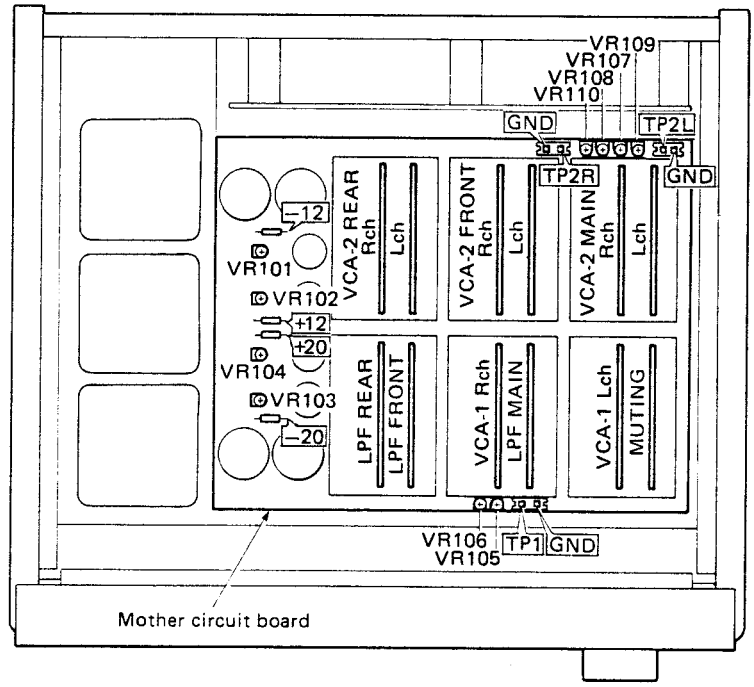
■ADJUSTMENT/TEST SPECIFICATIONS

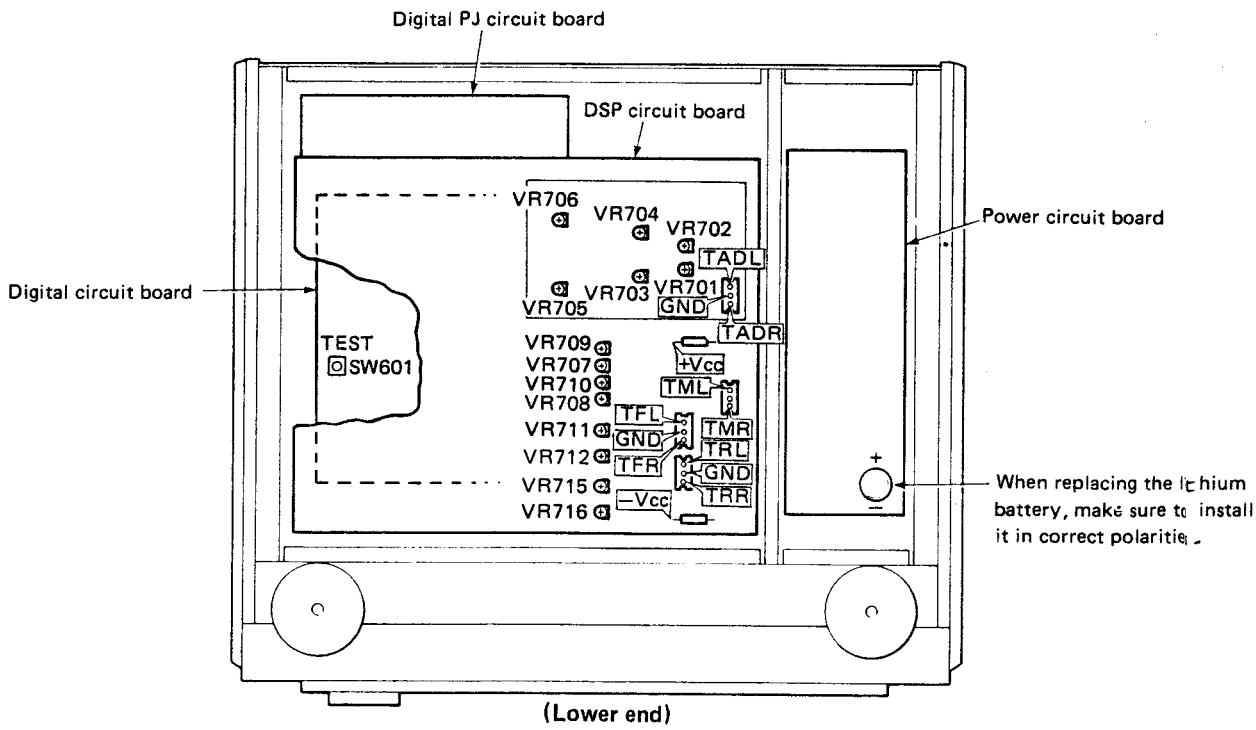
*When replacing the lithium battery, be sure to carry out the procedures described under "Step 6. Maker preset" of [3 Test program] section. (If the program is not maker preset, "USER MEM. ERROR" is displayed on the DSP LCD when the power is turned ON in the normal operation.)

- **Jigs**
  Test disc (YEDS-18 P/No. TX911730) : X1
  Extension circuit board (P/No. TX912160): 2 in a set
  (VCA-1 x 1
  VCA-2 x 1)

- **Measuring instruments**
  Audio frequency oscillator (A.F. OSC.)
  AC voltmeter (ACVM) : X1
  DC voltmeter (DCVM) : X1
  Distortion meter : X1
  Oscilloscope : X1
  Frequency counter : X1
  CD player with the digital out terminal : X1
  (CDX-1100 or equivalent)

- **Testing points**





1 Confirmation and adjustment of power voltage

Point for measurement	Point for adjustment	Specifications	Remarks
+20	VR104	+20V ± 0.3V	Mather circuit board
−20	VR103	−20V ± 0.3V	
+12	VR102	+12V ± 0.2V	
−12	VR101	−12V ± 0.2V	
+5	–	+5V ± 0.5V	Digital circuit board
−5	–	−5V ± 0.5V	
−7	–	−7V ± 0.5V	
+5S	–	+5V ± 0.5V	Power circuit board
BU	–	+5V ± 0.5V	
C957 (Positive "+" side)	–	+5V $^{+1.0}_{-0.5}$ V	
D954 (Anode side)	–	+3V $^{+0.5}_{-0}$ V	
+Vcc	–	+5V to +5.5V	DSP circuit board
−Vcc	–	−5V to −5.5V	
Q1058 (Emitter)	–	+5V ± 0.5V	Analog PJ circuit board
Q1057 (Emitter)	–	+5V ± 0.5V	

* After having adjusted the ±20V voltage, adjust the gain variation curve of VCA-1 and 2. This adjustment is also necessary when its control system part has been changed or the circuit board has been replaced.

2 Confirmation of BCO oscillation

Connect the frequency counter to the BCO terminal or MCLK terminal (IC720, 1 pin) of the DSP circuit board and measure the output.

Specification: 3.072MHz ± 3%

3 Test program

The CX-10000 has built-in test programs for checking its various functions.

- **Contents of Test Programs**

  Test program activation: DSP·MOD·DEQ control circuit (ACIA) check
  Test program 1 : LCD unit operation check
  Test program 2 : LED unit operation check
  Test program 3 : Key code reception check
  Test program 4 : A/D offset adjustment
  Test program 5 : Maker preset
  Test program 6 : DSP LCD control unit check
  Test program 7 : I/O port check
  Test program 8 : VCA adjustment
  Test program 9 to 14 : DRAM operation check

  Note that check sum of the ROM·S-RAM·RAM in CPU and read/write tests are automatically performed when the POWER switch is turned ON during normal operation.

- **Test program activation**

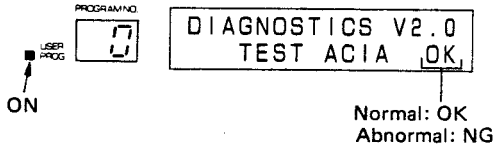
  The test program can be activated in either of the following ways, (1) and (2).

  (1) Turn ON the POWER switch while pressing the CD, DAT 1 and DAT 2 keys.
  (2) Turn ON the POWER switch while pressing the TEST switch (SW601) of the digital circuit board.

Step 1 DSP · MOD · DEQ control circuit (ACIA) check

① Activate the test program.
(The ACIA check automatically follows the test program activation.)

② Check to make sure that the DSP LCD display appears as follow.

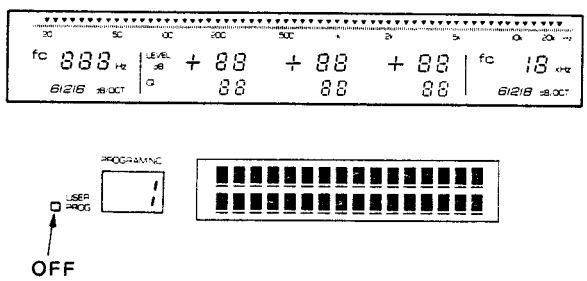


③ If "NG" is displayed, it is possible that a trouble lies somewhere in the following.

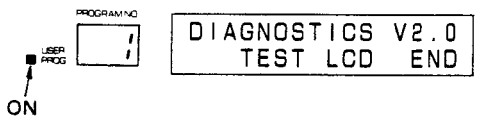
HD63B50 (ACIA)	Digital circuit board
YM3818 (DSP) YM3807 (MOD) YM3608 (DEQ)	DSP circuit board
Transfer line of each of the above [CDI, CDO, RTS, XCK, RES, #36, etc.]	

Step 2 LCD unit operation check

① Activate the test program.
② Press the program key "1". (Test program 1)
③ Check to make sure that all DEQ and DSP LCD dots turn ON as they should.



④ Press the program key "1" again.
This time, DEQ LCD should turn OFF except the frequency scale display and DSP LCD should display as follows.



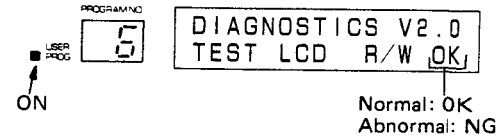
⑤ If the check result is satisfactory, proceed to Step 3.

<When defective dots are found in DEQ LCD>

It is possible that a trouble lies in the DEQ LCD unit or in the circuit connected to #48 or #49 of the digital circuit board.

<When defective dots are found in DSP LCD>

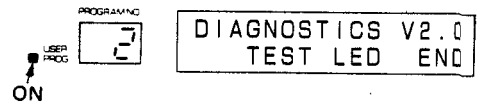
(1) Press the program key "6". (Test program 6)
(2) Check the DSP LCD display.



(3) If "OK" is displayed, it is possible that the DSP LCD unit is defective. If "NG" is displayed, it is possible that the circuit connected to #47 of the digital circuit board is defective.

Step 3 LED unit operation check

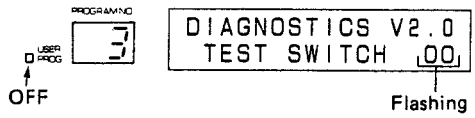
① Activate the test program.
② Press the program key "2". (Test program 2)
③ Check the LED operation in the following order.
1) "0" to "10" appear on the PROGRAM No. display in that order.
2) REC OUT (red), MODE (red) and DIGITAL (green) indicators turn ON in that order.
3) DAT2, DAT1, CD, VCR2, VCR1, VDP2, VDP1, TAPE2, TAPE1, TUNER, PHONO AMP indicators (all green) turn ON in that order.
4) DAT2, DAT1, CD, VCR2, VCR1, VDP2, VDP1, TAPE2, TAPE1, TUNER, PHONO AMP indicators (all red) turn ON in that order.
5) MUTING (red), PRESET (red), USER PROG (red), MAIN MUTE (red), EFFECT MUTE (red) indicators turn ON in that order.
6) All LED indicators turn ON. ("18" appears on the PROGRAM No. display.)
7) Upon completion of the above cycle, the DSP LCD displays as follows.



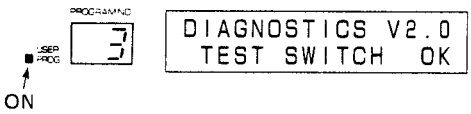
④ If the LED fails to operate as described, it is possible that a trouble lies in the LED circuit of the panel unit or somewhere, such as HD6321 (PIA) connected to #43 and #44 of the digital circuit board.

Step 4 Key code reception check

① Activate the test program.
② Press the program key "3". (Test program 3)
③ The DSP LCD displays as follows and "00" flashes.



④ In this state, press VCR1, VCR2, VDP2, PHONO AMP, REC OUT and MAIN MUTE keys in that order (the corresponding LED indicator flashes as each key is pressed), and "01", "02", "03", "04" and "05" flash respectively and "OK" is displayed in the end.

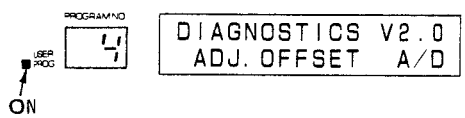


"NG" is displayed when the keys are not pressed in the proper order or when some trouble exists.

⑤ If "NG" is displayed due to any other reason than erroneously pressed key, it is possible that a trouble exists in the key scan circuit of the panel unit or somewhere, such as HD6321 (PIA) connected to #42 of the digital circuit board.

Step 5 A/D offset adjustment

① Activate the test program.
② Press the program key "4". (Test program 4)
③ Check that DSP LCD displays as follows.



Rectangular waveform is obtained as an output by amplifying the DC offset generated at the A/D converting section by means of the DSP IC or inverting its phase.

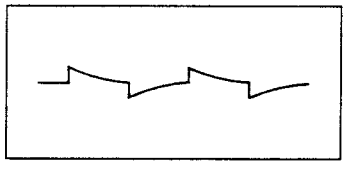
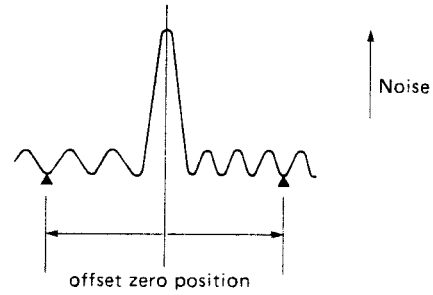


Fig. A

④ Adjust VR705 (L ch) and VR706 (R ch) so as to minimize the modulation level of the main output.
⑤ Make a final adjustment to the point where noise is minimized at about ±15° away from the above adjusted angle.

NOTE: When set to the point where offset is totally zero, it is the specific point where the S/N ratio is low due to the property of the A/D converter. Therefore, such specific point should be avoided and yet the set point should not be too far away from it and the S/N ratio should be high.
The reason for setting to the point about 15° away is to keep the noise low even when the temperature changes.

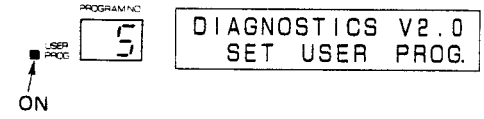


Refer to "Step 13 Dither adjustment" and make both adjustments alternately if necessary.

Step 6 Maker preset

① Activate the test program.
② Press the program key "5". (Test program 5)
③ Check that DSP LCD displays as follows.

④ Press the program key "5" again and check that DSP LCD displays as follows.



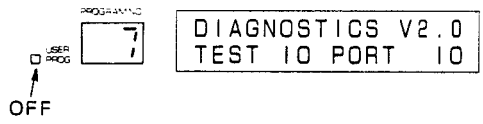
* If the USER PROGRAM is not written in or some abnormality exists in the memory back-up, the following message is displayed when the power is turned ON in normal operation.

⑤ If "NG" is displayed, it is possible that a trouble lies somewhere of the following.

Lithium battery	Power circuit board
Back-up capacitor, etc.	
Circuit connected to BU of #52	
μPD4464C-15L (SRAM), etc. . . . 3 types used jointly	Digital circuit board
Circuit connected to BU8 of #44	
Panel unit circuit connected to each of the above	

Step 7 I/O port check

① Activate the test program.
② Press the program key "7". (Test program 7)
③ Check that DSP LCD displays as follows.



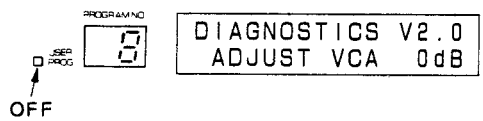
④ Check that every time the program key "7" is pressed, "I0" to "I7", "MMT", "ENT", "ST", "DEF" and "A/D" appear one after another and the corresponding terminal of the digital circuit board becomes H level (others at L level).

H level: +5V ± 0.5V
L level: 0V ± 0.5V

⑤ "END" is displayed in the end and all terminals become L level.
⑥ If "NG" is displayed, it is possible that some trouble lies in each IC of the digital circuit board connected to the "NG" indicated terminal or in the circuit to which connection is made.

Step 8 VCA adjustment

① Activate the test program.
② Press the program key "8". (Test program 8)
③ Check that DSP LCD displays as follows.



④ Check that "0dB" and "50dB" are displayed alternately every time the program key "8" is pressed. This test program adjusts the VCA-1 and 2 gain variation curve.

< VCA-1 and 2 gain variation curve adjustment >

The VCA gain control changes the DAC analog signal (electric current) of the digital circuit board into the voltage signal in the mother circuit board and thus controls the VCA unit.

* Be sure to carry out this adjustment when the control system parts (including D606 of the digital circuit board) have been changed or the circuit board (digital circuit board, mother circuit board, VCA unit) has been replaced.
Check and adjustment is also required when the ±20V voltage has been adjusted.
* As VCA-1 and 2 execute temperature compensation for the gain, the voltage at the test point varies as the time elapses (temperature rises).
Voltage variation after the adjustment is acceptable as long as it is within specification.
The specified voltage is that of the normal temperature (between 20°C and 30°C). Do not make an adjustment when the system has been warmed for hours after the power was turned ON. If adjustment is unavoidable, multiply the specified voltage by 1.1 and adjust to that voltage.

1. VCA-1

① Connect the DC voltmeter to TP1 and GND. (Mother circuit board)
② Select the test program "8" and obtain "0dB" display.
③ Adjust VR106 to obtain 0V ± 15mV.
④ Obtain "50dB" display by pressing the program key "8" again.
⑤ Adjust VR105 to obtain 3V ± 20mV.
⑥ With "50dB" displayed, adjust VR106 again to obtain 1V ± 20mV.
⑦ Obtain "0dB" display and if the voltage is −2V ± 0.1V then, the check proves satisfactory. If not, repeat above ③ to ⑦ for proper adjustment.

* The voltage variation after adjustment is acceptable.

2. VCA-2

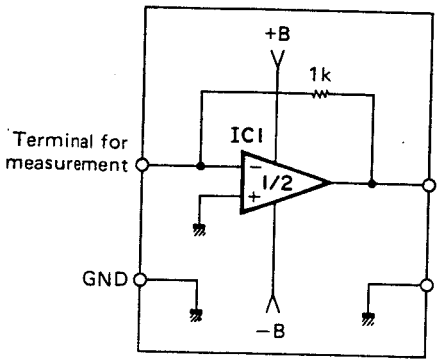
① Connect the DC voltmeter to TP2L and GND, and TP2R and GND. (Mother circuit board)
② Select the test program "8" and obtain "0dB" display.
③ Adjust VR109 (TP2L) and VR110 (TP2R) to obtain 0V ± 15mV.
④ Obtain "50dB" display by pressing the program key "8" again.
⑤ Adjust VR107 so that TP2L becomes 4.5V ±30mV.
⑥ Adjust VR108 so that TP2R becomes ± 20mV of the TP2L's voltage.
⑦ With "50dB" displayed, adjust VR109 again so that TP2L becomes 2.5V ± 30mV.
⑧ Further, adjust VR110 so that TP2R becomes ± 20mV of the TP2L's voltage.
⑨ Obtain 0dB display and if both TP2L and TP2R are −2V ± 0.1V then, the check proves satisfactory. If not, repeat above ③ to ⑨ for proper adjustment.

* The voltage variation after adjustment is acceptable.

3. VC1, VC2L, VC2R operation check (Reference)

Have the following adjusting tool (buffer amplifier) ready for this check.

IC1: NJM4558S (iG076800) or its equivalent



*Note that the buffer amplifier is used only for this check. It must be disconnected otherwise.

① Connect the adjusting tool to each of VC1, VC2L and VC2R connectors of #3 (but not to the connector from the mother circuit board).
② Activate the test program.
③ Press the program key "8". (Test program 8)
④ Check to make sure that the output voltage is as given below.

Terminal / Indication	VC1	VC2L	VC2R
0dB	2V ±0.2V	2V ±0.2V	2V ±0.2V
50dB	0V ±0.1V	0.85V ±0.1V	0.85V ±0.1V

⑤ If some defect is found when VCA is adjusted and if this check proves satisfactory, it is possible that the circuit connected to VC1, VC2L or VC2R on the mother circuit board is defective. If this check proves unsatisfactory, it is possible that some trouble exists in BA9201 (AD converter, current output) of the digital circuit board.

< VCA unit adjustment >

Before this adjustment, carry out the check and adjustment as described under previous "VCA-1, 2 gain variation curve adjustment".

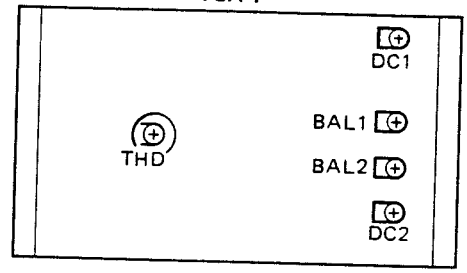
- **Circuit board**

VCA-1 R (XC402-1, 3)
VCA-1 L (XC402-2, 5)
VCA-2 REAR R (XC402-7)
VCA-2 REAR L (XC402-8)
VCA-2 FRONT R (XC402-9)
VCA-2 FRONT L (XC402-10)
VCA-2 MAIN R (XC402-11)
VCA-2 MAIN L (XC402-12)

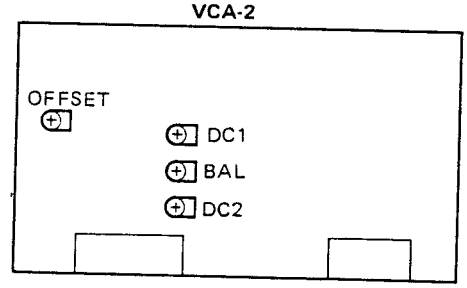
- **VR for adjustment**

	VCA−1		VCA−2					
	L	R	MAIN L	MAIN R	FRONT L	FRONT R	REAR L	REAR R
DC 1	VR151	VR152	VR155	VR156	VR1313	VR1314	VR1315	VR1316
DC 2	VR157	VR158	VR163	VR164	VR1309	VR1310	VR1311	VR1312
BAL1	VR153	VR154	—	—	—	—	—	—
BAL2	VR155	VR156	—	—	—	—	—	—
BAL	—	—	VR161	VR162	VR1305	VR1306	VR1307	VR1308
OFFSET	—	—	VR169	VR170	VR1317	VR1318	VR1319	VR1320
THD	VR167	VR168	—	—	—	—	—	—

VCA-1



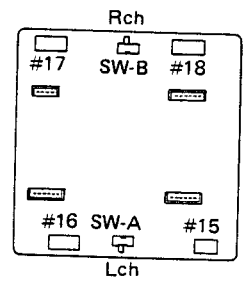
VCA-2



- **Connection**

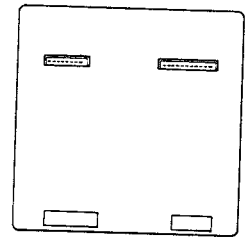
Remove the circuit board to be adjusted and connect it via the extension circuit board.

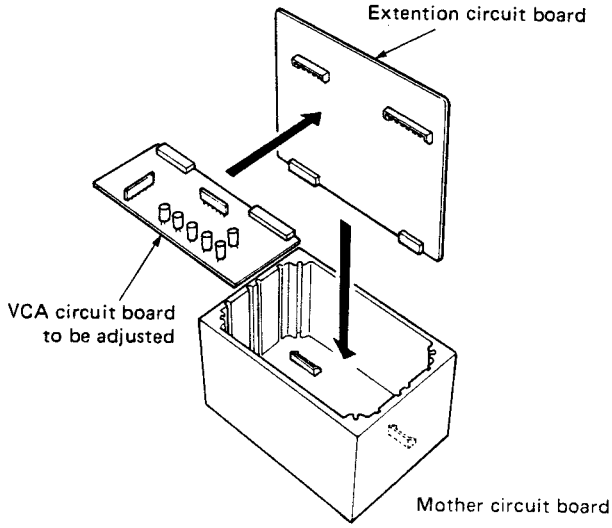
Extention circuit board VCA-1



***Use care to connect to the mother circuit board with the L and R matched correctly.**

Extention circuit board VCA-2





1. VCA-1 adjustment

*As the control voltage for VCA-1 L (XC402-2,5) comes from VCA-1 R (XC402-1, 3), start adjustment with VCA-1 R.

1-1. DC offset adjustment when gain is minimum. (DC 1)

① Set SW-A and B of the extension circuit board to −∞ position.
② Connect the DC voltmeter to 8 pin of IC154 (TP of C176). Use 8 pin of IC153 (TP of C175) for L ch.
③ Adjust VR152 (DC 1) to obtain 0V ± 10mV. Use VR151 (DC 1) for L ch.

1-2. DC offset adjustment when gain is maximum. (DC 2)

① Set SW-A and B of the extension circuit board to NORMAL position.
② Connect the DC voltmeter to 8 pin of IC154 (TP of C176).
Use 8 pin of IC153 (TP of C175) for Lch.
③ Set VOLUME to the maximum position.
④ Adjust VR158 (DC2) to obtain 0V ± 10mV. Use VR157 (DC2) for L ch.

1-3. DC balance adjustment (BAL 1, 2)

① Set SW-A and B of the extension circuit board to NORMAL position.
② Connect the oscilloscope (DC) to 8 pin of IC154 (TP of C176).
③ Select the test program "8".
④ While pressing the program key "8" repeatedly and observing the waveform at the point where the display changes between "0dB" and "50dB", adjust VR154 (BAL 1) and VR156 (BAL 2) alternately so that the DC variation is minimized (30mVp-p or less). The waveform with projections is not acceptable. Use VR153 (BAL 1) and VR155 (BAL 2) for L ch.

VCA-1 DC balance adjustment

Make this adjustment while watching the DC variation when the VCA-1 gain increases from −20dB to Max.

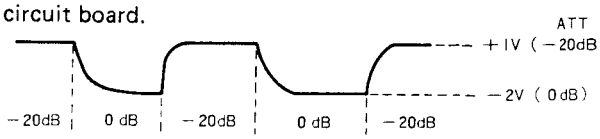
1) Oscilloscope (2-ch oscilloscope) setting

- DC connection
- CH1 to VCA-1 observation point
  5 to 100mV/DIV (Vertical)
- CH2 to mother circuit board test point 1
  0.2 to 0.5V/DIV (Vertical)
- TRIGER SOURCE: CH2
- TRIGER MODE: NORMAL
- TRIGER slope: " − "

*When there is no CH2, input should be made to EXT-TRIG. Set the horizontal axis to 10msec/DIV.

2) TRIGER setting

Every time the test program 8 is selected, the waveform as shown below appears on TP1 of the mother circuit board.

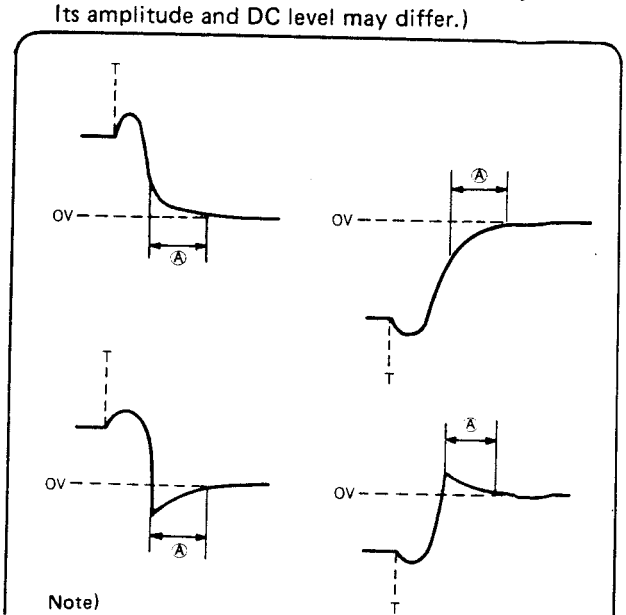


Adjust the TRIGER level so that TRIGER is applied when the gain changes from −20dB to 0dB.
(Set immediately after the waveform starts to fall so that TRIGER will not be applied during the trailing slope.)

*TRIGER should not be applied when the gain changes from 0dB to −20dB.

3) Waveform observation

Select the test program 8 and observe the waveform of CH 1. If it appears as shown below and is stable, it means that the oscilloscope has been set properly.
(It is a typical waveform obtained before adjustment. Its amplitude and DC level may differ.)

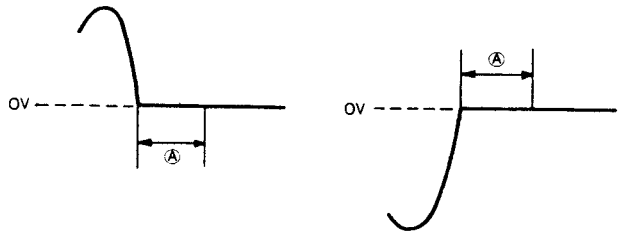


Note)
"T" indicates the point where the gain changes (when the indication changes from 50dB to 0dB in the test program).

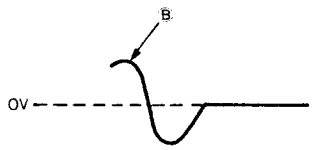
Fig. 2

4) Adjustment

4-1) Adjust VR153 and 154 (BAL 1) so that the part Ⓐ of the waveform in Fig. Z becomes flat.



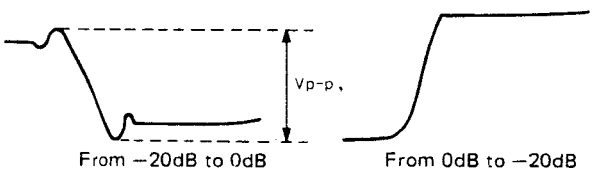
4-2) Adjust VR155 and 156 (BAL 2) so that the waveforms on the " + " and " - " sides become symmetrical.



*Note that the part Ⓑ as indicated in the above figure may be partially missing depending on the TRIGER point of the oscilloscope.

Note) In the above figure, the flat part coincides with 0V, but some deviation (±10mV) is no problem.

4-3) Set the TRIGER mode to AUTO and observe the waveform.



If the peaks at the top and the bottom of the waveform are small as shown above and the DC variation is 30mVp-p or less, it is acceptable. (The DC value at −20dB may differ from that at 0dB.)

1-4. Distortion adjustment (THD)

① Set SW-A and B of the extension circuit board to the NORMAL position.

② Apply a 1kHz, 10dB (3V) signal to the input terminal (such as CD) and adjust VOLUME so that the MAIN OUT output becomes 3V.

*Turn off DEQ.

③ Minimize the distortion (0.005% or less) by adjusting VR168 (THD). Adjust VR167 for L ch.

*The distortion is minimized by making the waveform in the monitor as level as possible.

2. VCA-2 adjustment

*VCA-2 (XC402-7 to 12) are all pin compatible. They operate even when they are exchanged, but set them in place except for checking.

*Turn off DEQ and DSP.

2-1. DC offset adjustment when gain is minimum (DC 1)

① Connect the DC voltmeter to 8 pin of IC177, 178 1317 to 1320 (TP of C209, 210, 1333 to 1336).

② Set VOLUME to minimum.

③ Adjust VR165, 166, 1313 to 1316 (DC1) so that 0V ± 5mV is obtained.

2-2. DC offset adjustment when gain is maximum (DC 2)

① Connect the DC voltmeter to 8 pin of IC177, 178, 1317 to 1320 (TP of C209, 210, 1333 to 1336).

② Set VOLUME to maximum.

③ Adjust VR163, 164, 1309 to 1312 (DC 2) so that 0V ± 5mV is obtained.

2-3. DC balance adjustment (BAL)

① Connect the oscilloscope (DC) to 8 pin of IC177, 178, 1317 to 1320 (TP of C209, 210, 1333 to 1336).

② Set VOLUME to maximum.

③ Check the waveform at the point when INPUT switch is turned ON and OFF and adjust VR161, 162, 1305 to 1308 (BAL) to minimize (10mVp-p or less) the DC variation.

2-4. DC offset adjustment of output buffer amplifier (OFFSET)

① Connect the DC voltmeter to the emitter side of Q245, 246, 1309 to 1312.

② Adjust VR169, 170, 1317 to 1320 (OFFSET) to obtain 0V ± 2.5mV.

Step 9 DRAM check

The condition of the DRAM connected to the DSP IC is checked by varying the resolution of the signal to be sent to the D/A converter from 16 bit to 4 bit accuracy in the DSP IC.

① Apply a 1kHz, 2Vrms to ANALOG INPUT. (a 0dB signal if measured at DIGITAL INPUT), and measure the distortion at PRESENCE OUT (FRONT and REAR).

② Activate the test program.

③ Press the program key "14" (Test program 14)
Specification: 4%

④ Press the program key "13". (Test program 13)
Specification: 0.25% or less

⑤ Press the program key "12". (Test program 12)
Specification: 0.05% or less

⑥ Press the program key "11". (Test program 11)
Specification: 0.05%

⑦ Press the program key "10". (Test program 10)
Specification: 0.05% or less

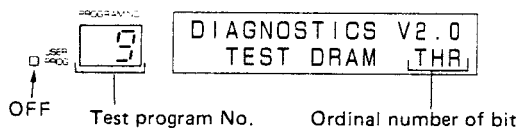
⑧ Press the program key "9". (Test program 9)
Specification: 0.05% or less

⑨ If the check result is not satisfactory, refer to Table to determine where a failure exists.

Example: If the FRONT L distortion of the test programs 10 to 14 is within specification and only that of the test program 9 is out of specification, it is possible that IC747 is defective.

< Table 1 > Test programs 9 to 14, Output-to-DSP, DRM relationship

Output	DSP used		DRAM used													
			4 3 2 1	4 3 2 1	4 3 2 1	4 3 2 1	4 3 2 1	4 3 2 1
FRONT L	IC743		IC747	IC748	IC749	IC750	IC751	IC752
REAR L	IC744		IC753	IC754	IC755	IC756	IC757	IC758
FRONT / REAR R	IC745		IC759	IC760	IC761	IC762	IC763	IC764
Test program 09	Indication THR	Accuracy 16 bit	MSB 15 14 13	12 11 10 9	8 7 6 5	4 3 2 LSB		
10	04B	16 bit		MSB 15 14 13	12 11 10 9	8 7 6 5	4 3 2 LSB	
11	08B	16 bit			MSB 15 14 13	12 11 10 9	8 7 6 5	4 3 2 LSB
12	12B	12 bit				MSB 11 10 9	8 7 6 5	4 3 2 LSB
13	16B	8 bit					MSB 7 6 5	4 3 2 LSB
14	20B	4 bit						MSB 3 2 LSB



*When the remote control key 15 is pressed, "–MX" is displayed and when 16 is pressed, "+MX" is displayed.

Step 10 D/A gain adjustment

① Apply a 1kHz, 0dB digital signal to the digital input. [Using the CD player with the DIGITAL OUT terminal, play the test disc YEDS-18 (track 2) and apply a digital signal (1kHz, 0dB) to the digital input of CX-10000.]
② Activate the test program.
③ Press the program key "9". (Test program 9)
④ Adjust to meet the specified value.

Testing point	Point for measurement	Specification
TML – GND	VR707	2.6 Vrms
TMR – GND	VR708	
TFL – GND	VR711	
TFR – GND	VR712	
TRL – GND	VR715	
TRR – GND	VR716	

Step 11 D/A distortion factor adjustment

① Apply a 1kHz, 0dB digital signal to the digital input. [Using the CD player with the DIGITAL OUT terminal, play the test disc YEDS-18 (track 2) and apply a digital signal (1kHz, 0dB) to the digital input of CX-10000.]
② Activate the test program.
③ Press the program key "9". (Test program 9)
④ Adjust VR709 (L ch) and VR710 (R ch) so that the distortion at MAIN OUT is minimized.

Step 12 A/D gain adjustment

① Activate the test program.
② Press the program key "9". (Test program 9)
③ Apply a 1kHz signal to ANALOG INPUT and set the output level of the oscillator so that 2.6Vrms is obtained at TADL and TADR terminals respectively.
④ Adjust to the specified value.

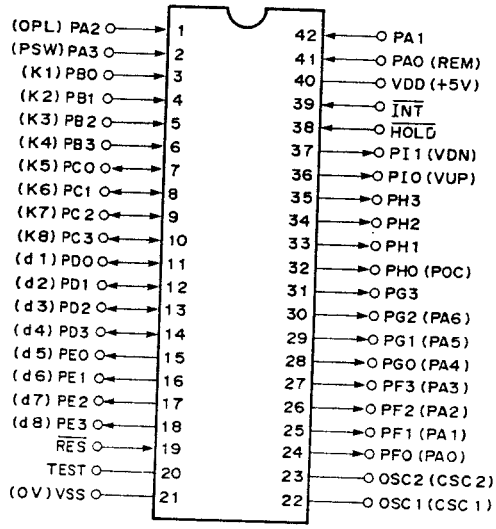
Testing point	Point for measurement	Specification
TML – GND	VR701	2.6Vrms
TMR – GND	VR702	

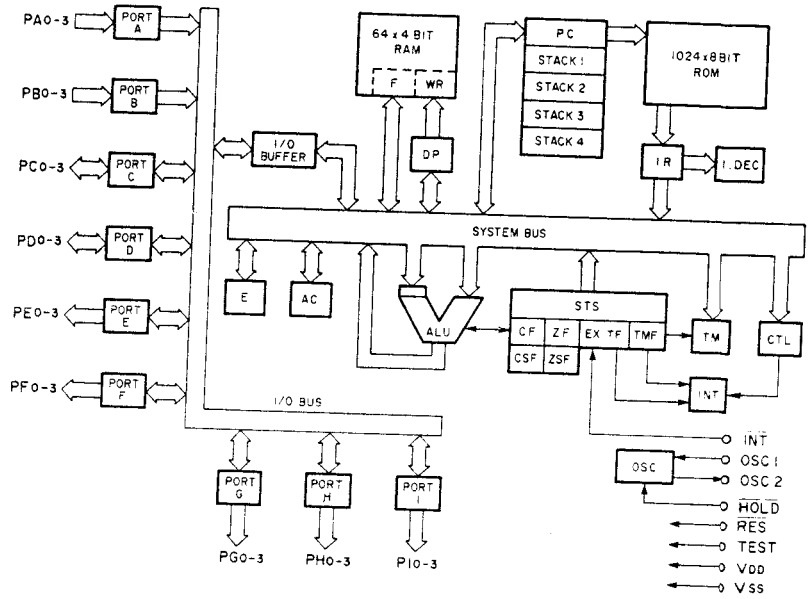
Step 13 A/D dither adjustment

① Activate the test program.
② Press the program key "9". (Test program 9)
③ Without applying any signal, adjust VR703 (L ch) and VR704 (R ch) so that the noise at MAIN OUT is minimized.

LSI DATA

IC1g: LC6505C-3265
4 bit μ-COM

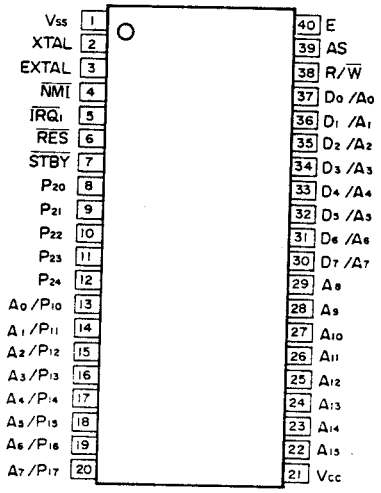


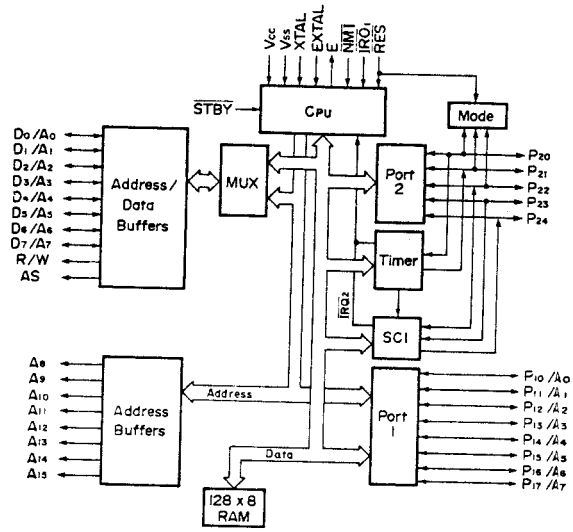


Pin No.	Pin Name	I/O	Function
1	PA_2 (OPL)	—	Not used
2	PA_3 (PSW)	I	Power switch input
3	PB_0 (K1)	I	Key input
4	PB_1 (K2)	I	
5	PB_2 (K3)	I	
6	PB_3 (K4)	I	
7	PC_0 (K5)	I	
8	PC_1 (K6)	I	
9	PC_2 (K7)	I	
10	PC_3 (K8)	I	
11	PD_0 (d1)	O	Key digit output
12	PD_1 (d2)	O	
13	PD_2 (d3)	O	
14	PD_3 (d4)	O	
15	PE_0 (d5)	O	
16	PE_1 (d6)	O	
17	PE_2 (d7)	O	
18	PE_3 (d8)	O	Not used
19	$\overline{RES}$	I	Reset input
20	TEST	—	LSI test terminal, ordinarily connected to Vss
21	Vss (0V)	—	Connected to 0V power source
22	OS_1 (CSC1)	I	Used together with CSC2 terminal with a resistor, capacitor or ceramic oscillator attached.

Pin No.	Pin Name	I/O	Function
23	OS_2 (CSC2)	O	External terminal of resonance circuit for internal clock oscillation
24	PF_0 (PA0)	O	Data output
25	PF_1 (PA1)	O	
26	PF_2 (PA2)	O	
27	PF_3 (PA3)	O	
28	PG_0 (PA4)	O	
29	PG_1 (PA5)	O	
30	PG_2 (PA6)	O	
31	PG_3	—	Not used
32	PH_0 (POC)	O	Power control output (ON: H, OFF: L)
33	PH_1	—	Not used
34	PH_2	—	Not used
35	PH_3	—	Not used
36	PI_0 (Vup)	O	Volume UP signal output
37	PI_1 (Von)	O	Volume DOWN signal output
38	$\overline{HOLD}$	I	Hold mode request input
39	$\overline{INT}$	I	Interrupt request input
40	VDD (+5V)	—	Power supply (+5V)
41	PA_0 (REM)	I	Remote control input
42	PA_1	I	Power ON/OFF backup (H: Backup, L: Ever ON)

IC603: HD6303RP
8 bit CPU

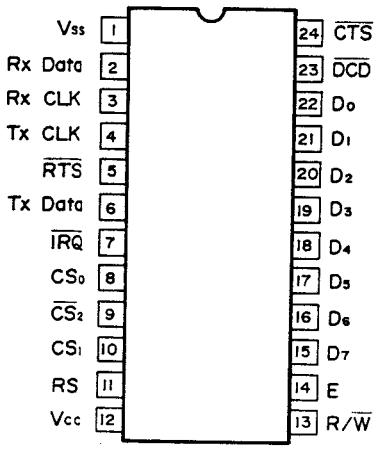


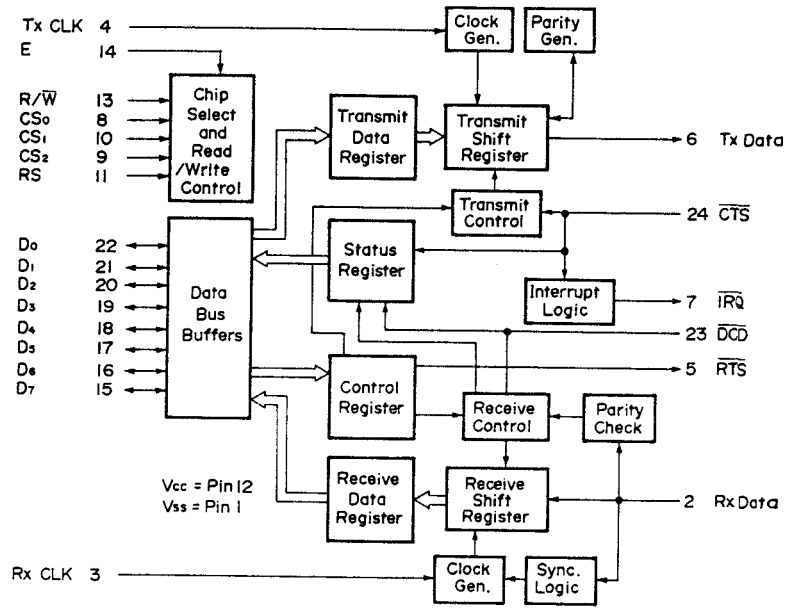


Pin No.	Pin Name	Function
1	Vss	GND
2	XTAL	Connecting terminal for AT cut parallel resonant type crystal oscillator
3	EXTAL	
4	$\overline{NMI}$	When the end of the input signal is detected, the non-maskable interrupt sequence is initiated in CPU.
5	$\overline{IRQ_1}$	Level detecting terminal which generates the interrupt sequence in CPU.
6	$\overline{RES}$	Resets and starts MPU from the power OFF state.
7	$\overline{STBY}$	Sets MPU to the stand-by mode.
8	P_{20}	I/O port 2 Input/output direction is determined by the date direction register. After resetting MPU, I/O terminals all become input. During the reset period, P_{20}, P_{21} and P_{22} are used for mode programming.
9	P_{21}	
10	P_{22}	
11	P_{23}	
12	P_{24}	
13	A_0/P_{10}	I/O port 1, TTL compatible terminal 8 bit port, each bit is determined for the output or input according to the content of the corresponding data direction register. After resetting MPU, port 1 operates as a parallel I/O terminal in the expanded multiplex mode and becomes a low order address ($A_0 \sim A_7$) output terminal in the expanded non-multiplex mode.
14	A_1/P_{11}	
15	A_2/P_{12}	
16	A_3/P_{13}	
17	A_4/P_{14}	
18	A_5/P_{15}	
19	A_6/P_{16}	
20	A_7/P_{17}	

Pin No.	Pin Name	Function
21	Vcc	Power supply input +5V
22	A_{15}	TTL compatible terminal After resetting, each becomes an upper order address ($A_8 \sim A_{15}$) output terminal
23	A_{14}	
24	A_{13}	
25	A_{12}	
26	A_{11}	
27	A_{10}	
28	A_9	
29	A_8	
30	D_7/A_7	Each becomes exclusively for the data bus ($D_0 \sim D_7$) in the expanded non-multiplex mode. In the expanded multiplex mode, the data bus ($D_0 \sim D_7$) and low order 8 bit ($A_0 \sim A_7$) of the address bus are multiplexed and used.
31	D_6/A_6	
32	D_5/A_5	
33	D_4/A_4	
34	D_3/A_3	
35	D_2/A_2	
36	D_1/A_1	
37	D_0/A_0	
38	$R/\overline{W}$	TTL compatible output signal, which indicates whether CPU is "read" (high) or "write" (low) for peripheral and memory.
39	AS	Address strobe is output when operating in the expanded multiplex mode.
40	E	E clock output terminal

IC615: HD63B50
ACIA (Asynchronous Communications Interface Adapter)

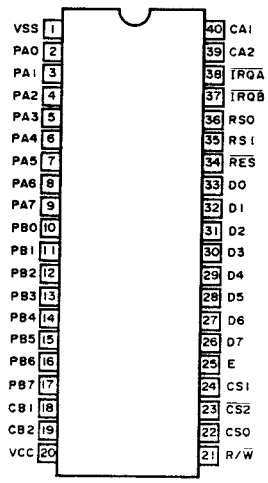


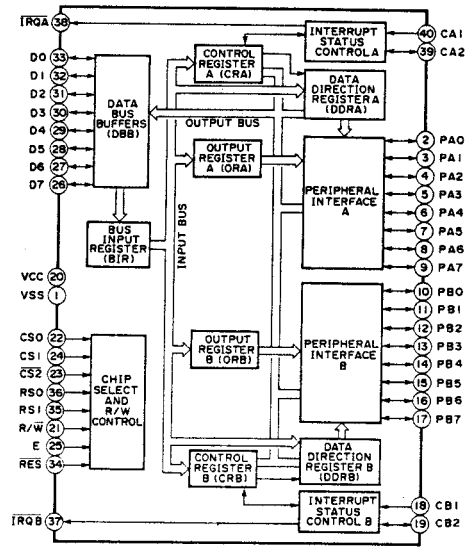


Pin No.	Pin Name	Function
1	Vss	GND
2	Rx Data	Input signal to receive the receive data and serial data.
3	Rx CLK	Receive clock input, which synchronizes with received data.
4	Tx CLK	Transmit clock input, which is used to synchronize with transmitted data and transmits the data at the end of the clock.
5	$\overline{RTS}$	TTL compatible output, which is controlled by writing from MPU to the control register bits 5 and 6 according to the program.
6	Tx Data	Transmit data, which transmits the serial data to the modem or other input/output devices.
7	$\overline{IRQ}$	Open drain TTL compatible output, which demands interrupt into MPU.
8	CS_0	TTL compatible input, which determins ACIA address.
9	$\overline{CS_2}$	
10	$\overline{CS_1}$	
11	RS	TTL compatible input, which selects either the transmit data register/receive data register of control register/status register.
12	Vcc	Power supply input +5V.

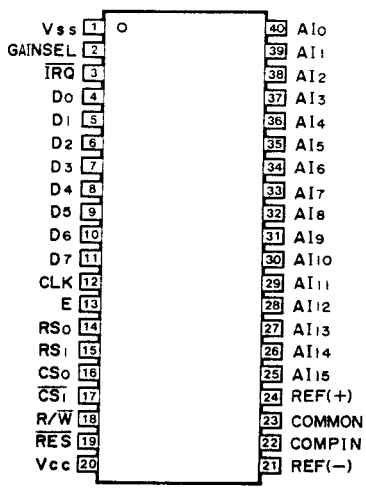
Pin No.	Pin Name	Function
13	R/$\overline{W}$	TTL compatible input, which controls the data transmit direction of the ACIA bidirectional data bus.
14	E	TTL compatible input, which enables data input from the data bus and data output to the data bus and also synchronizes the data transmission between MPU and ACIA.
15	D_7	Bidirectional data bus Used to transmit data between ACIA and MPU
16	D_6	
17	D_5	
18	D_4	
19	D_3	
20	D_2	
21	D_1	
22	D_0	
23	$\overline{DCD}$	Input signal which corresponds to the "carrier detect" signal which indicates detection of the modem carrier.
24	$\overline{CTS}$	Input signal which enables to read the TDRE flag in ACIA and to output a request for transmission interrupt.

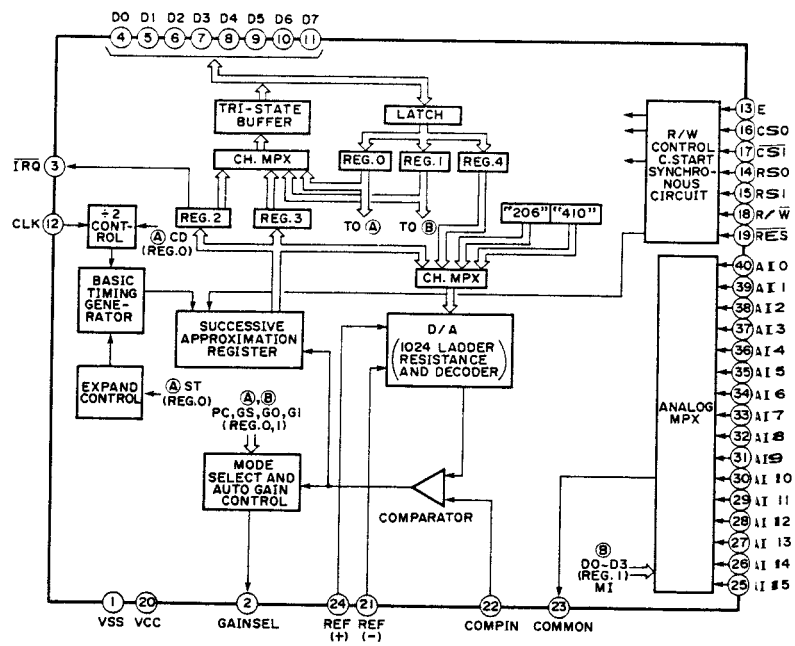
IC614: HD6321
PIA (Peripheral Interface Adapter)



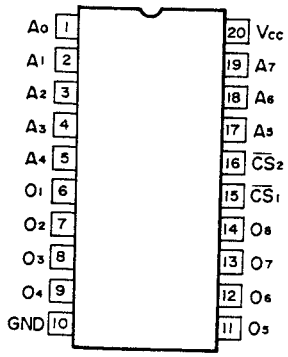


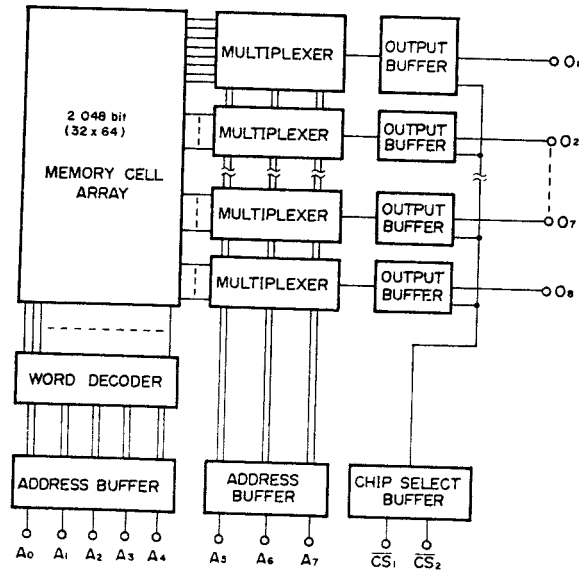
IC619: HD46508A-1
ADU (Analog Data Acquisition Unit)





IC605: μPB421C
2048 bit ROM



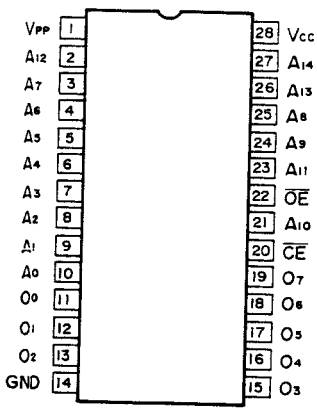


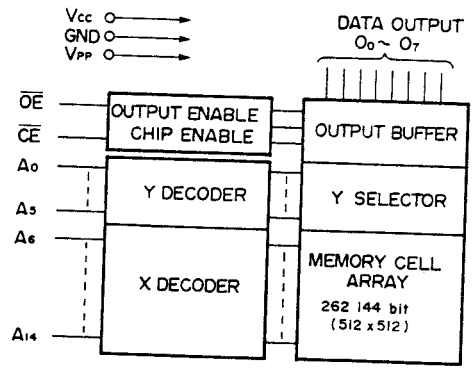
$A_0 \sim A_7$: Address input
$O_1 \sim O_8$: Data output
$\overline{CS_1}$, $\overline{CS_2}$: Chip select input
Vcc : Power supply input (+5V)
GND : Ground

Mode \ Terminal	$\overline{CS}$	$\overline{CS}$
Read	L	L
Output disable	H	X
	X	H

H: High level L: Low level X: H or L

IC606, 607: μPD27C256C-20
256k bit ROM



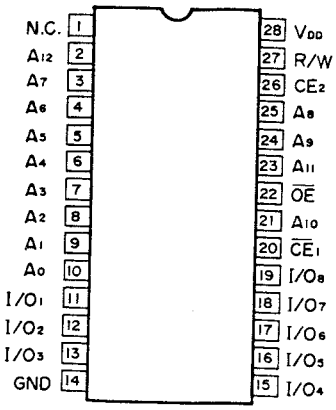


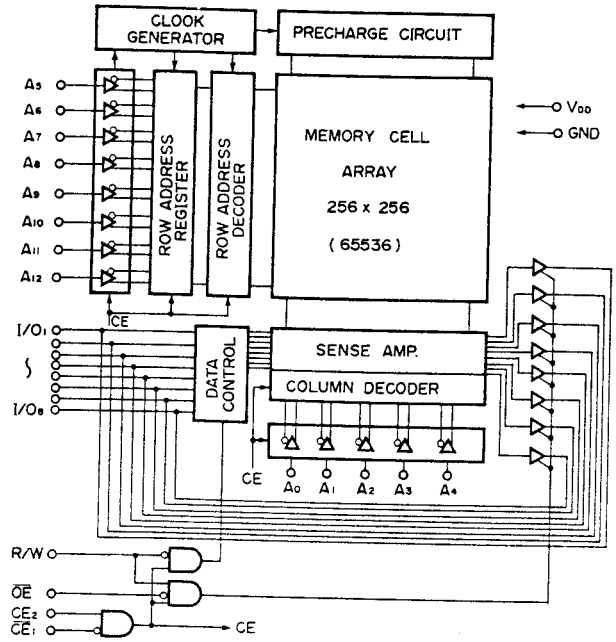
$A_0 \sim A_7$	Address input
$O_0 \sim O_1$	Data output
$\overline{CE}$	Chip enable input
$\overline{OE}$	Output enable input
Vcc	Power supply input
Vpp	Program power supply input
GND	Ground

Mode \ Terminal	$\overline{CE}$	$\overline{OE}$	Vpp	Vcc	$O_0 \sim O_7$
Read	V_{IL}	V_{IL}	+5V	+5V	Data output
Output disable	V_{IL}	V_{IH}	+5V	+5V	High impedance
Standby	V_{IH}	X	+5V	+5V	High impedance
Program	V_{IL}	V_{IH}	+21V	+6V	Data input
Program verify	V_{IL}	V_{IL}	+21V	+6V	Data output
Program inhibit	V_{IH}	X	+21V	+6V	High impedance

X: V_{IL} or V_{IH}

IC608: μPD4464C-15L, TC5564PL-20 or TC5564PL-15
64 Kbit RAM

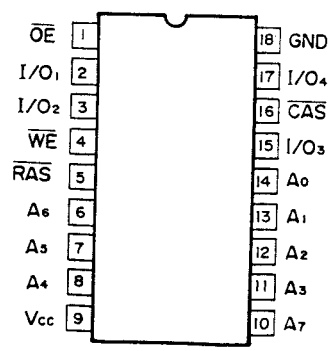


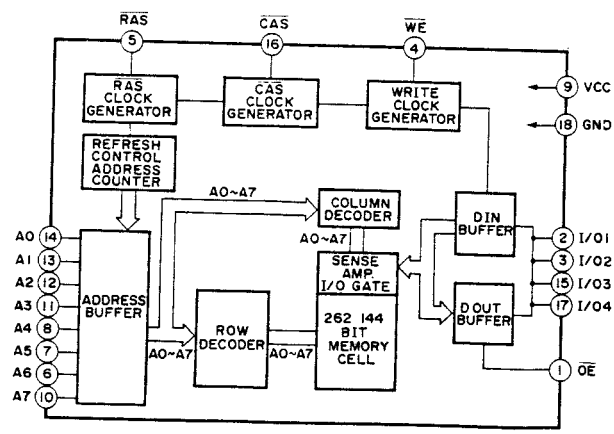


$A_0 \sim A_{12}$	Address input
R/W	Read/write control input
$\overline{OE}$	Output enable input
$\overline{CE_1}$, CE_2	Chip enable input
$I/O_1 \sim I/O_8$	Data input/output
VDD	Power supply input (+5V)
GND	Ground
N.C.	Not used

Operation mode	$\overline{CE_1}$	CE_2	$\overline{OE}$	R/W	$I/O_1 \sim I/O_8$	Power
Read	L	H	L	H	D_{OUT}	I_{DDO}
Write	L	H	*	L	D_{IN}	I_{DDO}
Output disable	*	*	H	*	High – Z	I_{DDO}
Standby	H	*	*	*	"	I_{DDS}
	*	L	*	*	"	I_{DDS}

IC747 ~ 764: μPD41464-12
RAM





$A_0 \sim A_7$: Address input
($A_0 \sim A_7$ low address input
$A_1 \sim A_6$ column address input)

$I/O_1 \sim I/O_4$: Data input/output

$\overline{RAS}$: Low address strobe input

$\overline{CAS}$: Column address strobe input

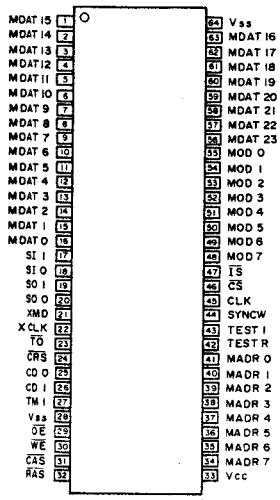
$\overline{WE}$: Read/write control input

$\overline{OE}$: Output enable input

$\overline{Vcc}$: Power supply input

GND : Ground

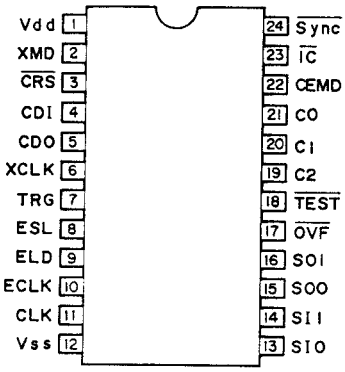
IC743 ~ 745: YM3818
DSP (Digital Signal Processor)

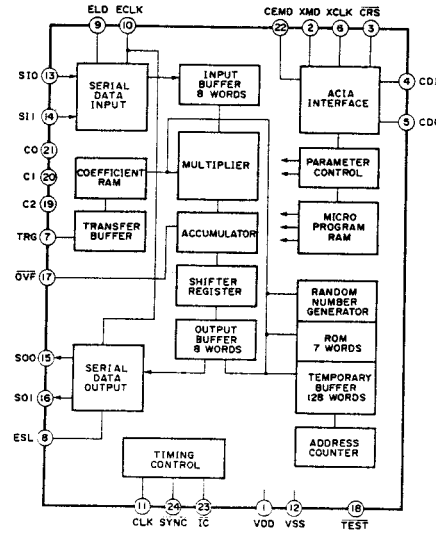


Pin No.	Pin Name	I/O	Function
1	MDAT 15	I/O	I/O pins connected to memory data bus (24 bit)
2	MDAT 14	I/O	
3	MDAT 13	I/O	
4	MDAT 12	I/O	
5	MDAT 11	I/O	
6	MDAT 10	I/O	
7	MDAT 9	I/O	
8	MDAT 8	I/O	
9	MDAT 7	I/O	
10	MDAT 6	I/O	
11	MDAT 5	I/O	
12	MDAT 4	I/O	
13	MDAT 3	I/O	
14	MDAT 2	I/O	
15	MDAT 1	I/O	
16	MDAT 0	I/O	
17	SI 1	I	Serial data input
18	SI 0	I	
19	SO 1	O	Serial data output
20	SO 0	O	
21	XMD	I	Synchronous/asynchronous select signal input for serial interfaces CDI and CDO
22	XCLK	I	Data send/receive clock input used when serial interface is placed in asynchronous mode (705.6kHz)
23	$\overline{TO}$	O	Time Out output
24	$\overline{CRS}$	I	CDI data counter reset input
25	CDO	O	Serial data output used for connecting interfaces in cascade
26	CDI	I	Serial interface input
27	TM 1	O	General-purpose timing signal output
28	$\overline{GND}$	–	Ground (0 V)
29	$\overline{OE}$	O	Memory control signal output
30	$\overline{WE}$	O	
31	$\overline{CAS}$	O	

Pin No.	Pin Name	I/O	Function
64	VSS	–	Ground (0 V)
63	MDAT 16	I/O	I/O pins connected to memory's data bus (24 bit)
62	MDAT 17	I/O	
61	MDAT 18	I/O	
60	MDAT 19	I/O	
59	MDAT 20	I/O	
58	MDAT 21	I/O	
57	MDAT 22	I/O	
56	MDAT 23	I/O	
55	MOD 0	I	Inputs to accept modulation signal from MOD (8 bit)
54	MOD 1	I	
53	MOD 2	I	
52	MOD 3	I	
51	MOD 4	I	
50	MOD 5	I	
49	MOD 6	I	
48	MOD 7	I	
47	$\overline{IC}$	I	Initial Clear signal input
46	$\overline{CS}$	I	Chip Select input
45	CLK	I	Master Clock input (2.8224MHz)
44	SYNCW	I	System sync. signal input (44.1kHz cycle)
43	TEST 1	I	Chip test input (+5V)
42	TEST R	I	
41	MADR 0	O	Outputs connected to memory's addres bus
40	MADR 1	O	
39	MADR 2	O	
38	MADR 3	O	
37	MADR 4	O	
36	MADR 5	O	
35	MADR 6	O	
34	MADR 7	O	
33	Vcc	–	Power supply input (+5 V)
32	$\overline{RAS}$	O	Memory control signal output

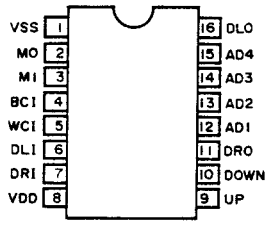
IC723, 724: YM3608
DEQ

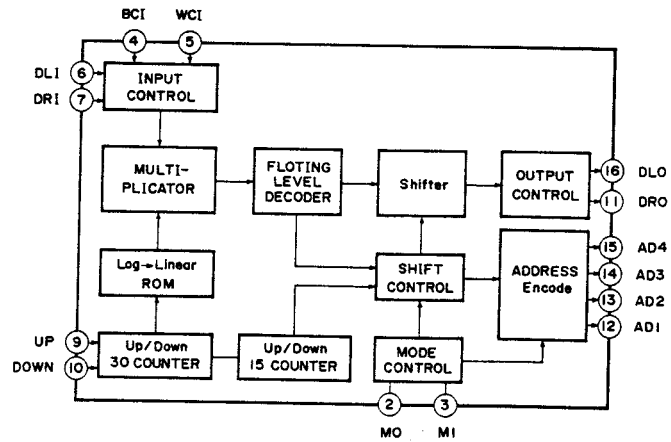




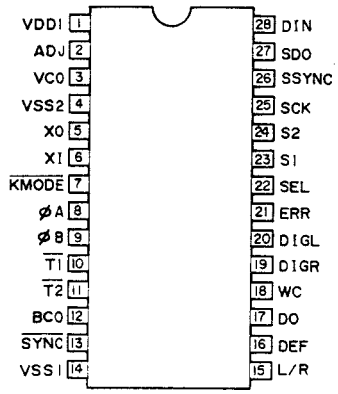
Pin No.	Pin Name	I/O	Function
1	V_{DD}	I	+5V power supply
2	XMD	I	Switches CDI input to either synchronous mode (1 : 1) +0V or asynchrnous mode+5V (Start-stop synchrnous system 16 : 1)
3	/CRS	I	Initializes ACIA interface
4	CDI	I	ACIA input for setting micro program, factor and control register
5	CDO	O	ACIA output for setting micro program, factor and control register
6	XCLK	I	Input-output clock for CDI and CDO
7	TRG	I	Determines parameter transfer timing from transfer buffer to factor buffer when external trigger is selected
8	ESL	I	Enters output timing into SO0 and SO1 when EXT clock is selected
9	ELD	I	Enters input timing into SIO and SII when EXT clock is selected
10	ECLK	I	Enters input-output clock for SI0, SI1, SO0 and SO1 when EXT clock is selected
11	CLK	I	Master clock input
12	Vss	I	Ground
13, 14	SI0, SI1	I	16 bits serial input
15, 16	SO0, SO1	O	16 bits serial output
17	$\overline{OVF}$	O	Over flow detect
18	/TEST	I	Used for testing. Usually connected to +5V
19	C2/Sign	O	Outputs bit 2 of factor RAM while delaying it by 1 bit. Used as a timing signal. Monitors sign bit of accumulator by setting test Reg. (When factor RAM is used as a timing signal, effective bit number of factor decreases.)
20	C1/TESTM	O	Outputs bit 1 of factor RAM while delaying it by 1 bit. Used as a timing signal Switches to test output of multiplier by setting test Reg.
21	CO	O	Outputs bit 2 of factor RAM while delaying it by 1 bit. Can be used as a timing signal.
22	CEMD	I	Turns OFF CE of ACIA input. CE ON +5V CE OFF 0V
23	/IC	I	Initializes DEQ operation
24	/Sync	I	Synchronous signal of system

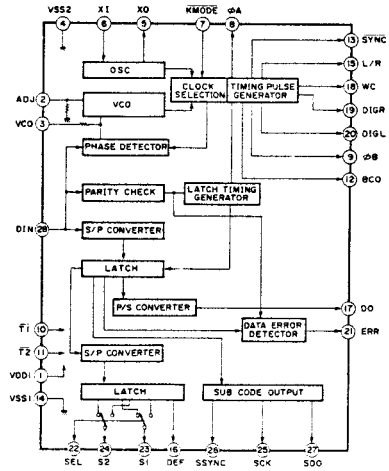
IC726: YM3615
Digital Volume Controller





IC719: YM3623
Digital I/O





The pin with (PU) in the I/O column is pulled up internally.

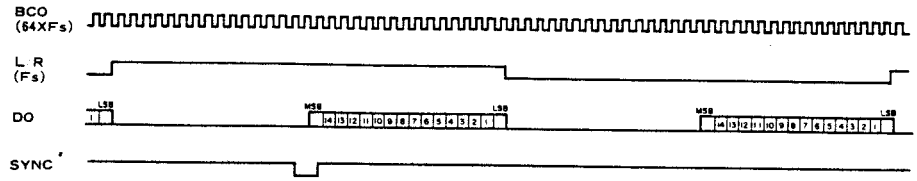
Pin No.	Pin Name	I/O	Function
1	VDD1		Power supply for system (+5V)
2	ADJ	I	For adjustment of VCO oscillation frequency, non-connected
3	VCO	I/O	External capacitor terminal for VCO circuit
4	Vss2		Ground of VCO circuit Connect commonly with Vss1 (Inside of IC is not used in common.)
5	XO	O	For crystal oscillator (16.9344MHz)
6	XI	I	For crystal oscillator
7	$\overline{KMODE}$	I (PU)	H: Activates PLL circuit if input is entered to DIN pin but if not, it operates by using crystal oscillator. L: Uses crystal oscillator regardless of DIN pin
8	ØA	O	Crystal oscillator oscillation frequency output (16.9344MHz)
9	ØB	O	1/3 division of ØA when crystal oscillator is used With PLL circuit in operation, it varies depending on data speed entered to DIN pin (About 5.6448 MHz when fs = 44.1 kHz)
10	$\overline{T1}$	I (PU)	For checking internal circuit
11	$\overline{T2}$	I (PU)	For checking internal circuit
12	BCO	O	Timing clock of output signal from DO pin
13	$\overline{SYNC}$	O	Synchronizing signal
14	Vss1	O	System ground (+0V)
15	L/R	O	Indicates that H = L channel and L = R channel data is output from DO pin
16	DEF	O	H: Indicates that input data is emphasized L: Indicates that input data isn't emphasized
17	DO	O	16 bit data output
18	MC	O	Indicates that data is output at DO pin
19	DIGR	O	Signal for R channel deglitch
20	DIGR	O	Signal for L channel deglitch
21	ERR	O	H: Indicates parity error or in operation with crystal L: Indicates that there is no error
22	SEL	I (PU)	Refer to the separate table.
23	S1	O	Refer to the separate table.
24	S2	O	Refer to the separate table.
25	SCK	O	Clock for sub-code output
26	SSYNC	O	Signal for sub-code
27	SDO	O	For output of sub-code data
28	DIN	I (PU)	For data input

- **S1, S2 SEL**
  The output function of S1 and S2 pins is increased. Switching the SEL pin input will switch to S1 or S2 pin output.

Input	Output		Output	
SEL	S1	Function	S2	Function
L	L	Copy forbidden	L	CD (except DAT)
	H	Copy enable	H	DAT
H	L		L	Sampling frequency of DIN input signal 44.1KHz
	L		H	48.1KHz
	H		H	32kHz
	H		L	–

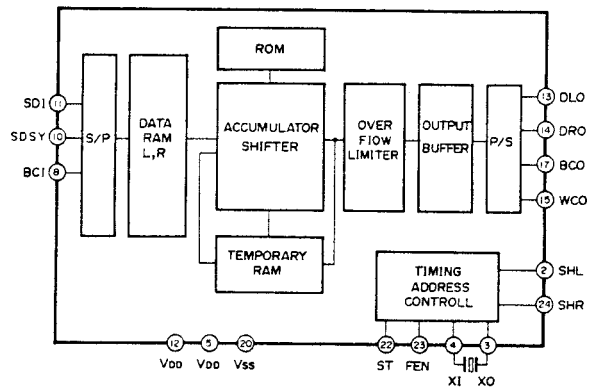
As in the above table, necessary data is drawn out of the digital audio interface format signals which have been entered and output at S1 and S2 pins.

• OUTPUT TIMING



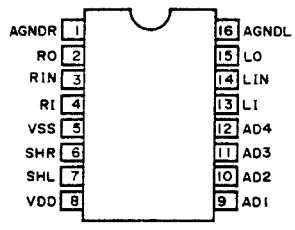
Note) FS shows the sampling frequency. For example, it is 44.1kHz with the compact disk and 48kHz with the DAT. The internal sampling frequency Fa of CX-10000 at analog-in is 48kHz (and internal crystal oscillation is 18.432MHz).

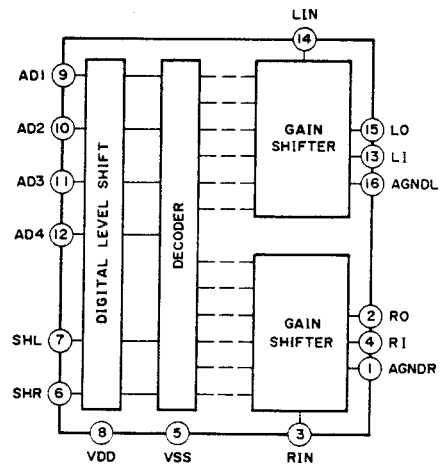
IC725, 731, 737: YM3619
Digital Filter



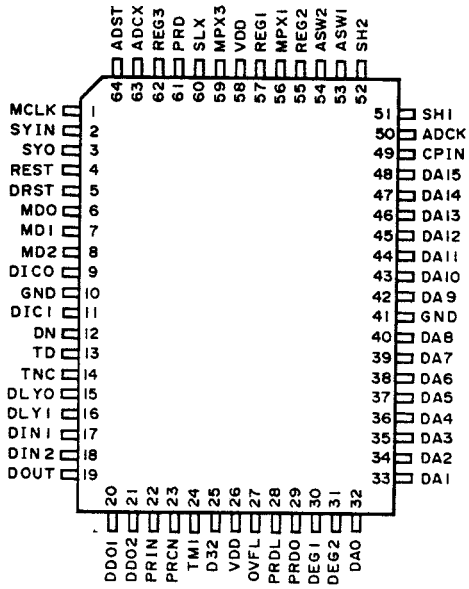
YM3619 Pin No.	Pin Name	I/O	Function
11	SD1	I	Serial input of converted digital signal
10	SDSY	I	Identifies L or R channel of input data and specifies data input timing
8	BCI	I	Enters bit block of input data
4	XI	I	Clock oscillation 196fs = "L" or 192fz = 16.9344MHz
3	XO	O	
22	ST	I	1 DAC = "L" or 2 DAC = "H" switching input
23	FEN	I	Input for switching system clock 196fs = "L" 192fs = "H"
13	DLO	O	At 1DAC: L, R channel data output At 2DAC: L channel data output
14	DRO	O	R channel data output
15	WCO	O	Word clock of output data (DLO, DRO)
17	BCO	O	Output of output data bit clock and SPC II system clock 98fs = 8.6436MHz or 96fs = 8.4672MHz
2	SHL	O	At 1 DAC: L channel deglitcher signal output At 2 DAC: L, R channel deglitcher signal output
24	SHR	O	At 1 DAC: R channel deglitcher signal output
12	VDD1		+5 power supply for digital signal
5	VDD2		+5V power supply for clock and deglitcher signal
20	Vss		Ground

IC729: YM3023
F. S/H





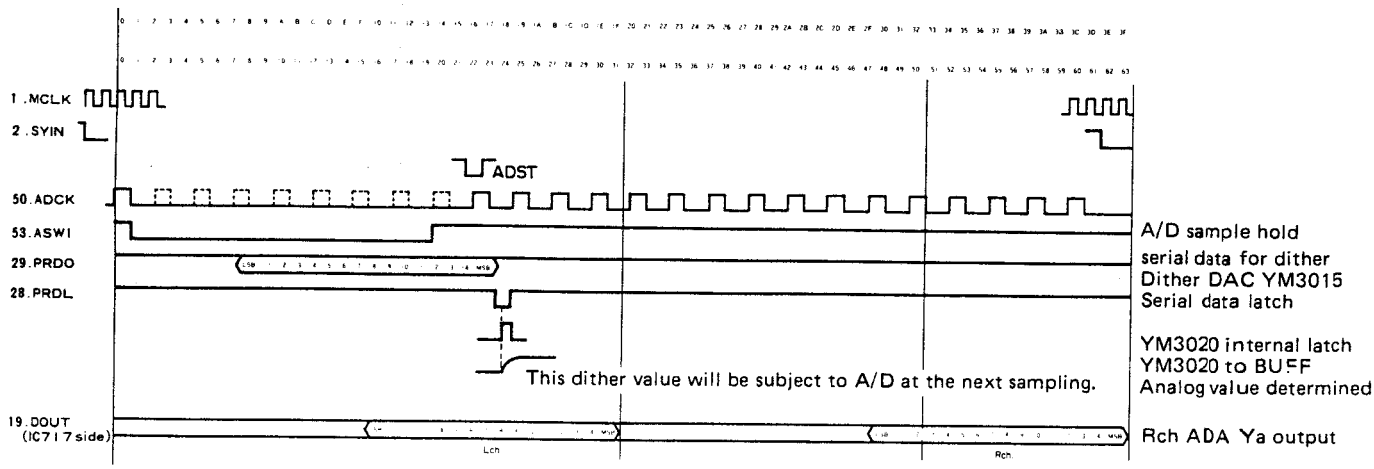
IC717, 718: YM3901 ADA



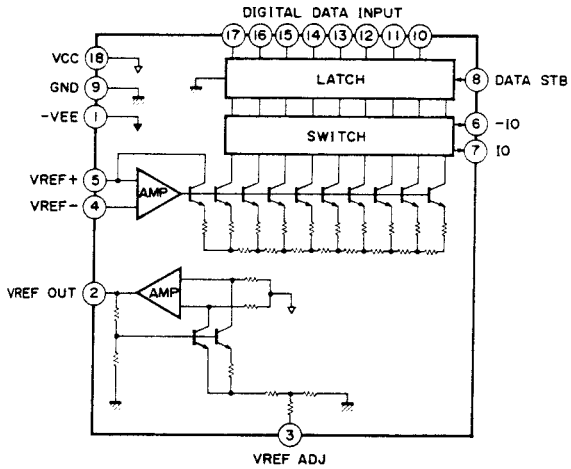
Pin No.	Pin Name	I/O	Function
26, 58	Vdd	I	+5V power supply
10, 41	GND	I	Ground
1	MCLK	I	System clock
2	SYIN	I	Enters system frequency signal
3	SYO	O	Outputs system frequency signal
4	REST	I	System reset signal (except random number generator)
5	DRST	I	Reset signal for random number generator
6, 7, 8	MD0, 1, 2	I	Selects system mode Refer to Table 1.
12	DN	I	Selects serial data format. Refer to Fig. 1. (DSP/NORMAL)
14	TNEC	I	Selects serial input data mode when mode 3 is used. (Time Sharing/NOT) Refer to Fig. 2.
9, 11	DICO, I	I	Selects dither mode. Refer to Table 2.
15, 16	DLYO, I	I	Selects amount of phase delay of DIN1 and 2. Refer to Table 3.
50	ADCK	O	Clock for internal successive comparison register
51	SH1 (A. SW, D. SW at Mode 1)	O	Sample hold signal 1 (outputs switch select signal at Mode 1)
52	SH2 (A. SW., D. SW. at Mode 2) (DEG3 at Mode 4)	O	Sample hold signal 2 (Outputs switch select signal at Mode 2) (Outputs deglitch signal 3 at Mode 4)

Pin No.	Pin Name	I/O	Function
49	CPIN	I	Comparator output at successive comparison
19	DOUT	O	A/D converted serial data output
48	DA15	O	Parallel data 15 (MSB) output to D/A converter.
47	DA14	O	Parallel data 14 (MSB) output to D/A converter
46	DA13	O	Parallel data 13 (MSB) output to D/A converter
45	DA12	O	Parallel data 12 (MSB) output to D/A converter
44	DA11	O	Parallel data 11 (MSB) output to D/A converter
43	DA10	O	Parallel data 10 (MSB) output to D/A converter
42	DA9	O	Parallel data 9 (MSB) output to D/A converter
40	DA8	O	Parallel data 8 (MSB) output to D/A converter
39	DA7	O	Parallel data 7 (MSB) output to D/A converter
38	DA6	O	Parallel data 6 (MSB) output to D/A converter
37	DA5	O	Parallel data 5 (MSB) output to D/A converter
36	DA4	O	Parallel data 4 (MSB) output to D/A converter
35	DA3	O	Parallel data 3 (MSB) output to D/A converter
34	DA2	O	Parallel data 2 (MSB) output to D/A converter
33	DA1	O	Parallel data 1 (MSB) output to D/A converter
32	DA0	O	Parallel data 0 (LSB) output to D/A converter
17, 18	DIN1, 2	I	Serial data input for D/A convertion
20, 21	DDO1, 2	O	Serial data output for phase delay of DIN1, 2.
25	D32	O	Outputs DIN2 serial data which was delayed by 32 bit
30, 31	DEG1, 2	O	Outputs deglitch signal
53	ASWL (DEG4 at Mode 4)	O	Outputs switch select signal (Outputs deglitch signal at Mode 4)
28	PRDL	O	Outputs input timing of serial, random number data which is output from PRDO
29	PRDO	O	Outputs serial random number data
27	OVFL	O	Outputs overflow detect signal after AD conversion (Active L)
24	TM1	O	Outputs timing signal
13	TD	I	For testing. Enters internal synchronous signal from outside, usually connected to +5V.
22	PRIN	I	For testing. Enters initial value of random number, usually connected to GND
23	PRCN	I	For testing. Control pin to enter initial value of random number, usually connected to GND.
54	ASW2	O	For testing. Outputs switch select signal
55	REG2	O	For testing. Outputs enable signal of register 2
56	MPX1	O	For testing. Outputs select signal of selector 1
57	REG1	O	For testing. Outputs enable signal of register 1
59	MPX3	O	For testing. Outputs select signal of selector 3
60	SLX	O	For testing. Outputs shift load X signal
61	PRD	O	For testing. Outputs random number output timing.
62	REG3	O	For testing. Outputs enable signal of register 3
63	ADCX	O	For testing. Outputs control signal for successive clock
64	ADST	O	For testing. Outputs start signal for successive approximation

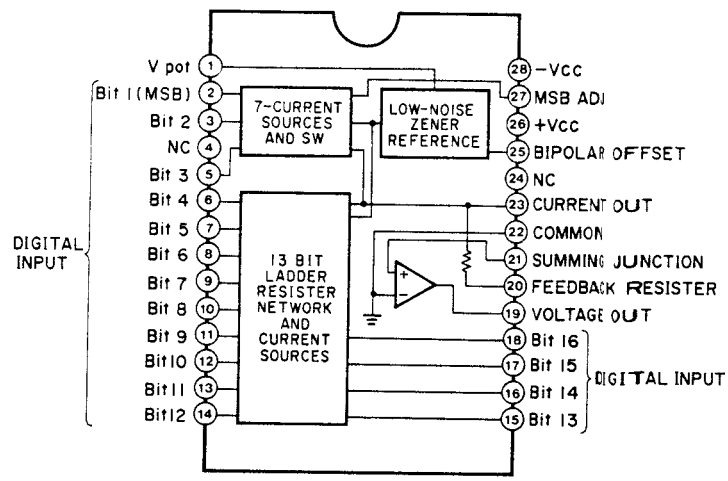
• **A/D timing (ADA 1 in)**



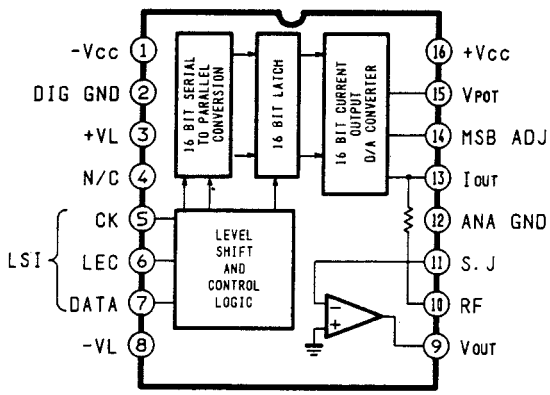
IC631 ~ 633: BA9201
D/A Converter



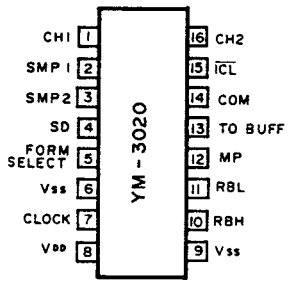
IC715, 716: PCM54HP
D/A Converter

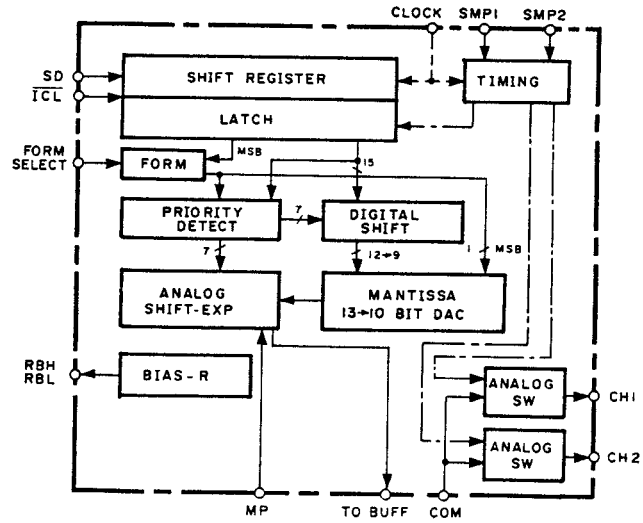


IC727, 728, 733, 734, 739, 740: PCM56P
D/A Converter

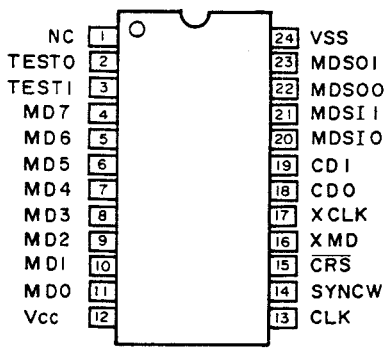


IC711, 712: YM3020
D/A Converter





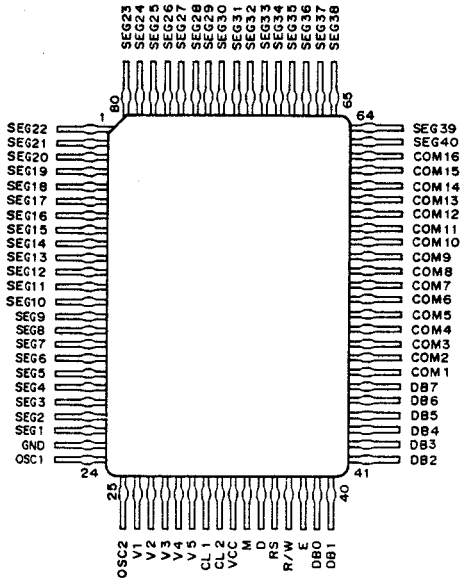
IC746: YM3807
MOD (Modulation Data Generator)

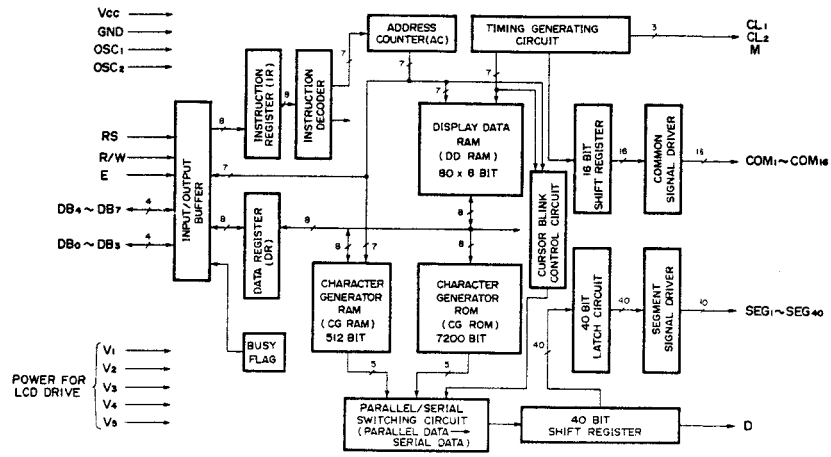


Pin No.	Pin Name	I/O	Function
1	NC	I	Initial Clear signal input (presently not used)
2	TEST 0	I	Chip test inputs
3	TEST 1	I	
4	MD 7	O	8-bit parallel multiplexed outputs for waveform data
5	MD 6	O	
6	MD 5	O	
7	MD 4	O	
8	MD 3	O	
9	MD 2	O	
10	MD 1	O	
11	MD 0	O	
12	Vcc	–	+5V
13	CLK	I	Master clock input

Pin No.	Pin Name	I/O	Function
24	VSS	–	GND
23	MDSO 1	O	Serial waveform data outputs
22	MDSO 0	O	
21	MDSI 1	I	Data inputs to MOD's internal adder
20	MDSI 0	I	
19	CDI	I	Serial interface input
18	CDO	O	Serial data output used to connect serial interfaces in cascade
17	XCLK	I	Data send/receive clock input for asynchronous mode
16	XMD	I	Synchronous (L)/asynchronous (H) select input for serial interfaces CDI and CDO
15	CRS	I	Reset input to reset the serial input CDI data counter
14	SYNCW	I	System sync. signal input

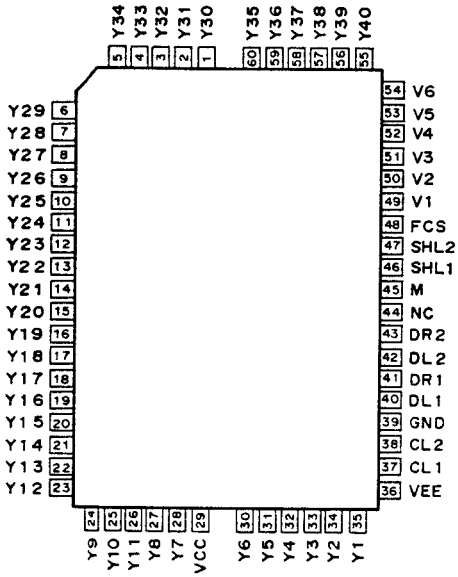
IC11: HD44780SA00H0
LCD Controller/Driver

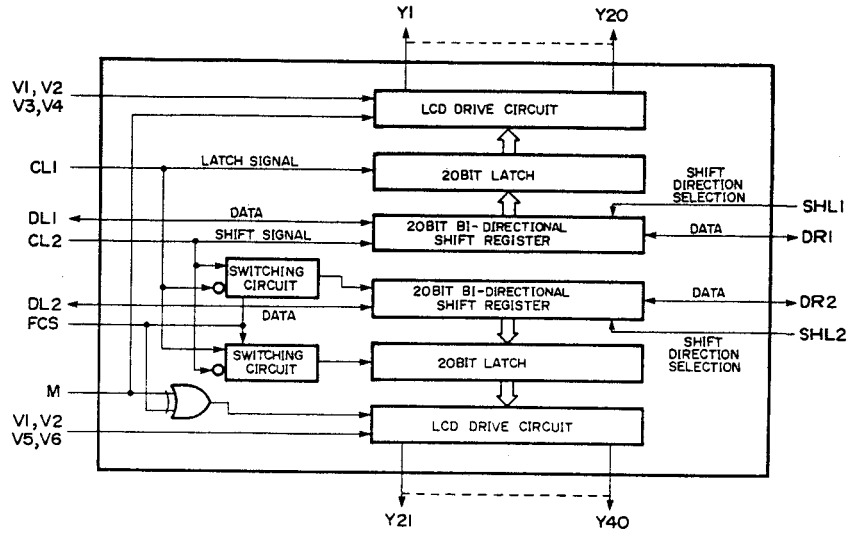




Pin No.	Pin Name	I/O	Function
1 : 22 63 : 80	SEG22 : SEG1 SEG40 : SEG23	O	Segment signal
23	GND	—	Ground (0V)
24 25	OSC_1 OSC_2	I	A resistor or ceramic filter for internal clock oscillation is connected here. The external clock should be entered into OSC_1.
26 : 30	V_1 : V_5	—	Power for LCD drive
31	CL_1	O	Clock which latches the serial data D sent to driver, LSI HD44100H.
32	CL_2	O	Clock which shifts the serial data D
33	Vcc	—	Power supply (+5V)
34	M	O	Switching signal to make the LCD drive waveform alternating
35	D	O	The character pattern data corresponding to each common signal is sent serially one after another. O: Not selected, 1: Selected
36	RS	I	Signal to select register "0" : Instruction register (when writing) Busy flag; address counter (when reading) "1": Data register (Write, read)
37	R/W	I	Read (R), Write (W) select signal "0": Write "1": Read
38	E	I	Operation start signal. With this signal, data read or write is started.
39 : 42	DB_0 : DB_3	I/O	4 low order data buses. They are three-state bi-directional. Data is transmitted between MPU and HD44780 through this line. These 4 buses are not used in 4-bit operation.
43 : 46	DB_4 : DB_7	I/O	4 high order data buses. They are three-state bi-directional. Data is transmitted between MPU and HD44780 through this line. DB_7 is also useable as a busy flag.
47 : 62	COM_1 : COM_{16}	O	They are common signals. All the common signals which are not used become non-select waveforms. That is, when the duty ratio is 1/8, COM_9 to COM_{16} become non-select waveforms and when the duty ratio is 1/11, COM_{12} to COM_{16} become non-select waveforms.

IC12: HD44100H
LCD Driver





Pin No.	Pin Name	I/O	Function
1 – 5	Y_{30} – Y_{34}	O	LCD drive output (CH2)
6 – 14	Y_{29} – Y_{21}		
55 – 60	Y_{40} – Y_{35}		
15 – 23	Y_{20} – Y_{12}	O	LCD drive output (CH1)
24 – 35	Y_9 – Y_1		
29	Vcc	–	Power supply for logic circuit (+5V)
36	VEE	–	Power supply for LCD circuit (–5V)
37	CL_1	I	Latch signal for CH 1 (⊓_) *1 Also used for CH2 when FCS is GND.
38	CL_2	I	Shift signal for CH 1 shift register (⊓_)*1 Also used for CH2 when FCS is GND.
39	GND	–	0V
40	DL_1	I/O	Shift register input/output of CH 1
41	DR_1		
42	DL_2	I/O	Shift register input/output of CH 2
43	DR_2		
44	NC	–	Open
45	M	I	Signal to make the LCD drive output alternating
46	SHL_1	I	Shift direction selection of CH 1 shift register
47	SHL_2	I	Shift direction selection of CH 2 shift register

SHL_1	DL_1	DR_1
Vcc	OUT	IN
GND	IN	OUT

SHL_2	DL_2	DR_2
Vcc	OUT	IN
GND	IN	OUT

Pin No.	Pin Name	I/O	Function
48	FCS	I	CH 2 mode select signal According to the FCS signal level, the latch signal and shift signal are exchanged and the M signal level is reversed. Use of CH 2 can be selected; for segment drive or for common drive.
49	V_1	I	LCD drive voltage input (select level)
50	V_2		
51	V_3	I	LCD drive voltage input (CH 1 non-select level)
52	V_4		
53	V_5	I	LCD drive voltage input (CH 2 non-select level)
54	V_6		

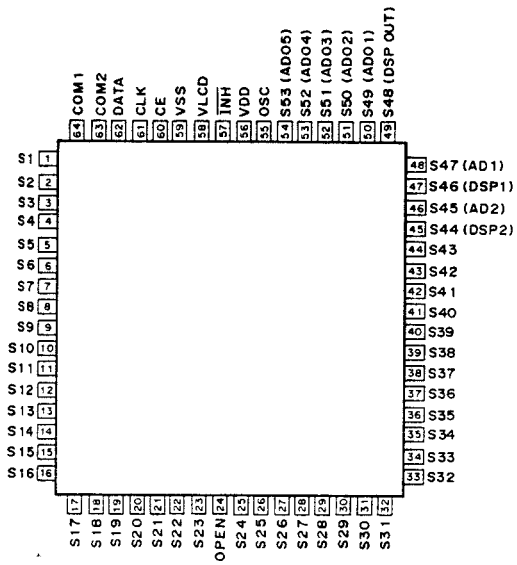
FCS level	Channel 2 Latch signal	Channel 2 Shift signal	M polarity	Use
Vcc	CL2 ⊓_	CL1 ⊓_	$\overline{M}$	For common drive
GND	CL1 _⊓	CL2 _⊓	M	For segment drive
	*1	*1		*2

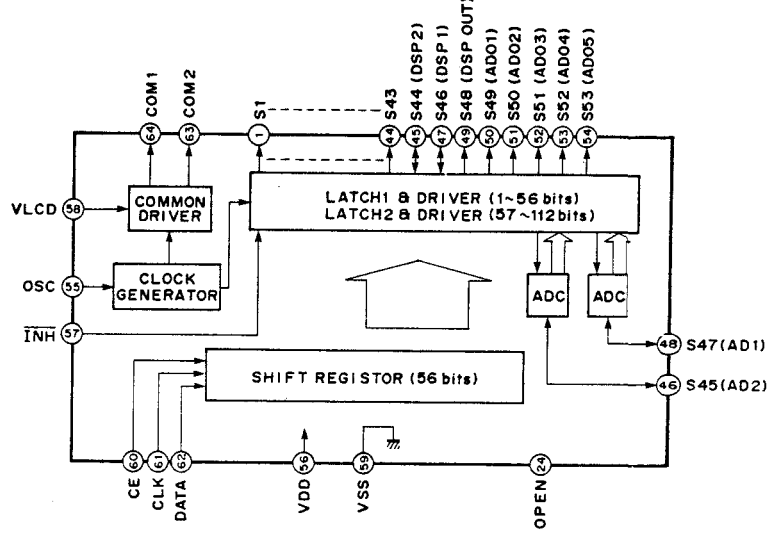
*1 ⊓_ and _⊓ indicate latch at leading edge and at trailing edge respectively.

*2 Output levels for CH 1 and CH 2 vary according to the FCS signal level as follows.

FCS	Data	M	Output level CH1 ($Y_1 \sim Y_{20}$)	Output level CH2 ($Y_{21} \sim Y_{40}$)
Vcc ("1")	"1" (Select)	"1"	V_1	V_2
		"0"	V_2	V_1
	"0" (Non-select)	"1"	V_3	V_6
		"0"	V_4	V_5
GND ("0")	"1" (Select)	"1"	V_1	V_1
		"0"	V_2	V_2
	"0" (Non-select)	"1"	V_3	V_5
		"0"	V_4	V_6

IC21, 22: LC7582
LCD Driver

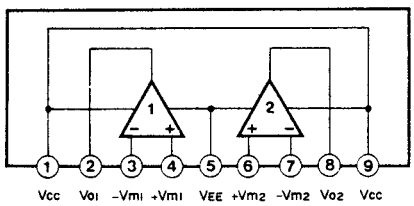




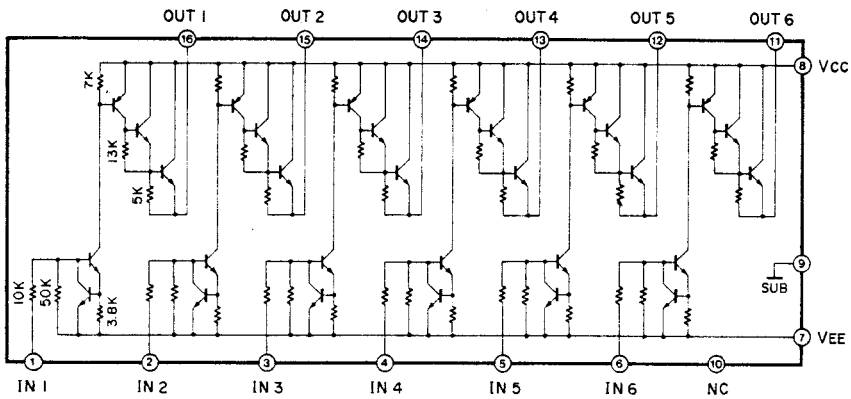
Pin No.	Pin Name	I/O	Function
1 ⋮ 23, 25 ⋮ 44	S1 ⋮ S43	O	Segment output
24	OPEN	—	Not used
45	S44 (DSP2)	I/O	Segment output or display input
47	S46 (DSP1)		
46	S45 (AD2)	I/O	Segment output or AD input
48	S47 (AD1)		
49	S48 (DSP OUT)	O	Segment output or display output
50 ⋮ 54	S49 (AD01) ⋮ S53 (AD05)	O	Segment output or AD output
55	OSC	I	Oscillation terminal
56	VDD	—	Power source
59	Vss		
57	$\overline{INH}$	I	Display OFF input (It is effective only for output driver. Therefore, the serial data an be transferred while OFF.)
58	VLCD	I	LCD bias voltage setting
60	CE	I	Serial data transfer input
61	CLK		
62	DATA		
63	COM2	O	Common output (At 1/1 duty, only COM 1 is used. COM 2 should be open then.)
64	COM1		

IC BLOCK

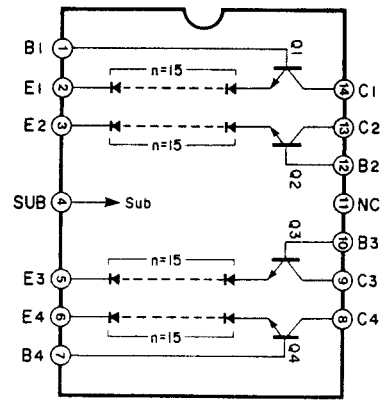
IC101, 102: NJM4558S
IC157 ~ 162, 173, 174, 1309 ~ 1312: NJM2041S
IC155, 156, 169, 170, 175, 176, 185, 186, 1301 ~ 1304, 1313 ~ 1316: NJM5532S
IC153, 154, 177, 178, 1317 ~ 1320: NJM5532SD
IC151, 152, 179 ~ 182, 701, 702, 705, 709, 710, 730, 736, 742, 1321 ~ 1324, 1501 ~ 1504: μPC4570HA
Dual Ope-amp



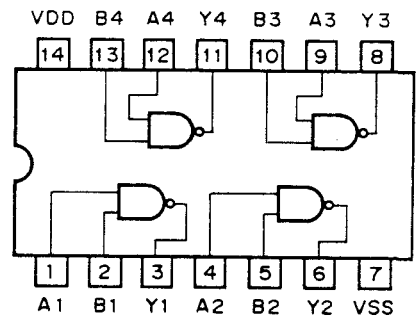
IC187, 1019 ~ 1023: LB1294
LED Driver



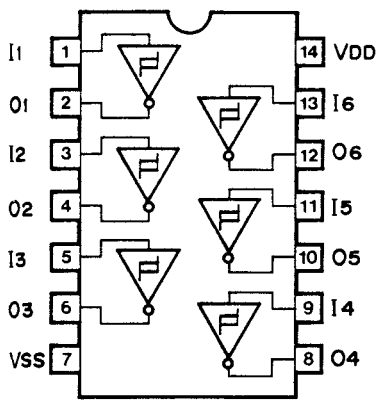
IC163 ~ 168,
171, 172, 1305 ~ 1308: M510101P
Transistor Array



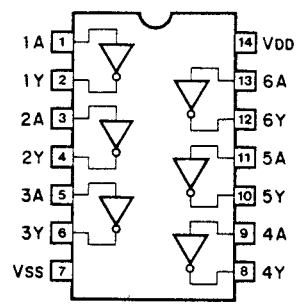
IC617, 626: TC74HC00P
Quad 2-Input Nand Gate



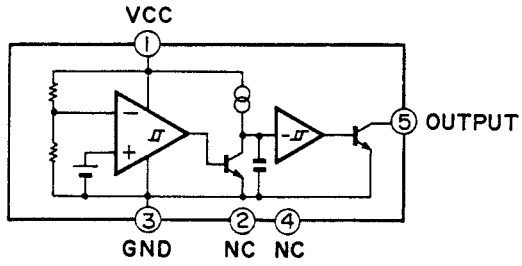
IC616: TC74HC14P, M74HC14P or MN74HC14
Hex Schmitt Trigger Inverters



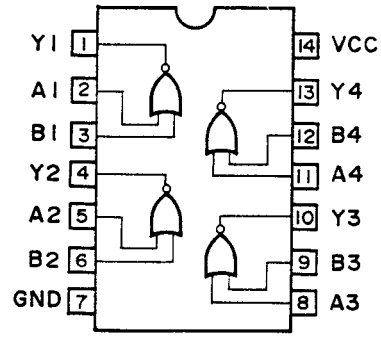
IC618, 627: TC74HC04P or M74HC04P
IC901 ~ 907: μPD74HCU04C
Hex Inverters



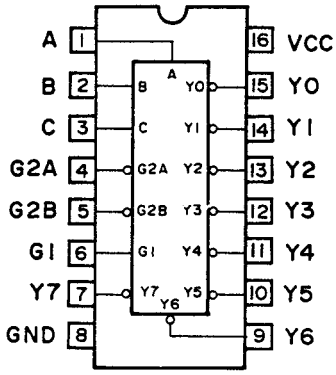
IC7g, 620: M51951BL
Line Voltage Detecting Delay Circuit



IC621, 622, 624, 720: TC74HC02P or M74HC02P
Quad 2-Input NOR Gate



IC623: TC74HC138P or M74HC138P
3-to-8 Line Decoder

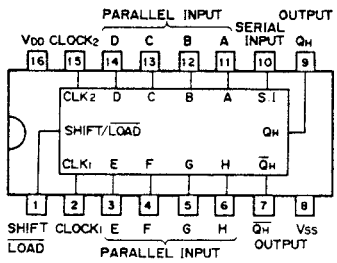


Truth Table

Inputs					Outputs							
Enable		Select										
G1	$\overline{G2}$*	C	B	A	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
X	H	X	X	X	H	H	H	H	H	H	H	H
L	X	X	X	X	H	H	H	H	H	H	H	H
H	L	L	L	L	L	H	H	H	H	H	H	H
H	L	L	L	H	H	L	H	H	H	H	H	H
H	L	L	H	L	H	H	L	H	H	H	H	H
H	L	L	H	H	H	H	H	L	H	H	H	H
H	L	H	L	L	H	H	H	H	L	H	H	H
H	L	H	L	H	H	H	H	H	H	L	H	H
H	L	H	H	L	H	H	H	H	H	H	L	H
H	L	H	H	H	H	H	H	H	H	H	H	L

*$\overline{G2} = \overline{G2A} + \overline{G2B}$

IC628 ~ 630: TC74HC163P or M74HC163P
Binary Counter with Synchronous Reset

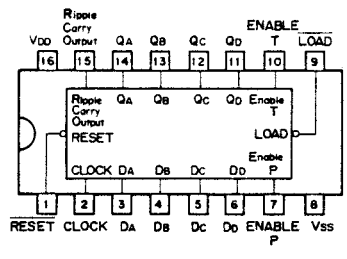


Truth Table

INPUT					OUTPUTS
CLOCK	$\overline{RESET}$	$\overline{LOAD}$	ENABLE P	ENABLE T	QA
↑	L	X	X	X	L
↑	H	L	X	X	LOAD
↑	H	H	H	H	COUNT
X	H	H	L	H	NO COUNT
X	H	H	H	L	NO COUNT

H: HIGH LEVEL L: LOW LEVEL X: H or L n = A ~ D

IC625: μPC74HC165C
8-bit Serial or Parallel-In/
Serial-Out Shift Register

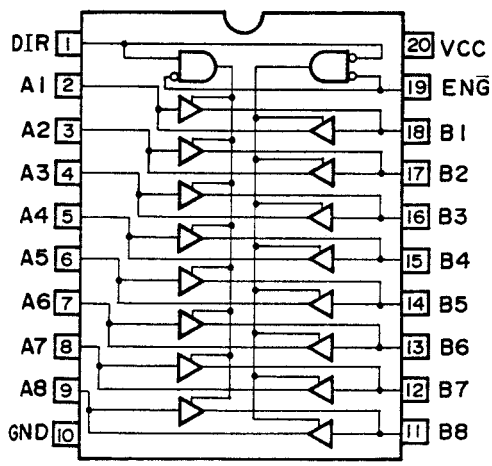


Truth Table

INPUT					Internal Output QA ··· QB	Output QH
SHIFT/$\overline{LOAD}$	$CLOCK_1$	$CLOCK_2$	SERIAL INPUT S_1	PARALLEL INPUT A ··· H		
L	X	X	X	a ··· h	a b	h
H	L	L	X	X	no change	change
H	↑	L	H	X	H QAa	QGa
H	↑	L	L	X	L QAa	QGa
H	L	↑	H	X	H QAa	QGa
H	L	↑	L	X	L QAa	QGa
H	X	H	X	X	no change	no change

H: HIGH LEVEL L: LOW LEVEL X: H or L
QAa . . . QGa: Shifted Pre-output

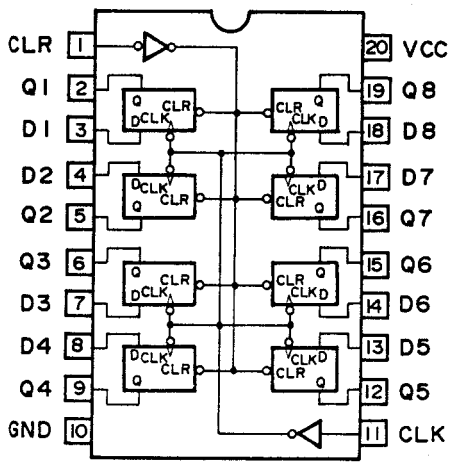
IC609: TC74HC245P or MN74HC245
Octal 3 State Transceiver



Truth Table

Control Inputs		Operation
$\overline{G}$	DIR	
L	L	B data to A bus
L	H	A data to B bus
H	X	Isolation

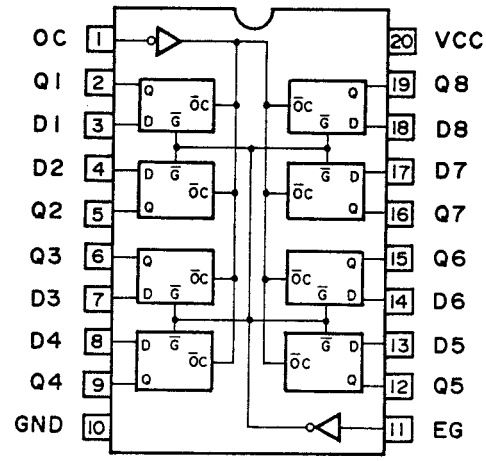
IC4g, 5g, 611 ~ 613: TC74HC273P or M74HC273P
Octal D Flip-Flops with Clear



Truth Table

Inputs			Outputs
Clear	Clock	D	Q
L	X	X	L
H	↑	H	H
H	↑	L	L
H	L	X	Q_0

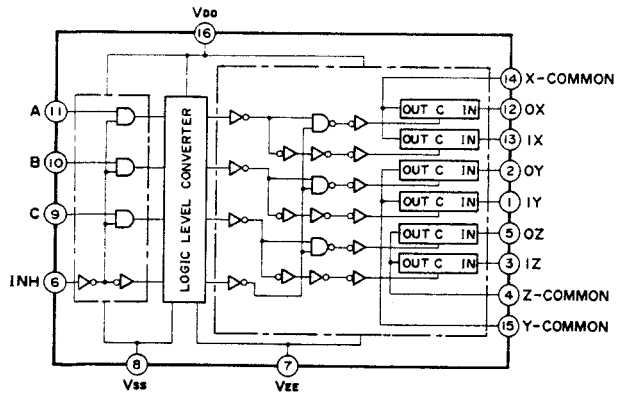
IC604, 610, 634: TC74HC373P or M74HC373P
3 State Octal D-type Latch



Truth Table

Output Control	Enable G	Data	373 Output	573 Output
L	H	H	H	L
L	H	L	L	H
L	L	X	Q_0	Q_0
H	X	X	Z	Z

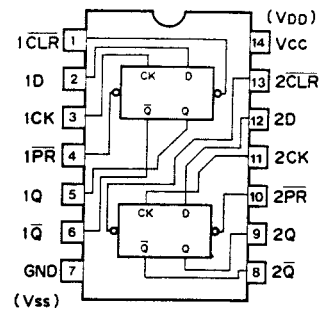
IC707, 708: μPD4053BC
Triple-2 channel Multiplexer/Demultiplexer



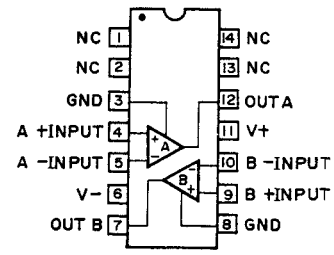
CONTROL INPUTS				"ON" CHANNEL
INHIBIT (Pin 6)	C (Pin 9)	B (Pin 10)	A (Pin 11)	0X (Pin 12), 0Y (Pin 2), 0Z (Pin 5) 1X (Pin 13), 1Y (Pin 1), 1Z (Pin 3)
L	L	L	L	0X, 0Y, 0Z
L	L	L	H	1X, 0Y, 0Z
L	L	H	L	0X, 1Y, 0Z
L	L	H	H	1X, 1Y, 0Z
L	H	L	L	0X, 0Y, 1Z
L	H	L	H	1X, 0Y, 1Z
L	H	H	L	0X, 1Y, 1Z
L	H	H	H	1X, 1Y, 1Z
H	*	*	*	NOTE

*Don't Care

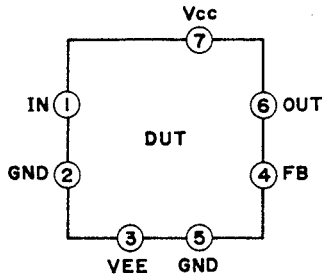
IC721: TC74HC74P or M74HC74P
Dual-D-FFs with Preset and Clear



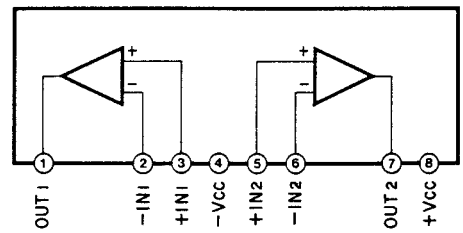
IC713, 714: μPC319C or NJM319D
Comparator



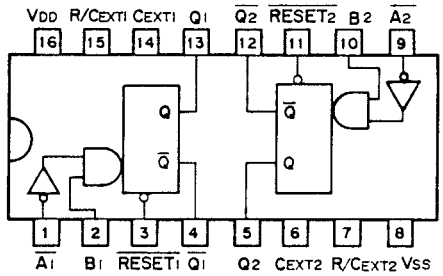
IC703, 704: LP22D9B3
Low Pass Filter



IC706: M5238L
IC1001 ~ 1011: NJM5532DD
Dual Ope-amp



IC722: μPD74HC123AC
Dual Retriggerable Single Shot

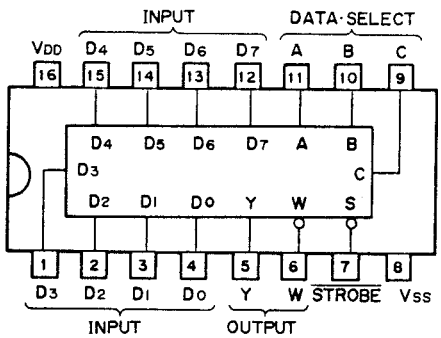


Truth Table

INPUT			OUTPUT	
$\overline{\text{RESET}}$	$\overline{\text{A}}$	B	Q	$\overline{\text{Q}}$
L	X	X	L	H
X	H	X	L	H
X	X	L	L	H
H	L	↑	⊓	⊔
H	↓	H	⊓	⊔
↓	L	H	⊓	⊔

H: HIGH LEVEL L: LOW LEVEL X: H or L
⊓: ONE H LEVEL PULSE
⊔: ONE L LEVEL PULSE

IC908 ~ 910: μPD74HC151C
8 to 1 Data Selector

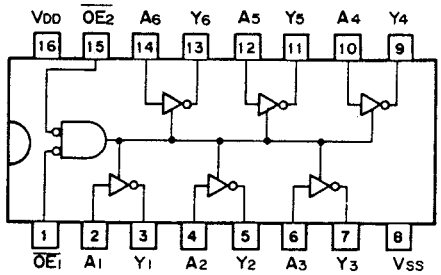


Truth Table

INPUT				OUTPUT	
SELECT			$\overline{\text{STROBE}}$		
C	B	A	$\overline{\text{S}}$	Y	W
X	X	X	H	L	H
L	L	L	L	D_0	$\overline{D_0}$
L	L	H	L	D_1	$\overline{D_1}$
L	H	L	L	D_2	$\overline{D_2}$
L	H	H	L	D_3	$\overline{D_3}$
H	L	L	L	D_4	$\overline{D_4}$
H	L	H	L	D_5	$\overline{D_5}$
H	H	L	L	D_6	$\overline{D_6}$
H	H	H	L	D_7	$\overline{D_7}$

H: HIGH LEVEL L: LOW LEVEL X: H or L

IC1018: μPD74HC366C
Hex 3-State Bus Inverters

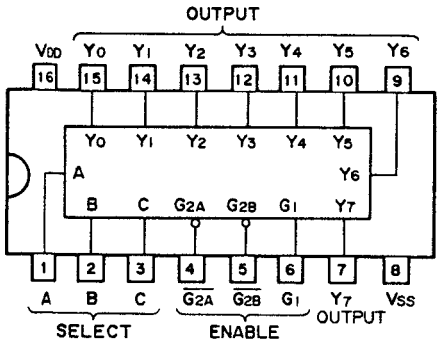


Truth Table

INPUT			OUTPUT
$\overline{\text{OUTPUT ENABLE}_1}$ $\overline{\text{OE}_1}$	$\overline{\text{OUTPUT ENABLE}_2}$ $\overline{\text{OE}_2}$	A	Y
L	L	L	H
L	L	H	L
H	X	X	Z
X	H	X	Z

H: HIGH LEVEL L: LOW LEVEL X: H or L
Z: HIGH IMPEDANCE

IC1012 ~ 1015: μPD74HC238C
Decoder/Demultiplexer

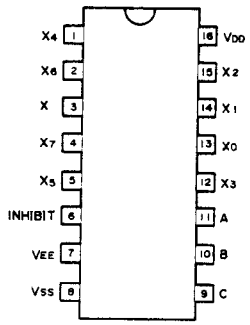


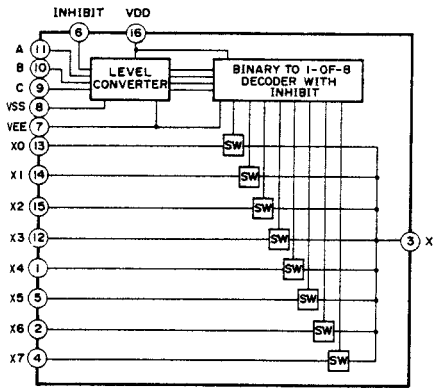
Truth Table

INPUT					OUTPUT							
ENABLE		SELECT										
G_1	$\overline{G_2}$*	C	B	A	Y_0	Y_1	Y_2	Y_3	Y_4	Y_5	Y_6	Y_7
X	H	X	X	X	L	L	L	L	L	L	L	L
L	X	X	X	X	L	L	L	L	L	L	L	L
H	L	L	L	L	H	L	L	L	L	L	L	L
H	L	L	L	H	L	H	L	L	L	L	L	L
H	L	L	H	L	L	L	H	L	L	L	L	L
H	L	L	H	H	L	L	L	H	L	L	L	L
H	L	H	L	L	L	L	L	L	H	L	L	L
H	L	H	L	H	L	L	L	L	L	H	L	L
H	L	H	H	L	L	L	L	L	L	L	H	L
H	L	H	H	H	L	L	L	L	L	L	L	H

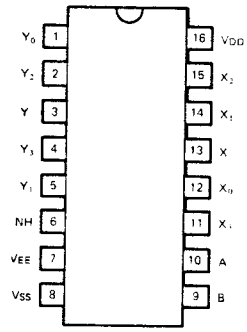
$\overline{G_2}$* = $\overline{G_2A}$ X $\overline{G_2B}$
H: HIGH LEVEL L: LOW LEVEL X: H or L

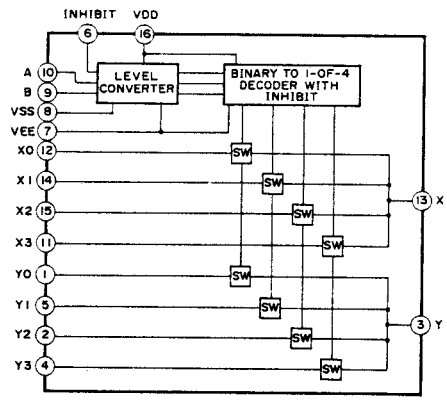
IC1017: TC4051BP
Single 8-Channel Multiplexer/Demultiplexer





IC1016: μPD4052BC
Differential 4-Channel Multiplexer/Demultiplexer



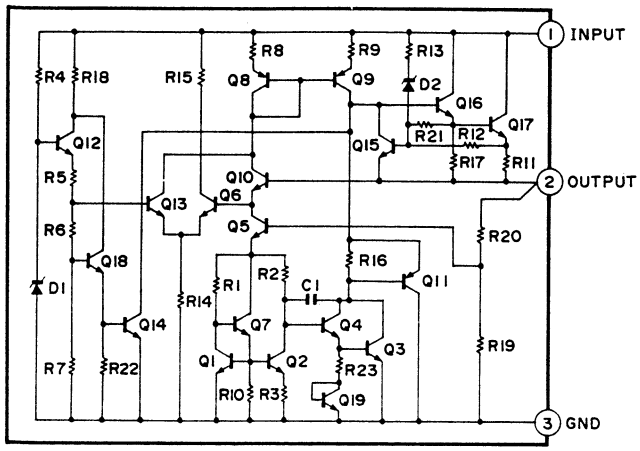


Truth Table

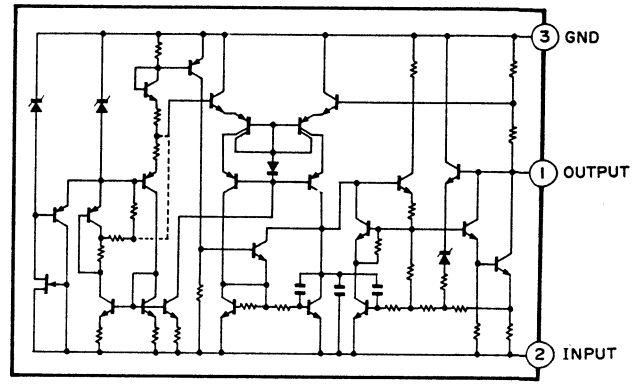
CONTROL INPUT				"ON" CHANNEL		
INHIBIT	C	B	A	μPD4051BC /4051BG	μPD4052BC /4052BG	μPD4053BC /4053BG
L	L	L	L	X_0	Y_0, X_0	Z_0, Y_0, X_0
L	L	L	H	X_1	Y_1, X_1	Z_0, Y_0, X_1
L	L	H	L	X_2	Y_2, X_2	Z_0, Y_1, X_0
L	L	H	H	X_3	Y_3, X_3	Z_0, Y_1, X_1
L	H	L	L	X_4	—	Z_1, Y_0, X_0
L	H	L	H	X_5	—	Z_1, Y_0, X_1
L	H	H	L	X_6	—	Z_1, Y_1, X_0
L	H	H	H	X_7	—	Z_1, Y_1, X_1
H	X	X	X	NONE	NONE	NONE

H: HIGH LEVEL L: LOW LEVEL X: H or L
*EXCEPT μPD4052BC/4052BG

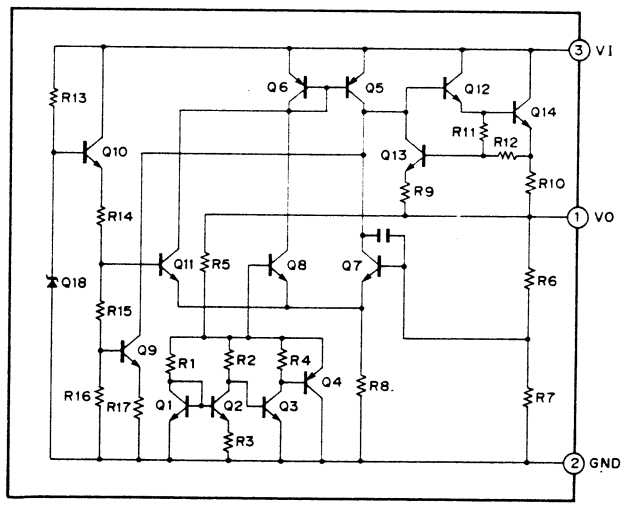
IC601: μPC7805HF
Regulator



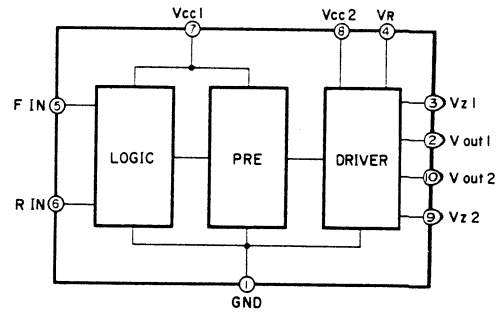
IC602: NJM79M05A
Regulator



IC951: NJM78L05
Regulator



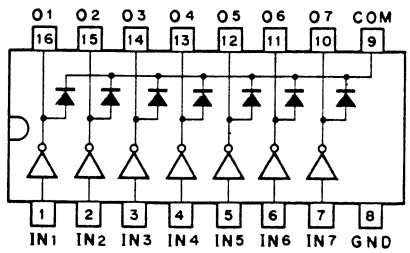
IC8g: BA6209
Motor Driver



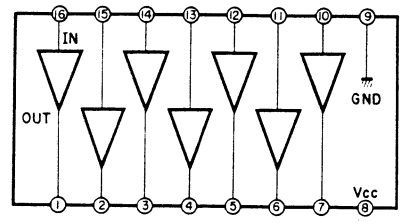
Truth Table

F IN	R IN	Vout 1	Vout 2
1	1	L	L
0	1	L	H
1	0	H	L
0	0	L	L

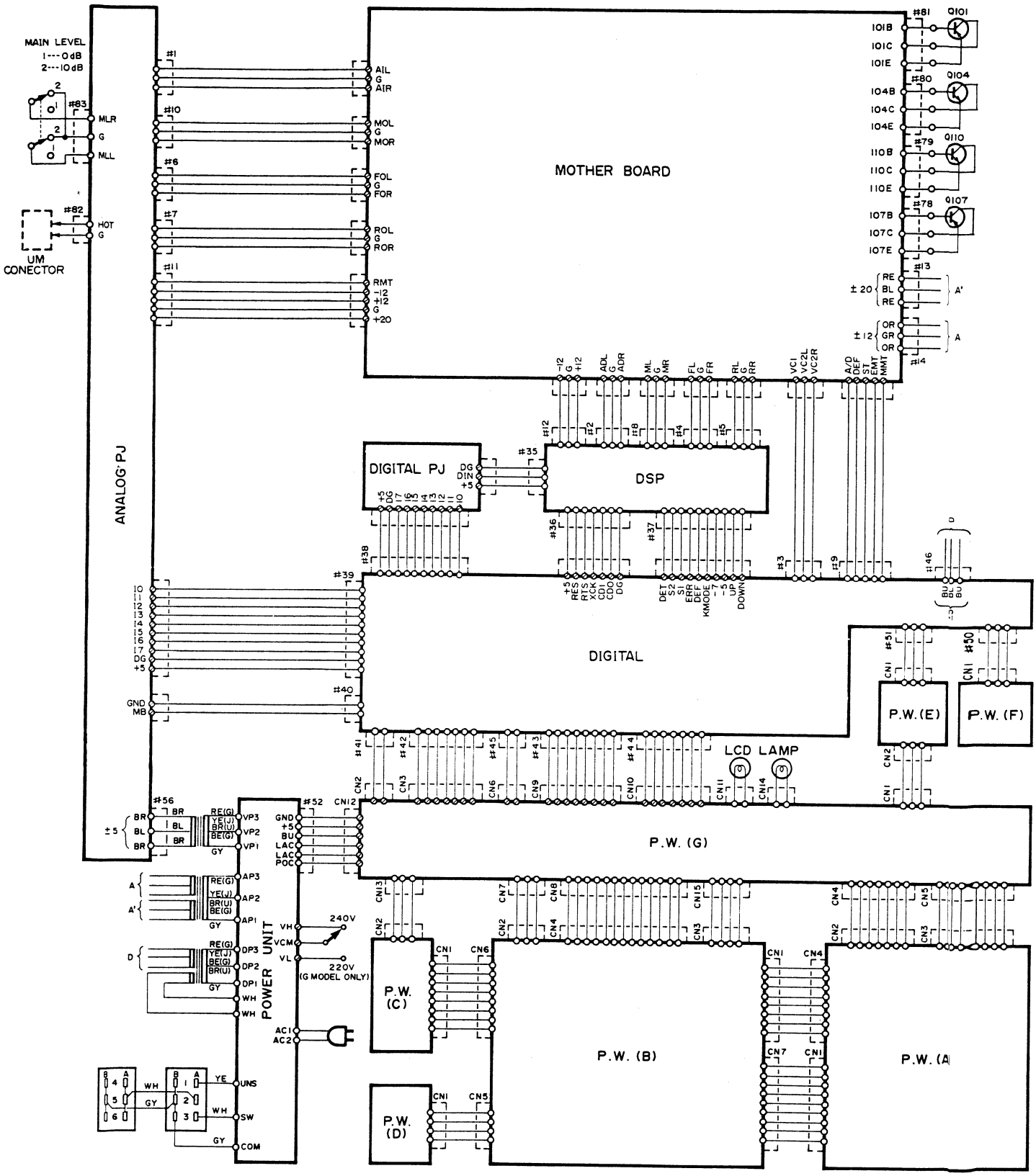
IC2g: LB1234 or BA12004
LED Driver



IC3g, 6g: BA618
LED Driver



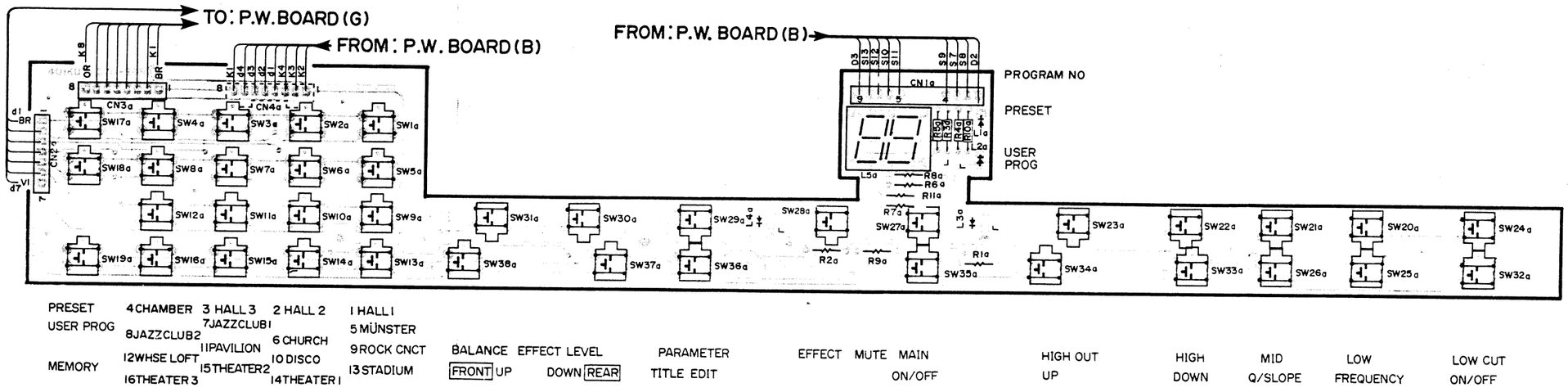
WIRING


MOTHER BOARD
ANALOG PJ
DIGITAL PJ
DSP
DIGITAL
POWER UNIT
P.W. (A)
P.W. (B)
P.W. (C)
P.W. (D)
P.W. (E)
P.W. (F)
P.W. (G)
LCD LAMP
MAIN LEVEL
1---0dB
2---10dB
UM CONECTOR
240V
220V
(G MODEL ONLY)

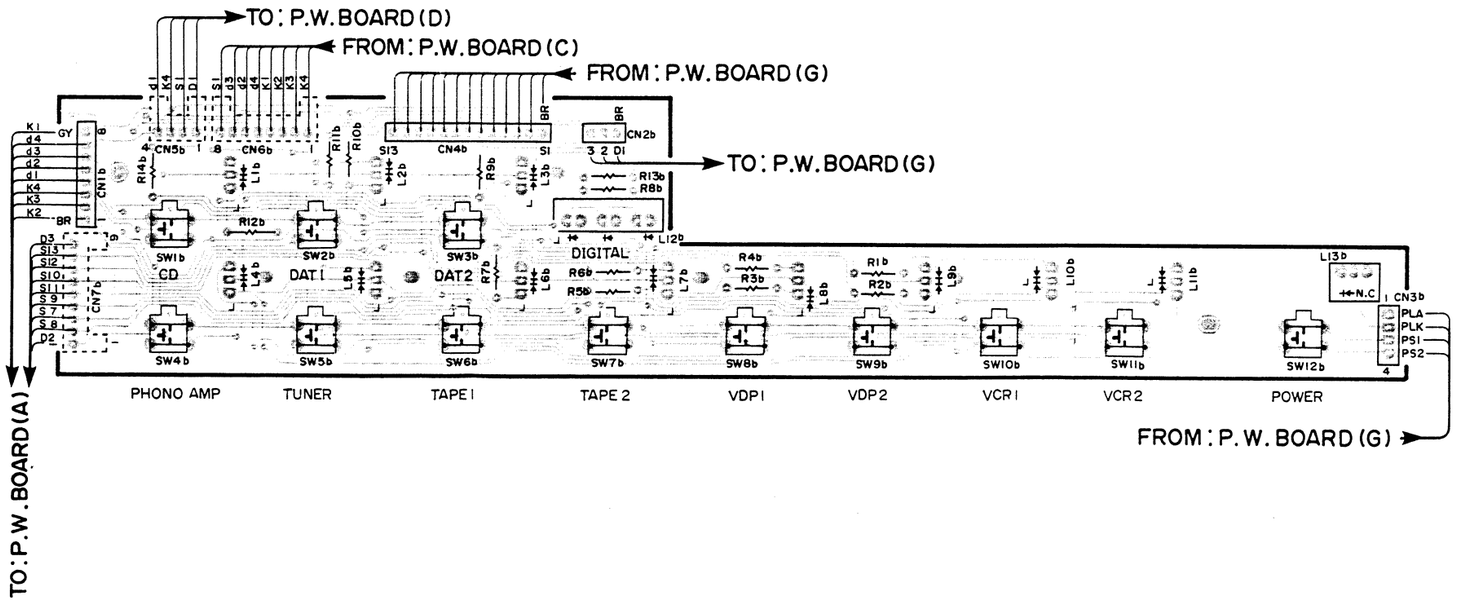
■PRINTED CIRCUIT BOARD(Pattern side)

Note) 文字面 : Component side

PW Circuit Board (A)



PW Circuit Board (B)

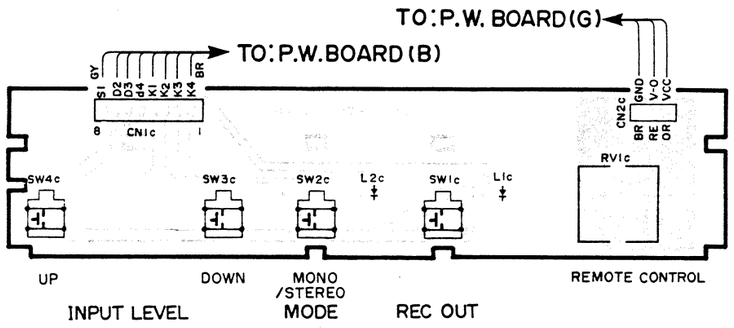


: Front pattern
: Back pattern

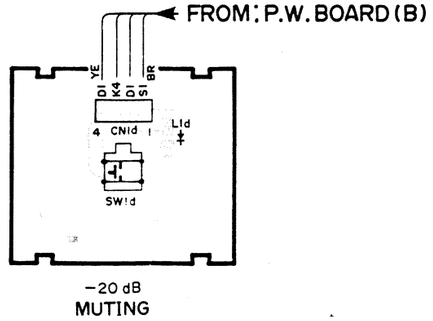
■ PRINTED CIRCUIT BOARD(Pattern side)

Note) 文字面 : Component side

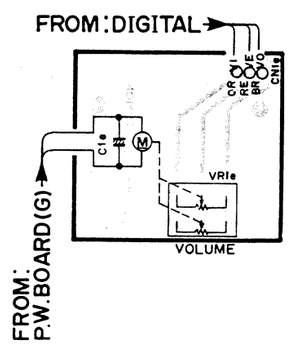
PW Circuit Board (C)



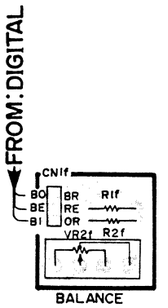
PW Circuit Board (D)



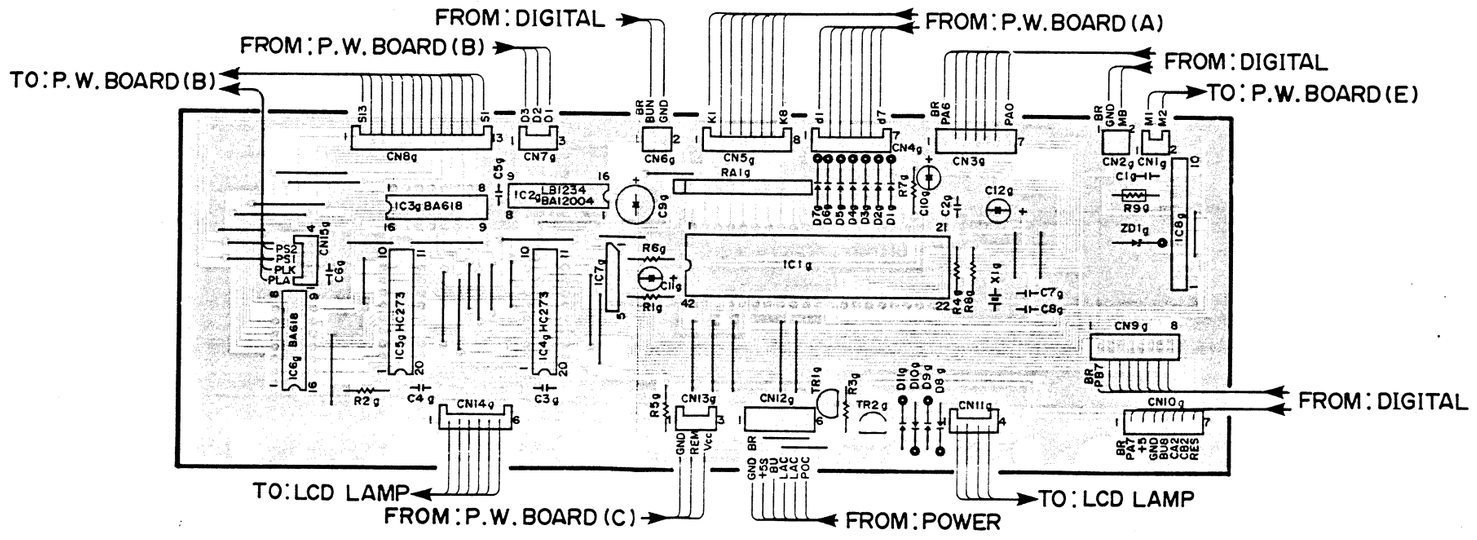
PW Circuit Board (E)



PW Circuit Board (F)



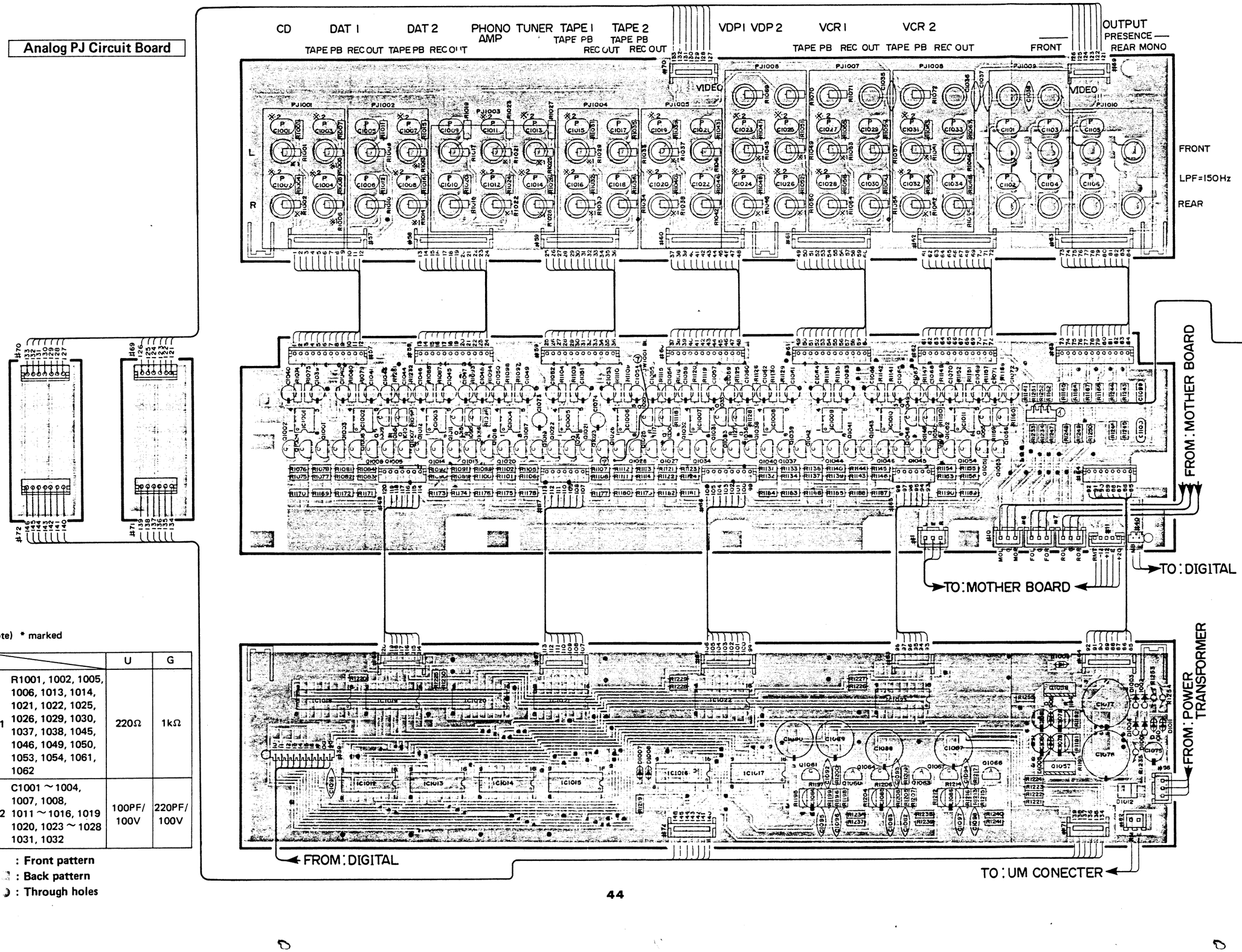
PW Circuit Board (G)



PRINTED CIRCUIT BOARD(Pattern side)

Note) 文字面 : Component side

Analog PJ Circuit Board



Note) * marked

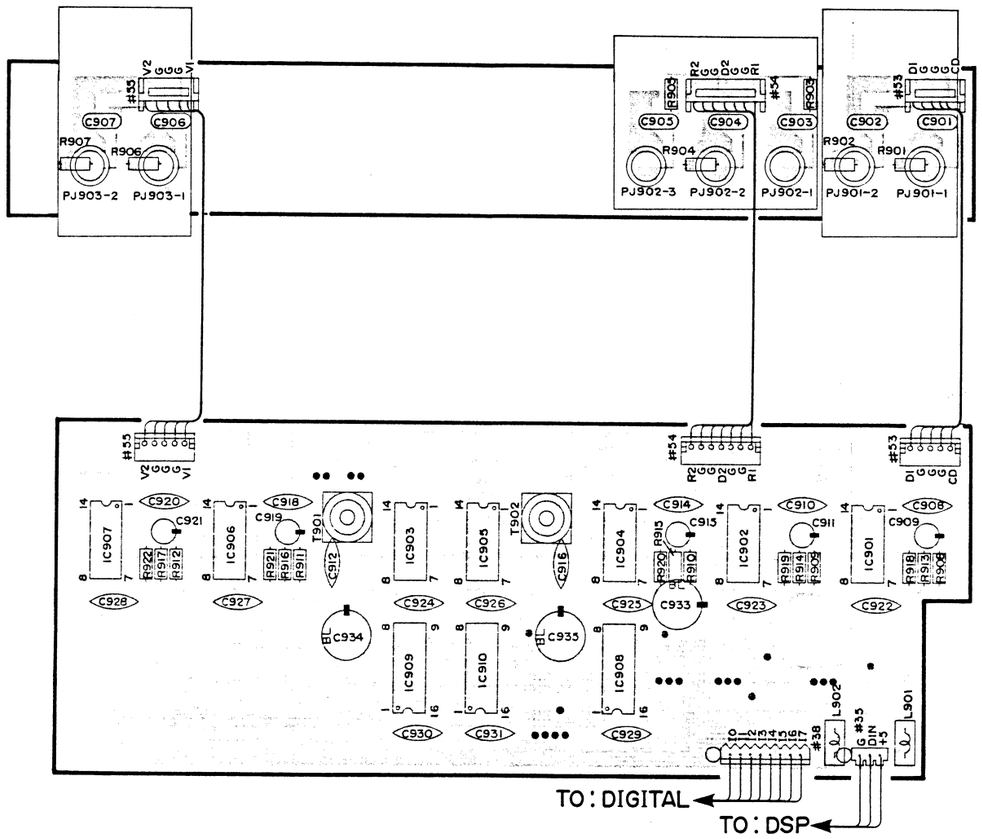
		U	G
*1	R1001, 1002, 1005, 1006, 1013, 1014, 1021, 1022, 1025, 1026, 1029, 1030, 1037, 1038, 1045, 1046, 1049, 1050, 1053, 1054, 1061, 1062	220Ω	1kΩ
*2	C1001 ～1004, 1007, 1008, 1011 ～1016, 1019 1020, 1023 ～1028 1031, 1032	100PF/ 100V	220PF/ 100V

: Front pattern
: Back pattern
: Through holes

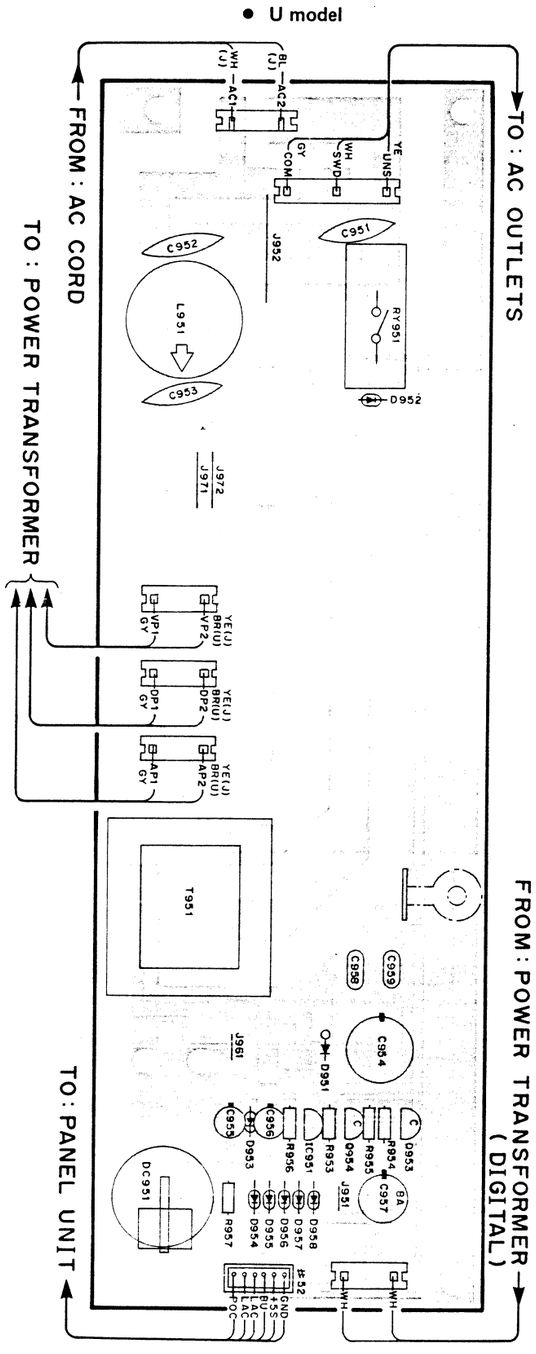
PRINTED CIRCUIT BOARD (Pattern side)

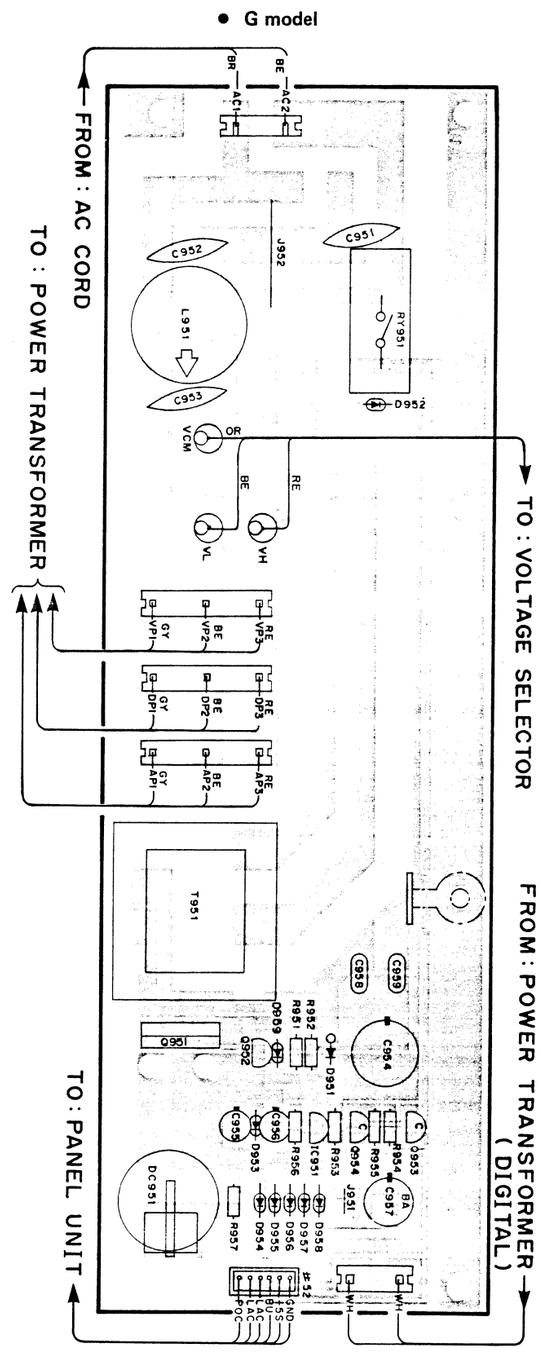
Note) 文字面 : Component side

Digital PJ Circuit Board



Power Circuit Board



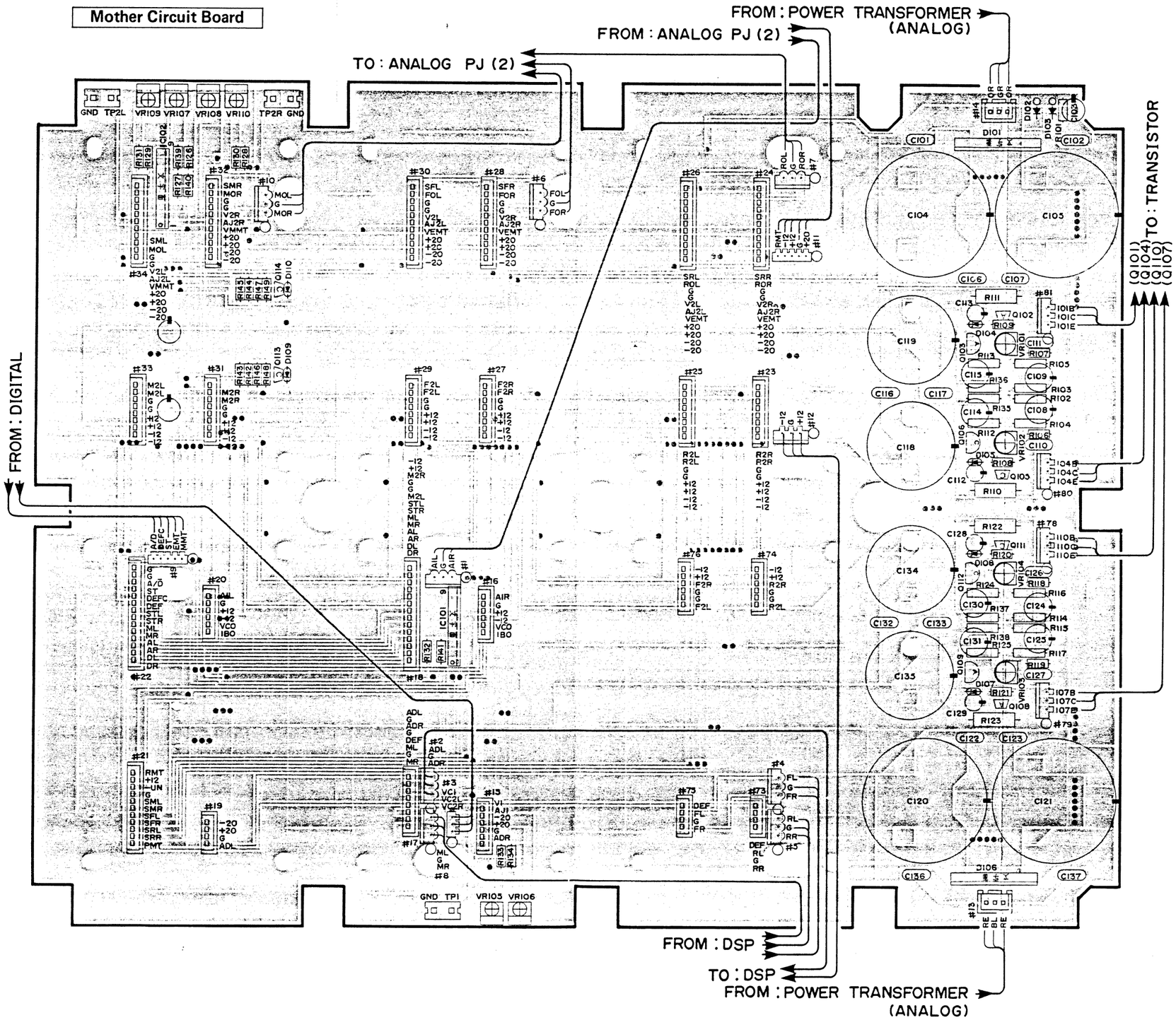


: Front pattern
: Back pattern
: Through holes

PRINTED CIRCUIT BOARD(Pattern side)

Note) 文字面 : Component side

: Front pattern
: Back pattern
: Through holes

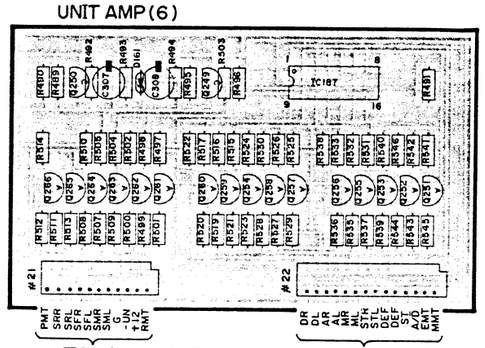


PRINTED CIRCUIT BOARD (Pattern side)

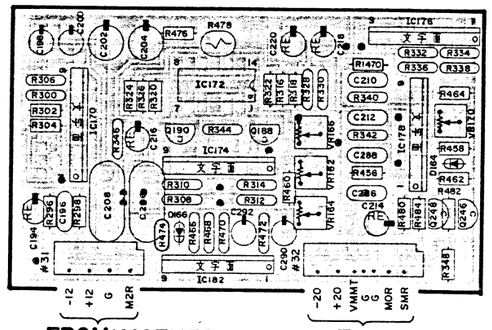
Note) 文字面 : Component side

Unit Amp Circuit Board

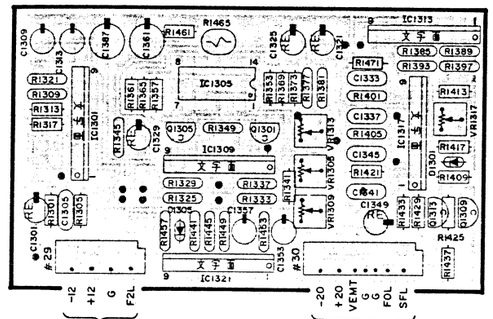
UNIT AMP(6)



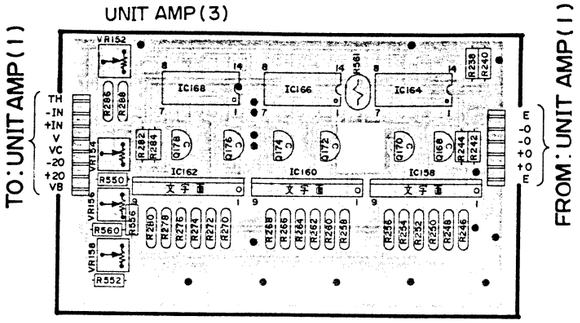
UNIT AMP(11)



UNIT AMP(10)



UNIT AMP(3)



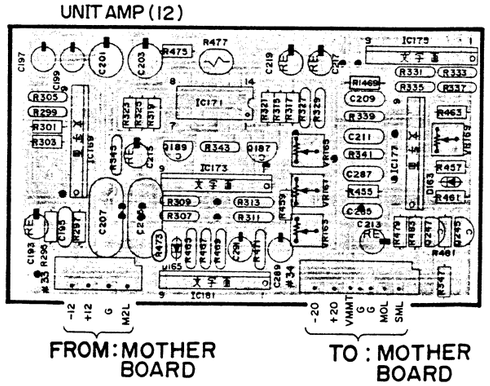
UNIT AMP(4)

UNIT AMP(2)

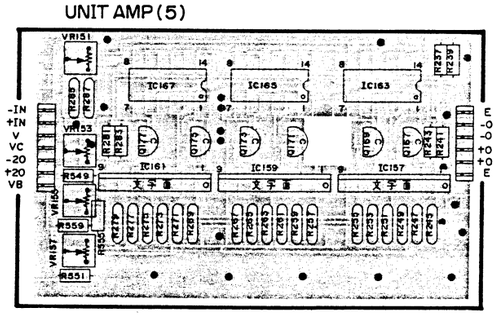
UNIT AMP(9)

UNIT AMP(8)

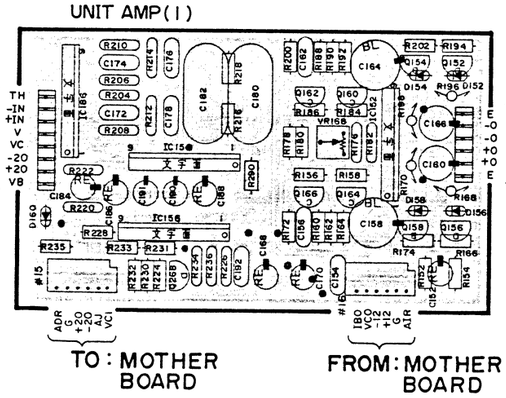
UNIT AMP(12)



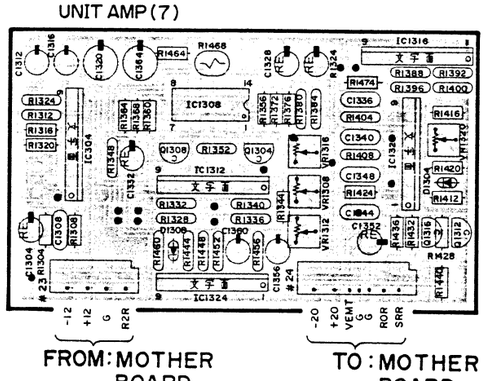
UNIT AMP(5)



UNIT AMP(1)



UNIT AMP(7)

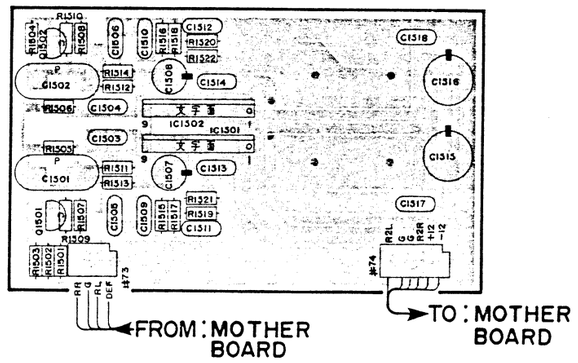


: Front pattern
: Back pattern
: Through holes

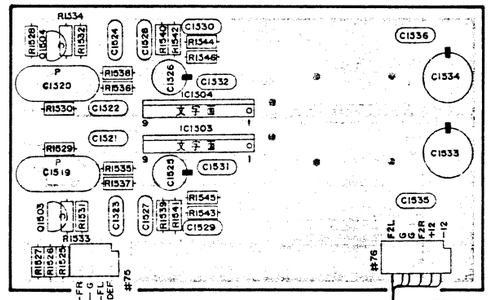
■ PRINTED CIRCUIT BOARD(Pattern side)

Note) 文字面 : Component side

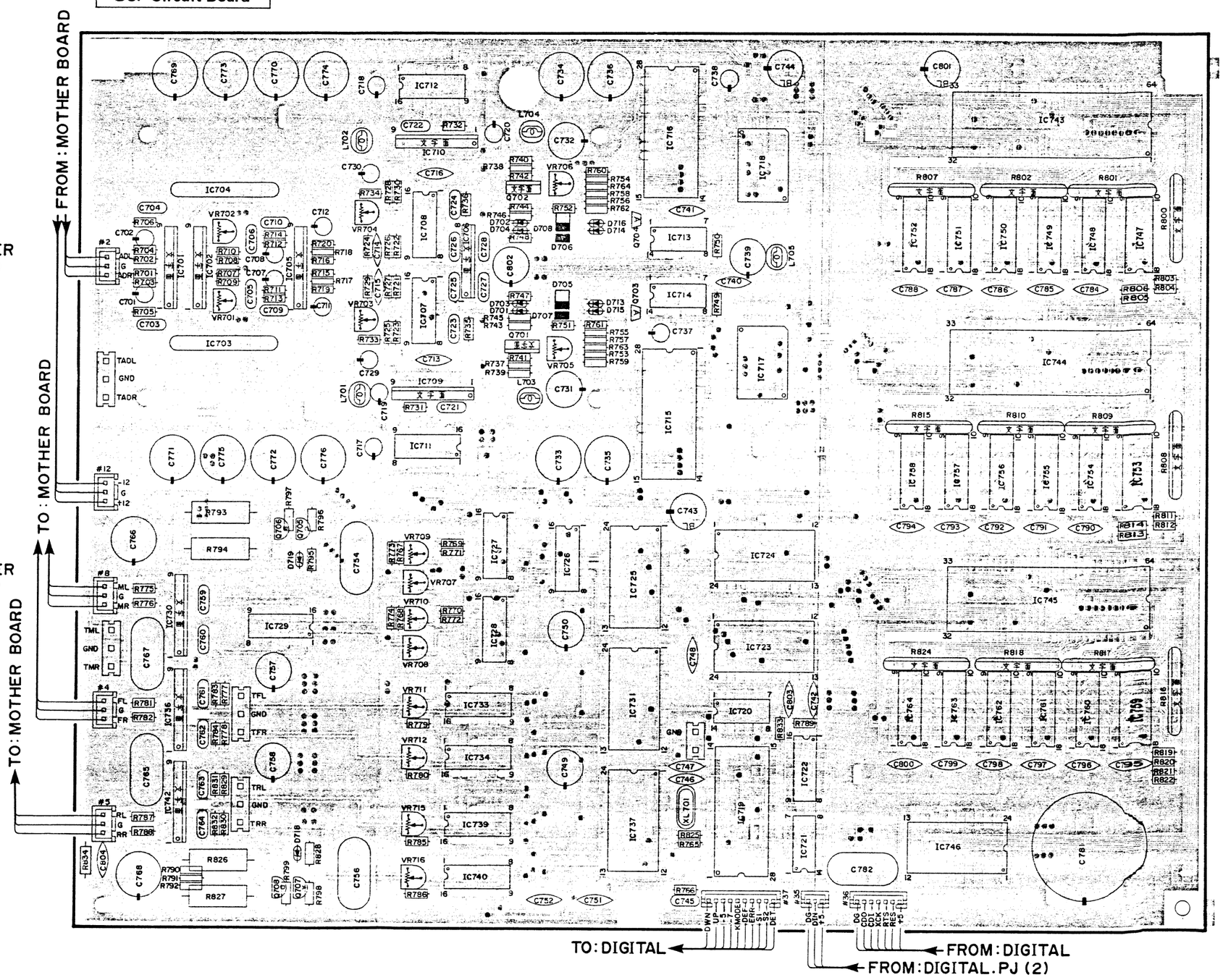
Unit Amp Effect Circuit Board (1)



Unit Amp Effect Circuit Board (2)



DSP Circuit Board

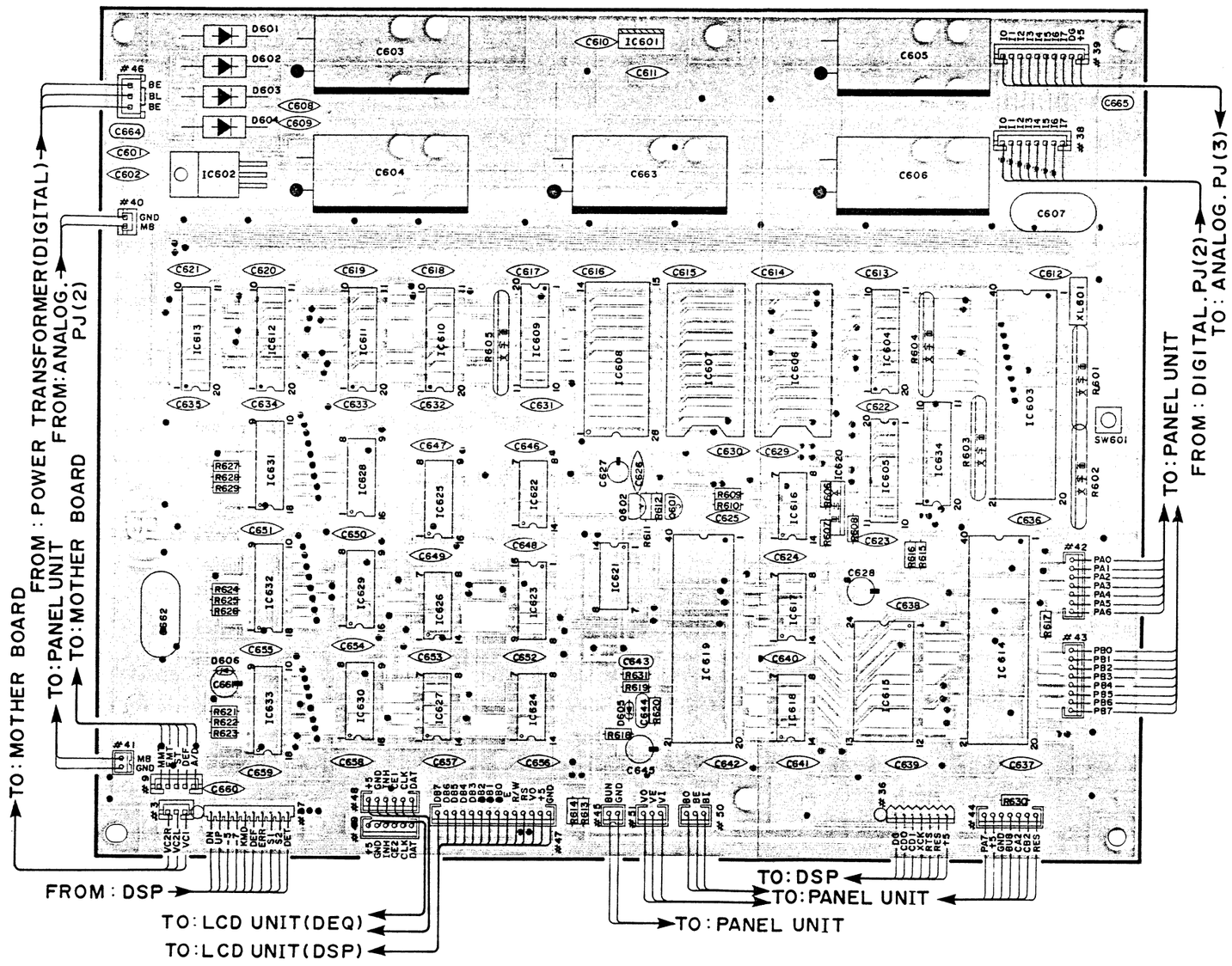


: Front pattern
: Back pattern
: Through holes

PRINTED CIRCUIT BOARD(Pattern side)

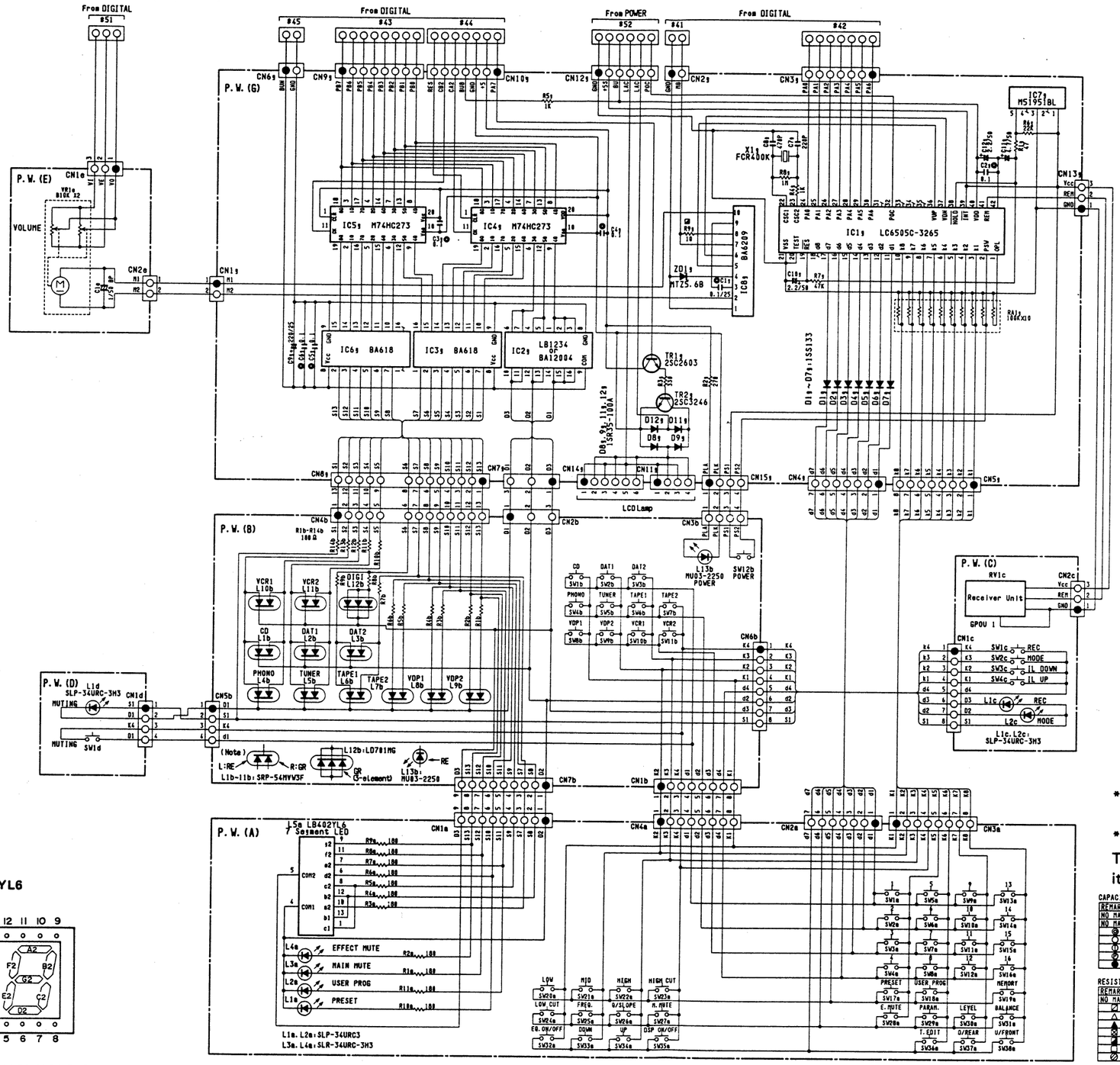
Note) 文字面 : Component side

Digital Circuit Board



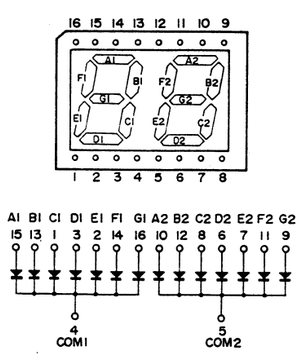
: Front pattern
: Back pattern
) : Through holes

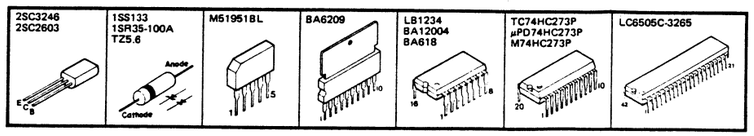
■SCHEMATIC DIAGRAM(1/10) PW Circuit Board



Switch			IC1g [Pin No.]	Switch		IC1g [Pin No.]
REC OUT		SW1c	6(K4)—14(d4)	M. MUTE	SW27a	6(K4)—16(d6)
MODE		SW2c	5(K3)—14(d4)	E. MUTE	SW28a	7(K5)—16(d6)
INPUT	DOWN	SW3c	4(K2)—14(d4)	DSP ON/OFF	SW35a	6(K4)—17(d7)
	UP	SW4c	3(K1)—14(d4)	PARAM.	SW29a	8(K6)—16(d6)
POWER		SW12b	2(PSW)—Vcc	E. LEVEL	SW30a	9(K7)—16(d6)
VCR2		SW11b	6(K4)—13(d3)	E. BALANCE	SW31a	10(K8)—16(d6)
VCR1		SW10b	5(K3)—13(d3)	T. EDIT	SW36a	8(K6)—17(d7)
VDP2		SW9b	4(K2)—13(d3)	D/REAR	SW37a	9(K7)—17(d7)
VDP1		SW8b	3(K1)—13(d3)	U/FRONT	SW38a	10(K8)—17(d7)
TAPE 2		SW7b	6(K4)—12(d2)	1	SW1a	7(K5)—11(d1)
TAPE 1		SW6b	5(K3)—12(d2)	2	SW2a	7(K5)—12(d2)
TUNER		SW5b	4(K2)—12(d2)	3	SW3a	7(K5)—13(d3)
PHONO		SW4b	3(K1)—12(d2)	4	SW4a	7(K5)—14(d4)
DAT2		SW3b	5(K3)—11(d1)	5	SW5a	8(K6)—11(d1)
DAT1		SW2b	4(K2)—11(d1)	6	SW6a	8(K6)—12(d2)
CD		SW1b	3(K1)—11(d1)	7	SW7a	8(K6)—13(d3)
MUTING		SW1d	6(K4)—11(d1)	8	SW8a	8(K6)—14(d4)
LOW CUT		SW24a	3(K1)—16(d6)	9	SW9a	9(K7)—11(d1)
EQ ON/OFF		SW32a	3(K1)—17(d7)	10	SW10a	9(K7)—12(d2)
LOW		SW20a	3(K1)—15(d5)	11	SW11a	9(K7)—13(d3)
MID		SW21a	4(K2)—15(d5)	12	SW12a	9(K7)—14(d4)
HIGH		SW22a	5(K3)—15(d5)	13	SW13a	10(K8)—11(d1)
HIGH CUT		SW23a	6(K4)—15(d5)	14	SW14a	10(K8)—12(d2)
FREQ		SW25a	4(K2)—16(d6)	15	SW15a	10(K8)—13(d3)
Q/SLOPE		SW26a	5(K3)—16(d6)	16	SW16a	10(K8)—14(d4)
DOWN		SW33a	4(K2)—17(d7)	PRESET	SW17a	7(K5)—15(d5)
UP		SW34a	5(K3)—17(d7)	USER PROG.	SW18a	8(K6)—15(d5)
				MEMORY	SW19a	10(K8)—15(d5)

L5a: LB402YL6





*The mark " ● " in the connector indicates pin No. 1.

*Note on PW circuit Board Parts
The circuit code in this service manual has an alphabet at its end but the one on the circuit board itself doesn't

CAPACITOR

REMARKS	PARTS NAME
NO MARK	ELECTROLYTIC CAPACITOR
NO MARK	CERAMIC CAPACITOR
	POLYESTER FILM CAPACITOR (Mylar)
	POLYSTYRENE FILM CAPACITOR
	MICA CAPACITOR
	POLYPROPYLENE FILM CAPACITOR
	SEMICONDUCTIVE CERAMIC CAPACITOR

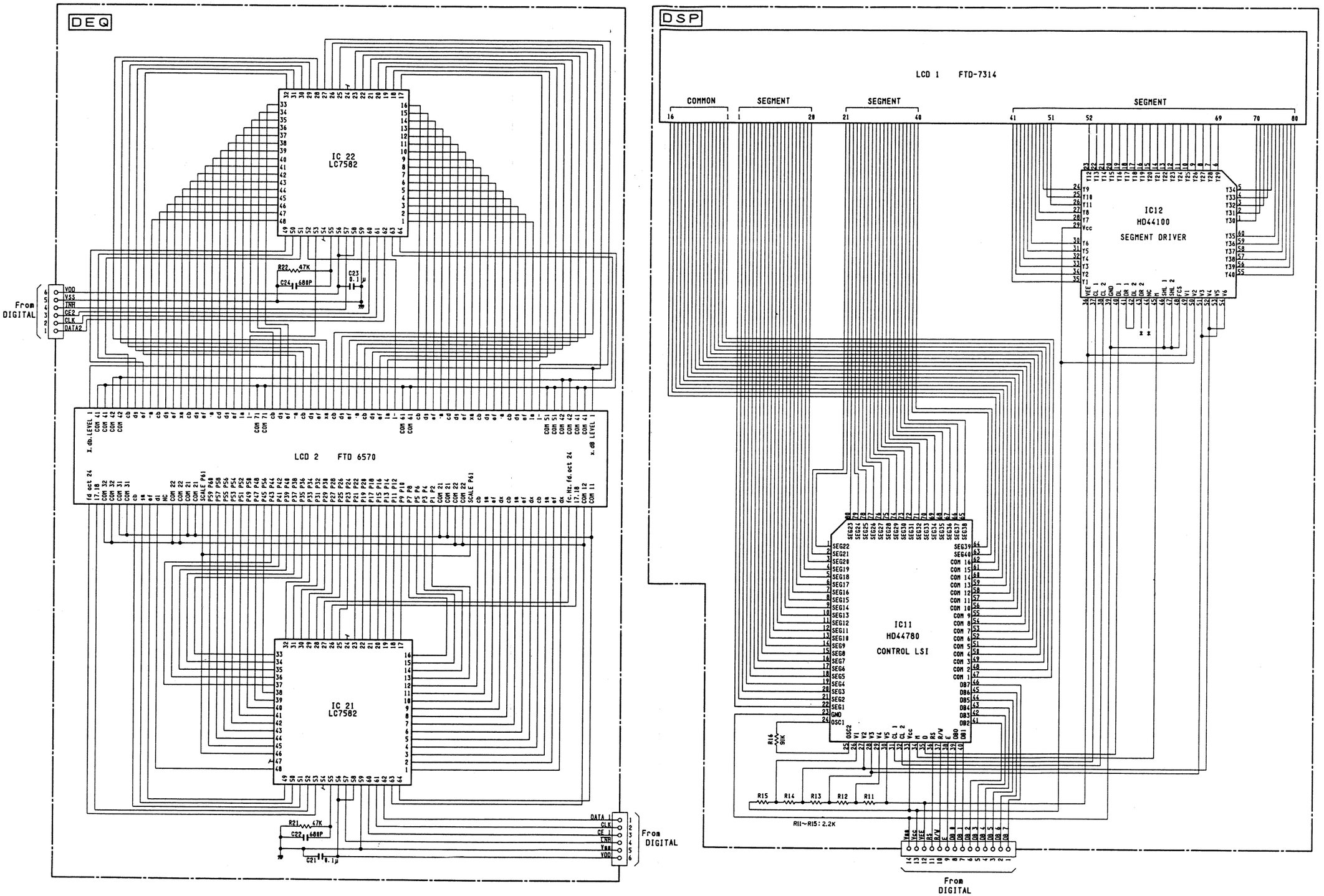
RESISTOR

REMARKS	PARTS NAME
NO MARK	CARBON FILM RESISTOR (1/4W)
	CARBON FILM RESISTOR (1/6W)
	METAL OXIDE FILM RESISTOR
	METAL FILM RESISTOR
	METAL PLATE RESISTOR
	FIRE PROOF CARBON FILM RESISTOR
	CEMENT MOLDED RESISTOR
	SEMI VARIABLE RESISTOR

Schematic diagram is subject to change without notice.

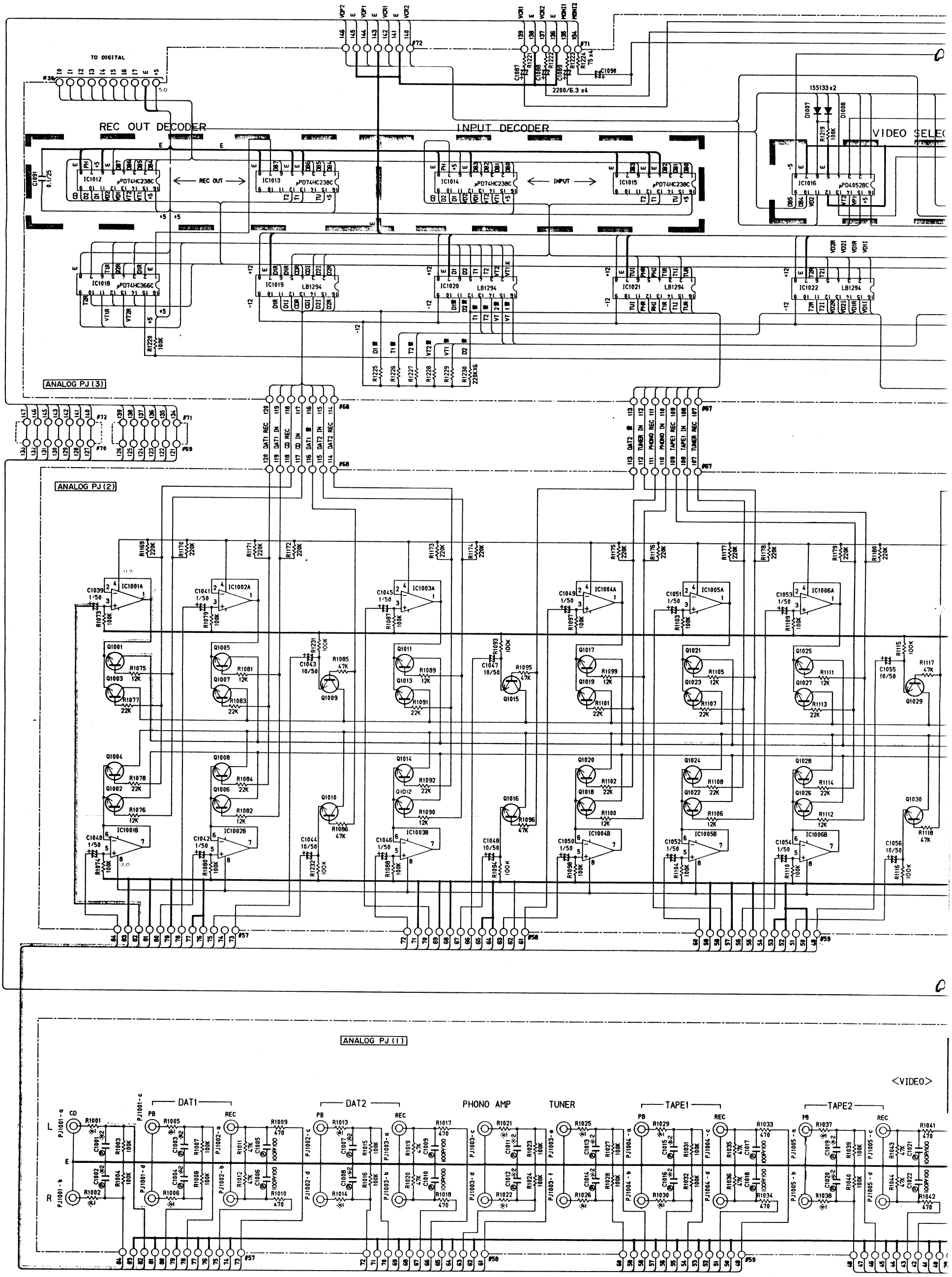
SCHEMATIC DIAGRAM(2/10) LCD Unit

Note) The LCD alone can not be replaced. When its replacement is necessary, replace the whole LCD unit.



Schematic diagram is subject to change without notice.

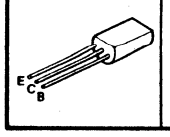
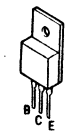
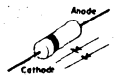
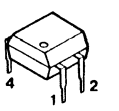
■SCHEMATIC DIAGRAM(3/10) Analog PJ Circuit Board

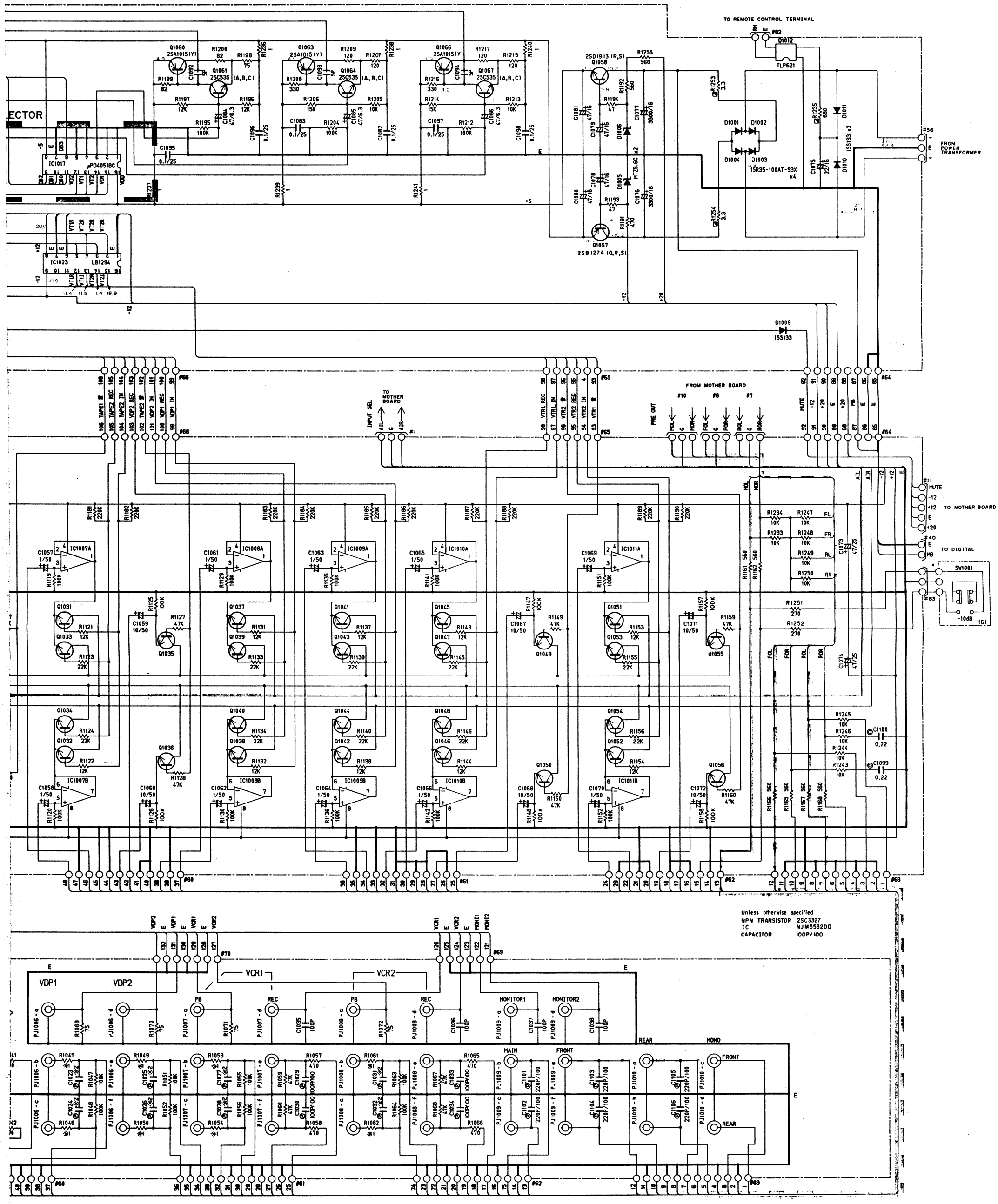


Note) ※marked

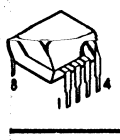
		J.U	G
※1	R1001, 1002, 1005, 1006, 1013, 1014, 1021, 1022, 1025, 1026, 1029, 1030, 1037, 1038, 1045, 1046, 1049, 1050, 1053, 1054, 1061, 1062	220	1K
※2	C1001~1004, 1007, 1008, 1011~1016, 1019, 1020, 1023~1028, 1031, 1032	100P/100	220P/100

PIN CONNECTION DIAGRAM OF TRANSISTORS, DIODES AND ICS.

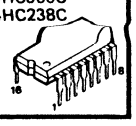
2SA1015 (Y) 2SC535 (A, B, C) 2SC3327	2SB1274 (Q, R, S) 2SD1913 (R, S)	1SS133 1SR35-100A MTZ5.6C	TLP621	NJM553
				



NJM5532DD

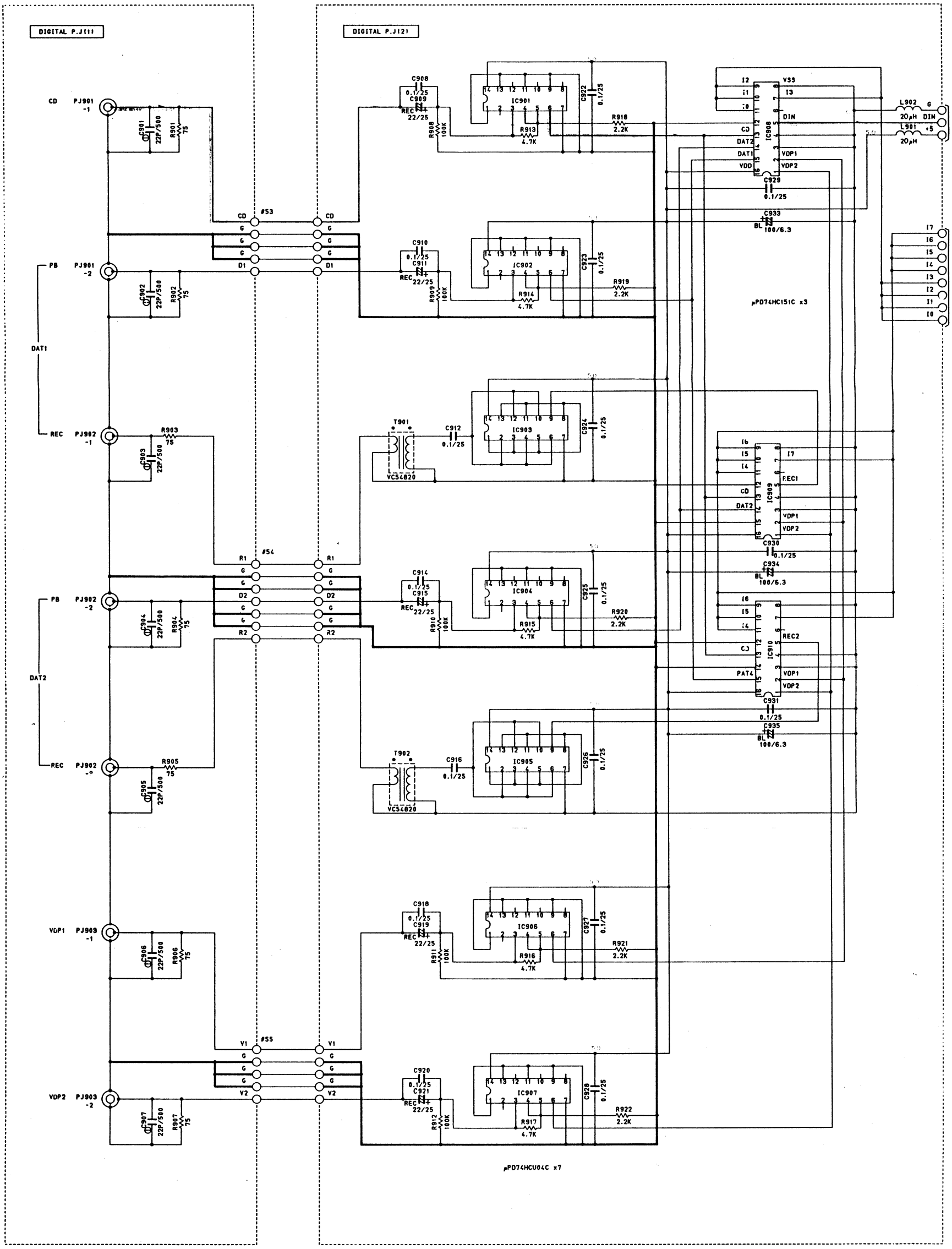


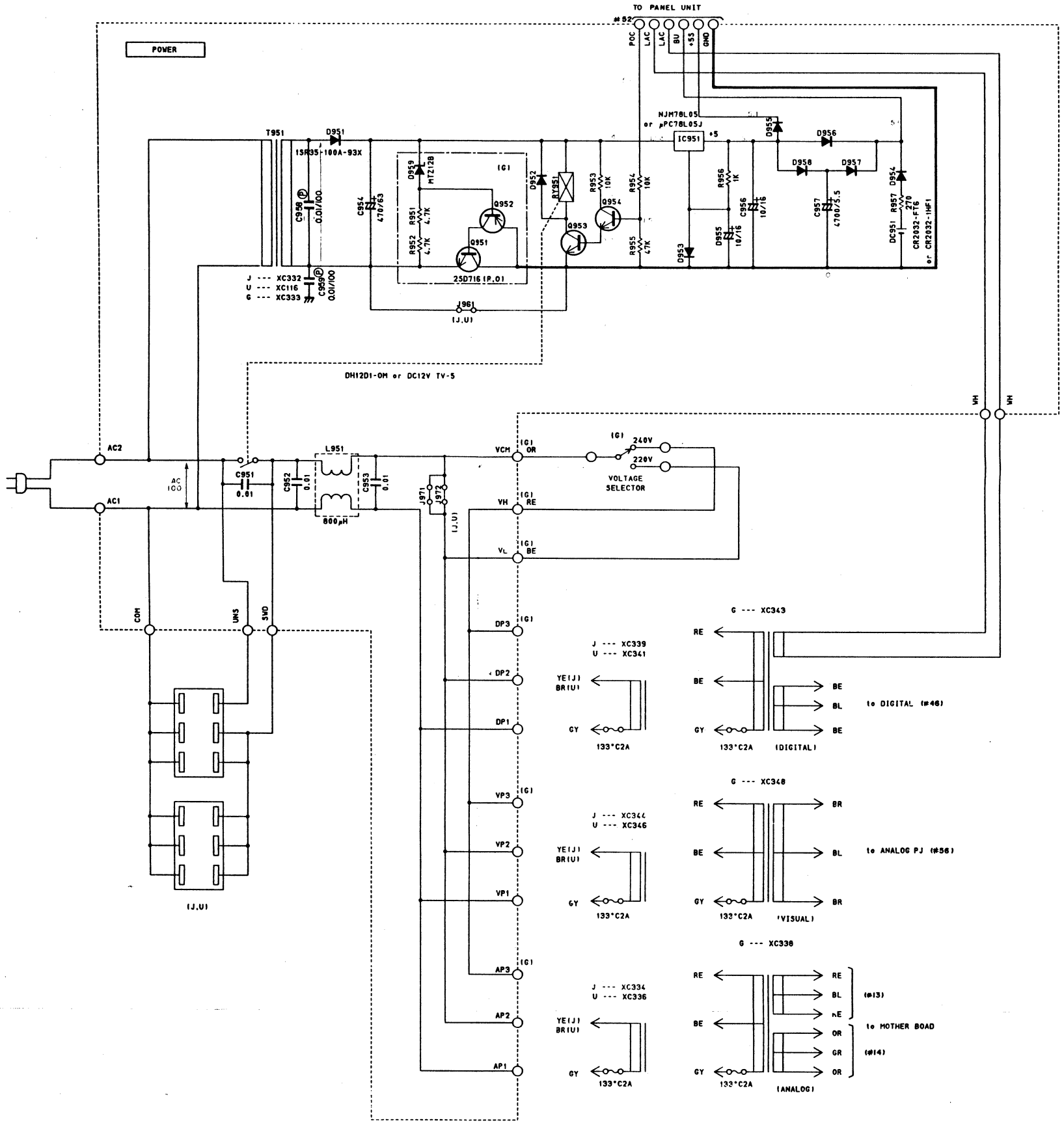
TC4051BP
μPD4052BC
LB1294
μPD74HC366C
μPD74HC238C



** All voltages are measured with a 10MΩ/DC electric volt meter.*
** Components having special characteristics are marked ⚠ and must be replaced with parts having specifications equal to those originally installed.*
** Schematic diagram is subject to change without notice.*

SCHEMATIC DIAGRAM(4/10) Digital PJ Circuit Board/ Power Circuit Board





•RESISTOR

REMARKS	PARTS NAME
NO MARK	CARBON FILM RESISTOR
☑	CARBON FILM RESISTOR (1/6W)
△	METAL OXIDE FILM RESISTOR
▲	METAL FILM RESISTOR
⊠	METAL PLATE RESISTOR
◪	FIRE PROOF CARBON FILM RESISTOR
□	SEMENT MOLDED RESISTOR
⊘	SEMI VARIABLE RESISTOR

•CAPACITOR

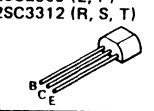
REMARKS	PARTS NAME	
NO MARK	ELECTROLYTIC CAPACITOR	⧺
NO MARK	CERAMIC CAPACITOR	
◎	POLYESTEL FILM CAPACITOR	
○	POLYSTYRENE FILM CAPACITOR	⫪
Ⓘ	MICA CAPACITOR	
Ⓟ	POLYPROPYLENE FILM CAPACITOR	
●	SEMICONDUCTIVE CERAMIC CAPACITOR	

•Unless otheerwise specified

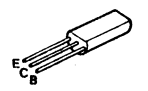
PNP TRANSISTOR	2SA1115(E,F)or2SA933S(Q,R)or2SA1310(R,S,T)
NPN TRANSISTOR	2SC2603(E,F)or2SC1740S(S,R)or2SC3312(R,S,T)
DIODE	1SS133

PIN CONNECTION DIAGRAM OF TRANSISTORS, DIODES AND ICS.

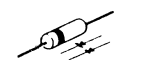
2SA933S (Q, R)
2SA1115 (E, F)
2SA1310 (R, S, T)
2SC1740S (S, R)
2SC2603 (E, F)
2SC3312 (R, S, T)



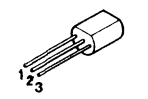
2SD716 (R, O)



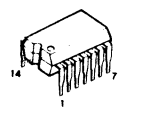
1SS133
1SR35-100A
MTZ12B



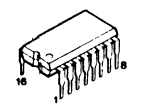
NJM78L05



μPD74HCU04C

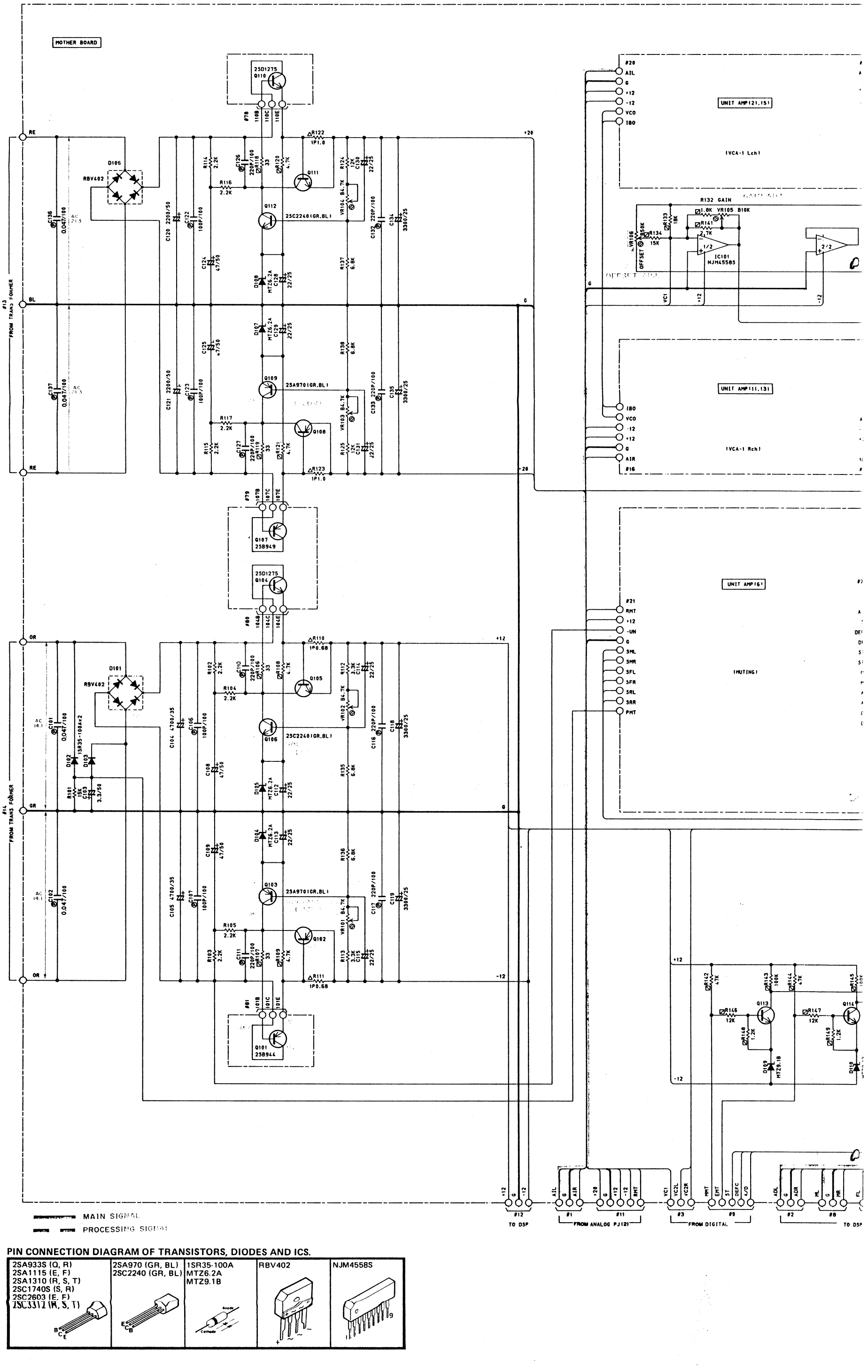


μPD74HC151C



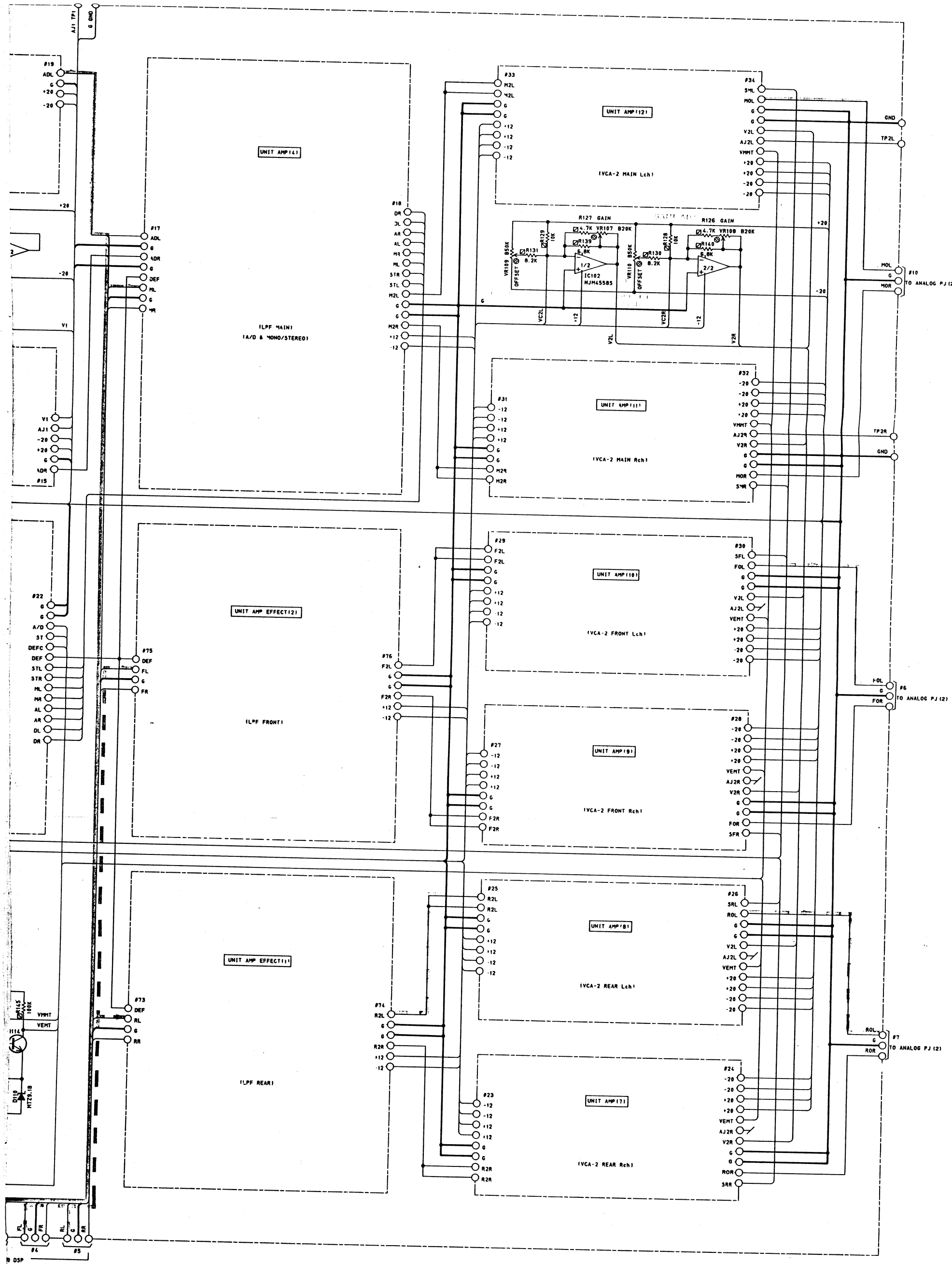
*All voltages are measured with a 10MΩ/DC electric volt m
*Components having special characteristics are marked must be replaced with parts having specifications equal originally installed.
*Schematic diagram is subject to change without notice.

■SCHEMATIC DIAGRAM(5/10) Mother Circuit Board



PIN CONNECTION DIAGRAM OF TRANSISTORS, DIODES AND ICS.

2SA933S (Q, R) 2SA1115 (E, F) 2SA1310 (R, S, T) 2SC1740S (S, R) 2SC2603 (E, F) 2SC3311 (R, S, T)	2SA970 (GR, BL) 2SC2240 (GR, BL)	1SR35-100A MTZ6.2A MTZ9.1B	RBV402	NJM4558S

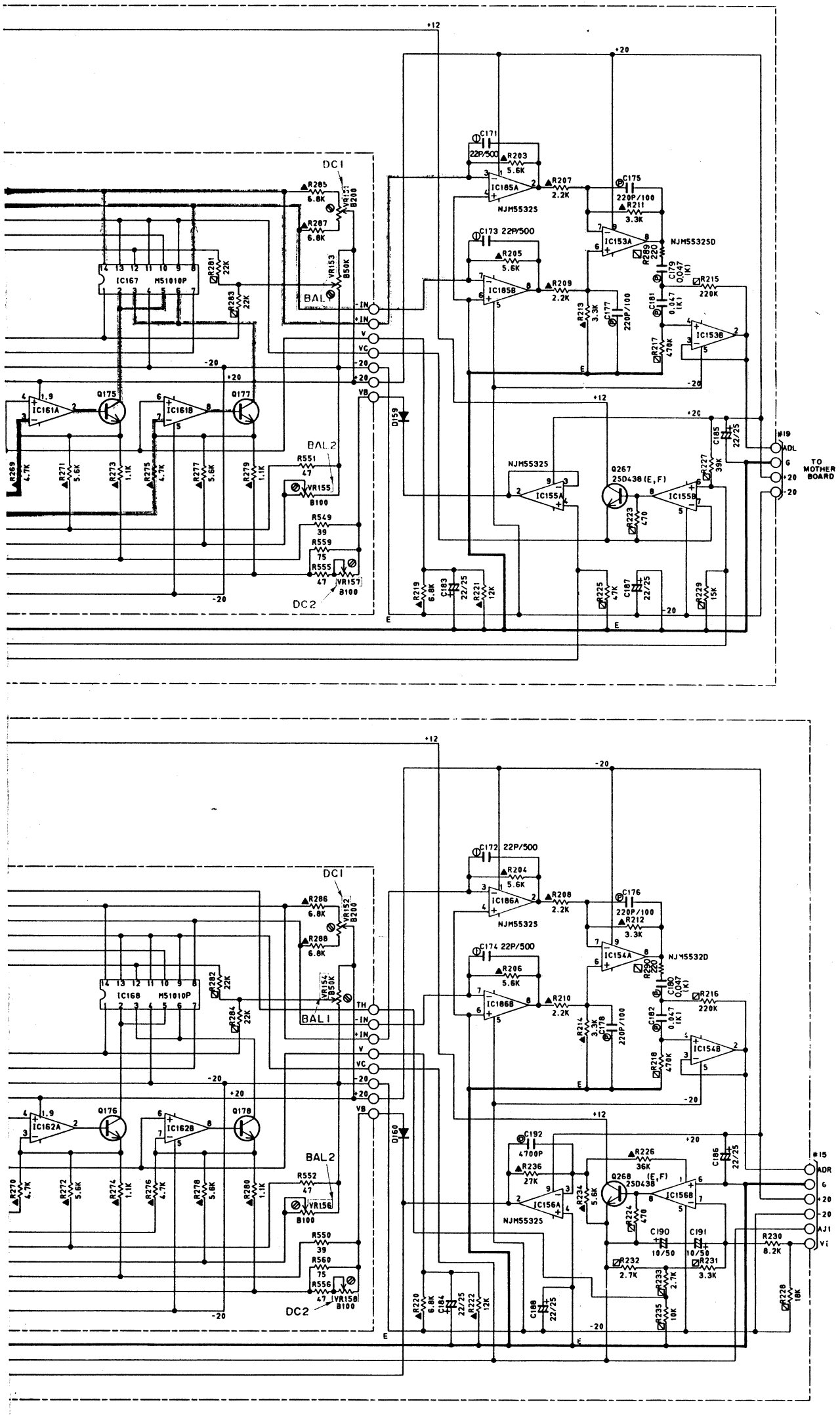


*Unless otheerwise specified

PNP TRANSISTOR	2SA933S(Q,R)or2SA1115(E,F)or2SA1310(R,S,T)
NPN TRANSISTOR	2SC1740S(Q,R)or2SC2603(E,F)or2SC3312(R,S,T)
DIODE	

*All voltages are measured with a 10MΩ/DC electric volt meter.
*Components having special characteristics are marked ⚠ and must be replaced with parts having specifications equal to those originally installed.
*Schematic diagram is subject to change without notice.

■SCHEMATIC DIAGRAM(6/10) Unit Amp Circuit Board (1), (2)



	Used NO.
C	151-188,192,206,208
R	151-552,555,556,559-561
VR	151-158,167,168
Q	151-178,267,268
D	151-160
IC	151-168,185,186

•Unless otheerwise specified

PNP TRANSISTOR	
NPN TRANSISTOR	2SC2240(GR,BL)
DIODE	1SS133

•RESISTOR

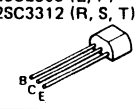
REMARKS	PARTS NAME
NO MARK	CARBON FILM RESISTOR
☑	CARBON FILM RESISTOR (1/6W)
△	METAL OXIDE FILM RESISTOR
▲	METAL FILM RESISTOR
⊠	METAL PLATE RESISTOR
◪	FIRE PROOF CARBON FILM RESISTOR
□	SEMENT MOLDED RESISTOR
⊘	SEMI VARIABLE RESISTOR

•CAPACITOR

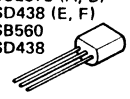
REMARKS	PARTS NAME	
NO MARK	ELECTROLYTIC CAPACITOR	⫫
NO MARK	CERAMIC CAPACITOR	
◉	POLYESTEL FILM CAPACITOR	⫪
○	POLYSTYRENE FILM CAPACITOR	
◐	MICA CAPACITOR	
◔	POLYPROPYLENE FILM CAPACITOR	
●	SEMICONDUCTIVE CERAMIC CAPACITOR	

PIN CONNECTION DIAGR
TRANSISTORS, DIODES A

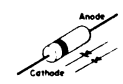
2SA933S (Q, R)
2SA1115 (E, F)
2SA1310 (R, S, T)
2SC1740S (S, R)
2SC2603 (E, F)
2SC3312 (R, S, T)



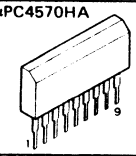
2SC2240 (GR, BL)
2SC2878 (A, B)
2SD438 (E, F)
2SB560
2SD438



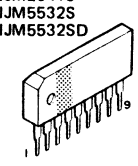
1SS133
MTZ5.6B



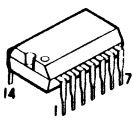
μPC4570HA



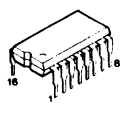
NJM2041S
NJM5532S
NJM5532SD



M51010P

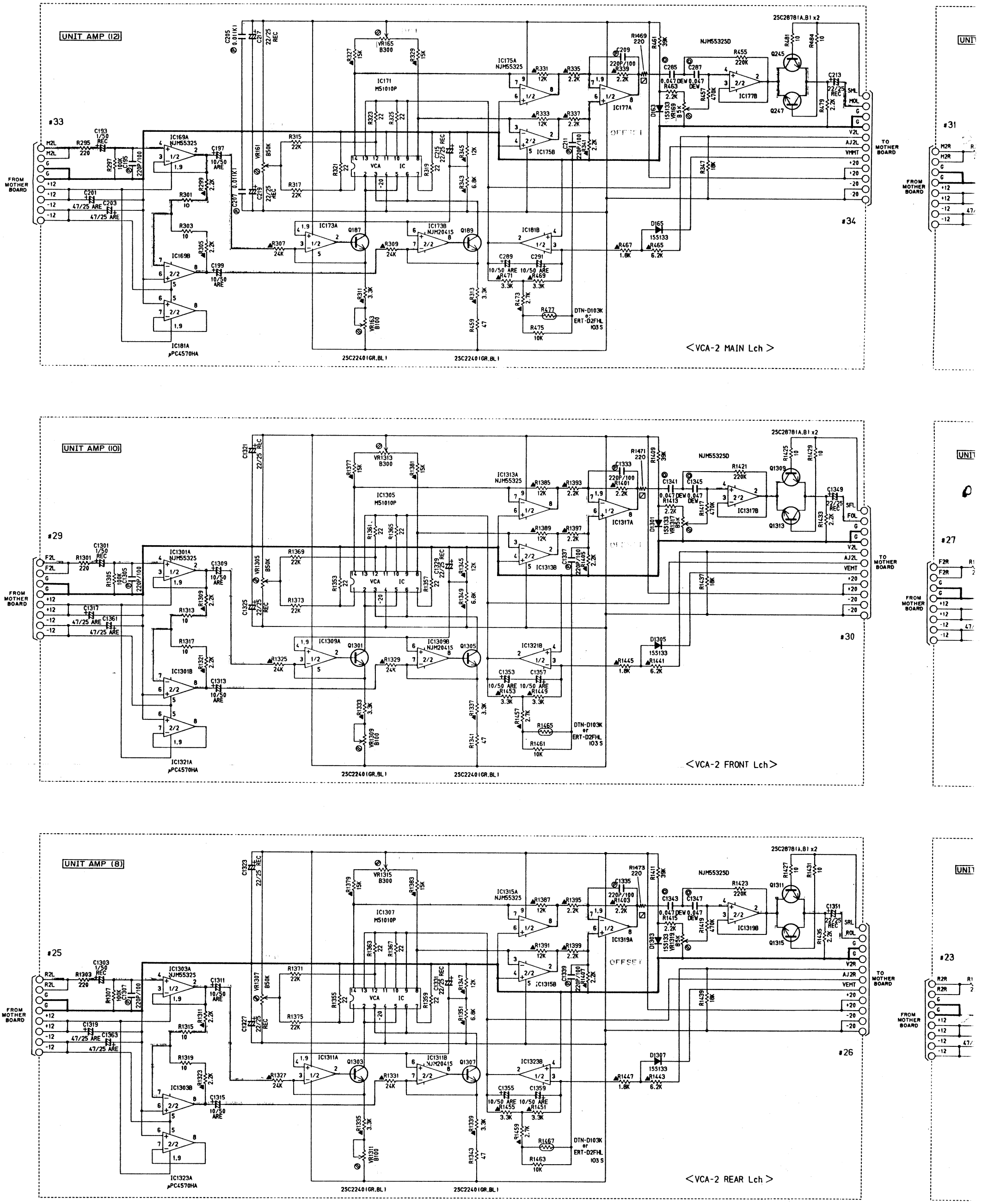


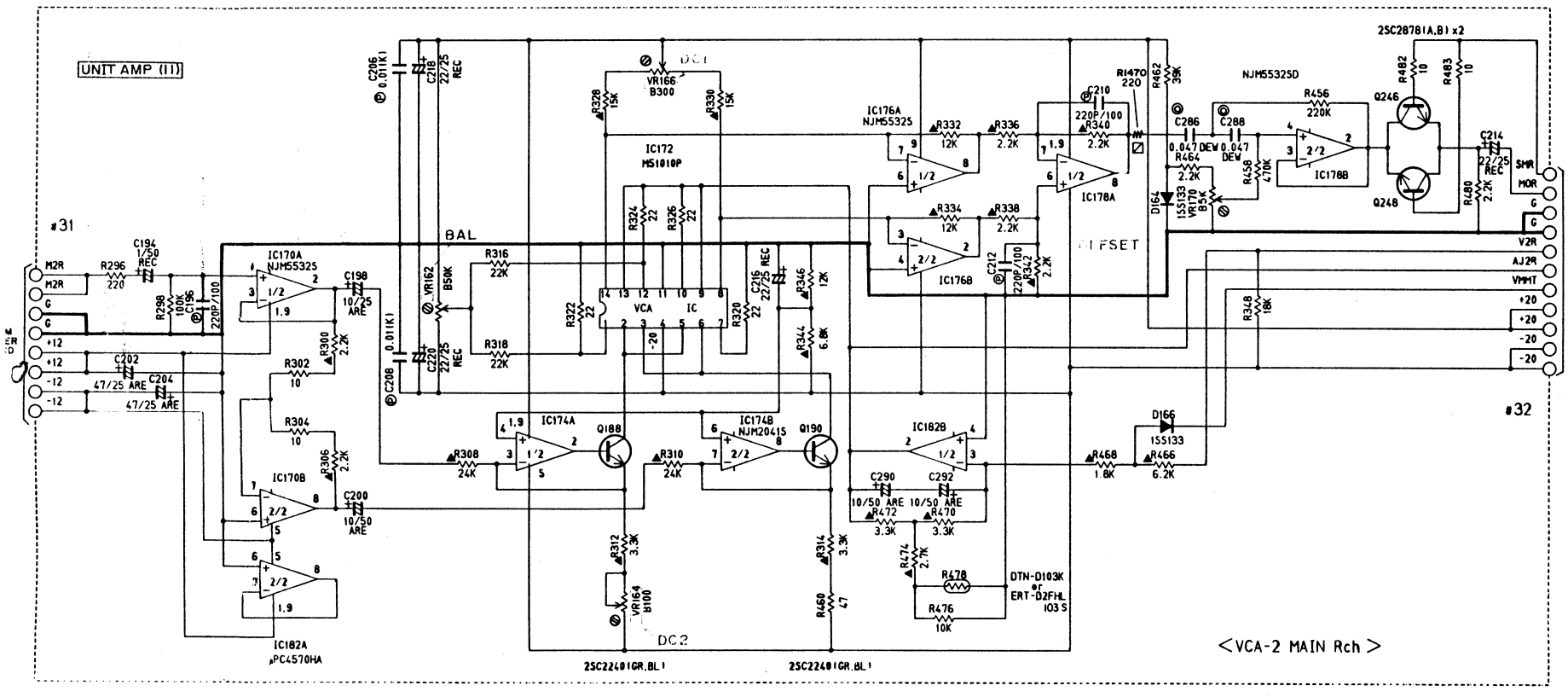
LB1294



*All voltages are measured with a 10MΩ/DC electric volt
*Components having special characteristics are marked must be replaced with parts having specifications equ originally installed.
*Schematic diagram is subject to change without notice.

■SCHEMATIC DIAGRAM(7/10) Unit Amp Circuit Board (7) ~ (12)





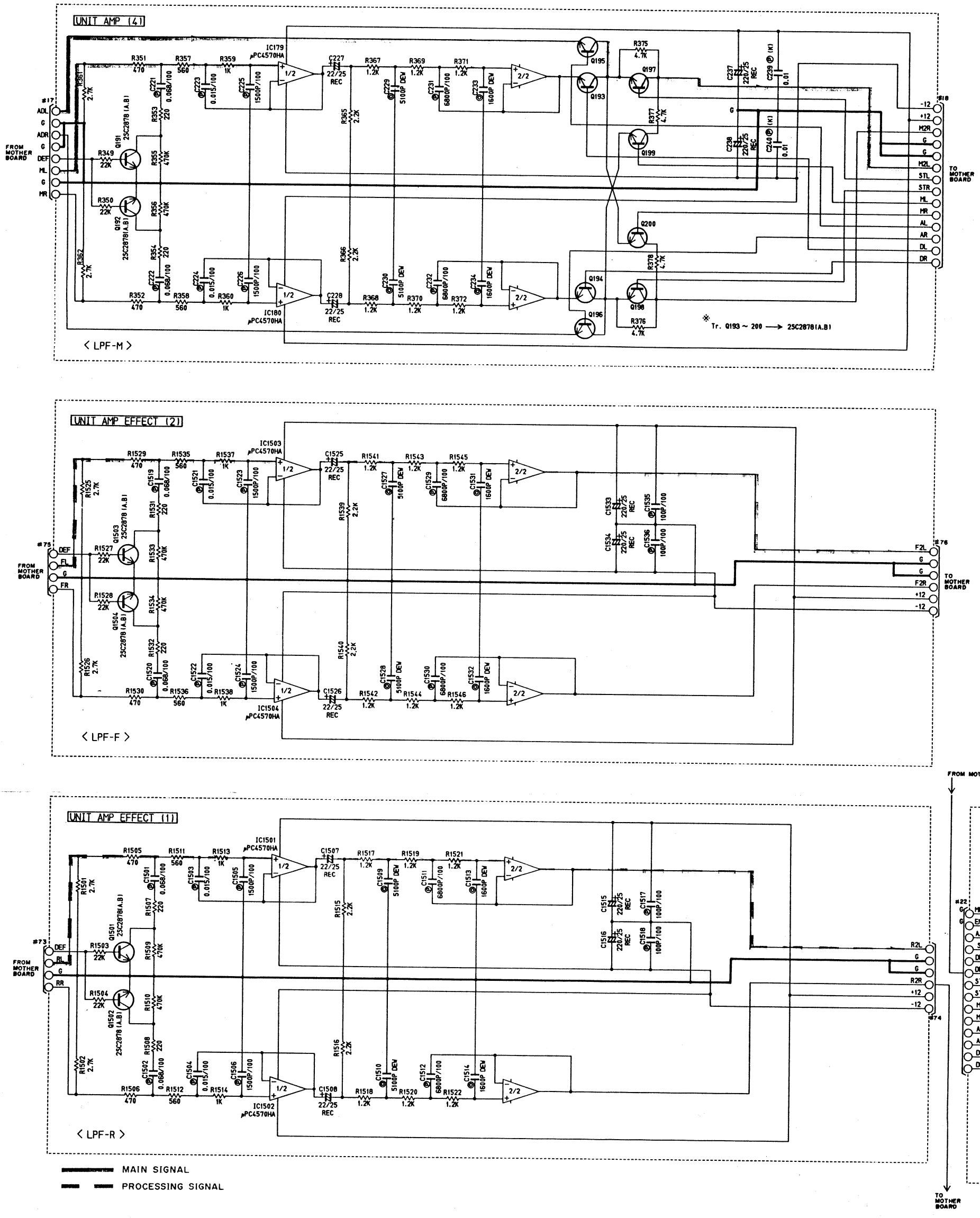
** All voltages are measured with a 10MΩ/DC electric volt meter.*

** Components having special characteristics are marked ⚠ and must be replaced with parts having specifications equal to those originally installed.*

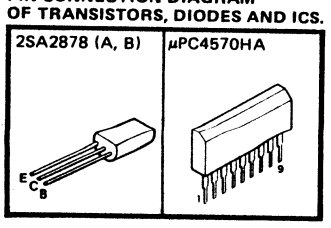
** Schematic diagram is subject to change without notice.*

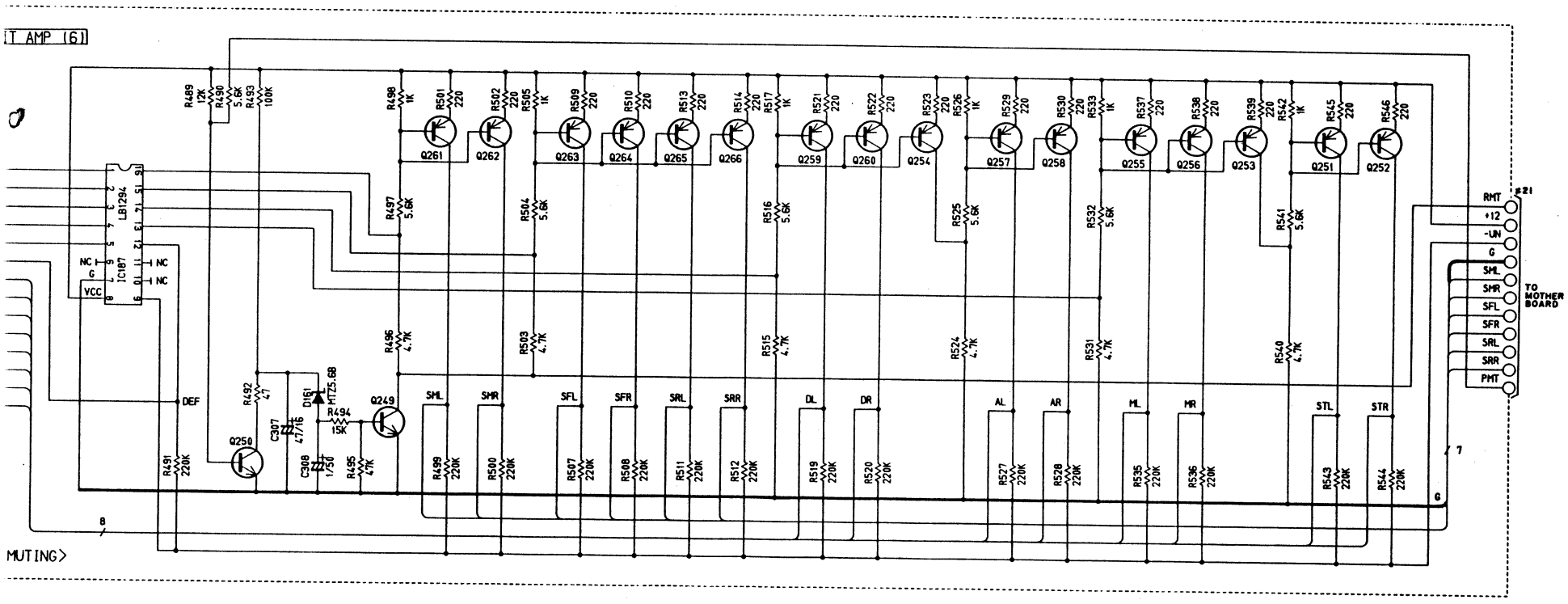
■SCHEMATIC DIAGRAM(8/10)

Unit Amp Circuit Board (4), (6)/Unit Amp Effect Board (1), (2)



PIN CONNECTION DIAGRAM OF TRANSISTORS, DIODES AND ICS.





•Unless otheerwise specified

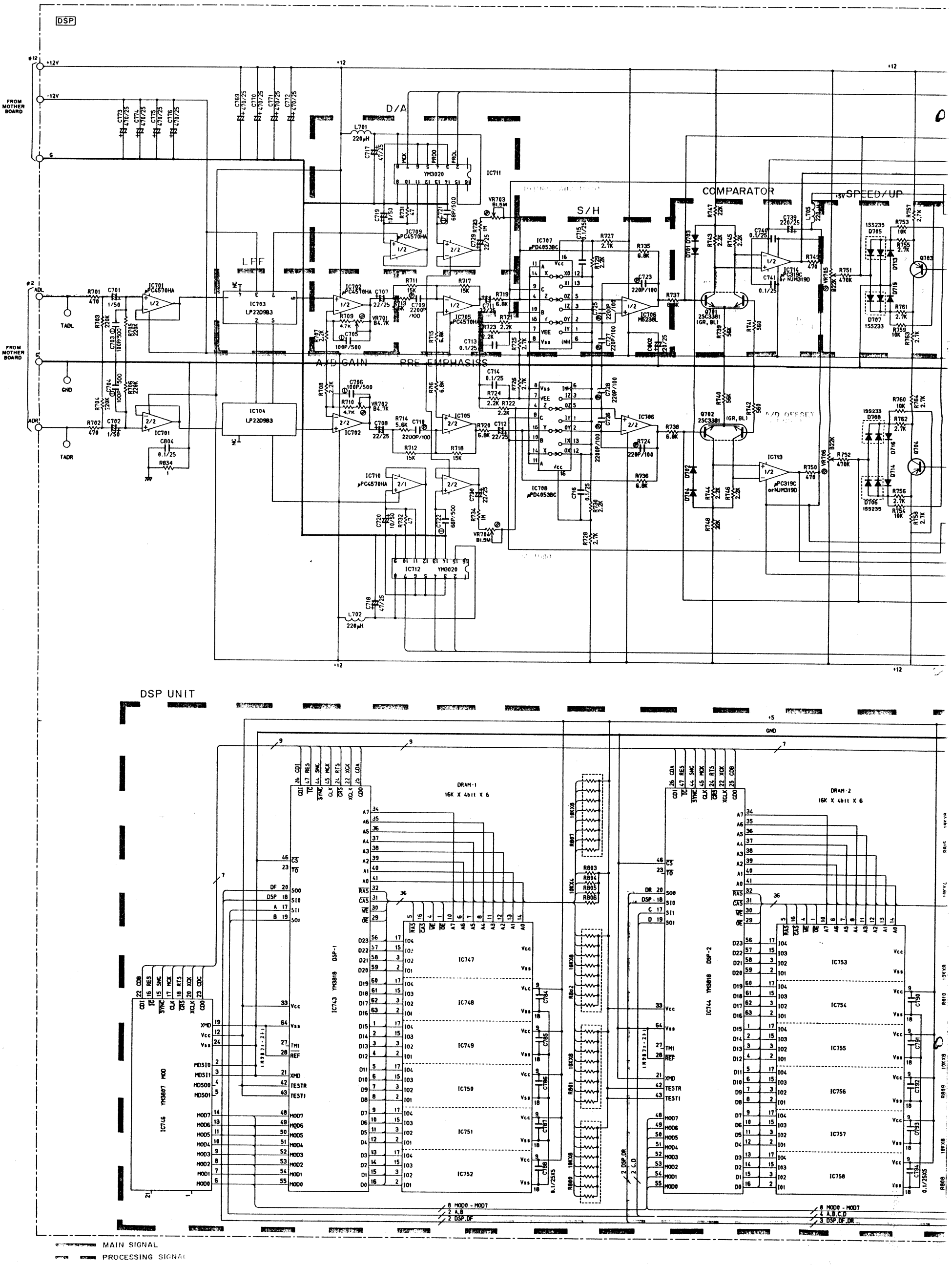
PNP TRANSISTOR	2SA933S(Q,R)or2SA1115(E,F)or2SA1310(R,S,T)
NPN TRANSISTOR	2SC1740S(S,R)or2SC2603(E,F)or2SC3312(R,S,T)
DIODE	

** All voltages are measured with a 10MΩ/DC electric volt meter.*

** Components having special characteristics are marked ⚠ and must be replaced with parts having specifications equal to those originally installed.*

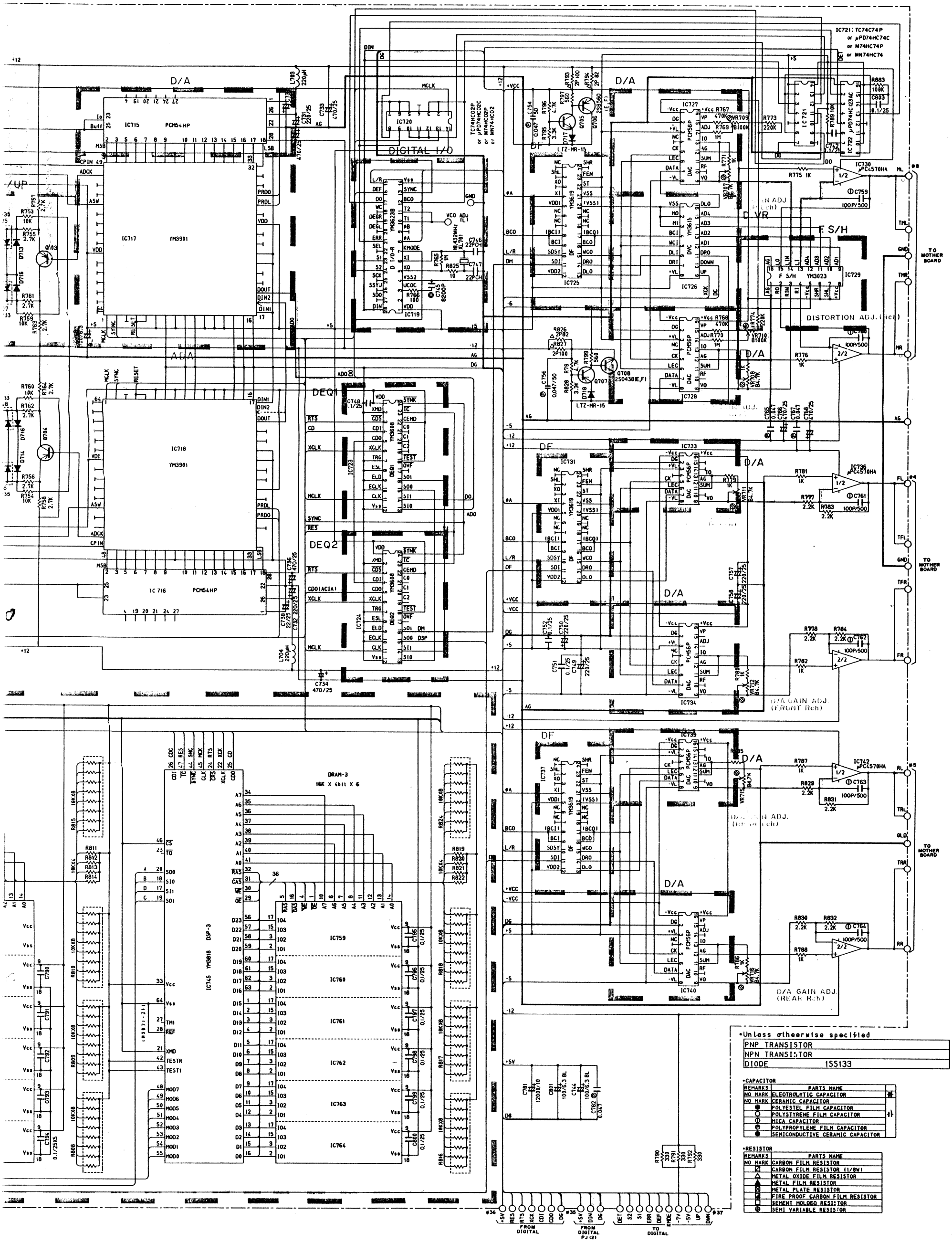
** Schematic diagram is subject to change without notice.*

SCHEMATIC DIAGRAM(9/10) DSP Circuit Board



PIN CONNECTION DIAGRAM OF TRANSISTORS, DIODES AND ICS.

2SA933S (Q, R) 2SA1115 (E, F) 2SA1310 (R, S, T) 2SC1740S (S, R) 2SC2603 (E, F) 2SC3312 (R, S, T)	2SB560 (E, F) 2SD438 (E, F)	2SC3381 (GR, BL)	1SS133 1SS233 1SS235	LP22D9B3	M5238L	μPC4570HA	μPC319C NJM319D TC74HC74P M74HC74P TC74HC02P M74HC02P	YM3020 μPD4053BC PCM56P μPD74HC123AC	YM3615 YM3023	μPD41464-12	YM3619 YM3608 YM3807



•Unless otherwise specified

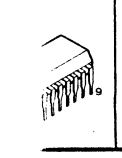
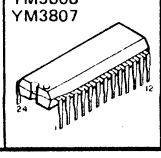
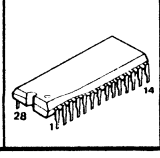
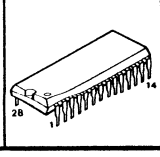
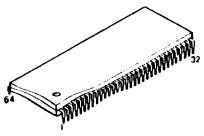
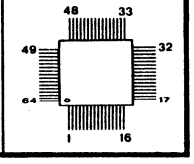
PNP TRANSISTOR	
NPN TRANSISTOR	
DIODE	1SS133

•CAPACITOR

REMARKS	PARTS NAME
NO MARK	ELECTROLYTIC CAPACITOR
NO MARK	CERAMIC CAPACITOR
●	POLYESTEL FILM CAPACITOR
○	POLYSTYRENE FILM CAPACITOR
Ⓜ	MICA CAPACITOR
Ⓟ	POLYPROPYLENE FILM CAPACITOR
●	SEMICONDUCTIVE CERAMIC CAPACITOR

•RESISTOR

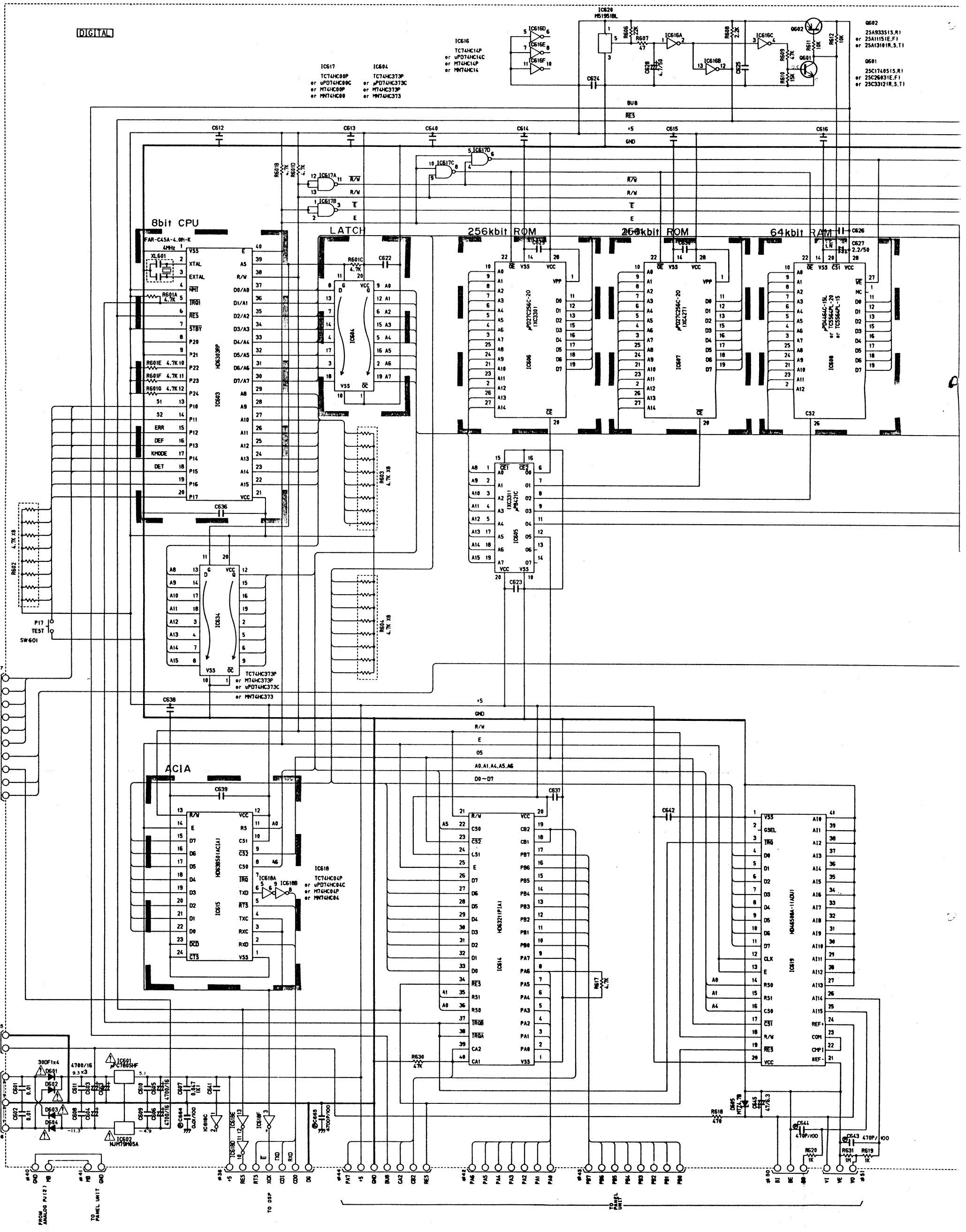
REMARKS	PARTS NAME
NO MARK	CARBON FILM RESISTOR
☑	CARBON FILM RESISTOR (1/8W)
△	METAL OXIDE FILM RESISTOR
▲	METAL FILM RESISTOR
⊠	METAL PLATE RESISTOR
◪	FIRE PROOF CARBON FILM RESISTOR
□	SEMENT MOLDED RESISTOR
⊘	SEMI VARIABLE RESISTOR

1-12	YM3619 YM3608 YM3807	PCM54HP	YM3623	YM3818	YM3901
					

** All voltages are measured with a 10MΩ/DC electric volt meter.*
** Components having special characteristics are marked ⚠ and must be replaced with parts having specifications equal to those originally installed.*
** Schematic diagram is subject to change without notice.*

CX-10000

■SCHEMATIC DIAGRAM(10/10) Digital Circuit Board



PIN CONNECTION DIAGRAM OF TRANSISTORS, DIODES AND ICS.

2SA933S (Q, R) 2SA1115 (E, F) 2SA1310 (R, S, T) 2SC1740S (S, R) 2SC2603 (E, F) 2SC3312 (R, S, T)	30DF1	MTZ4.7B MTZ7.5A	µPC7805HF	NJM79M05A	M51951BL	TC74HC00P TC74HC02P M74HC02P TC74HC04P M74HC04P TC74HC14P M74HC14P MN74HC14	TC74HC163P M74HC163P µPD74HC165C	TC74HC138P M74HC138P	BA9201	µPB421C TC74HC373P TC74HC245P M74HC373P MN74HC245 TC74HC273P M74HC273P	HD63B5

F G H I J K

LCD DRIVER

D.VR CONTROL

SWITCH CONTROL

SELECTOR CONTROL

VCA-1 CONTROL

VCA-2 CONTROL

TO LCD UNIT (DSP)

TO LCD UNIT (DEG)

INPUT

FROM DIGITAL /ANALOG PJ (3)

REC OUT

TO MOTHER BOARD

TO MOTHER BOARD

IC609 TC74HC245P or uPD74HC245C or MN74HC245

IC610 TC74HC373P or uPD74HC373C or M74HC373P or MN74HC373

IC611~613 TC74HC273P or uPD74HC273C or M74HC273P or MN74HC273

IC621.622.624 TC74HC02P or uPD74HC02C or M74HC02P or MN74HC02

IC623 TC74HC138P or uPD74HC138C or M74HC138P or MN74HC138

IC625 uPD74HC165C

IC626 TC74HC00P or uPD74HC00C or M74HC00P or MN74HC00

IC627 TC74HC04P or uPD74HC04C or M74HC04P or MN74HC04

IC628~630 TC74HC163P or uPD74HC163C or M74HC163P

IC631~633 BA9201

R605 10K X8

R613 4.7K

R614 560

R615 4.7K

R616 4.7K

R619 1K

R621 2.2K

R622 2.2K

R623 33K

R624 2.2K

R625 2.2K

R626 33K

R627 2.2K

R628 2.2K

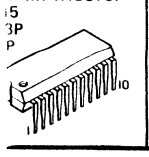
R629 33K

D606 MTZ7.5A

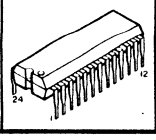
•Unless otheerwise specified

PNP TRANSISTOR
NPN TRANSISTOR
DIODE
CERAMIC CAPACITOR 0.1/25

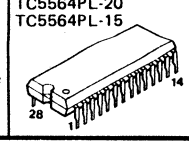
TC74HC373P
PM74HC373P



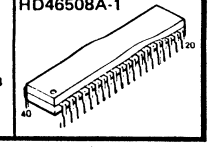
HD63B50



μPD27C256C-20
μPD4464C-15L
TC5564PL-20
TC5564PL-15



HD6303RP
HD6321
HD46508A-1



*All voltages are measured with a 10MΩ/DC electric volt meter.
*Components having special characteristics are marked ⚠ and must be replaced with parts having specifications equal to those originally installed.
*Schematic diagram is subject to change without notice.

PARTS LIST

■WARNING

Components having special characteristics are marked ⚠ and must be replaced with parts having specifications equal to those originally installed.

- Carbon resistors (1/6W or 1/4W) are not included in the ELECTRICAL PARTS list. For the parts No. of the carbon resistor, refer to p. 85.

■ELECTRICAL PARTS

	Ref. No.	Part No.	Description		部品名	Remarks	Common Model	Markets	ランク
※		***NA 09 38 80***	***Mother Circuit Board***		マザーボードシート				
		UJ 46 63 30	Electrolytic Cap.	3.3μF 50V	ケミコン	C103			
※		VC 91 63 00	//	4700μF 35V	ブロックケミコン	C104,105			
※		VC 91 65 00	//	2200μF 50V	//	C120,121			
※		VC 89 57 00	//	3300μF 25V	ケミコン	C118,119,134,135			
		UJ 14 72 20	//	22μF 25V	//	C114,115,130,131			
		UM 05 72 20	//	22μF 25V	オーディオケミコン	C112,113,128,129			
		UJ 16 74 70	//	47μF 50V	//	C108,109,124,125			
		UT 45 21 00	Polypropylene Film Cap.	100pF 100V	ポリプロコン	C106,107,122,123			
		UT 45 22 20	//	220pF 100V	//	C110,111,116,117,126,127,132,133			
		UT 45 44 70	//	0.047μF 100V	//	C101,102,136,137			
		HJ 35 62 20	Carbon Resistor	2.2kΩ 1/4W	カーボン抵抗	R102～105,114～117			
		HJ 35 63 30	//	3.3kΩ 1/4W	//	R112,113			
		HJ 35 66 80	//	6.8kΩ 1/4W	//	R135～138			
		HJ 35 71 20	//	12kΩ 1/4W	//	R124,125			
		HL 31 26 80	Metal Oxide Film Resistor	0.68Ω 1W	酸金抵抗	R110,111			
		HL 31 31 00	//	1.0Ω 1W	//	R122,123			
※		VD 16 36 00	Pre-Set Potentiometer	B10kΩ	半固定抵抗	VR105			
※		VD 16 37 00	//	B20kΩ	//	VR107,108			
		VA 78 79 00	//	B4.7kΩ	//	VR101～104			
※		VD 16 38 00	//	B50kΩ	//	VR106,109,110			
		iA 09 33 00	Transistor	2SA933S(Q,R)	トランジスタ	Q102,108			
		iA 11 15 10	//	2SA1115(E,F)	//	// (inter-changeable)			
		iX 60 31 70	//	2SA1310(R,S,T)	//	// (inter-changeable)			
		iA 09 70 00	//	2SA970(GR,BL)	//	Q103,109			
		iC 17 40 00	//	2SC1740S(S,R)	//	Q105,111,113,114			
		iC 26 03 10	//	2SC2603(E,F)	//	// (inter-changeable)			
		iX 60 31 80	//	2SC3312(R,S,T)	//	// (inter-changeable)			
		iC 22 40 00	//	2SC2240(GR,BL)	//	Q106,112			
		iG 07 68 00	IC	NJM4558S	IC	IC101,102			
		iF 00 84 80	Diode	ISR35-100A	ダイオード	D102,103			
		iX 60 41 20	Zener Diode	MTZ6.2A	ツェナーダイオード	D104,105,107,108			
		iF 01 08 60	//	MTZ9.1B	//	D109,110			
※		VC 97 15 00	Diode Bridge	RBV402	ダイオードブリッジ	D101,106			
		LB 91 80 30	Base Pin	3P i-Type	X Hベースピン				
		LA 00 21 10	Lapping Terminal	P=5 2P i-Type	i型ラッピング端子板				
		NA 09 38 90	***Unit Amp Circuit Board***		ユニットアンプシート				
		FC 44 44 70	Mylar Cap.	0.047μF 50V	マイラーコン	C285～288,1341～1348			
		FU 35 12 20	Mica Cap.	22pF 500V	FEマイカコン	C171～174			
		FZ 00 54 10	Electrolytic Cap.	100μF 6.3V	ブラックゲートコン	C157,158,163,164			
		FA 15 34 70	Mylar Cap.	4700pF 50V	マイラーコン	C192			
		UJ 13 74 70	Electrolytic Cap.	47μF 16V	ケミコン	C307			
		UJ 16 61 00	//	1μF 50V	//	C308			
		UJ 14 74 70	//	47μF 25V	//	C159,160,165,166,201～204,1317～1320,1361～1364			
		UJ 14 72 20	//	22μF 25V	//	C167～170,183～188,213～220,227,228,1321～1332,1349～1352			
		UJ 14 82 20	//	220μF 25V	//	C237,238			

※New Parts (新規部品)

	Ref. No.	Part No.	Description		部品名	Remarks	Common Model	Markets	ランク
		UJ 16 61 00	Electrolytic Cap.	1μF 50V	ケミコン	C151,152,193,194,1301～1304			
		UJ 16 71 00	//	10μF 50V	//	C190,191,197～200,289～292,1309～1316,1353～1360			
		UT 45 22 20	Polypropylene Film Cap.	220pF 100V	ポリプロコン	C153,154,175～178,195,196,209～212,1305～1308,1333～1340			
		UT 45 31 00	//	1000pF 100V	//	C155,156,161,162			
		UT 45 31 50	//	1500pF 100V	//	C225,226			
		FT 46 36 80	//	6800pF 50V	//	C231,232			
		FT 46 46 80	//	0.068μF 50V	//	C221,222			
		UT 45 41 50	//	0.015μF 100V	//	C223,224			
※		VC 93 79 00	//	0.047μF 50V	銅ハクポリプロコン	C179～182			
※		VC 93 80 00	//	0.01μF 50V	//	C205～208,239,240			
		VB 05 70 00	Mylar Cap.	1600pF 50V	銅リードマイラーコン	C233,234			
※		VD 03 28 00	//	5100pF 50V	//	C229,230			
		HU 57 54 70	Metal Film Resistor	470Ω 1/4W	金属皮膜抵抗	R175,176,181,182			
		HU 57 61 10	//	1.1kΩ 1/4W	//	R249,250,255,256,261,262,267,268,273,274,279,280			
		HU 57 62 20	//	2.2kΩ 1/4W	//	R207～210,299,300,305,306,335～342,1309～1312,1321～1324,1393～1408			
		HU 57 63 30	//	3.3kΩ 1/4W	//	R211～214,311～314,469～472,1333～1340,1449～1456			
		HU 57 64 70	//	4.7kΩ 1/4W	//	R245,246,251,252,257,258,263,264,269,270,275,276			
		HU 07 62 70	//	2.7kΩ 1/4W	//	R473,474,1457～1460			
		HU 07 61 80	//	1.8kΩ 1/4W	//	R467,468,1445～1448			
		HU 07 66 20	//	6.2kΩ 1/4W	//	R465,466,1441～1444			
		HU 57 65 60	//	5.6kΩ 1/4W	//	R203～206,234,247,248,253,254,259,260,265,266,271,272,277,278			
		HU 57 66 80	//	6.8kΩ 1/4W	//	R219,220,285～288,343,344,1349～1352			
		HU 57 71 20	//	12kΩ 1/4W	//	R221,222,331～334,345,346,1345～1348,1385～1392			
		HU 57 71 50	//	15kΩ 1/4W	//	R327～330,1377～1384			
※		HU 57 72 40	//	24kΩ 1/4W	//	R307～310,1325～1332			
		HU 57 72 70	//	27kΩ 1/4W	//	R236			
		HU 57 73 60	//	36kΩ 1/4W	//	R226			
		HV 45 42 20	Flame Proof Carbon Resistor	22Ω 1/4W	不燃化カーボン抵抗	R167～170,195～198			
※		VD 26 77 00	Pre-Set Potentiometer	B100Ω	半固定抵抗	VR155～158,163,164,1309～1312			
※		VB 85 90 00	//	B100Ω	//	VR167,168			
※		VD 26 78 00	//	B200Ω	//	VR151,152			
※		VD 26 79 00	//	B300Ω	//	VR165,166,1313～1316			
※		VD 16 38 00	//	B50kΩ	//	VR153,154,161,162,1305～1308			
※		VD 26 80 00	//	B5kΩ	//	VR169,170,1317～1320			
※		VD 23 22 00	Thermistor	10kΩ	サーミスタ	R477,478,561,1465～1468			
		iA 09 33 00	Transistor	2SA933S(Q,R)	トランジスタ	Q251～266 } Inter-changeable			
		iA 11 15 10	//	2SA1115(E,F)	//	//			
		iX 60 31 70	//	2SA1310(R,S,T)	//	//			
		iC 17 40 00	//	2SC1740S(S,R)	//	Q249,250 } Inter-changeable			
		iC 26 03 10	//	2SC2603(E,F)	//	//			
		iX 60 31 80	//	2SC3312(R,S,T)	//	//			
		iC 22 40 00	//	2SC2240(GR,BL)	//	Q159～178,187～190,1301～1308			
		iX 60 42 00	//	2SC2878(A,B)	//	Q191～200,245～248,1309～1316			
		iD 04 38 00	//	2SD438(E,F)	//	Q267,268			
		iB 05 60 00	//	2SB560	//	Q153,154,157,158			
		iD 04 38 00	//	2SD438	//	Q151,152,155,156			
		iG 06 69 00	IC	M51010P	IC	IC163～168,171,172,1305～1308			
		iG 07 69 00	//	NJM2041S	//	IC157～162,173,174,1309～1312			

※New Parts (新規部品)

Ref. No.	Part No.	Description		部品名	Remarks	Common Model	Markets	ランク
	XA 42 60 01	IC	NJM5532S	I C	IC155,156,169,170,175,176,185,186,1301～1304,1313～1316			
	XC 63 20 01	〃	NJM5532SD	〃	IC153,154,177,178,1317～1320			
	XA 54 90 01	〃	LB1294	〃	IC187			
	XB 24 70 01	〃	μPC4570HA	〃	IC151,152,179～182,1321～1324			
	iF 00 34 50	Diode	ISS133	ダイオード	D151～160,163～166,1301～1308			
	iX 60 23 50	Zener Diode	MTZ5.6B	ツェナーダイオード	D161			
※	***NA 09 46 00***	***Unit Amp Effect Circuit Board***		ユニットアンプエフェクトシート				
	UJ 14 72 20	Electrolytic Cap.	22μF 25V	ケミコン	C1507,1508,1525,1526			
	UJ 14 82 20	〃	220μF 25V	〃	C1515,1516,1533,1534			
	UT 45 21 00	Polypropylene Film Cap.	100pF 100V	ポリプロコン	C1517,1518,1535,1536			
	UT 45 31 50	〃	1500pF 100V	〃	C1505,1506,1523,1524			
	FT 46 36 80	〃	6800pF 50V	〃	C1511,1512,1529,1530			
	UT 45 41 50	〃	0.015μF 100V	〃	C1503,1504,1521,1522			
	FT 46 36 80	〃	0.068μF 50V	〃	C1501,1502,1519,1520			
	VB 05 70 00	Mylar Cap.	1600pF 50V	銅リードマイラーコン	C1513,1514,1531,1532			
	VD 03 28 00	〃	5100pF 50V	〃	C1509,1510,1527,1528			
	iX 60 42 00	Transistor	2SC2878(A,B)	トランジスタ	Q1501～1504			
	XB 24 70 01	IC	μPC4570HA	I C	IC1501～1504			
※	***NA 09 39 00***	***Digital Circuit Board***		デジタルシート				
	FG 44 41 00	Ceramic Cap.	0.01μF 50V	セラコン	C601,602			
※	VA 76 21 00	〃	0.1μF 25V	積層セラコン	C608,609～626,629～642,646～660			
	UJ 11 74 70	Electrolytic Cap.	47μF 6.3V	ケミコン	C645			
	UJ 13 74 70	〃	47μF 16V	〃	C661			
	UJ 16 64 70	〃	4.7μF 50V	〃	C628			
	UL 46 62 20	〃	2.2μF 50V	ローノイズケミコン	C627			
※	VC 89 54 00	〃	4700μF 16V	〃	C603～606,663			
	UT 45 24 70	Polypropylene Film Cap.	470pF 100V	ポリプロコン	C643,644			
	UT 45 34 70	〃	4700pF 100V	〃	C665			
	UT 45 41 00	〃	0.01μF 100V	〃	C664			
※	VC 93 79 00	〃	0.047 50V	銅ハクポリプロコン	C607,662			
	VB 74 91 00	Resonator	FAR-C4SA-4.0M-K	FAR振動子	XL601			
	HZ 00 28 80	Resistor Array	10kΩ×8	抵抗アレー	R605			
	HZ 00 47 40	〃	4.7kΩ×8	〃	R601～604			
	iA 09 33 00	Transistor	2SA933S(Q,R)	トランジスタ	Q602 } Inter-changeable			
	iA 11 15 10	〃	2SA1115(E,F)	〃	〃 } Inter-changeable			
	iX 60 31 70	〃	2SA1310(R,S,T)	〃	〃 } Inter-changeable			
	iC 17 40 00	〃	2SC1740S(S,R)	〃	Q601 } Inter-changeable			
	iC 26 03 10	〃	2SC2603(E,F)	〃	〃 } Inter-changeable			
	iX 60 31 80	〃	2SC3312(R,S,T)	〃	〃 } Inter-changeable			
※	XC 43 50 01	IC	μPC7805HF	I C	IC601			
※	XB 11 60 01	〃	NJM79M05A	〃	IC602			
	iG 09 35 00	〃	HD6303RP	〃	IC603			
※	iG 14 73 00	〃	HD63B50	〃	IC615			
※	XC 32 40 01	〃	HD6321	〃	IC614			

※New Parts (新規部品)

	Ref. No.	Part No.	Description	部品名	Remarks	Common Model	Markets	ランク
※		iG 12 92 00	IC	HD46508A-1 I C	IC619			
※		XC 33 10 01	〃	μPB421C 〃	IC605			
※		XC 33 00 01	〃	μPD27C256C-20 〃	IC606			
※		XC 42 70 01	〃	μPD27C256C-20 〃	IC607			
		XA 99 50 01	〃	μPD4464C-15C 〃	IC608			
		XA 60 60 01	〃	TC5564PL-20 〃	〃 Inter-changeable			
		XB 01 30 01	〃	TC5564PL-15 〃	〃			
		XB 25 30 01	〃	M51951BL 〃	IC620			
		XB 98 00 01	〃	BA9201 〃	IC631～633			
※		iR 00 00 00	〃	TC74HC00P 〃	IC617,626			
		iR 00 02 00	〃	TC74HC02P 〃	IC621,622,624 Inter-changeable			
		iR 00 02 80	〃	M74HC02P 〃	〃			
		iR 00 04 00	〃	TC74HC04P 〃	IC618,627 Inter-changeable			
		iR 00 04 80	〃	M74HC04P 〃	〃			
		iR 00 14 00	〃	TC74HC14P 〃	IC616			
		iR 00 14 80	〃	M74HC14P 〃	〃 Inter-changeable			
		iR 00 14 90	〃	MN74HC14 〃	〃			
		iR 01 38 00	〃	TC74HC138P 〃	IC623 Inter-changeable			
		iR 01 38 80	〃	M74HC138P 〃	〃			
		iR 01 63 00	〃	TC74HC163P 〃	IC628～630 Inter-changeable			
※		iR 01 63 80	〃	M74HC163P 〃	〃			
※		iR 01 65 20	〃	μPD74HC165C 〃	IC625			
		iR 02 45 00	〃	TC74HC245P 〃	IC609			
		iR 02 45 90	〃	MN74HC245 〃	〃 Inter-changeable			
		iR 02 73 00	〃	TC74HC273P 〃	IC611～613 Inter-changeable			
		iR 02 73 80	〃	M74HC273P 〃	〃			
		iR 03 73 00	〃	TC74HC373P 〃	IC604,610,634 Inter-changeable			
		iR 03 73 80	〃	M74HC373P 〃	〃			
		iH 00 09 60	Diode	30DF1 ダイオード	D601～604			
		iF 01 06 60	Zener Diode	MTZ4.7B ツェナーダイオード	D605			
		iF 01 07 90	〃	MTZ7.5A 〃	D606			
		VB 79 90 00	Switch	5M EVQ-QSL04M スイッチ	SW601			
		VB 82 50 00	Socket, IC	CLC1028 ICソケット				
※		VD 00 45 00	Base Pin	2P PHベースピン				
		VD 00 46 00	〃	3P 〃				
		VD 00 48 00	〃	5P 〃				
		VD 00 53 00	〃	10P 〃				
		LB 91 80 30	〃	3P i-Type XHベースピン				
		CB 06 92 50	Binding Tie	BK-1 インシュロックタイ				
		Ei 33 00 86	Binding Head Tapping Screw	3×8 FCRM3-BI バインドタッピングネジ	PACK			
※		***NA 09 39 10***	***DSP Circuit Board***	DSPシート				
		FA 15 38 20	Mylar Cap.	8200pF 50V マイラーコン	C745			
※		VA 76 21 00	Ceramic Cap.	0.1μF 25V 積層セラコン	C713～716,740～742,748,751,752,784～798,800,803,～804			
		FG 21 12 20	〃	22pF 50V セラコン	C746,747			
		FU 35 16 80	Mica Cap.	68pF 500V FEマイカコン	C721,722			
		FU 35 21 00	〃	100pF 500V 〃	C703～706,759～764			
		UJ 16 61 00	Electrolytic Cap.	1μF 50V ケミコン	C701,702			
		UJ 14 72 20	〃	22μF 25V 〃	C707,708,711,712,729,730,737,738			
		UM 05 74 70	〃	47μF 25V オーディオケミコン	C717,718			

※New Parts (新規部品)

	Ref. No.	Part No.	Description		部品名	Remarks	Common Model	Markets	ランク
		UM 07 71 00	Electrolytic Cap.	10μF 50V	オーディオケミコン	C719,720			
		UJ 14 82 20	〃	220μF 25V	〃	C731,732,739,749,750,757,758,802			
		UJ 14 84 70	〃	470μF 25V	〃	C733～736,766,768～776			
		VC 89 53 00	〃	12000μF 10V	〃	C781			
		FZ 00 54 10	〃	100μF 6.3V	ブラックゲートコン	C743,744,801			
		UT 45 22 20	Polypropylene Film Cap.	220pF 100V	ポリプロコン	C723,724,727,728			
		UT 45 32 20	〃	2200pF 100V	〃	C709,710,725,726			
※		VC 93 79 00	〃	0.047μF 50V	銅ハクポリプロコン	C754,756,765,767,782			
		VB 10 96 00	Coil	220μH	コイル	L701～705			
		HL 32 51 00	Metal Oxide Film Resistor	100Ω 2W	酸金抵抗	R793,827			
		HL 32 48 20	〃	82Ω 2W	〃	R794,826			
		HZ 00 28 80	Resistor Array	10kΩ×8	抵抗アレー	R800～802,807～810,815～818,824			
		VB 86 14 00	Pre-Set Potentiometer	B4.7kΩ	半固定抵抗	VR701,702,707,708,711,712,715,716			
		VB 86 16 00	〃	B22kΩ	〃	VR705,706			
		VB 86 19 00	〃	B100kΩ	〃	VR709,710			
※		VD 61 74 00	〃	B1.5MΩ	〃	VR703,704			
		iA 09 33 00	Transistor	2SA933S(Q,R)	トランジスタ	Q703,704,707			
		iA 11 15 10	〃	2SA1115(E,F)	〃	〃 (Inter-changeable)			
		iX 60 31 70	〃	2SA1310(R,S,T)	〃	〃 (Inter-changeable)			
		iB 05 60 20	〃	2SB560(E,F)	〃	Q706			
		iC 17 40 00	〃	2SC1740S(S,R)	〃	Q705			
		iC 26 03 10	〃	2SC2603(E,F)	〃	〃 (Inter-changeable)			
		iX 60 31 80	〃	2SC3312(R,S,T)	〃	〃 (Inter-changeable)			
		iC 33 81 00	Dual Transistor	2SC3381(GR,BL)	デュアルトランジスタ	Q701,702			
		iD 04 38 10	Transistor	2SD438(E,F)	トランジスタ	Q708			
※		XC 35 40 01	IC	YM3818	IC	IC743～745			
※		XB 70 00 01	〃	YM3619DF	〃	IC725,731,737			
※		XA 89 50 01	〃	YM3608	〃	IC723,724			
※		XD 22 20 01	〃	YM3623B	〃	IC719			
※		XB 69 60 01	〃	YM3615	〃	IC726			
※		XB 70 30 01	〃	YM3023	〃	IC729			
※		XC 28 20 01	〃	YM3901	〃	IC717,718			
		XA 86 00 01	〃	YM3020	〃	IC711,712			
		iT 38 07 00	〃	YM3807	〃	IC746			
		XA 39 40 01	〃	PCM54HP	〃	IC715,716			
		iG 10 59 00	〃	μPD4053BC	〃	IC707,708			
		iG 08 67 00	〃	μPC319C	〃	IC713,714 (Inter-changeable)			
		XB 25 10 01	〃	NJM319D	〃	〃 (Inter-changeable)			
		XB 63 70 01	〃	PCM56P	〃	IC727,728,733,734,739,740			
		iR 00 74 00	〃	TC74HC74	〃	IC721 (Inter-changeable)			
		iR 00 74 80	〃	M74HC74P	〃	〃 (Inter-changeable)			
※		XC 32 70 01	〃	LP22D9B3	〃	IC703,704			
		XB 24 70 01	〃	μPC4570HA	〃	IC701,702,705,709,710,730,736,742			
		XB 24 80 01	〃	M5238L	〃	IC706			
		XB 26 10 01	〃	μPD41464-12	〃	IC747～764			
		iR 00 02 00	〃	TC74HC02P	〃	IC720 (Inter-changeable)			
		iR 00 02 80	〃	M74HC02P	〃	〃 (Inter-changeable)			
※		iR 01 23 20	〃	μPD74HC123AC	〃	IC722			

※New Parts (新規部品)

	Ref. No.	Part No.	Description		部品名	Remarks	Common Model	Markets	ランク
		VC 91 45 00	Quartz Crystal Unit	18,432MHz	水晶振動子	XL701			
		iF 00 34 50	Diode	ISS133	ダイオード	D701～704,713～716			
※		VD 45 04 00	Diode Array	ISS233	ダイオードアレーK	D707,708			
※		VD 45 05 00	〃	ISS235	〃 A	D705,706			
※		VC 89 58 00	LED (Red)	LTZ-MR15	LED	D717,718			
		LB 91 80 30	Base Pin	3P i-Type	XHベースピン				
		VD 00 46 00	〃	3P	PHベースピン				
		VD 00 50 00	〃	7P	〃				
		VD 00 53 00	〃	10P	〃				
		LA 00 21 10	Lapping Terminal	P=5 2P i=Type	i型ラッピング端子板				
		LA 00 21 20	〃	P=5 3P i=Type	〃				
※		***NA 09 39 50***	***Digital PJ Circuit Board***		デジタルPJシート			J	
※		***NA 09 39 60***	〃		〃			U	
※		***NA 09 39 70***	〃		〃			G	
		FU 35 12 20	Mica Cap.	22pF 500V	FEマイカコン	C901～907			
※		VA 76 21 00	Ceramic Cap.	0.1μF 25V	積層セラコン	C908,910,912,914,916,918,920,922～931			
		FZ 00 54 10	Electrolytic Cap.	100μF 6.3V	ブラックゲートコン	C933～935			
		UJ 14 72 20	〃	22μF 25V	ケミコン	C909,911,915,919,921			
※		VC 54 82 00	Coil		コイル	T901,902			
※		iG 14 22 20	IC	μPD74HCU04C	IC	IC901～907			
※		iR 01 51 20	〃	μPD74HC151C	〃	IC908～910			
※		VC 91 55 00	Pin Jack	2P OFC	ピンジャック	PJ901,903			
※		VC 91 53 00	〃	3P OFC	〃	PJ902			
		VB 97 11 00	Coil	20μH	コイル	L901,902			
※		***NA 09 39 20***	***Analog PJ Circuit Board***		アナログPJシート			J	
※		***NA 09 39 30***	〃		〃			U	
※		***NA 09 39 40***	〃		〃			G	
		FG 21 05 00	Ceramic Cap.	5pF 50V	セラコン	C1092～1094			
		FG 21 21 00	〃	100pF 50V	〃	C1035～1038			
※		VA 76 21 00	〃	0.1μF 25V	積層セラコン	C1082,1083,1091,1095～1098			
		FA 15 52 20	Mylar Cap.	0.22μF 50V	マイラーコン	C1099,1100			
		UJ 11 74 70	Electrolytic Cap.	47μF 6.3V	ケミコン	C1084～1086			
		UJ 13 72 20	〃	22μF 16V	〃	C1075			
		UW 93 93 30	〃	3300μF 16V	〃	C1076,1077			
		UJ 13 74 70	〃	47μF 16V	〃	C1078～1081			
		UJ 11 92 20	〃	2200μF 6.3V	〃	C1087～1090			
		UJ 14 74 70	〃	47μF 25V	〃	C1073,1074			
		UJ 16 71 00	〃	10μF 50V	〃	C1043,1044,1047,1048,1055,1056,1059,1060,1067,1068,1071,1072			
		UJ 16 61 00	〃	1μF 50V	〃	C1039～1042,1045,1046,1049～1054,1057,1058,1061～1066,1069,1070			
		UT 45 21 00	Polypropylene Film Cap.	100pF 100V	ポリプロコン	C1005,1006,1009,1010,1017,1018,1021,1022,1029,1030,1033,1034			
		UT 45 21 00	〃	100pF 100V	〃	C1001～1004,1007,1008,1011～1016,1019,1020,1023～1028,1031,1032		J,U	
		UT 45 22 20	〃	220pF 100V	〃	〃		G	
		UT 45 22 20	〃	220pF 100V	〃	C1101～1106			
		HV 45 56 80	Flame Proof Carbon Resistor	680Ω 1/4W	不燃化カーボン抵抗	R1235			

※New Parts (新規部品)

	Ref. No.	Part No.	Description		部品名	Remarks	Common Model	Markets	ランク
		HV 45 33 30	Flame Proof Carbon Resistor	3.3Ω 1/4W	不燃化カーボン抵抗	R1253,1254			
		iA 10 15 21	Transistor	2SA1015(Y)	トランジスタ	Q1060,1063,1066			
		iC 05 35 00	〃	2SC535(A,B,C)	〃	Q1061,1064,1067			
		iC 33 27 00	〃	2SC3327	〃	Q1001～1056			
		VC 61 40 00	〃	2SB1274(Q,R,S)	〃	Q1057			
		VC 40 79 00	〃	2SD1913(R,S)	〃	Q1058			
※		iG 00 17 70	IC	TC4051BP	IC	IC1017			
		XA 67 30 01	〃	NJM5532DD	〃	IC1001～1011			
※		XA 07 00 01	〃	μPD4052BC	〃	IC1016			
		XA 54 90 01	〃	LB1294	〃	IC1019～1023			
※		iR 03 66 20	〃	μPD74HC366C	〃	IC1018			
※		iR 02 38 20	〃	μPD74HC238C	〃	IC1012～1015			
※		VC 69 46 00	Photo Coupler	TLP621	フォトカプラー	D1012			
		iF 00 34 50	Diode	1SS133	ダイオード	D1007～1011			
		iF 00 84 80	〃	1SR35-100A	〃	D1001～1004			
		iF 01 07 20	Zener Diode	MTZ5.6C	ツェナーダイオード	D1005,1006			
		KA 40 09 40	Slide Switch	2-2NS	スライドスイッチ	SW1001			
※		VC 91 51 00	Pin Jack	4P	ピンジャック	PJ1001,1002,1004,1005,1010			
※		VC 91 48 00	〃	6P	〃	PJ1003			
※		VC 91 49 00	〃	6P	〃	PJ1006～1009			
		LB 91 80 20	Base Pin	2P i-Type	XHベースピン				
		LB 91 80 30	〃	3P i=Type	〃				
		VD 00 48 00	〃	5P	PHベースピン				
		BB 07 13 60	Terminal		ネジ端子				
※		***NA 09 39 80***	***Power Circuit Board***		電源シート			J	
※		***NA 09 40 00***	〃		〃			U	
※		***NA 09 40 20***	〃		〃			G	
		Fi 41 41 00	Ceramic Cap.	0.01μF VA-1	セラコン	C951～953 (Inter-changeable)			
		Fi 51 41 00	〃	0.01μF DNS	〃	〃 (Inter-changeable)			
		UJ 13 71 00	Electrolytic Cap.	10μF 16V	ケミコン	C955,956			
		UW 67 84 70	〃	470μF 63V	〃	C954			
		VB 17 01 00	〃	4700μF 5.5V	〃	C957			
		UT 45 41 00	Polypropylene Film Cap.	0.01μF 100V	ポリプロコン	C958,959			
※		XC 33 20 01	Power Transformer		電源トランス	T951		J	⚠
※		XC 11 60 01	〃		〃	〃		U	⚠
※		XC 33 30 01	〃		〃	〃		G	⚠
※		VC 89 59 00	Noise Filter	800μH	ACラインノイズフィルター	L951			
		iA 09 33 00	Transistor	2SA933S(Q,R)	トランジスタ	Q952 (Inter-changeable)		G	
		iA 11 15 10	〃	2SA1115(E,F)	〃	〃 (Inter-changeable)		G	
		iX 60 31 70	〃	2SA1310(R,S,T)	〃	〃 (Inter-changeable)		G	
		iC 17 40 00	〃	2SC1740S(S,R)	〃	Q953,954 (Inter-changeable)			
		iC 26 03 10	〃	2SC2603(E,F)	〃	〃 (Inter-changeable)			
		iX 60 31 80	〃	2SC3312(R,S,T)	〃	〃 (Inter-changeable)			

※New Parts (新規部品)

	Ref. No.	Part No.	Description		部品名	Remarks	Common Model	Markets	ランク
		iD 07 16 10	Transistor	2SD716(R,O)	トランジスタ	Q951		G	
		iF 00 34 50	Diode	1SS133	ダイオード	D952～958			
		iF 00 84 80	〃	1SR35-100A	〃	D951			
		iF 00 88 60	Zener Diode	MTZ12B	ツェナーダイオード	D959		G	
※		iG 06 55 10	IC	NJM78L05A	IC	IC951			
		VB 75 00 00	Battery	CR2032-FT6	リチウム電池	DC951	Inter-changeable		
		VB 82 24 00	〃	CR2032-1HF1	〃	〃	Inter-changeable		
		KC 00 19 10	Relay	DH12D1-0M		RY951	Inter-changeable		
		VA 91 78 00	〃	DC12V TV-5		〃	Inter-changeable		
		KA 40 12 60	Slide Switch	ESD39198S-F	スライドスイッチ			G	⚠
		LA 00 21 40	Lapping Terminal	P=1.0 2P i-Type	ラッピング端子板				
		LA 00 21 50	〃	P=1.0 3P i-Type	〃				
		LA 00 38 70	〃	P=1.0 2P WTM-Type	〃				
		BB 06 62 90	Washer, Ground		アースワッシャー				
※		***VC 91 97 00***	***LCD Unit, DSP***		LCDユニット(DSP)				
※		iX 60 94 60	IC	HD44780SA00H0	IC	IC11			
※		iX 60 94 50	〃	HD44100H	〃	IC12			
※		***VC 91 96 00***	***LCD Unit, DEQ***		LCDユニット(DEQ)				
※		iX 60 94 40	IC	LC7582	IC	IC21,22			
※		***NX 60 06 00***	***PW Circuit Board(A)***		PWボード(A)				
		HJ 35 51 80	Carbon Resistor	180Ω 1/4W	カーボン抵抗	R1a～11a			
※		iF 00 24 40	LED	SLR-34URC3	LED	L1a, 2a			
		iF 00 87 30	〃	SLR-34URC-3H3	〃	L3a, 4a			
※		iX 60 94 70	LED, 7seg.	LB402YL6	7 Seg LED	L5a			
※		KX 60 05 10	Switch, MT		MTスイッチ	SW1a～38a			
※		MX 60 01 30	Plug with Lead Wires	9P ℓ=200	ハーネス品	CN1a			
※		MX 60 01 40	〃	7P ℓ=410	〃	CN2a			
※		MX 60 01 50	〃	8P ℓ=410	〃	CN3a			
※		LX 60 04 40	Plug	8P	プラグ	CN4a			
※		***NX 60 06 10***	***PW Circuit Board(B)***		PWボード(B)				
		HJ 35 51 80	Carbon Resistor	180Ω 1/4W	カーボン抵抗	R1b～14b			
※		iX 60 94 80	LED	SRP-54MVW3F	LED	L1b～11b			
※		iX 60 94 90	〃	LD701MG	〃	L12b			
※		iX 60 95 00	〃	MU03-2250	〃	L13b			
※		KX 60 05 10	Switch, MT		MTスイッチ	SW1b～12b			
※		MX 60 01 60	Plug with Lead Wires	8P ℓ=150	ハーネス品	CN1b			
※		MX 60 01 70	〃	3P ℓ=110	〃	CN2b			

※New Parts (新規部品)

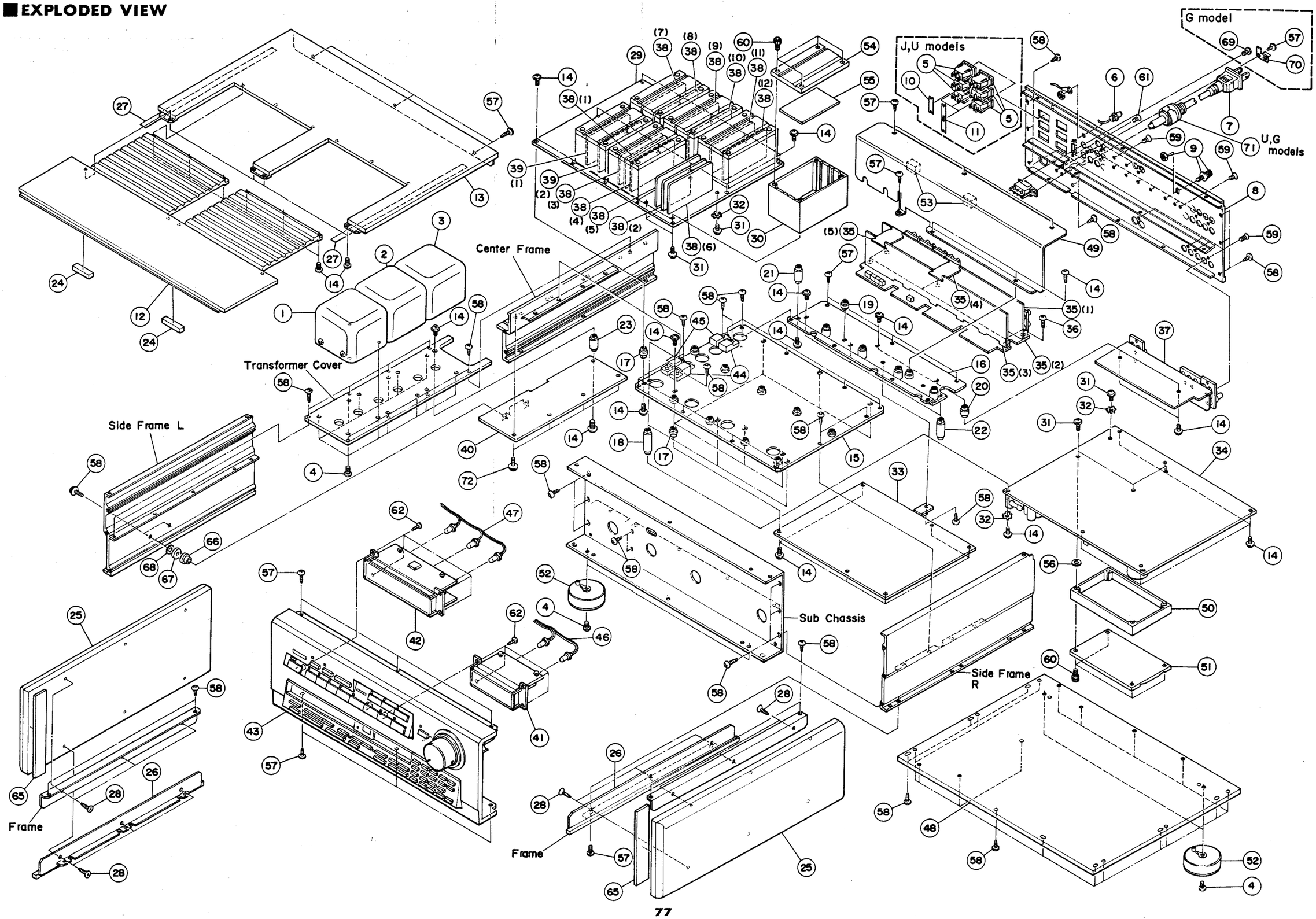
	Ref. No.	Part No.	Description		部品名	Remarks	Common Model	Markets	ランク
※		MX 60 01 80	Plug with Lead Wires	4P ℓ=190	ハーネス品	CN3b			
※		MX 60 01 90	〃	13P ℓ=110	〃	CN4b			
※		LX 60 04 50	Plug	4P	プラグ	CN5b			
※		LX 60 04 60	〃	8P	〃	CN6b			
※		LX 60 04 70	〃	9P	〃	CN7b			
※		***NX 60 06 20***	***PW Circuit Board(C)***		PWボード(C)				
		iF 00 87 30	LED	SLR-34URC-3H3	LED	L1c, 2c			
※		iX 60 95 10	Receiver Unit	GP1UP011	受光器	RV1c			
※		KX 60 05 10	Switch, MT		MTスイッチ	SW1c～4c			
※		MX 60 02 00	Plug with Lead Wires	8P ℓ=110	ハーネス品	CN1c			
※		MX 60 02 10	〃	3P ℓ=230	〃	CN2c			
※		***NX 60 06 30***	***PW Circuit Board(D)***		PWボード(D)				
		iF 00 87 30	LED	SLR-34URC-3H3	LED	L1d			
※		KX 60 05 10	Switch, MT		MTスイッチ	SW1d			
※		MX 60 02 20	Plug with Lead Wires	4P ℓ=100	ハーネス品	CN1d			
※		***NX 60 06 40***	***PW Circuit Board(E)***		PWボード(E)				
		FM 11 61 00	Electrolytic Cap.	1μF 50V	BPコン	C1e			
※		HX 60 18 90	Potentiometer	B10kΩ×2	ボリウム	VR1e			
※		MX 60 02 30	Plug with Lead Wires	3P ℓ=310	ハーネス品	CN1e			
※		MX 60 02 40	〃	2P ℓ=190	〃	CN2e			
※		***NX 60 06 50***	***PW Circuit Board(F)***		PWボード(F)				
		HJ 35 61 00	Carbon Resistor	1kΩ 1/4W	カーボン抵抗	R1f, 2f			
※		HX 60 19 00	Potentiometer	B10kΩ	ボリウム	VR2f			
※		MX 60 02 50	Plug with Lead Wires	3P ℓ=310	ハーネス品	CN1f			
※		***NX 60 06 60***	***PW Circuit Board(G)***		PWボード(G)				
		FG 21 22 20	Ceramic Cap.	220pF 50V	セラコン	C7g			
		FG 21 24 70	〃	470pF 50V	〃	C8g			
		FA 15 51 00	Mylar Cap.	0.1μF 50V	マイラーコン	C1g～6g			
		UJ 13 82 20	Electrolytic Cap.	220μF 16V	ケミコン	C9g			
		UJ 16 62 20	〃	2.2μF 50V	〃	C10g			
		UJ 16 64 70	〃	4.7μF 50V	〃	C11g			
		UL 46 62 20	〃	2.2μF 50V	ローノイズケミコン	C12g			
		HJ 35 44 70	Carbon Resistor	47Ω 1/4W	カーボン抵抗	R1g			
		HJ 35 52 70	〃	270Ω 1/4W	〃	R2g			
		HJ 35 53 30	〃	330Ω 1/4W	〃	R3g			
		HJ 35 61 00	〃	1kΩ 1/4W	〃	R4g, 5g			
		HJ 35 72 20	〃	22kΩ 1/4W	〃	R6g			
		HJ 35 74 70	〃	47kΩ 1/4W	〃	R7g			

※New Parts (新規部品)

	Ref. No.	Part No.	Description		部品名	Remarks	Common Model	Markets	ランク
		HJ 35 91 00	Carbon Resistor	1MΩ 1/4W	カーボン抵抗	R8g			
		HV 45 41 00	Flame Proof Carbon Resistor	10Ω 1/4W	不燃化カーボン抵抗	R9g			
※		HX 60 19 10	Resistor Array	100kΩ×10	抵抗アレイ	RA1g			
		iF 00 34 50	Diode	1SS133	ダイオード	D1g～7g			
		iF 00 84 80	〃	1SR35-100A	〃	D8g～11g			
		iF 00 64 60	Zener Diode	MTZ5.6B	ツェナーダイオード	ZD1g			
		iX 60 29 20	Transistor	2SC3246	トランジスタ	TR2g			
		iC 26 03 10	〃	2SC2603	〃	TR1g			
		GG 00 07 00	Ceramic Oscillator	FCR400K	セラミック発振子	X1g			
※		XC 32 90 01	IC	LC6505C-3265	IC	IC1g			
		XB 25 30 01	〃	M51951BL	〃	IC7g			
		iG 10 11 00	〃	BA6209	〃	IC8g			
		iG 14 54 00	〃	LB1234	〃	IC2g } Inter-changeable			
		iG 14 72 00	〃	BA12004	〃	〃 } Inter-changeable			
		iG 13 20 00	〃	BA618	〃	IC3g, 6g			
		iR 02 73 00	〃	TC74HC273P	〃	IC4g, 5g } Inter-changeable			
		iR 02 73 80	〃	M74HC273P	〃	〃 } Inter-changeable			
※		LX 60 04 80	Plug	2P (White)	プラグ	CN1g			
※		LX 60 04 90	〃	3P (Black)	〃	CN13g			
※		LX 60 05 00	〃	3P (Blue)	〃	CN7g			
※		LX 60 05 10	〃	4P (White)	〃	CN11g			
※		LX 60 05 20	〃	4P (Blue)	〃	CN15g			
※		LX 60 05 30	〃	6P (White)	〃	CN14g			
※		LX 60 05 40	〃	7P (White)	〃	CN4g			
※		LX 60 05 50	〃	8P (White)	〃	CN5g			
※		LX 60 05 60	〃	13P (White)	〃	CN8g			
※		MX 60 02 60	Plug with Lead Wire (A)	2P ℓ=300 (Red)	ハーネス品 A	CN2g			
※		MX 60 02 70	〃 (B)	2P ℓ=200 (Blue)	〃 B	CN6g			
※		MX 60 02 80	〃 (C)	6P ℓ=300 (Green)	〃 C	CN12g			
※		MX 60 02 90	〃 (D)	7P ℓ=300 (Red)	〃 D	CN3g			
※		MX 60 03 00	〃 (E)	7P ℓ=250 (Green)	〃 E	CN10g			
※		MX 60 03 10	〃 (F)	8P ℓ=250 (Blue)	〃 F	CN9g			

※New Parts (新規部品)

■EXPLODED VIEW



■ MECHANISM PARTS

Note) φ : Diameter

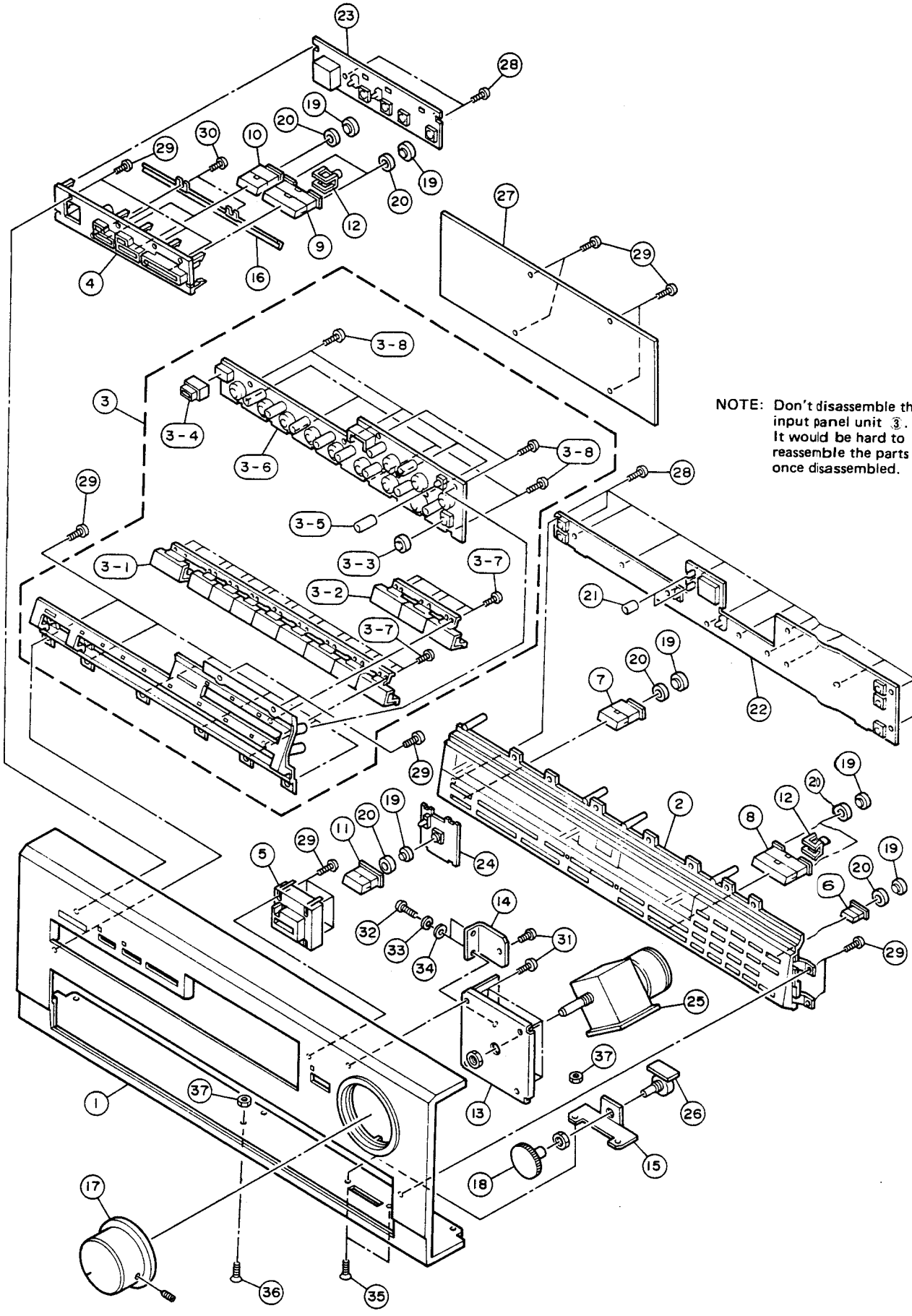
	Ref. No.	Part No.	Description		部品名	Remarks	Common Model	Markets	ランク	
※	1	XC 33 40 02	Power Transformer		電源トランス			J		⚠
※	//	XC 33 60 02	//		//			U		⚠
※	//	XC 33 80 02	//		//			G		⚠
※	2	XC 33 90 01	//		//			J		⚠
※	//	XC 34 10 01	//		//			U		⚠
※	//	XC 34 30 01	//		//			G		⚠
※	3	XC 34 40 01	//		//			J		⚠
※	//	XC 34 60 01	//		//			U		⚠
※	//	XC 34 80 01	//		//			G		⚠
	4	ED 24 01 06	Binding Head Screw	4×10 FCRM3-3g	バインド小ネジ	PACK				
※	5	VC 91 60 00	AC Outlet		ACアウトレット			J,U		⚠
※	6	VC 78 31 00	UM Socket		UMソケット					
※	7	VD 01 18 00	Power Cord	15A 125V	電源コード			J		⚠
	//	MG 00 23 80	//	13A 125V	//			U		⚠
	//	MG 00 09 10	//	6A 250V	//			G		⚠
※	8	VC 98 86 00	Rear Panel		リアパネル			J		
※	//	VC 98 88 00	//		//			U		
※	//	VC 98 90 00	//		//			G		
※	9	VC 98 77 00	Ground Terminal Ass'y		アース端子 Ass'y					
	10	BB 07 06 40	Coupler		カプラー			J,U		
※	11	BB 07 06 30	//		//			J,U		
※	12	VC 98 91 00	Top Cover,A		トップカバーA					
※	13	VC 98 93 00	// ,B		// B					
※	14	EX 60 07 50	BW Head Screw	3×6(φ8)FCRM3-3g	BWヘッド小ネジ					
※	15	VC 98 94 00	Center Cover,A		センターカバーA					
※	16	VC 98 95 00	// ,B		// B					
※	17	VD 04 70 00	Post,A		ポストA					
※	18	VD 04 71 00	// ,B		// B					
※	19	VD 04 72 00	// ,C		// C					
※	20	VD 04 73 00	// ,D		// D					
※	21	VD 04 74 00	// ,E		// E					
※	22	VD 04 75 00	// ,F		// F					
※	23	VD 04 76 00	// ,G		// G					
※	24	VD 35 43 00	Spacer(T)		スペーサー(T)					
※	25	VC 98 96 00	Side Cover		サイドカバー					
※	26	VC 98 98 00	Side Under Panel		サイドアンダーパネル					
※	27	VD 33 29 00	Spacer		スペーサー					
	28	EP 13 11 66	Flat Head Wood Screw	3.1×16 FNM3-3g	皿木ネジ	PACK				
※	29	NA 09 38 80	Mother Circuit Board		マザーボードシート					
※	30	VC 99 09 00	Shield Case,A		シールドケースA					
※	31	EX 60 07 60	BW Head Screw	3×8(φ8)FCRM3-3g	BWヘッド小ネジ					
	32	EV 42 00 36	Toothed Lock Washer	φ3 ZMC2-Y	歯付座金	PACK				
※	33	NA 09 39 00	Digital Circuit Board		デジタルシート					
※	34	NA 09 39 10	DSP Circuit Board		DSPシート					
※	35	NA 09 39 20	Analog PJ Circuit Board		アナログPJシート			J		
※	//	NA 09 39 30	//		//			U		
※	//	NA 09 39 40	//		//			G		
	36	ED 33 00 66	Binding Head Screw	3×6 FCRM3-BI	バインド小ネジ	PACK				
※	37	NA 09 39 50	Digital PJ Circuit Board		デジタルPJシート			J		
※	//	NA 09 39 60	//		//			U		
※	//	NA 09 39 70	//		//			G		
※	38	NA 09 38 90	Unit Amp Circuit Board		ユニットアンプシート					
※	39	NA 09 46 00	Unit Amp Effect Circuit Board		ユニットアンプエフェクトシート					

※New Parts (新規部品)

	Ref. No.	Part No.	Description		部品名	Remarks	Common Model	Markets	ランク
※	40	NA 09 39 80	Power Circuit Board		電源シート			J	
※	//	NA 09 40 00	//		//			U	
※	//	NA 09 40 20	//		//			G	
※	41	VC 91 97 00	LCD Unit		LCDユニット				
※	42	VC 91 96 00	//		//				
※	43	VC 98 72 00	Panel Unit		パネルユニット				
	44	iB 09 49 10	Transistor	2SB949	トランジスタ	Q101,107			
	45	iD 12 75 10	//	2SD1275	//	Q104,110			
※	46	VC 98 84 00	Lamp	4P l=200	ランプ				
※	47	VC 98 85 00	//	6P l=250	//				
※	48	VC 99 07 00	Bottom Cover		ボトムカバー				
※	49	VC 99 08 00	Rear Cover		リアカバー				
※	50	VC 99 10 00	Shield Case,D		シールドケースD				
※	51	VC 99 13 00	Shield Plate,D		シールドプレートD				
	52	VD 17 61 00	Leg Ass'y		脚 Ass'y				
	53	CB 64 20 50	Damper		ダンパー				
※	54	VC 99 12 00	Shield Plate,A		シールドプレートA				
※	55	VD 11 06 00	Cushion		クッション				
	56	CA 07 08 10	Washer		ワッシャー				
	57	Ei 23 00 86	Binding Head Tapping Screw	3× 8FCRM3-3g	バインドタッピングネジ	PACK			
	58	Ei 13 01 20	//	3×12 FNM3-3g	//	PACK			
	59	EF 23 00 86	Oval Head Screw	3× 8FCRM3-3g	丸皿小ネジ	PACK			
※	60	EX 60 07 40	Bolt with Hexagnal Holl	3× 8FCRM3-3g	六角穴付ボルト				
	61	EF 22 60 66	Oval Head Screw	2.6× 6FCRM3-3g	丸皿小ネジ	PACK			
	62	EX 60 02 00	Cup Tight Screw	2× 6FCRM3-Bl	カップスクリュー				
※	65	VD 46 44 00	Cushion		クッション				
※	66	VD 54 20 00	Dumper(A), Transformer		トランスダンパーA				
※	67	VD 54 21 00	// (B), //		// B				
	68	EV 20 00 46	Plain Washer	φ4 ZMC2-Y	平座金	PACK			
	69	ED 23 00 66	Binding Head Screw	3× 6FCRM3-3g	バインド小ネジ	PACK	G		
	70	CB 60 14 40	Stopper, VS		VSストッパー		G		
※	71	VD 33 31 00	Cord Stopper	SR-4K-4	コードストッパー		U,G		
※	72	EX 60 04 70	BW Head Tapping Screw	3×8(φ8)FNM3-3g	BWヘッドタッピングネジ				
		CB 06 92 50	Binding Tie	BK-1	インシュロックタイ				
			Accessories		付属品				
※		VC 96 13 00	Remote Control Transmitter	RS-CX10000	リモートコントロールトランスミッター				
			Dry Cell	SUM-3	単3電池				
		VA 97 63 00	Pin Cord		ピンコード(音声用)				
		VD 02 29 00	//		// (映像用)				

※New Parts (新規部品)

■EXPLODED VIEW(Panel Unit)



MECHANISM PARTS

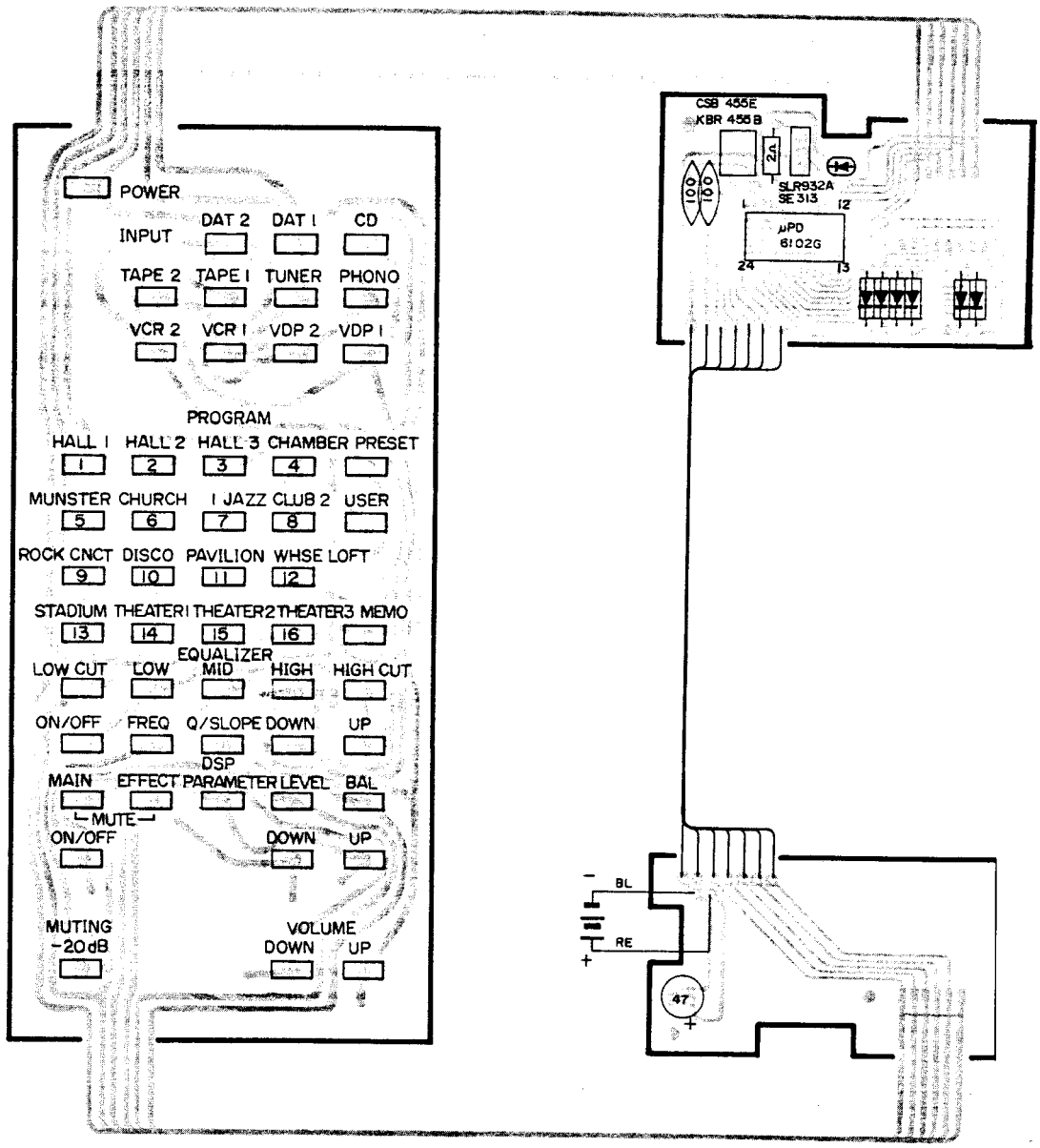
Note) φ : Diameter

	Ref. No.	Part No.	Description		部品名	Remarks	Common Model	Markets	ランク
※	1	NX 60 05 90	Front Panel		フロントパネル				
※	2	NX 60 05 70	Sub Panel Unit		サブパネルユニット				
※	3	NX 60 05 80	Input Panel Unit		インプットパネルユニット				
※	3-1	BX 60 03 40	Key Top Set (G)		キートップセット (G)				
※	3-2	BX 60 03 50	// (H)		// (H)				
※	3-3	CX 60 12 10	Cover		カバー				
※	3-4	CX 60 12 40	Cover (A)		カバー (A)				
※	3-5	CX 60 12 50	// (B)		// (B)				
※	3-6	NX 60 06 10	PW Circuit Board (B)		PWボード (B)				
	3-7	EX 60 05 30	Pan Head Tapping Screw	1.7×5 ZMC2-BI	ナベタッピングネジ				
	3-8	Ei 02 00 66	Binding Head Tapping Screw	2×6 ZMC2-Y	バインドタッピングネジ	PACK			
※	4	CX 60 12 00	Frame (B)		フレーム (B)				
※	5	CX 60 11 90	// (C)		// (C)				
※	6	BX 60 02 80	Key Top Set (A)		キートップセット (A)				
※	7	BX 60 02 90	// (B)		// (B)				
※	8	BX 60 03 00	// (C)		// (C)				
※	9	BX 60 03 10	// (D)		// (D)				
※	10	BX 60 03 20	// (E)		// (E)				
※	11	BX 60 03 30	// (F)		// (F)				
※	12	BX 60 03 60	Bracket (A)		ブラケット (A)				
※	13	BX 60 03 70	// (B)		// (B)				
※	14	BX 60 03 80	// (C)		// (C)				
※	15	BX 60 03 90	// (D)		// (D)				
※	16	BX 60 04 00	// (E)		// (E)				
※	17	BX 60 04 10	Knob (A)		ノブ (A)	VOLUME			
※	18	BX 60 04 20	// (B)		// (B)	BALANCE			
※	19	CX 60 12 10	Cover		カバー				
※	20	CX 60 12 20	Cushion		クッション				
※	21	CX 60 12 30	Tube		チューブ				
※	22	NX 60 06 00	PW Circuit Board (A)		PWボード (A)				
※	23	NX 60 06 20	// (C)		// (C)				
※	24	NX 60 06 30	// (D)		// (D)				
※	25	NX 60 06 40	// (E)		// (E)				
※	26	NX 60 06 50	// (F)		// (F)				
※	27	NX 60 06 60	// (G)		// (G)				
	28	Ei 02 00 66	Binding Head Tapping Screw	2×6 ZMC2-Y	バインドタッピングネジ	PACK			
	29	Ei 02 60 66	//	2.6×6 ZMC2-Y	//	PACK			
	30	Ei 02 60 80	//	2.6×8 ZMC2-Y	//				
	31	Ei 03 00 56	//	3×5 ZMC2-Y	//	PACK			
	32	EA 03 00 56	Pan Head Screw	3×5 ZMC2-Y	ナベ小ネジ	PACK			
	33	EV 30 00 36	Spring Washer	φ3 ZMC2-Y	バネ座金	PACK			
	34	EV 20 00 36	Plain Washer	φ3 ZMC2-Y	平座金	PACK			
	35	EF 23 01 06	Oval Head Screw	3×10FCRM3-3g	丸サラ小ネジ	PACK			
	36	EF 23 01 66	//	3×16FCRM3-3g	//	PACK			
	37	EV 10 10 36	Hexagonal Nut	φ3 FNM3-3g	六角ナット	PACK			
		CB 06 92 50	Binding Tie	BK-1	インシュロックタイ				

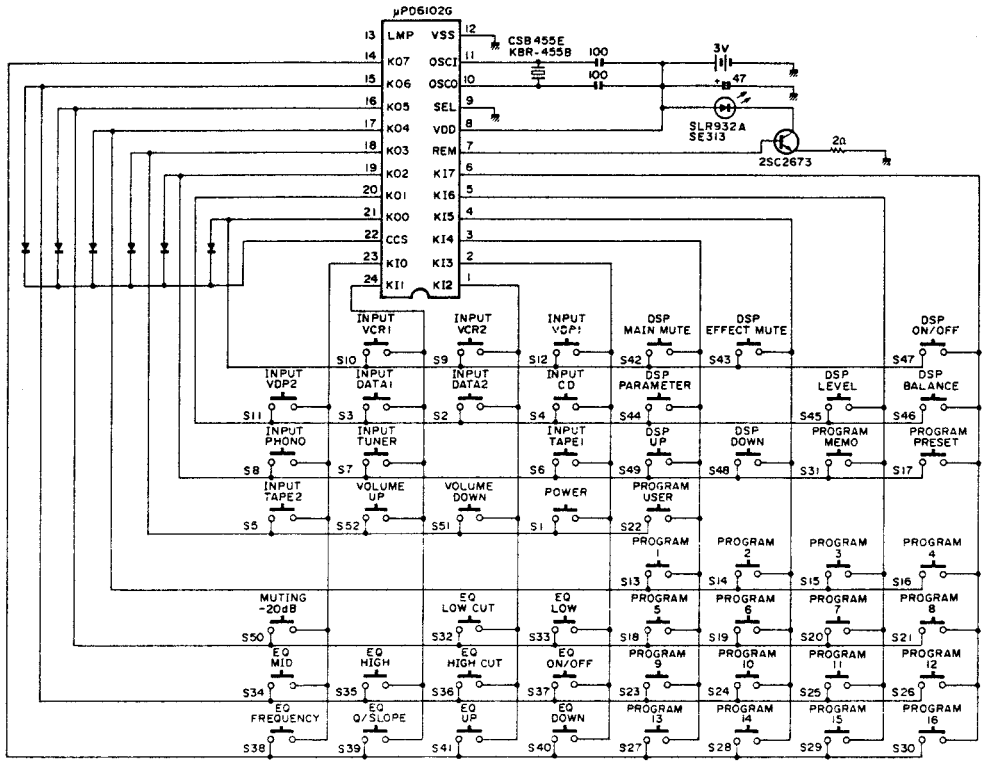
※New Parts (新規部品)

RS-CX10000
REMOTE CONTROL TRANSMITTER

■ PRINTED CIRCUIT BOARD (Pattern side)

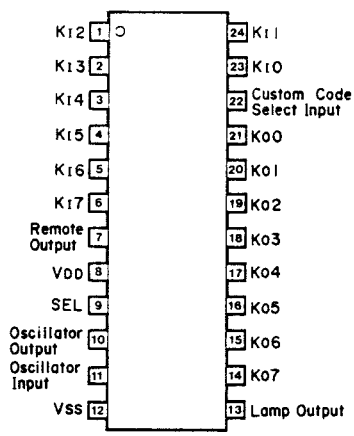


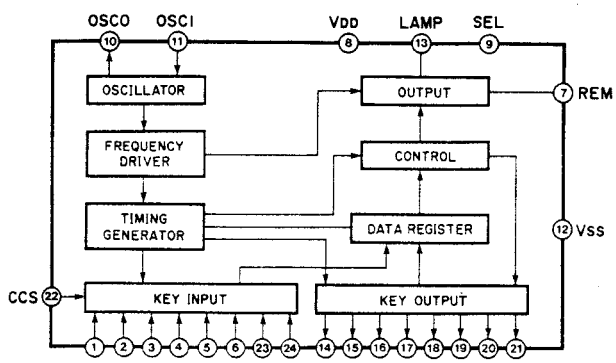
SCHEMATIC DIAGRAM(RS-CX10000)



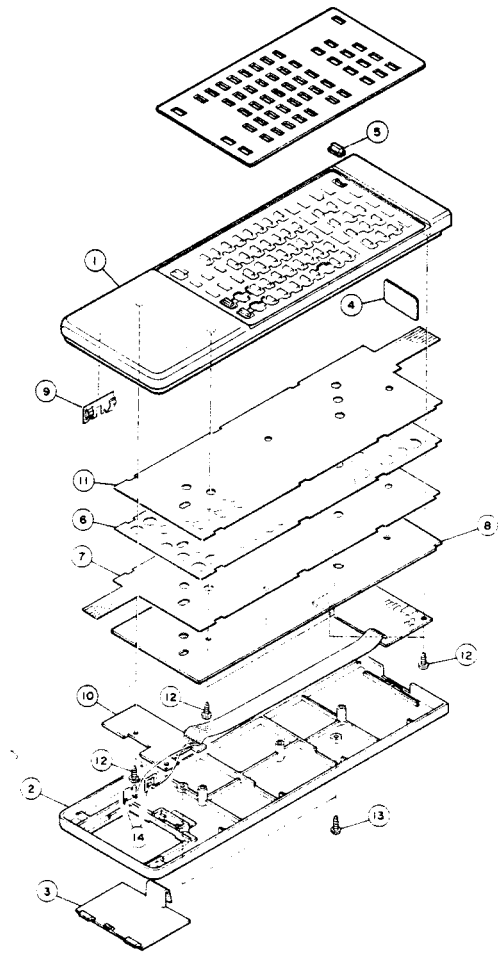
Key No.	Function		Data Code 00000000 01234567
S 1	POWER		8F 11110001
S 2	INPUT	DAT 2	86 01100001
S 3		DAT 1	85 10100001
S 4		CD	87 11100001
S 5		TAPE 2	8C 00110001
S 6		TAPE 1	8B 11010001
S 7		TUNER	89 10010001
S 8		PHONO	88 00010001
S 9		VCR 2	82 01000001
S10		VCR 1	81 10000001
S11		VDP 2	84 00100001
S12		VDP 1	83 11000001
S13	PROGRAM	1	D0 00001011
S14		2	D1 10001011
S15		3	D2 01001011
S16		4	D3 11001011
S17		PRESET	CB 11010011
S18		5	D4 00101011
S19		6	D5 10101011
S20		7	D6 01101011
S21		8	D7 11101011
S22		USER	CC 00110011
S23		9	D8 00011011
S24		10	D9 10011011
S25		11	DA 01011011
S26		12	DB 11011011
S27		13	DC 00111011
S28		14	DD 10111011
S29		15	DE 01111011
S30		16	DF 11111011
S31		MEMO	CA 01010011
S32	EQUAL-IZER	LOW CUT	96 01101001
S33		LOW	97 11101001
S34		MID	98 00011001
S35		HIGH	99 10011001
S36		HIGH CUT	9A 01011001
S37		ON/OFF	98 11011001
S38		FREQUENCY	9C 00111001
S39		Q/SLOPE	9D 10111001
S40		DOWN	9F 11111001
S41		UP	9E 01111001
S42	DSP	MAIN MUTE	C0 00000011
S43		EFFECT MUTE	C1 10010011
S44		PARAMETER	C4 00100011
S45		LEVEL	C6 01100011
S46		BALANCE	C7 11100011
S47		ON/OFF	C3 11000011
S48		DOWN	C9 10010011
S49		UP	C8 00010011
S50	MUTING	-20dB	94 00101001
S51	VOLUME	DOWN	8E 01110001
S52		UP	8D 10110001
Custom Code			7D 10111110

- μPD6102G





EXPLODED VIEW(RS-CX10000)



	Ref. No.	Part No.	Description		部品名	Remarks	Common Model	Markets	ランク
※		***VC 96 13 00***	***Remote Control Transmitter***	RS-CX10000	リモートコントロールトランスミッター				
※	1	CX 60 10 50	Cabinet (A) Ass'y		キャビネット (A) Ass'y				
※	2	CX 60 10 60	〃 (B)		キャビネット (B)				
※	3	CX 60 10 70	Battery Cover		電池フタ				
※	4	CX 60 10 00	Filter		フィルター板				
※	5	CX 60 10 80	Key Top (A)		キートップ (A)				
※	6	CX 60 10 90	Insulation Sheet (A)		絶縁シート (A)				
※	7	CX 60 11 00	Terminal Sheet (B)		電極シート (B)				
※	8	CX 60 10 40	Plate		補強板				
※	9	BX 60 01 40	Dry Cell Terminal (A)		電池接片 (A)				
※	10	NX 60 04 90	P.C. Board Ass'y		基板 Ass'y 品				
※	11	BX 60 01 60	Terminal Ass'y		可動接点貼合せ品				
	12	Ei 02 00 56	Binding Head Tapping Screw	2×5 ZMC2-Y	バインドタッピングネジ	PACK			
	13	Ei 32 00 56	〃	2×5 FCRM3-BI	〃	PACK			
※		***NX 60 04 90***	***P.C. Board Ass'y***		基板 Ass'y 品				
		iX 60 70 40	IC	μPD6102G	IC				
		QX 60 00 40	Ceramic Resonator	KBR-455B	セラミック振動子				
		FG 21 21 00	Ceramic Cap.	100pF 50V	セラコン				
		UJ 11 74 70	Electrolytic Cap.	47μF 6.3V	ケミコン				
		iX 60 36 00	IED	SLR932A	IED				
		iC 26 73 00	Transistor	2SC2673	トランジスタ				
		HX 60 14 00	Carbon Resistor	2Ω 1/4W	カーボン抵抗				
		iF 00 34 50	Diode	1SS133	ダイオード				
※	14	XX 67 16 90	Dry Cell Terminal(B)		電池接片 (B)				

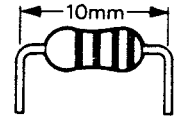
※New Parts (新規部品)

Parts List for Carbon Resistor

Value	1/4W Type Part No.	1/6W Type Part No.	Value	1/4W Type Part No.	1/6W Type Part No.
1.0 Ω	HJ353100	HF853100	12KΩ	HJ357120	HF857120
1.8 〃	HJ353180	※	15 〃	HJ357150	HF857150
2.2 〃	HJ353220	HF853220	18 〃	HJ357180	HF857180
3.3 〃	HJ353330	HF853330	22 〃	HJ357220	HF857220
4.7 〃	HJ353470	HF853470	27 〃	HJ357270	HF857270
5.6 〃	HJ353560	HF853560	33 〃	HJ357330	HF857330
10 〃	HJ354100	HF854100	39 〃	HJ357390	HF857390
15 〃	HJ354150	HF854150	47 〃	HJ357470	HF857470
22 〃	HJ354220	HF854220	56 〃	HJ357560	HF857560
27 〃	HJ354270	HF854270	68 〃	HJ357680	HF857680
33 〃	HJ354330	HF854330	82 〃	HJ357820	HF857820
39 〃	HJ354390	HF854390	91 〃	HJ357910	HF857910
47 〃	HJ354470	HF854470	100 〃	HJ358100	HF858100
56 〃	HJ354560	HF854560	120 〃	HJ358120	HF858120
68 〃	HJ354680	HF854680	150 〃	HJ358150	HF858150
82 〃	HJ354820	HF854820	180 〃	HJ358180	HF858180
100 〃	HJ355100	HF855100	220 〃	HJ358220	HF858220
110 〃	HJ355110	HF855110	270 〃	HJ358270	HF858270
120 〃	HJ355120	HF855120	330 〃	HJ358330	HF858330
150 〃	HJ355150	HF855150	390 〃	HJ358390	HF858390
160 〃	HJ355160	※	470 〃	HJ358470	HF858470
180 〃	HJ355180	HF855180	560 〃	HJ358560	HF858560
220 〃	HJ355220	HF855220	680 〃	HJ358680	HF858680
270 〃	HJ355270	HF855270	820 〃	HJ358820	HF858820
330 〃	HJ355330	HF855330	1.0MΩ	HJ359100	HF859100
390 〃	HJ355390	HF855390	1.2 〃	HJ359120	※
470 〃	HJ355470	HF855470	1.5 〃	HJ359150	HF859150
510 〃	※	HF855510	1.8 〃	HJ359180	HF859180
560 〃	HJ355560	HF855560	2.2 〃	HJ359220	HF859220
680 〃	HJ355680	HF855680	3.3 〃	HJ359330	HF859330
820 〃	HJ355820	HF855820	3.9 〃	HJ359390	※
910 〃	HJ355910	HF855910	4.7 〃	HJ359470	HF859470
1.0KΩ	HJ356100	HF856100			
1.2 〃	HJ356120	HF856120			
1.5 〃	HJ356150	HF856150			
1.8 〃	HJ356180	HF856180			
2.0 〃	HJ356200	HF856200			
2.2 〃	HJ356220	HF856220			
2.4 〃	HJ356240	HF856240			
2.7 〃	HJ356270	HF856270			
3.0 〃	HJ356300	HF856300			
3.3 〃	HJ356330	HF856330			
3.6 〃	HJ356360	HF856360			
3.9 〃	HJ356390	HF856390			
4.7 〃	HJ356470	HF856470			
5.1 〃	HJ356510	HF856510			
5.6 〃	HJ356560	HF856560			
6.8 〃	HJ356680	HF856680			
8.2 〃	HJ356820	HF856820			
9.1 〃	HJ356910	HF856910			
10 〃	HJ357100	HF857100			

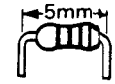
1/4W Type

HJ35○○○○



1/6W Type

HF85○○○○



GUIDE TO OPTIMUM UTILIZATION

Limited Centennial Edition 1887~1987

CX-10000

Natural Sound Control Amplifier

YAMAHA

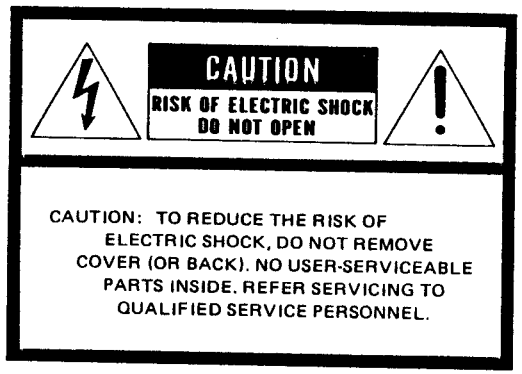
ENGLISH

INTRODUCTION

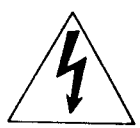
Thank you for purchasing the YAMAHA CX-10000 Limited Centennial Edition Stereo Control Amplifier.
The CX-10000 from YAMAHA is truly a sophisticated stereo control amplifier, that opens a new way of audio with its supreme quality.
We have prepared this brief guide to help you obtain many years of optimum performance from this superb control amplifier. Please read this before using control amplifier and keep it in a safe place for future reference.

CONTENTS

CAUTION



- **Explanation of Graphical Symbols**



The lightning flash with arrowhead symbol, within an equilateral triangle, is intended to alert you to the presence of uninsulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock to persons.

The exclamation point within an equilateral triangle is intended to alert you to the presence of important operating and maintenance (servicing) instructions in the literature accompanying the appliance.

WARNING
TO PREVENT FIRE OR ELECTRICAL SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.

SAFETY INSTRUCTIONS

1 Read Instructions – All the safety and operating instructions should be read before the appliance is operated.

2 Retain Instructions – The safety and operating instructions should be retained for future reference.

3 Heed Warnings – All warnings on the appliance and in the operating instructions should be adhered to.

4 Follow Instructions – All operating and other instructions should be followed.

5 Water and Moisture – The appliance should not be used near water – for example, near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool, etc.

6 Carts and Stands – The appliance should be used only with a cart or stand that is recommended by the manufacturer.

7 Wall or Ceiling – The appliance should be mounted to a wall or ceiling only as recommended by the manufacturer.

8 Ventilation – The appliance should be situated so that its location or position does not interfere with its proper ventilation. For example, the appliance should not be situated on a bed, sofa, rug, or similar surface, that may block the ventilation openings; or cabinet that may impede the flow of air through the ventilation openings.

9 Heat – The appliance should be situated away from heat sources such as radiators, stoves, or other appliances that produce heat.

10 Power Sources – The appliance should be connected to power supply only of the type described in the operating instructions or as marked on the appliance.

11 Power-Cord Protection – Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the appliance.

12 Cleaning – The appliance should be cleaned only as recommended by the manufacturer.

13 Nonuse Periods – the power cord of the appliance should be unplugged from the outlet when left unused for a long period of time.

14 Object and Liquid Entry – Care should be taken so that objects do not fall into and liquids are not spilled into the inside of the appliance.

15 Damage Requiring Service – The appliance should be serviced by qualified service personnel when:

A. The power-supply cord or the plug has been damaged; or
B. Objects have fallen, or liquid has been spilled into the appliance; or

ENGLISH

C. The appliance has been exposed to rain; or
D. The appliance does not appear to operate normally or exhibits a marked change in performance; or
E. The appliance has been dropped, or the cabinet damaged.

16 Servicing – The user should not attempt to service the appliance beyond those means described in the operating instructions. All other servicing should be referred to qualified service personnel.

17 Grounding or Polarization – The precautions that should be taken so that the grounding or polarization of an appliance is not defeated.

IMPORTANT
Please record the serial number of your unit in the space below.

Model: CX-10000
Serial No.:

The serial number is located on the rear of the unit. Retain this Owner's Manual in a safe place for future reference.

PLEASE NOTE

■ CLEANING
Wipe off dust with a soft dry cloth. For heavier dirt use a soft damp cloth then dry immediately with a clean cloth. Do not use harsh cloths, alcohol or other chemical solvents as these products may damage the finish.

■ HANDLING
Do not use force when using the switches and knobs. When removing the power plug from the wall outlet always pull directly on the plug, never pull the cord itself. Before moving your amplifier be sure to unplug the power cord and remove all other connecting cables.

■ CONVENIENCE OUTLETS
Do not connect audio equipment to the AC outlets on the rear panel if that equipment requires more power than the outlets are rated to provide.

IN CASE OF TROUBLE

■ TROUBLESHOOTING
Consult the Troubleshooting Chart for advice on the common operating errors before concluding that your unit is faulty.

■ SERVICING
Do not open the cabinet or attempt to make repairs by yourself as this may result in damage to the set or electrical shock to yourselt. Refer any servicing to your Yamaha dealer.

FEATURES

■ Digital control amplifier

- The CX-10000 is an audio component which incorporates a newly developed DEQ (Digital parameter EQualizer) and digital I/O (Input/Output) connectors.

- In addition to LOW cut and HIGH cut filters, the DEQ is equipped with three modes; LOW (Low-frequency), MID (Mid-range) and HIGH (High-frequency). In any mode, the center frequency, level and Q factor can be set as required (in 5 steps with LOW, MID and HIGH, and in 3 steps with LOW and HIGH cut). The user can store up to a total of 16 original equalization patterns including the equalized DSP (Digital Sound-field Processor) programs.

- Digital input/output connectors for CD, DAT and VDP are provided in addition to analog input/output connectors.
  Digital input/output connectors are equipped with the digital audio interface standard format that can accept two sampling frequencies (44.1 or 48 kHz).

■ Omni-sound facility - the CX-10000 reproduces 16 sound-field effects using the built-in DSP (Digital Sound-field Processor)

- The DSP processes the input signal digitally using one of reproduce 16 sound-field patterns programmed based on sound-field data measured in actual halls.

- The input signal is output directly from the main speakers (front L and front R) without any processing, while the other four speakers (FL, FR, RL and RR) output the processed signal to control the sound field of the user's listening room as required.

- 16 representative sound fields have been factory preset, including Hall 1, 2 and 3, Stadium and Jazz Club. The user can also program the same number of required sound-field patterns and store them in memory.

■ Improved analog sound quality using the VCA (Voltage-Controlled Amplifier)

- The VCA advanced by YAMAHA is used in this unit. It improves the quality of the analog system without the use of any mechanical contact.

■ Full remote control

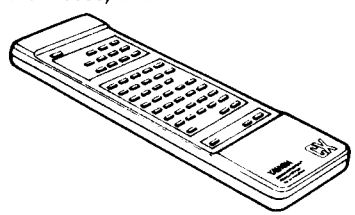
- Almost all functions of the control amplifier, including the DEQ and DSP, can be controlled from a remote control transmitter at your listening position.

BEFORE USE

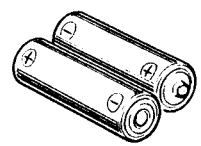
■ ACCESSORIES

Check that the following four accessories are provided together with the main unit.

Remote control transmitter
(RS-CX10000) x 1



Battery
(size "AA", or R06) x 2

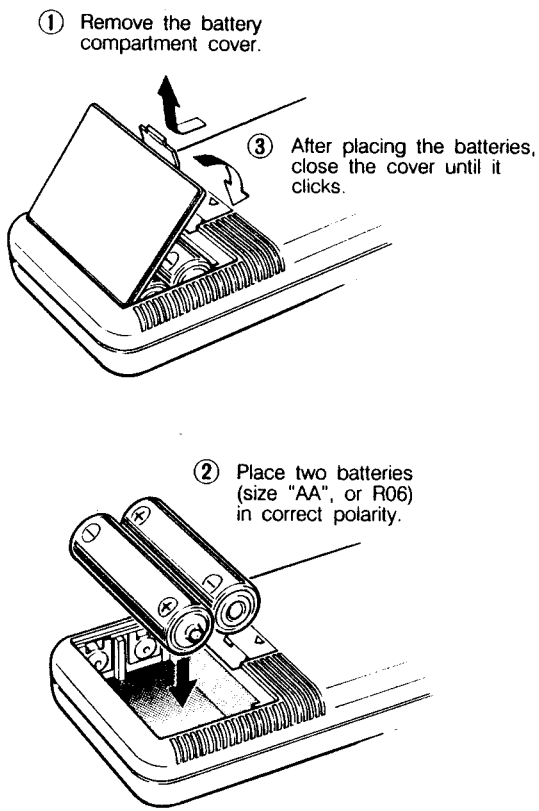


Audio connection cord x 3 sets

Video connection cord x 1 set

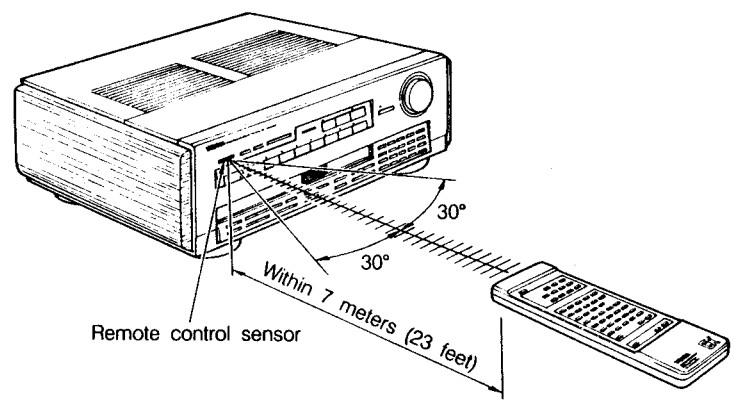
■ REMOTE CONTROL TRANSMITTER

Most operations of the unit can be controlled from the RS-CX10000 remote control transmitter provided. Before operating, install the provided batteries into the remote control transmitter properly.



OPERATION RANGE

As the remote control transmitter uses the infrared ray which travels linearly in the space, pay attention to the angle of the remote control sensor of the CX-10000 main unit.



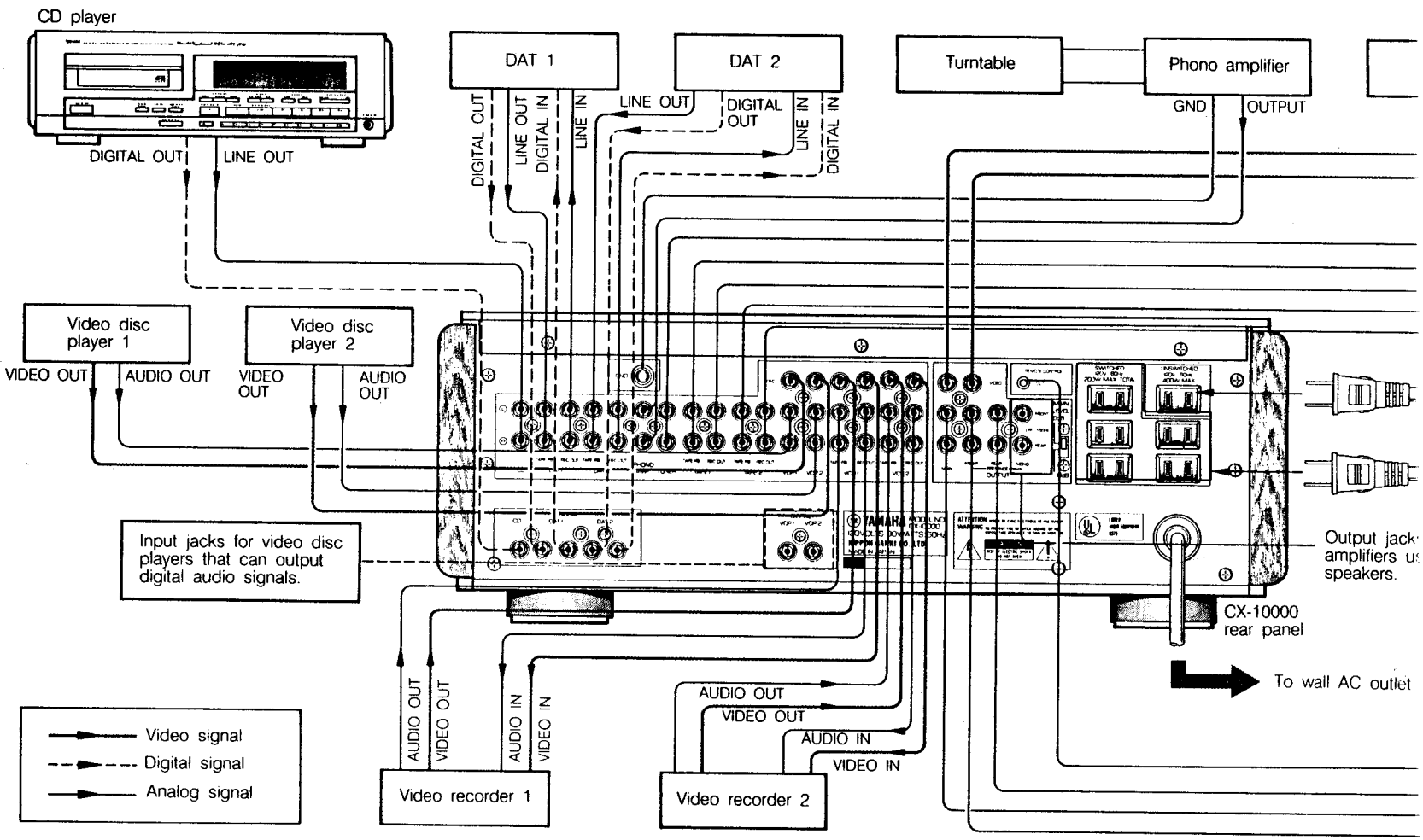
BATTERY REPLACEMENT

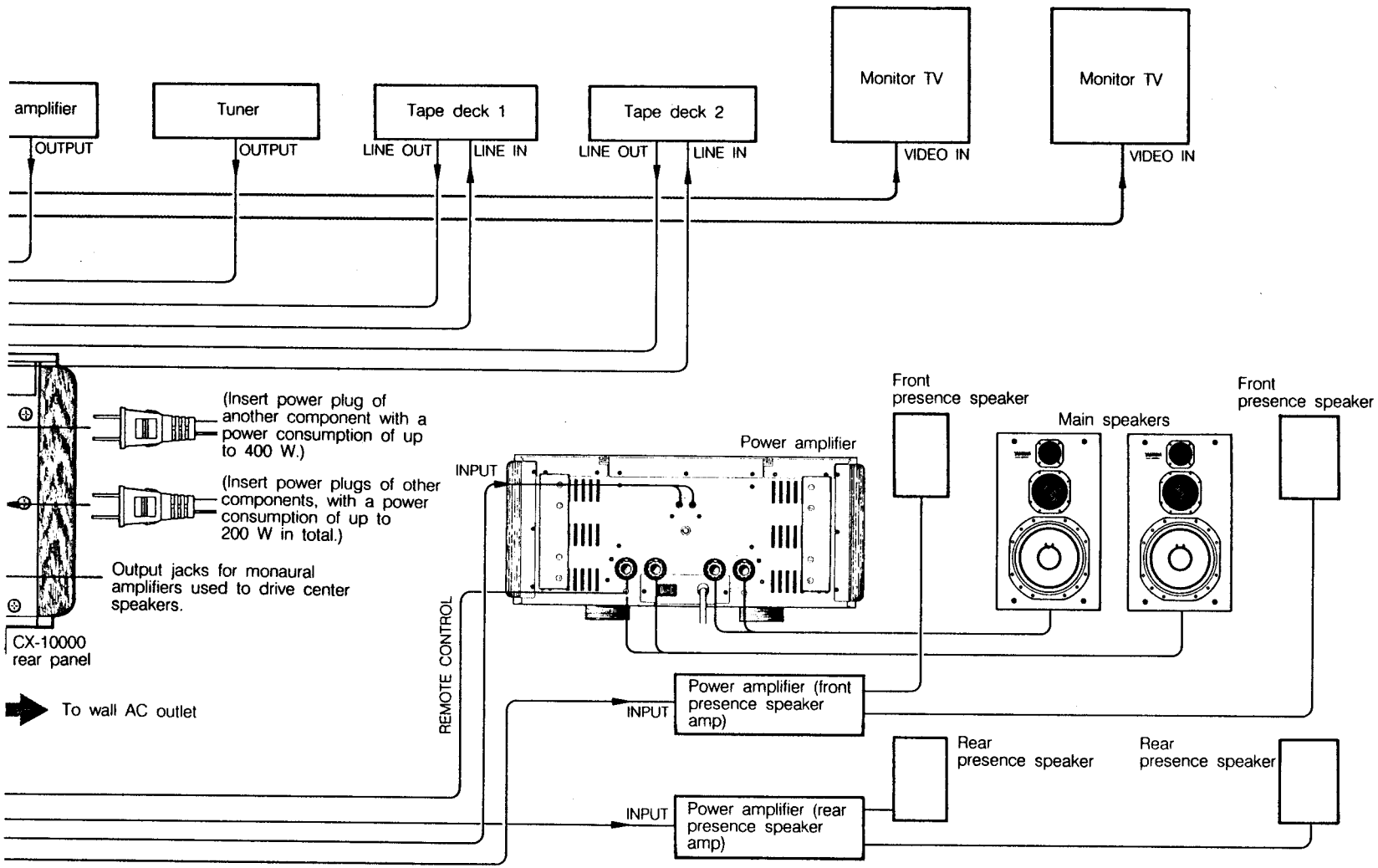
When the remote-controllable distance becomes short, this means that the batteries are exhausted. Replace both batteries with new ones.

NOTES

- Install the batteries in correct positive (+) and negative (−) polarities as indicated in the battery compartment.
- When the battery power becomes weak, change the batteries before they are exhausted completely.
- Do not use an old battery together with a new one.
- Do not use different kinds of batteries together. The performances of two batteries could differ even when their shape is the same.
- There are two kinds of batteries on the market; rechargeable and non-rechargeable. Read the caution labels on the battery carefully.
- Do not connect (short-circuit) between (+) and (−) directly with a piece of metal, etc.
- When the remote control transmitter is not to be used for an extended period of time, remove the batteries.
- Never attempt to open, heat, or throw a battery into a fire. In case of battery leakage, remove the old batteries, wipe off the electrolyte in the battery compartment completely, and insert new batteries.

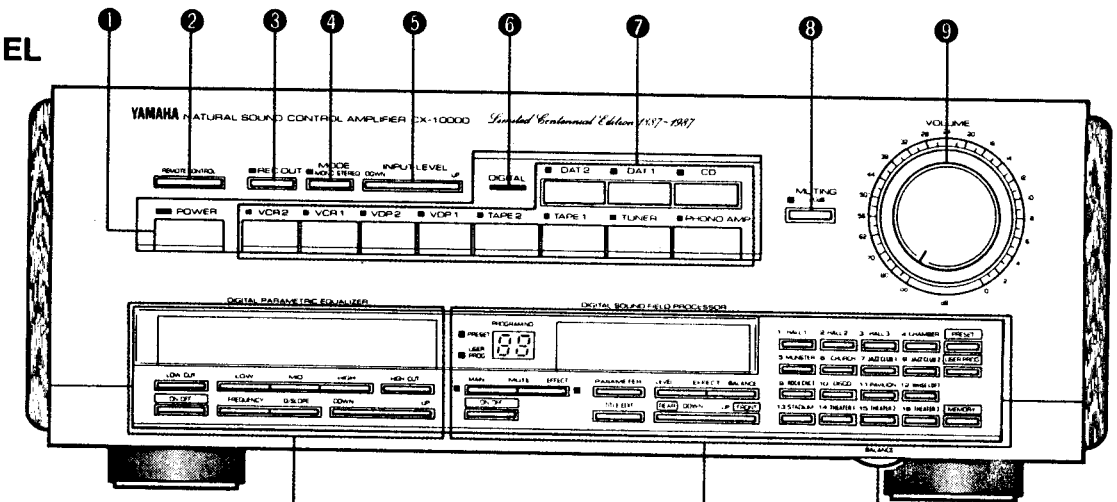
SYSTEM CONNECTION




amplifier
OUTPUT
Tuner
OUTPUT
Tape deck 1
LINE OUT
LINE IN
Tape deck 2
LINE OUT
LINE IN
Monitor TV
VIDEO IN
Monitor TV
VIDEO IN
(Insert power plug of another component with a power consumption of up to 400 W.)
(Insert power plugs of other components, with a power consumption of up to 200 W in total.)
Output jacks for monaural amplifiers used to drive center speakers.
CX-10000 rear panel
To wall AC outlet
REMOTE CONTROL
Power amplifier
INPUT
Front presence speaker
Main speakers
Front presence speaker
INPUT
Power amplifier (front presence speaker amp)
Rear presence speaker
Rear presence speaker
INPUT
Power amplifier (rear presence speaker amp)

CONTROLS AND FUNCTIONS

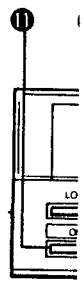
■ FRONT PANEL



DIGITAL PARAMETRIC EQUALIZER Control Section

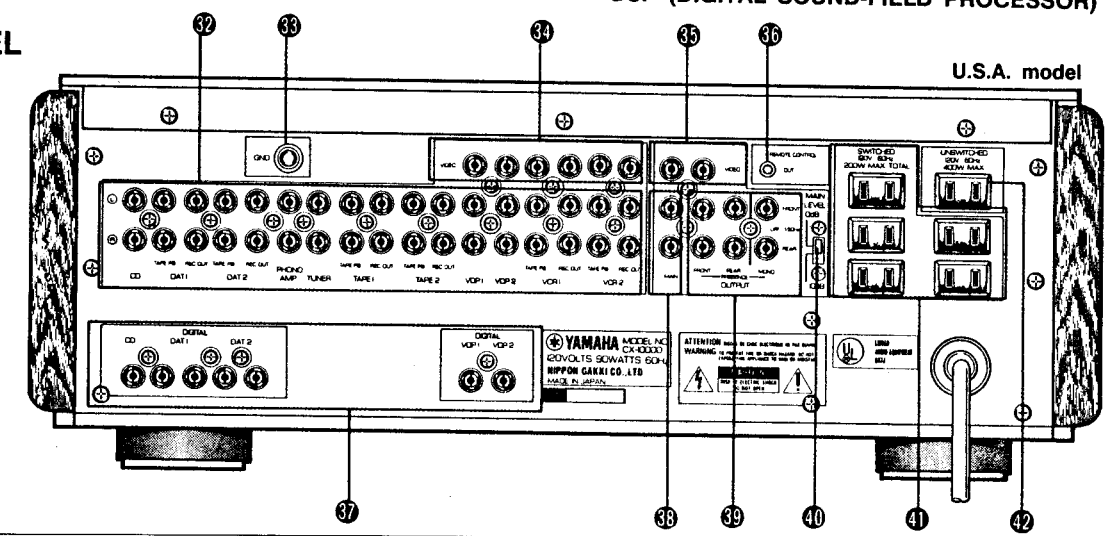
DSP (DIGITAL SOUND-FIELD PROCESSOR) Control Section

DIGITAL PARAM

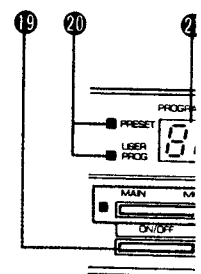


■ REAR PANEL

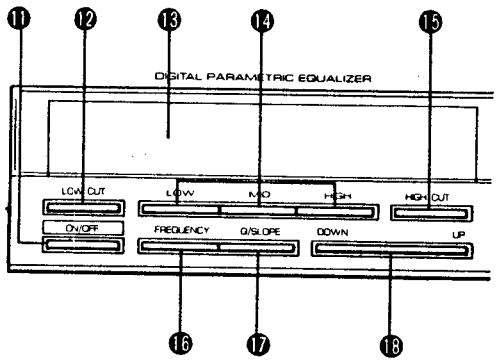
U.S.A. model



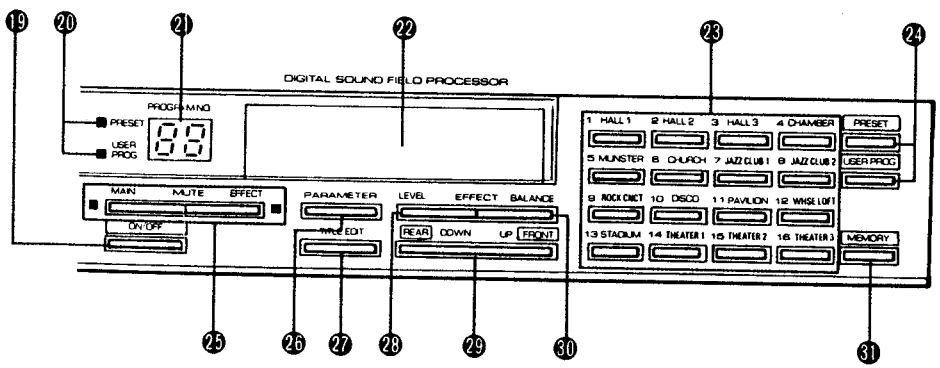
DSP (DIGITAL S



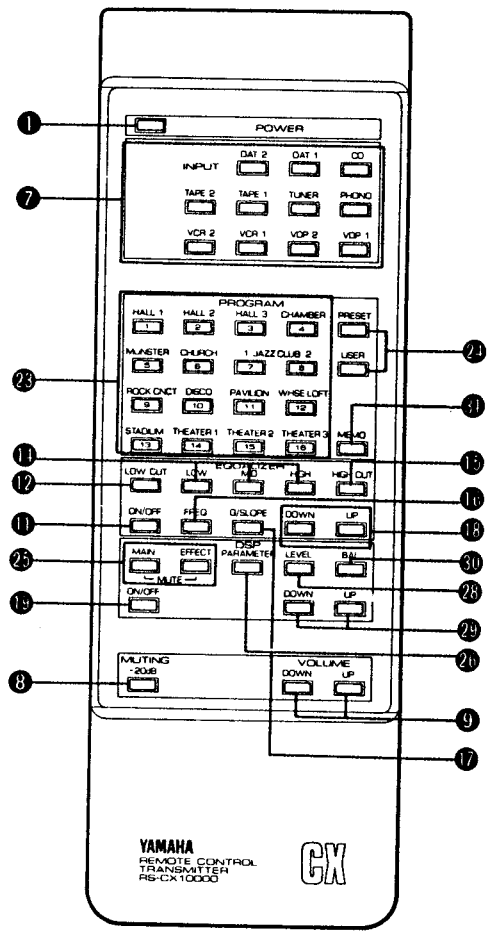
DIGITAL PARAMETRIC EQUALIZER Control Section



DSP (DIGITAL SOUND-FIELD PROCESSOR) Control Section



■ REMOTE CONTROL TRANSMITTER (RS-CX10000)



■ FRONT PANEL

❶ POWER switch
This turns the power on and off. When the power is turned on, the indicator above the switch will light.
For a few seconds after the power is turned on, the sound is muted by the protection circuit.

❷ REMOTE CONTROL sensor
This section receives the remote control infrared signal from the remote control transmitter.

❸ REC OUT button
When this button is pressed, input/recording output selectors function as the recording output selectors. When this button is pressed once, the indicator flashes for a few seconds, during which period you can select one program source to be recorded. When this button is pressed again, the indicator goes off and no signal will be output from the REC OUT jacks on the rear panel.

❹ MODE button
Press this button to change the playback mode between stereo and monaural. The mode is stereo while the indicator above the button is off, and mono when it is lit.

❺ INPUT LEVEL button
This controls the input sensitivity. Pressing the DOWN side decreases the input level, and pressing the UP side increases it. When the button is pressed, the input level is displayed on DSP display. The level can be adjusted within the range from 0 to −6 dB.

❻ DIGITAL indicator
This goes on when the digital signal is being input from the CD player, DAT (Digital Audio Tape) recorder or a video disc player.

❼ Input/recording output selectors
These buttons select the program source to be listened to or recorded. When one of the buttons is pressed, the indicator above it goes on in green to indicate that the program source is selected as the input source. To select the program source to be recorded, press REC OUT button before pressing one of these buttons. In this case, the indicator above the pressed button goes on in red.

❽ MUTING button
Used to reduce the audio volume temporarily or to fineadjust it at a low level. When the button is pressed, the indicator goes on and the volume level is attenuated by 20 dB.

❾ VOLUME control
This adjusts the audio volume. Turning the control clockwise increases the volume. (It has the same effect as when the remote control transmitter's UP key is pressed.)
Do not leave this control turned clockwise before turning power on or playing a program source, or a large sound will be produced suddenly, which could cause damage to the speakers. Be sure to set this control fully counterclockwise before these operations, and turn it gradually to increase the volume.

❿ BALANCE control
This adjusts the left and right audio balance. When the control is turned toward the left, the right-channel sound will decrease. When it is turned toward the right, the left-channel sound will decrease.
For normal operation, set this control to center click position.

DIGITAL PARAMETRIC EQUALIZER Control Section

⓫ Equalizer ON/OFF button
This turns the Digital Parametric Equalizer on and off.
When both the equalizer and DSP (Digital Sound-field Processor) are off, the back light of the equalizer display goes off.

⓬ LOW CUT button
This turns the low-cut filter on and off.

⓭ Equalizer display
This shows the setups of the Digital Parametric Equalizer, low-cut filter and high-cut filter.
The LCD (Liquid Crystal Display) has been designed so that it is most legible when viewed from a position slightly above the front panel.

⓮ LOW/MID/HIGH buttons
These buttons are used to select a band when changing the equalizing levels, center frequencies and Q factors of the Digital Parametric Equalizer. Pressing one of the buttons selects the band subject to change.

⓯ HIGH CUT button
This turns the high-cut filter on and off.

⓰ FREQUENCY button
Used to vary the equalizer center frequencies or the low-cut/high-cut filter cutoff frequencies. When the button is pressed, the frequency that can be varied flashes in the display. Use UP/DOWN button to vary it.

⓱ Q/SLOPE button
Used to vary the equalizer Q factors or the high-cut/low-cut filter cutoff characteristics (slopes). When the button is pressed, the value that can be varied flashes.
Operate UP/DOWN button to vary it.
For details, refer to "DIGITAL PARAMETRIC EQUALIZER CONTROL" on page 22.

⓲ UP/DOWN button
Used to vary the setup values. Pressing the UP side increase the value, and pressing the DOWN side decreases it.

DSP (DIGITAL SOUND-FIELD PROCESSOR) Control Section

⓳ DSP ON/OFF button
This turns the DSP on and off. When it is off, the display shows "DSP OFF". When both the DSP and equalizer is off, the back light of the DSP display goes off.

⓴ Program mode indicators
The PRESET indicator goes on when PRESET program mode button is pressed, and the USER PROG indicator goes on when the USER PROG button is pressed.

㉑ PROGRAM NO. display
This displays the program number.

㉒ DSP display
This shows the program name, parameter, etc. The input sensitivity is displayed when INPUT LEVEL button has been pressed.
The LCD has been designed so that it is most legible when viewed from a position slightly above the front panel.

㉓ Program buttons
These buttons store the sound-field programs. Once the sound-field program is stored, merely press the appropriate program button to recall it.

㉔ PRESET/USER PROG buttons
These select the program modes. Pressing the PRESET button recalls the sound-field programs that have been preset in this unit, and pressing the USER PROG button recalls the sound-field programs that have been stored by the user. When the unit left the factory, the contents of the user programs has been set the same as the preset programs.

㉕ MUTE (MAIN/EFFECT) buttons
These are used to mute the sound. Pressing the MAIN button mutes the main speaker sound, and pressing the EFFECT button mutes the presence speaker sound.
These buttons function regardless of the setting of the DSP ON/OF button.

㉖ PARAMETER button
This is used to recall the parameters (factors/elements to determine each sound field) stored in the programs. Each time this button is pressed, a different parameter is recalled on DSP display.

㉗ TITLE EDIT button
This is used to change the program name stored in the user program mode.

㉘ EFFECT LEVEL button
This varies the levels of the sound-field effect signals.
When the button is pressed, the sound-field signal level of the current program is displayed on DSP display for a few seconds. In this period, the set value can be varied by operating UP/DOWN button.

㉙ UP/DOWN button
This button is used to vary the parameter values, sound-field signal levels and balances. Pressing the UP side increases the value and pressing the DOWN side decreases it.

㉚ EFFECT BALANCE button
This varies the left and right balance of the sound-field signals. When the button is pressed, the sound-field signal balance of the current program is displayed on DSP display for a few seconds. In this period, the set balance can be varied by operating UP/DOWN button.

㉛ MEMORY button
Used to store the sound-field program modified as desired in the user program mode.

ENGLISH

■ REAR PANEL

㉜ Analog input/output jacks
These input or output the analog audio signals from/to the program sources.

CD

Input jacks for analog signals from the CD player.

DAT1/DAT2

TAPE PB: Input jacks for analog signals from the DAT (Digital Audio Tape) recorders.
REC OUT: Output jacks for analog signals to the DAT recorders.

PHONO AMP

Input jacks for the turntable signal output from the phono amplifier.

TUNER

Input jack for signals from the tuner.

TAPE1/TAPE2

TAPE PB: Input jacks for signals from the tape decks.
REC OUT: Output jacks for signals to the tape decks.

VDP1/VDP2

Input jacks for analog audio signals from the video disc players.

VCR1/VCR2

TAPE PB: Input jacks for audio signals from the video cassette recorders.
REC OUT: Output jacks for audio signals to the video cassette recorders.

㉝ GND terminal
Connect the grounding wire from the phono amplifier.

㉞ VIDEO input/output jacks
These input or output the video signals from or to the video disc players and video recorders.

VDP1/VDP2

Input jacks for video signals from the video disc players.

VCR1/VCR2

TAPE PB: Input jacks for video signals from the video cassette recorders.
REC OUT: Output jacks for video signals to the video cassette recorders.

㉟ VIDEO monitor jacks
Connect to the video inputs of the monitor TVs. The video signal selected by input selectors on the front panel is output from both jacks.

㊱ REMOTE CONTROL jack
When the YAMAHA MX-10000 Power Amplifier is used, connect it to this jack. The power of the MX-10000 can be turned on and off from the POWER switch of this unit.

㊲ DIGITAL input/output jacks

CD

Input jack for digital signal from the CD player.

DAT1/DAT2

With these jacks, the digital equipment with a sampling frequency of 44.1 kHz or 48 kHz can be connected. A digital equipment with a sampling frequency of 38 kHz cannot be connected.

TAPE PB: Input jacks for digital audio signals to the DAT recorders.
REC OUT: Output jacks for digital audio signals to the DAT recorders.

VDP1/VDP2

Input jacks for digital signals from the video disc players.

㊳ MAIN OUTPUT jacks
These output jacks supply the audio signal of the selected program source to the power amplifier.

㊴ PRESENCE OUTPUT jacks
These output jacks supply the DSP sound-field signals to the power amplifier.

FRONT

Stereo output jacks for front sound-field signals.

REAR

Stereo output jacks for rear sound-field signals.

MONO (FRONT)

Monaural output jack for front sound-field signals.
This jack outputs the low-frequency signals obtained using a 150 Hz low-pass filter.

MONO (REAR)

Monaural output jack for rear sound-field signals.
This jack outputs the low-frequency signals obtained using a 150 Hz low-pass filter.

㊵ MAIN LEVEL switch
This is used to reduce the main signal output level.
Normally set it to 0 dB. Set to −10 dB to reduce the main speaker volume during DSP operation.

㊶ AC outlets (SWITCHED) (U.S.A. model only)
These supply the AC power to other system components connected to this unit. The power is interlocked with the front-panel POWER switch, and the total power consumption of the components should not exceed 200 W.

㊷ AC outlet (UNSWITCHED) (U.S.A. model only)
This supplies the AC power to another system component connected to this unit. The power is supplied regardless of the setting of the front-panel POWER switch, and the power consumption of the component should not exceed 400 W.

VOLTAGE SELECTOR (Europe model only)
Before operating the unit, be sure to set the VOLTAGE SELECTOR located at the rear to your local line voltage.

CONNECTIONS

ENGLISH

- Before making connections, check that the power cords of the CX-10000 and the components to be connected to it are disconnected.
- Connect the audio cords with correct L (left) and R (right) channels firmly.
- After confirming that all connections are correct, plug the power plug of this unit into the AC outlet.
- If this unit interferes with other components (such as a TV set or tuner), place this unit away from other units.

■ TURNTABLE CONNECTION

As the CX-10000 does not incorporate a phono amplifier, it is not possible to connect a turntable directly to it. When connecting a turntable, connect it via an optional phono amplifier.

1. Connect the turntable to the phono amplifier. (For the connection method, refer to the Owner's Manual provided with the phono amplifier.)

2. Connect the phono amplifier output cord to the PHONO AMP jacks of this unit.
   If the phono amplifier is equipped with a grounding wire, connect it to the GND terminal of this unit.

■ TUNER CONNECTION

Using an audio connection cord with a set of L/R pin plugs on each end, connect the tuner's output jacks to the TUNER jacks of this unit.

■ TAPE DECK CONNECTION

Two tape decks, TAPE1 and TAPE2, can be connected.

1. Using an audio connection cord with a set of L/R pin plugs on each end, connect the tape deck's output jacks (LINE OUT) to the TAPE PB jacks of this unit.

2. Using an audio connection cord with a set of L/R pin plugs on each end, connect the tape deck's input jacks (LINE IN) to the REC OUT jacks of this unit.

■ CD PLAYER CONNECTION

This unit is equipped with both analog and digital input jacks for CD player signals. If your CD player is equipped with a digital out jack, the signal can be input directly to the D/A converter of this unit for high-quality sound.

- **Connection of CD player with digital signal output**
  Using a connection cord with one pin plug on each end, connect the CD player's digital out jack to the DIGITAL CD input jack of this unit.

* The L and R digital signals are transmitted through one cord.

- **Connection of CD player with analog signal output**

Using an audio connection cord with a set of L/R pin plugs on each end, connect the CD player's output jacks to the analog CD jacks of this unit.

* When the analog and digital signals are input simultaneously, the digital signal is input in priority.

■ DAT RECORDER CONNECTION

Two DAT recorders, DAT1 and DAT2, can be connected. Each DAT recorder is equipped with both analog and digital input/output jacks.

- **Connection via the analog line**

1. Using an audio connection cord with a set of L/R pin plugs on each end, connect the DAT recorder's analog output jacks to the analog TAPE PB jacks (DAT1 or DAT2) of this unit.

2. Using an audio connection cord with a set of L/R pin plugs on each end, connect the DAT recorder's analog output jacks to the analog REC OUT jacks (DAT1 or DAT2) of this unit.

- **Connection via the digital line**

Using a connection cord with one pin plug on each end, connect the DAT recorder's digital out jack to the DIGITAL TAPE PB input jack (DAT1 or DAT2) of this unit.
When two DAT recorders are connected, connect the digital in jacks of both DAT recorders to the DIGITAL REC OUT jacks (DAT1 and DAT2) of this unit using two connection cords with one pin plug on each end of each cord.

* The L and R digital signals are transmitted through one cord.

* When the analog and digital signals are input simultaneously, the digital signal is input in priority.

* A digital equipment with a sampling frequency of 38 kHz cannot be connected. If a digital equipment with a sampling frequency of 38 kHz is connected, the DIGITAL indicator lights, but no sound can be heard. At that time, when the digital equipment is supplied with both digital and analog jacks, use the analog jacks.

■ VIDEO DISC PLAYER CONNECTION

Two video disc players, VDP1 and VDP2, can be connected. As this unit is equipped with both analog and digital VDP input jacks, if your video disc player is equipped with the digital out jack, the signal can be input directly to the D/A converter of this unit for high-quality sound.

- **Connection of audio lines**

Connection of video disc player with analog signal output
Using an audio connection cord with a set of L/R pin plugs on each end, connect the video disc player's audio output jacks to the analog VDP jacks (VDP1 or VDP2) of this unit.
Connection of CD player with digital signal output
Using a connection cord with one pin plug on each end, connect the video disc player's digital audio output jack to the digital VDP input jack (VDP1 or VDP2) of this unit.

* The L and R digital signals are transmitted through one cord.

* When the analog and digital signals are input simultaneously, the digital signal is input in priority.

- **Connection of video line**

Using a video connection cord with one pin plug on each end, connect the video disc player's video output jack to the VIDEO VDP jack (VDP1 or VDP2) of this unit.

■ VIDEO RECORDER CONNECTION

Two video cassette recorders, VCR1 and VCR2, can be connected.

- **Connection of audio line**

1. Using an audio connection cord with a set of L/R pin plugs on each end, connect the video recorder's audio output jacks to the TAPE PB jacks (VCR1 or VCR2) of this unit.

2. Using an audio connection cord with a set of L/R pin plugs on each end, connect the tape deck's audio input jacks to the REC OUT jacks (VCR1 or VCR2) of this unit.

- **Connection of video line**

1. Using a video connection cord with one pin plug on each end, connect the video recorder's video output jack to the VIDEO TAPE PB jack (VCR1 or VCR2) of this unit.

2. Using a video connection cord with one pin plug on each end, connect the video recorder's video input jack to the VIDEO REC OUT jack (VCR1 or VCR2) of this unit.

■ MONITOR TV CONNECTION

Two monitor TVs can be connected.
Using a video connection cord with one pin plug on each end, connect the video input jack of each monitor TV to one of the VIDEO output jacks of this unit.

■ POWER AMPLIFIER CONNECTION

For sound-field reproduction using the DSP (Digital Sound-field Processor) of this unit, it is required to install the sound-field reproduction amplifiers (two 2-channel power amps or one 4-channel amp) in addition to the main 2-channel system (one 2-channel power amp + two speakers).

- **Connection of main system**

Connect the components in the same ways as installing an ordinary 2-channel system.

1. Using an audio connection cord with a set of L/R pin plugs on each end, connect the input jacks of the main power amplifier of the system to the MAIN OUTPUT jacks of this unit.

2. Connect the two speakers (L, R) used as the main speakers of the system to the main power amplifier.

- **Connection of presence system**

This system is used for the reproduction of the sound-field signal generated by the DSP.

1. Using an audio connection cord with a set of L/R pin plugs on each end, connect the input jacks of the sound-field power amplifier to the FRONT PRESENCE OUTPUT jacks (L, R) of this unit.
   Connect the two front presence speakers (L, R) to the power amplifier.

2. Using an audio connection cord with a set of L/R pin plugs on each end, connect the input jacks of another sound-field power amplifier to the REAR PRESENCE OUTPUT jacks (L, R) of this unit.
   Connect the two rear presence speakers (L, R) to the power amplifier.

The sound-fields effect is available with the connections above. However, if you need the additional center sound-field speakers (which reproduce bass below 150 Hz), make additional connections as described below.

- **Connection of bass-enhancement speakers**

1. Connection of front center speaker
   Using an audio connection cord with one pin plug on each end, connect the input jack of the monaural amplifier for the center speaker to the FRONT MONO PRESENCE OUTPUT jack of this unit. Connect the speaker used as the front center speaker to the amplifier.

2. Connection of rear center speaker
   Using an audio connection cord with one pin plug on each end, connect the input jack of the monaural amplifier for the rear center speaker to the REAR MONO PRESENCE OUTPUT jack of this unit. Connect the speaker used as the rear center speaker to the amplifier.

* When you use both the front and rear center speakers, it is recommended to use only one stereo amplifier for convenience.

* **Connection to YAMAHA MX-10000 Power Amplifier**
When the MX-10000 is connected to the POWER CONTROL jack of this unit via the connection cord provided with the MX-10000, the power of the MX-10000 can be turned on and off at the same time as when the POWER switch of this unit is operated.
For details, refer to the Owner's Manual provided with the MX-10000.

■ POWER SUPPLY CONNECTION (U.S.A. model only)

1. Insert the power plugs of the components connected to this unit into its AC outlets or into other AC wall outlets.
   The SWITCHED AC outlets of this unit are interlocked with the POWER switch of this unit and can supply a total of 200 W while the POWER switch is on.
   The UNSWITCHED AC outlet supplies a maximum power of 400 W regardless of the POWER switch on or off.
   Do not connect an apparatus with high power consumption, including the MX-10000, to any of the AC outlets of this unit.
   Check the power consumption of the components and be sure not to exceed the specified power consumption value.

2. Insert the power plug of this unit into an AC wall outlet.

BASIC OPERATIONS

ENGLISH

This section describes the basic operation of the CX-10000 as a control amplifier.

- Before turning power on, confirm that all the components are connected correctly.
- Using the remote control provided transmitter, most functions of this unit can be controlled from a distance.

■ POWER ON/OFF

Press the POWER switch. The indicator above it will light, indicating that the power of the unit is on. The protection circuit is activated so that the sound is muted for a few seconds after the power is turned on. To turn power off, press the POWER switch again.
This unit incorporates a backup battery, so the setup after turning power on is the same as that immediately before turning power off.

■ VOLUME ADJUSTMENT

From the fully counterclockwise position, turn the VOLUME control gradually to optimize the audio volume. The volume can also be controlled from the remote control transmitter using the VOLUME keys. (Press the UP key to increase the volume and the DOWN key to decrease it.) To reduce the volume temporarily, press the MUTING button.
When MUTING is on, the volume can be fine-adjusted for listening at low level. When turning power off after playing the program source, set the VOLUME control fully counterclockwise.

■ INPUT PROGRAM SOURCE SELECTION

To select the program source to be played among the components connected to this unit, press one of the input/recording output selectors. When the button is pressed and the indicator goes on in green, the program source selected can be listened to.
When a CD player, DAT recorder or video disc player is equipped with both analog and digital outputs, the digital signal is accepted in priority. (When the analog and digital signals are input simultaneously, only the digital signal is input to this unit.) When normal signal with a sampling frequency of 44.1 kHz or 48 kHz is input, the unit is switched automatically for the digital input mode, and the DIGITAL indicator goes on.

* If the digital signal which has been converted into digital using the sampling frequency of other than 44.1 kHz or 48 kHz, the DIGITAL indicator goes on, but the signal cannot be processed.

■ AUDIO LEVEL BALANCE ADJUSTMENT

If the program source is unbalanced on the left and right, or if your listening position is not at the center of the speakers, adjust the left and right balance with the BALANCE control.
First press the MODE button to set to the monaural mode (with the indicator on), and adjust the BALANCE control so that the audio volumes from the left and right speakers are the same from your listening position. After adjustment, press the MODE button again for the stereo mode (with the indicator off).

■ INPUT LEVEL ADJUSTMENT

To prevent the volume level change between the program sources, this unit makes it possible to set the input sensitivity for each program source.
Each setup is made with respect to the component which outputs the lowest level. The sensitivity of the components with higher output level is set lower as same level as that of the other component.
To set up the input level of the program source being selected, press the INPUT LEVEL button (UP/DOWN), and adjust the input level within the range from 0 to −6 dB referring to the DSP display.

■ AUDIO/VIDEO RECORDING

The program source to be recorded can be selected regardless of the program source to be listened to at present.
Press the REC OUT button. The REC OUT indicator will flash for a few seconds. While the indicator is flashing, press the button for the program source to be recorded. The indicator above the button goes on in red, and the signal of the selected program source is output from the corresponding REC OUT jacks toward the tape deck, DAT or video recorder connected.
The digital and analog audio lines of this unit are provided independently. Therefore, the input digital signal is output directly from the DAT1 and DAT2 REC OUT jacks in the DIGITAL input/output jack section, and it is not possible to output digital signal from analog REC OUT jacks or analog signal from digital REC OUT jacks. (The digital signal from the CD player cannot be recorded on an analog tape deck without conversion, or the analog signal from the turntable cannot be recorded onto a DAT without conversion.)
To cancel the signal outputs from the REC OUT jacks, press the REC OUT button again so that the indicator goes off.

DIGITAL PARAMETRIC EQUALIZER CONTROL

ENGLISH

Conventional tone controls, or frequency equalizers, could only enhance or boost high and low frequency bands by boosting or cutting each frequency band around a specific center frequency. The DEQ (Digital-parametric EQualizer) of this unit was designed based on the parametric equalizer system used with mixing consoles in professional studios. By using the YAMAHA high-precision digital filtering signal processor with 32-bit operations, it has for the first time made possible the digital control of equalization. The DEQ exerts correct and precise control over the center frequency, Q and equalizing of each equalization band, and improves various audio characteristics also in consideration of the listening room characteristics.

■ EQUALIZER ON/OFF

The equalizer is turned on and off by pressing the ON/OFF button. The equalizer is on when the Digital Parametric Equalizer display shows the setup values, and is off when it shows nothing. When the equalizer is off, the equalizer circuit is by-passed so the frequency characteristics become flat.

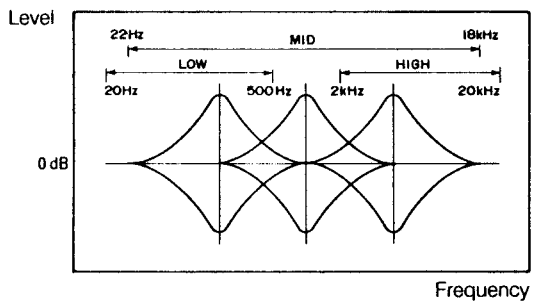
* When the equalizer is turned on during listening to an analog input, noise may increase. This is due to the quantization noise from the A/D (analog-to-digital) converter.

■ PARAMETRIC EQUALIZER

• CENTER FREQUENCY SETTING

This operation sets the center frequency of each equalizing frequency band.

Three equalizing bands, LOW, MID and HIGH, can be set between 20 Hz and 20 kHz. The center frequencies of these bands can be set respectively between 20 Hz and 500 Hz for LOW, 22 Hz and 18 kHz for MID, and 2 kHz and 20 kHz for HIGH. The center frequencies are set in 1/6 OCT steps.



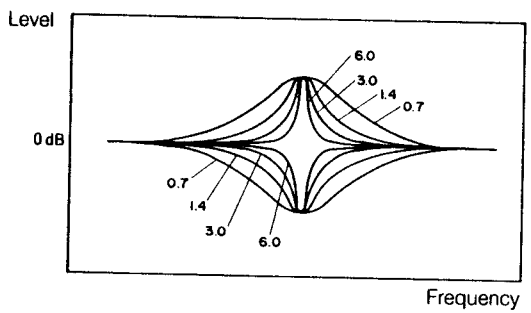
Procedure

1. Press the LOW, MID or HIGH button to specify a band, then press the FREQUENCY button. When the button is pressed, the center frequency indication (▽) of the specified band flashes a few times.

2. Operate the UP/DOWN button to set the desired center frequency for the band. Press the UP side to increase the frequency and press the DOWN side to decrease it.

• Q SETTING

This operation varies the filter bandwidth (that is, the range subject to equalizing control of each band). The Q factor can be set to one of four values 0.7/1.4/3.0/6.0. The audible variation becomes sharper when a larger value is selected (because the equalizing bandwidth becomes smaller).



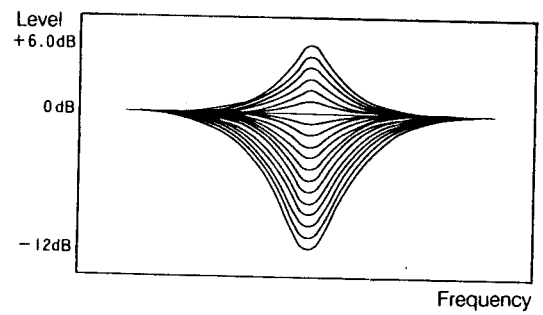
Procedure

1. Press the LOW, MID or HIGH button to specify a band, then press the Q/SLOPE button. When the button is pressed, the Q indication of the specified band flashes a few times.

2. Operate the UP/DOWN button to set the desired Q value for the band. Press the UP side to increase the value and press the DOWN side to decrease it.

• LEVEL SETTING

This operation sets the boost/cutoff level within the range from +6.0 dB to −12.0 dB. The boost amount increases as the value is increased in the positive side, and the cutoff amount increases as the value is decreased in the negative side. The boost/cutoff becomes flat when the level is 0.0 dB.

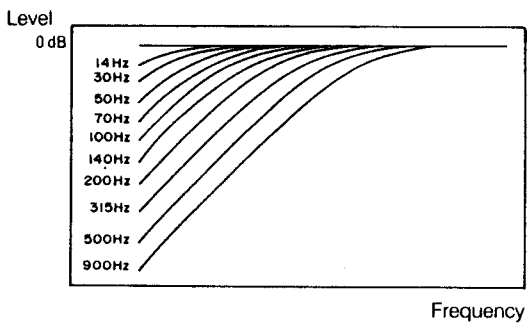


Procedure

1. Press the LOW, MID or HIGH button to specify a band.
2. Operate the UP/DOWN button to set the desired level for the band. Press the UP side to increase the value and press the DOWN side to decrease it. At the transition from the positive value to negative or negative value to positive, the variation stops at 0.0 dB even when the button is held depressed. In this case, press the same side again to continue.

■ LOW AND HIGH CUT FILTERS

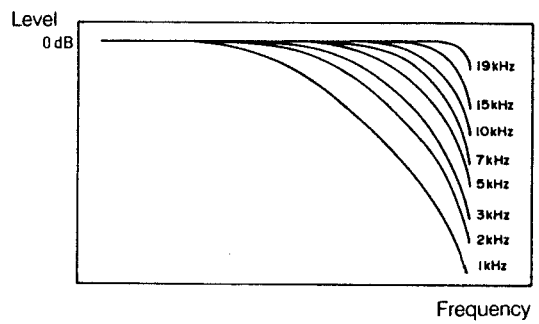
The low-cut filter is used to eliminate sound ambiguity caused by excessive low frequencies or to eliminate ultra-low-frequency noise of record.
The high-cut filter is used to reduce noise caused by record scratches or tape hiss.



Procedure
When the LOW CUT or HIGH CUT button is pressed, the filter setting value is displayed on the left of the display.
(When the filtering is not required, press the button again so that the display disappears.)

• CUTOFF FREQUENCY SETTING

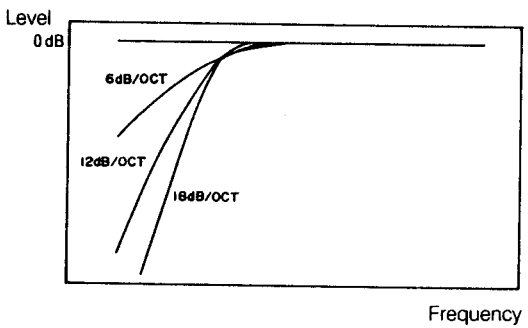
The frequencies below the set frequency are cut off. The cutoff frequency can be set between 14 Hz and 900 Hz for low-cut filter and 1 kHz and 19 kHz for high-cut filter.

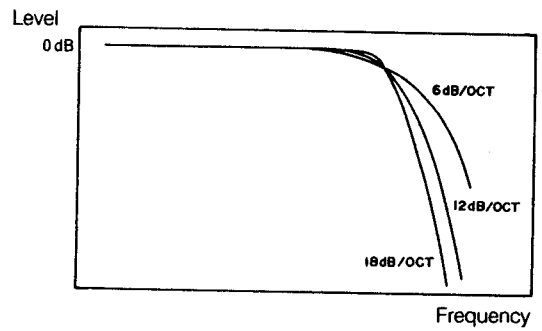


1. To vary the cutoff frequency, press the FREQUENCY button.
2. Operate the UP/DOWN button to set the desired cutoff frequency. Press the UP side to move toward higher frequencies and press the DOWN side to move toward lower frequencies.

- **CUTOFF CHARACTERISTIC SETTING**

The cutoff characteristic can be set in three steps; to 6 dB/oct, 12 dB/oct or 18 dB/oct.





1. Press the Q/SLOPE button. The present value flashes a few times.
2. Operate the UP/DOWN button to set the desired value. Press the UP side to increase the value and press the DOWN side to decrease it.

The setups of the Digital Parametric Equalizer and high/low-cut filters can be stored in memory. For the storage procedures, refer to "USER PROGRAM MEMORY" on page 40.

ENGLISH

DSP(DIGITAL SOUND-FIELD PROCESSOR)CONTROL

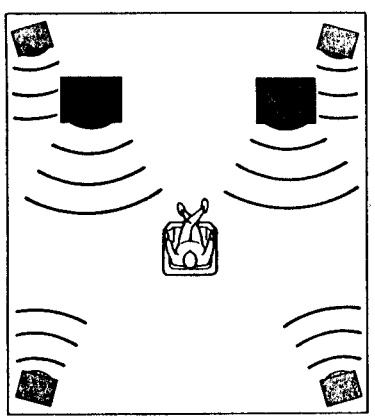
It has long been a dream of musical lovers to reproduce famous concert halls of the world in their own listening rooms.
The dream has come true, with the DSP (Digital Sound-field Processor) developed by YAMAHA. The DSP project was backedup by YAMAHA's high technology and long experience cultivated through the production of musical instruments as well as music promotion activities.
The concept of the DSP is the spatial simulation of concert halls, churches, live clubs and other celebrated places of musical performance in the world. Their sound-field characteristics were measured and determined by means of impulse signals and 4-point proximity microphones, and the original musical source signal is processed based on this sound-field data to generate the sound-field signal, which is reproduced through six speakers in the listening room.
The DSP of this unit stores 16 different reflection-sound patterns collected from the sound fields of actual concert halls and live-performance clubs. In addition to the reproduction of these basic, preset sound fields, the DSP also allows the user to control the parameters of acoustic-surrounding or sound-field factors (delay time, frequency response, live feeling, spatial capacity), the balance between front and rear volumes, the balance between the effect volume and front main volume, etc., as required.
These user-programmed data are stored in the user program memories. So that you can make full use of this facility and that you can create the sound presence that meets your own sense of music, please read the following description, which explains the method of sound-field creation using the DSP step by step.

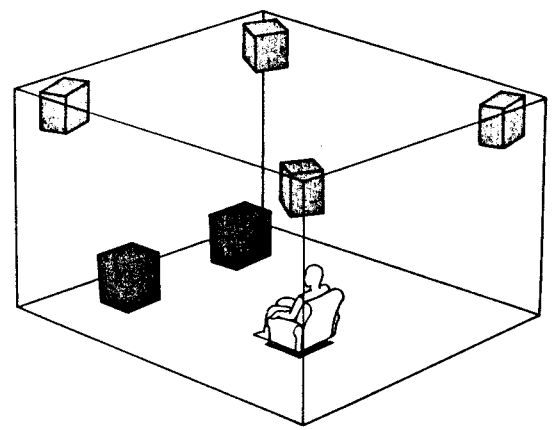
■ LISTENING ROOM CONDITION

To reproduce a large-scale sound field equivalent to a concert hall or church, you first have to eliminate as many factors that may obstruct the operation as possible.
What is harmful to conventional 2-channel stereo is also harmful for the DSP sound-field reproduction. This refers especially to the generation of standing wave and flutter echo (a phenomenon in which specific frequencies are reflected repeatedly between walls).
As the presence speakers reproduce the reflections which create the sound field, their sounds should not be further reflected by the walls, floor or ceiling of your listening room. To prevent such reflections that degrade the DSP sound-field effect, keep your listening room as "dead" as possible by using thick curtains, tapestry, carpet, etc.

■ SPEAKER PLACEMENT

The basic idea of the DSP is to simulate the sound image of a concert hall by synthesizing the original music source sound and its reflections in space using six speakers.
The illustrations below show an example of the speaker installation. Note that the presence speakers (used for sound-field reproduction) are placed at higher positions than the main speakers and the ears of the listener, because this configuration will give a better effect. Also, it is better to place the front presence speakers at a wider distance than the main speakers. In short, it is ideal to place the front presence speakers on the upper corners of the listening room.
When the four presence speakers are to be newly installed, it is recommended to use the same type of speakers. Select speakers having similar tone character to the main speakers.
Even if the presence speakers are small, thick sound can be obtained by installing them near the wall, thanks to the baffle effect of the wall.





: Main speakers (for source sound reproduction)

: Presence speakers (for effective sound reproduction)

ENGLISH

■ PRESET PROGRAM OPERATION

To enable sound-field reproduction that match various types of musical categories, the DSP is provided with 16 preset programs based on actual sound-field data. The contents of the preset programs are as follows.

Program No.	Program Name	Features/Applicable Sources
1	HALL 1	Large European concert hall, seating capacity 2,500. Wood interior. Suitable for reproducing operas or orchestral music.
2	HALL 2	Medium European concert hall, seating capacity 2,000 – 1,300. Suitable for reproducing orchestral music, etc.
3	HALL 3	Sound field such as a multi-purpose hall with a seating capacity of some 1,000. Deeper ambiance is obtained.
4	CHAMBER	Sound field such as a grand ball room in the court. Suitable for reproducing chamber music, etc.
5	Münster	Sound field such as in a cathedral.
6	CHURCH	Sound field such as in a church. Suitable for reproducing pipe organ music or other church music.
7	JAZZ CLUB 1	Sound field such as in a jazz club.
8	JAZZ CLUB 2	Sound field such as in a live jazz concert hall, which is larger than that of JAZZ CLUB 1.
9	ROCK CONCERT	Sound field with tight ambiance, suitable for rock or rock-related music.
10	DISCO	Sound field such as in a disco.
11	PAVILION	Sound field such as in an indoor stadium.
12	WAREHOUSE LOFT	Sound field such as in a concrete-built warehouse or loft.
13	STADIUM	Sound field such as in an open-air theater or stadium.
14	THEATER 1	Suitable for Audio/Video sources. Sound field applying a depth to the video.
15	THEATER 2	Suitable for A/V sources. Sound field applying a width to the video.
16	THEATER 3	Suitable for A/V sources. Sound field applying a feeling of expansion in the background and surroundings, while maintaining the sound image position.

* THEATER 1, 2 and 3 are generated by processing the phase difference between the L and R channels. Therefore, the sound-field signals will not be generated in case of monaural sources.

Procedure

1. Press the DSP ON/OFF button to turn the DSP on.
2. Press the PRESET button so that the PRESET indicator lights.
3. Press the program button corresponding to the desired preset program.

■ BALANCE ADJUSTMENT

This operation adjusts the balance between the speakers in the system. This is performed to eliminate volume difference caused by the differences in the speaker efficiencies or power amplifier gains.

Procedure

1. Press program button "1 HALL 1" to recall HALL 1, and play a musical source that you are familiar with or reproduce pink noise.

2. Press the MAIN and EFFECT MUTE buttons alternately, and adjust the levels of the connected power amplifiers so that the volumes of the two main speakers and the four presence speakers are the same.

3. If the main speaker volume is too high, it can be reduced by 10 dB by the MAIN LEVEL switch on the rear panel.

The sound-field signal level and front/rear signal-level balance can be adjusted separately for each program. Follow the procedure below.

- **Adjustment of sound-field signal level**

1. Press the EFFECT LEVEL button. The effect level (sound-field signal level) of the program being recalled will be displayed for a few seconds on the DSP display.

2. While the EFFECT LEVEL display is being shown, operate the UP/DOWN button to adjust the level.

NOTE

When another program button is pressed to recall another program, the setup made above will be cleared. To prevent the setup from being cleared, store it in the user program memory together with the program. (Refer to "USER PROGRAM MEMORY" on page 40.)

- **Adjustment of front/rear balance of sound-field signal**

1. Press the EFFECT BALANCE button. The effect balance (sound-field signal balance between the front and rear speakers) of the program being recalled will be displayed for a few seconds on the DSP display.

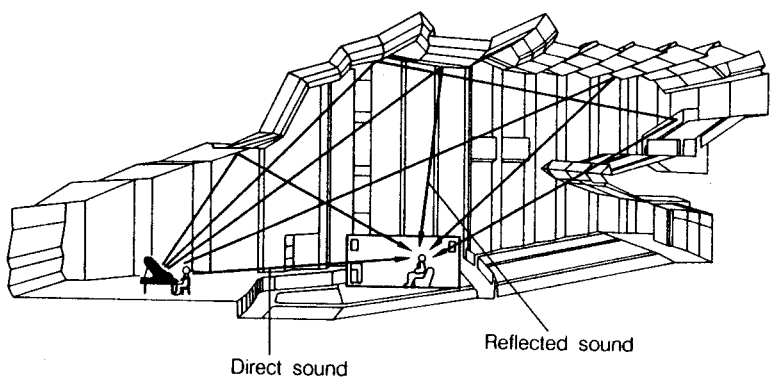
2. While the EFFECT BALANCE display is being shown, operate the UP/DOWN button to adjust the balance.

NOTE

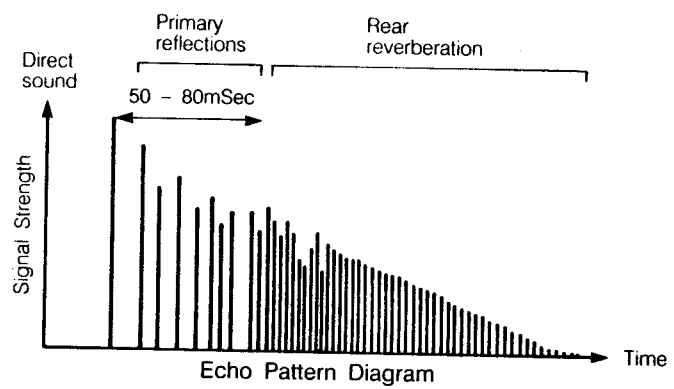
When another program button is pressed to recall another program, the setup made above will be cleared. To prevent the setup from being cleared, store it in the user program memory together with the program. (Refer to "USER PROGRAM MEMORY" on page 40.)

■ PARAMETER CONTROL

The DSP stores 16 kinds of preset programs of sound fields.
However, when you recall a preset program and listen to music using that effect, you may sometimes feel; "there should be a little more expansion"; "the music should have a more live feeling", "the distance to the stage should be closer to make the sound field more real", etc. In such cases, the desired sound-field feeling can be created by controlling the parameters, which will be described in the following.



Before explaining what the parameters are, we first have to explain the relation between the actual sound field and human audition.
Even when you're closing your eyes in a concert hall, you may judge the approximate dimensions of the hall, position of your seat in it, the amount of reflected sound (if it is large, or live, or small, or dead). This judgment is possible because your ears detect, in addition to the direct sound from the stage, large and small reflection sounds coming from every direction around you.
The reflection sounds that are heard after the direct sound can be classified into two groups with different characteristics. The primary reflections include those between 50 and 80 milliseconds after the first reflection sound, and the rear reverberation refers to those heard after the primary reflections. The echo pattern diagram below shows the sounds coming from various directions on a time axis.



Echo Pattern Diagram

The primary reflections work as an accentuation to the direct sound enhancing the clarity and feeling of volume, and the rear reverberation is the echo creating the ambiance of a concert hall. They are both very important factors in determining the sound field.
Based on these reflections, the DSP programs are provided in two types; the primary reflection programs in which only the primary reflections are reproduced; and the reverberation programs in which both the primary reflections and rear reverberation are reproduced.
The following tables show the programs in the two groups and the parameters constituting the programs.

- **Primary reflection programs**

In these programs, only the primary reflections are reproduced. As they do not reproduce the rear reverberation, they are suitable for clear reproduction of classic or other music sources.

No.	Program Name
1	HALL 1
2	HALL 2
3	HALL 3
7	JAZZ CLUB 1
8	JAZZ CLUB 2
9	ROCK CONCERT
10	DISCO
13	STADIUM
14	THEATER 1
15	THEATER 2
16	THEATER 3

- **Reverberation programs**

In these programs, the rear reverberation is reproduced as well as the primary reflections.

No.	Program Name
4	CHAMBER
5	Münster
6	CHURCH
11	RAVILION
12	WAREHOUSE LOFT

■ PARAMETER LIST

No.	Program Name	Parameter Name	Initial Value		Increase	Control Contents
1	HALL 1	TYPE	TYPE A (TYPE B)			Echo pattern of primary reflections.
		ROOM SIZE	0.1	1.0	4.0	Simulates the room size. Larger value for larger space.
		LIVENSS	0	5	10	Attenuation characteristic of primary reflections. Larger value for more lively feeling.
		INIT DLY	5ms	30ms	150ms	Time until the start of primary reflections.
		HPF	–	THRU	32Hz ~ 1.0kHz	Low-frequency cutoff frequency. –6 dB/oct.
		LPF	1.0kHz	7.0kHz	~ 16kHz, THRU	High-frequency cutoff frequency. –6 dB/oct.
2	HALL 2	TYPE	TYPE C (TYPE D)			Echo pattern of primary reflections.
		ROOM SIZE	0.1	1.0	4.0	Simulates the room size. Larger value for larger space.
		LIVENESS	0	5	10	Attenuation characteristic of primary reflections.
		INIT DLY	5ms	30ms	150ms	Time until the start of primary reflections.
		HPF	–	THRU	32Hz ~ 1.0kHz	Low-frequency cutoff frequency. –6 dB/oct.
		LPF	1.0kHz	7.0	~ 16kHz, THRU	High-frequency cutoff frequency. –6 dB/oct.
3	HALL 3	TYPE	LIVE CONCERT (ON STAGE)			Echo pattern of primary reflections.
		ROOM SIZE	0.1	2.0	4.0	Simulates the room size. Larger value for larger space.
		LIVENESS	0	5	10	Attenuation characteristic of primary reflections.
		INIT DLY	5ms	45ms	150ms	Time until the start of primary reflections.
		HPF	–	THRU	32Hz ~ 1.0kHz	Low-frequency cutoff frequency. –6 dB/oct.
		LPF	1.0kHz	4.0 kHz	~ 16kHz, THRU	High-frequency cutoff frequency. –6 dB/oct.
4	CHAMBER	REV TIME	0.3s	1.1s	10.0s	Length of reverberation time.
		HIGH	0.1	0.7	1.0	High-frequency attenuation time ratio. Smaller value for shorter attenuation time.
		INIT DLY	5ms	15ms	150ms	Time until the start of primary reflections.
		HPF	–	THRU	32Hz ~ 1.0kHz	Low-frequency cutoff frequency. –6 dB/oct.
		LPF	1.0kHz	10kHz	~ 16kHz, THRU	High-frequency cutoff frequency. –6 dB/oct.
		REV LVL	0%	50%	100%	Level of reverberation signal.
5	Münster	REV TIME	0.3s	4.0s	10.0s	Length of reverberation time.
		HIGH	0.1	0.8	1.0	High-frequency attenuation time ratio. Smaller value for shorter attenuation time.
		INIT DLY	5ms	95ms	150ms	Time until the start of primary reflections.
		HPF	–	THRU	32Hz ~ 1.0kHz	Low-frequency cutoff frequency. –6 dB/oct.
		LPF	1.0kHz	7kHz	~ 16kHz, THRU	High-frequency cutoff frequency. –6 dB/oct.
		REV LVL	0%~95%	100%	–	Level of reverberation signal

No.	Program Name	Parameter	← Decrease	Preset Value	→ Increase	Control Contents
6	CHURCH	REV TIME	0.3s	2.5s	10.0s	Length of reverberation time.
		HIGH	0.1	0.9	1.0	High-frequency attenuation time ratio. Smaller value for shorter attenuation time.
		INIT DLY	5ms	40ms	150ms	Time until the start of primary reflections.
		HPF	–	THRU	32Hz ~ 1.0kHz	Low-frequency cutoff frequency. −6 dB/oct.
		LPF	1.0kHz	8.0kHz	~ 16kHz, THRU	High-frequency cutoff frequency. −6 dB/oct.
		REV LVL	0%~95%	100%	–	Level of reverberation time
7	JAZZ CLUB 1	TYPE	LIVE (DYNAMITE!, REVERSE, SPACIOUS)			Echo pattern of primary reflections.
		ROOM SIZE	0.1	1.0	4.0	Simulates the room size. Larger value for larger space.
		LIVENESS	0	5	10	Attenuation characteristic of primary reflections. Larger value for more lively feeling.
		INIT DLY	5ms	20ms	150ms	Time until the start of primary reflections.
		HPF	–	THRU	32 Hz ~ 1.0kHz	Low-frequency cutoff frequency. −6 dB/oct.
		LPF	1.0kHz ~ 16kHz	THRU	–	High-frequency cutoff frequency. −6 dB/oct.
8	JAZZ CLUB 2	TYPE	LIVE (DYNAMITE!, REVERSE, SPACIOUS)			Echo pattern of primary reflections.
		ROOM SIZE	0.1	1.2	4.0	Simulates the room size. Larger value for larger space.
		LIVENESS	0	7	10	Attenuation characteristic of primary reflection. Larger value for more lively feeling.
		INIT DLY	5ms	20mm	150mms	Time until the start of primary reflections.
		HPF	–	THRU	32Hz ~ 1.0kHz	Low-frequency cutoff frequency. −6 dB/oct.
		LPF	1.0kHz ~ 16kHz	THRU	–	High-frequency cutoff frequency. −6 dB/oct.
9	ROCK CONCERT	TYPE	DYNAMITE! (REVERSE, SPACIOUS, LIVE)			Echo pattern of primary reflections.
		ROOM SIZE	0.1	4.0	–	Simulates the room size. Larger value for larger space.
		LIVENESS	0	9	10	Attenuation characteristic of primary reflections. Larger value for more lively feeling.
		INIT DLY	5ms	15ms	150ms	Time until the start of primary reflections.
		HPF	–	THRU	32Hz ~ 1.0kHz	Low-frequency cutoff frequency. −6 dB/oct.
		LPF	1.0kHz ~ 16kHz	THRU	–	High-frequency cutoff frequency. −6 dB/oct.
10	DISCO	TYPE	DYNAMITE! (REVERSE, SPACIOUS, LIVE)			Echo pattern of primary reflections.
		ROOM SIZE	0.1	1.0	4.0	Simulates the room size. Larger value for larger space.
		LIVENESS	0	6	10	Attenuation characteristic of primary reflections. Larger value for more lively feeling.
		INIT DLY	5ms	10ms	150ms	Time until the start of primary reflections.
		HPF	–	THRU	32Hz ~ 1.0kHz	Low-frequency cutoff frequency. −6 dB/oct.
		LPF	1.0kHz ~ 16kHz	THRU	–	High-frequency cutoff frequency. −6 dB/oct.
11	PAVILION	REV TIME	0.3s	1.9s	10.0s	Length of reverberation time.
		HIGH	0.1	0.9	1.0	High-frequency attenuation time ratio. Smaller value for shorter attenuation time.
		INIT DLY	–	5ms	150ms	Time until the start of primary reflectons.
		HPF	THRU, 32Hz	56Hz	1.0kHz	Low-frequency cutoff frequency. −6 dB/oct.
		LPF	1.0kHz	2.5kHz	~ 16kHz, THRU	High-frequency cutoff frequency. −6 dB/oct.
		REV LVL	0% ~ 95%	100%	–	Level of reverberation signal.

No.	Program Name	Parameter Name	← Decrease	Preset value	→ Increase	Control Contents
12	WAREHOUSE LOFT	REV TIME	0.3s	1.0s	10.0s	Length of reverberation time.
		HIGH	0.1	0.7	1.0	High-frequency attenuation time ratio. Samaller value for shorter attenuation time.
		INIT DLY	5ms	20ms	150ms	Time until the start of primary reflections.
		HPF	–	THRU	32Hz ~ 1.0kHz	Low-frequency cutoff frequency. –6 dB/oct.
		LPF	1.0kHz	9.0 kHz	~ 16kHz, THRU	High-frequency cutoff frequency. –6 dB/oct.
		REV LVL	0%	100%	–	Level of reverberation signal.
13	STADIUM	TYPE	SPACIOUS (LIVE, DYNAMITE!, REVERSE)			Echo pattern of primary reflections.
		ROOM SIZE	0.1	4.0	–	Simulates the room size. Larger value for larger space.
		LIVENESS	0	5	10	Attenuation characteristic of primary reflections. Larger value for more lively feeling.
		INIT DLY	5ms	85ms	150ms	Time until the start of primary reflections.
		HPF	–	THRU	32Hz ~ 1.0kHz	Low-frequency cutoff frequency. –6 dB/oct.
		LPF	1.0kHz	3.6kHz	~ 16kHz, THRU	High-frequency cutoff frequency. –6 dB/oct.
14	THEATER 1	TYPE	LIVE CONCERT (ON STAGE, HALL TYPE A, HALL TYPE B)			Echo pattern of primary reflections.
		ROOM SIZE	0.1	1.0	4.0	Simulates the room size. Larger value for larger space.
		LIVENESS	0	5	10	Attenuation characteristic of primary reflections. Larger value for more lively feeling.
		INIT DLY	5ms	30ms	150ms	Time until the start of primary reflections.
		HPF	–	THRU	32Hz ~ 1.0kHz	Low-frequency cutoff frequency. –6 dB/oct.
		LPF	1.0kHz	5.0kHz	~ 16kHz, THRU	High-frequency cutoff frequency. –6 dB/oct.
15	THEATER 2	TYPE	LIVE, (DYNAMITE! REVERSE, SPACIOUS)			Echo pattern of primary reflections.
		ROOM SIZE	0.1	1.0	4.0	Simulates the rool size. Larger value for larger space.
		LIVENESS	0	5	10	Attenuation characteristic of primary reflections. Larger value for more lively feeling.
		INIT DLY	5ms	20ms	150ms	Time until the start of primary reflections.
		HPF	–	THRU	32Hz ~ 1.0kHz	Low-frequency cutoff frequency. –6 dB/oct.
		LPF	1.0kHz	7.0kHz	~ 16kHz, THRU	High-frequency cutoff frequency. –6 dB/oct.
16	THEATER 3	TYPE	MOVIE TYPE A (B, C, D)			Echo pattern of primary reflections.
		ROOM SIZE	0.1	1.0	4.0	Simulates the room size. Larger value for larger space.
		LIVENESS	0	5	10	Attenuation characteristic of primary reflections. Larger value for more lively feeling.
		INIT DLY	5ms	20ms	150ms	Time until the start of primary reflectons.
		HPF	–	THRU	32Hz ~ 1.0kHz	Low-frequency cutoff frequency. –6 dB/oct.
		LPF	1.0kHz	7.0kHz	~ 16kHz, THRU	High-frequency cutoff frequency. –6 dB/oct.

* THEATER 1, 2 and 3 are generated by processing the phase difference between the L and R channels. Therefore, the sound-field signals will not be generated in case of monaural sources.

• **PARAMETER MODIFICATION METHOD**

Each program consists of six parameters. When a program is recalled, the name of one of six parameters appears on the bottom of the DSP display. The value set up for the parameter can be varied by operating the UP/DOWN button.
Pressing the PARAMETER button recalls different parameters included in the program in sequence.

NOTE

When another program button is pressed to recall another program, the setup made above will be cleared. To prevent the setup from being cleared, store it in the user program memory. (Refer to "USER PROGRAM MEMORY" on page 40.)

PARAMETERS

• **TYPE**

These are echo patterns of the primary reflections. They are important factors of the primary reflection programs for determining the sound-field feeling.
Although the patterns included are different depending on the programs, two to four patterns are provided in each program. Operate the UP/DOWN button to select the desired sound field.

*** TYPE A**

This reproduces the primary reflections in a concert hall having almost wooden interior. Features a rich expanse of sound and fine-textured echo. Listened on the left center seat of the ground floor.

*** TYPE B**

This also reproduces a concert hall having wooden interior.
The reflections from the direction of the stage is increased by several layers of painted reflection plates above the stage, emphasizing direct sound thereby featuring tight and powerful sound (echo). Listened at the center right seat of the ground floor.

*** TYPE C**

An asymmetrically-designed concert hall. The right-side wall is made of thick teak, the left-side wall is made of concrete with a large curve, the ceiling has ups and downs which provide sound dispersion and time lags, and reflection plates are installed above the stage.
Listened at the center seat of the ground floor.

*** TYPE D**

A juke-box type concert hall. The floor is flat and narrow, and marble is used in the interior. It has good acoustic characteristics so is often used for recording orchestral performances. Listened at the front center seat of the ground floor.

*** LIVE CONCERT**

Large, round-shaped hall, with rich presence and full echo provided by the multiple reflections coming from the surroundings.

*** ON STAGE**

Sound field on the stage during performance. The audience seats are behind you. The reflections from the rear wall reaches you in long delays with respect to the reflections from the wall behind the stage.

*** LIVE**
Listened to just in front of a small stage, featuring real and live sound field.

*** DYNAMITE**
Sound field featuring concentrated energy rather than an expanse is obtained.

*** REVERSE**
The reflections, which usually attenuates as time elapses, is emphasized in reverse. Features a mellow sound.

*** SPACIOUS**
Spacious sound field with wider expanse.

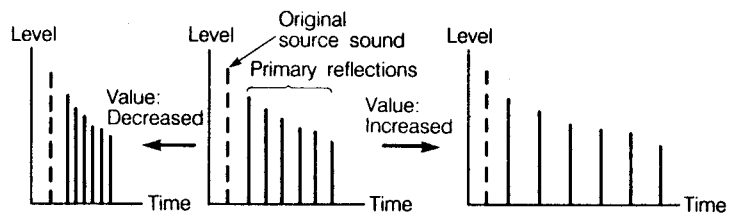
*** MOVIE TYPE A**
Features a natural expanse towards the left and right in the rear direction.

*** MOVIE TYPE B**
The rear space is not so wide, making the sound steady and compact.

*** MOVIE TYPE C**
The rear space is wide and deep, providing beautiful echo.

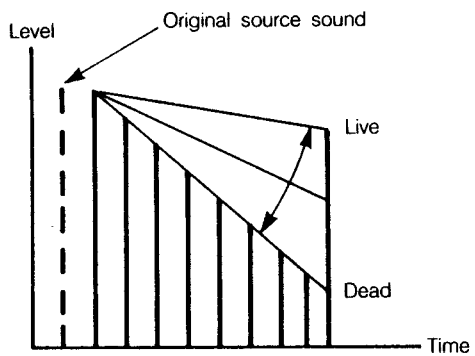
*** MOVIE TYPE D**
Sound field with clear acoustic image at the rear.

• ROOM SIZE
This parameter simulates the extent of the listening room.
The variation range is from 0.1 to 4.0. The more the value is increased the wider the extent of the space (room), and the more the value is decreased the the narrower the extent of the space.
The difference between large and small halls lie in the time required for reflections of sound on the walls. The time is longer in larger halls and shorter in smaller halls. This means that the feeling of extent can be controlled by varying the time between each reflection sound.



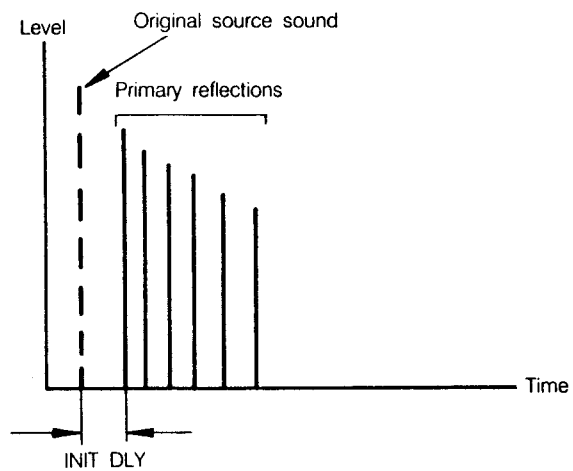
- **LIVENESS**

This parameter determines if the sound field is "live" or "dead", with the variation range from 0 to 10. Increasing the value makes the sound field "live" and decreasing the value makes it "dead".
The "live" or "dead" feelings of actual halls are determined by the absorption characteristic of the reflections. The sound field is felt "live" is the reflections are attenuated rapidly, and "dead" if they are attenuated slowly.



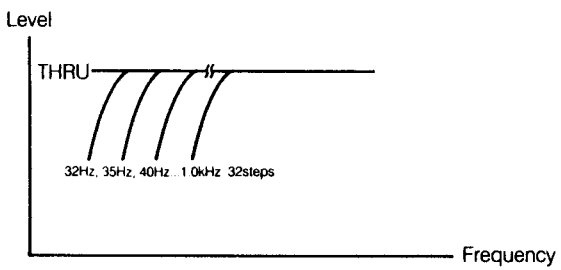
- **INIT DLY (Initial Delay)**

This parameter determines the positioning of the sound using the variation range from 5 to 150 ms.
The positioning is determined by varying the interval (time difference) between the direct sound and the first primary reflection sound.
For example, in the CHURCH program, when the INIT DLY is 5 ms, the music is heard like it is played near the wall. The distance between the music source and wall increases as the value is increased. The optimum point is determined depending on the mutual relationship between the source sound, primary reflection echo patterns, and the positions of the main and presence speakers. However, the relationship between the sound image on the stage and the surrounding sound image can be controlled by fine adjustment of this parameter.



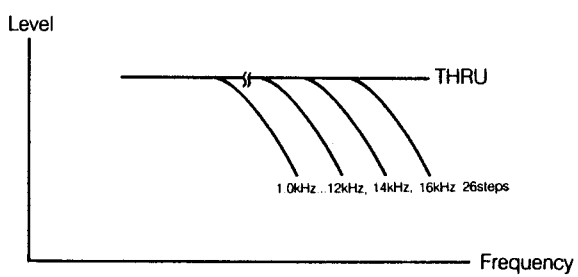
- **HPF (High-Pass Filter)**

The HPF can attenuate the low-frequency components in the primary reflections by 6 dB/oct.
The cutoff frequency can be set in 32 steps between 32 Hz and 1.0 kHz. The filtering effect is canceled when the value is set to THRU. This is effective to make the sound clear when the low frequencies are emphasized.



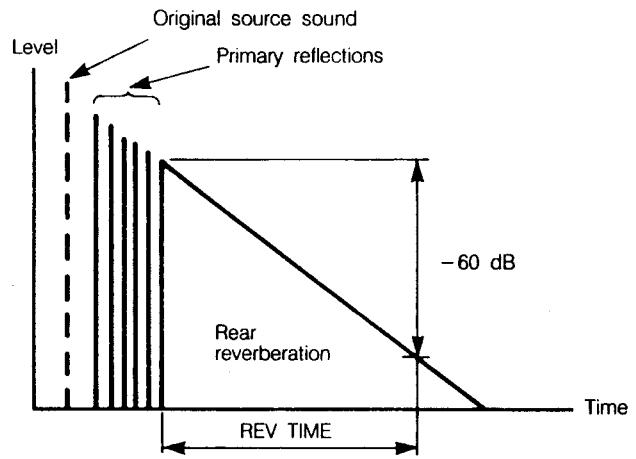
- **LPF (Low-Pass Filter)**

The LPF can attenuate the high-frequency components in the primary reflections by 6 dB/oct.
The cutoff frequency can be set in 26 steps between 1 kHz and 16 kHz. The filtering effect is canceled when the value is set to THRU. This is effective when the high frequencies are offensively emphasized.

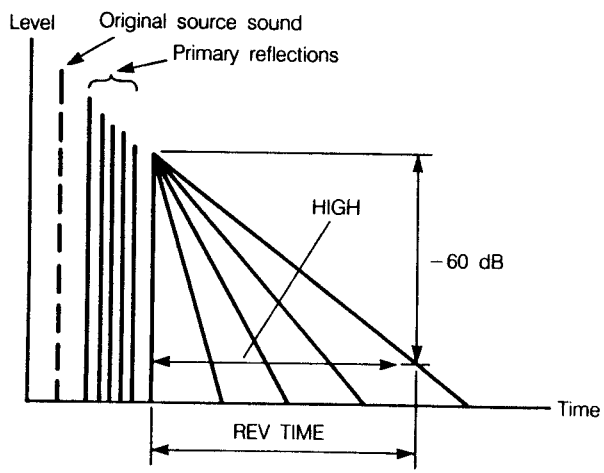


- **REV TIME (Reverberation Time)**

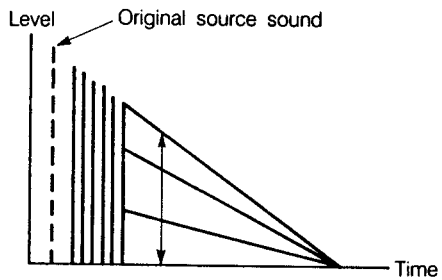
This parameter determines the reverberation time in the middle frequencies, within the variation range from 0.3 to 10 seconds. The larger the value, the longer the reverberation time is. The time until the reverberation at 1 kHz is attenuated to −60 dB (1/1000 time) can be set.



• **HIGH (High-Frequency Reverberation Time Ratio)**
This determines the reverberation time of high frequencies.
The value is the ratio to the middle-frequency reverberation time (REV TIME), and set within the range from 0.1 to 1.0. The more the value is increased, the longer the high-frequency reverberation becomes.
The high-frequency reverberation attenuates faster than lower frequencies, and the attenuation speed varies depending on the material of the reflection surfaces and the number of people in audience. Therefore, the HIGH parameter is indispensable for reproducing the ambiance of actual concert halls.



• **REV LVL (Reverberation Level)**
This parameter determines the level of the rear reverberation. The variation range is from 0% to 100%, and the rear reverberation becomes longer when the value is increased.



NOTE
Each program also includes internal fixed parameters that cannot be varied. Therefore, even if the parameters of two different programs are set equally, the sound field reproduced by the programs could be different.

■ USER PROGRAM MEMORY

The new sound fields created by varying the parameters can be stored in the user program memories. Once stored, the user program memory will not be cleared even when another program is recalled or when power is turned off.
At the same time as the DSP user program, it is also possible to store the effect level, effect balance and equalizer setup in memory.
16 user programs, No. 1 to No.16, are provided for the storage of created programs.

Procedure

1. Set the DEQ equalizer and DSP processor as required.
   To store only the equalizer setup in memory, press the DSP's ON/OFF button to turn it off. To store only the DSP setup in memory, press the DEQ's ON/OFF button to turn it off.

2. Press the MEMORY button. The USER PROG indicator and PROGRAM NO. display will flash for a few seconds.

3. The program can be stored in one of the user programs No. 1 to No. 16. While the indicators are flashing, press the program button with the No. you want to store the program.

4. When memory storage has been carried out correctly, the DSP display shows "MEMORY STORE", and the storage is completed.
   To recall a user program, press the USER PROG button so that the USER PROG indicator lights, then press the desired program button.

NOTE

If a program has already been stored in the user program No. selected, the previous program is cleared and replaced by the new program.

BACKUP BATTERY

This unit incorporates a battery to backup the user program memories. The battery life is 5 years, and it is recommended to replace with a new battery before the 5 year period expires.
When the backup battery is replaced, the user programs are cleared. Before replacing the battery, write down the data of wanted user programs on paper, and store them again after installing a new battery.
For the backup battery replacement, please consult your nearest YAMAHA dealer or service station.

■ TITLE EDITING (PROGRAM NAME CHANGE)

The program names stored in the user program are can be changed as required.
Using alphabet, numerals or symbols, each program name can be registered within 16 characters.

Procedure

1. Press program button to select the program to be changed.

2. Press the TITLE EDIT button on the main unit once. When the button is pressed, the cursor (_) is displayed on the left side of the DSP display. The cursor indicates the character that can be changed.

3. Press the TITLE EDIT button again. The cursor is moved from the left to the right. Press the button until the cursor moves to the position of the character to be changed.

4. After moving the cursor to the desired position, operate the UP/DOWN button to select a character. Each time the button is pressed, the character is changed continuously in the order shown in the table below.

5. Repeat steps 3 and 4 until the program name is changed as desired.
   After changing the program name, press the PARAMETER button. The display will return to the normal display.

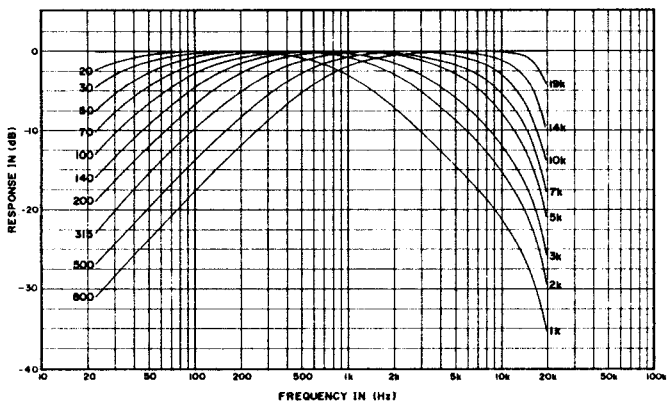
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
R	S	T	U	V	W	X	Y	Z		a	ä	b	c	d	e	f	g
h	i	j	k	l	m	n	o	ö	p	q	r	s	t	u	ü	v	w
x	y	z		[	]	<	>	:	·	*	+	−	=	&	/	,	.
'	%	!	?	→	←		#	0	1	2	3	4	5	6	7	8	9

NOTE
The program names cannot be changed in the preset program mode. If the TITLE EDIT button is pressed during in the preset program mode, the DSP display will show "USER PROG ONLY" alarm.

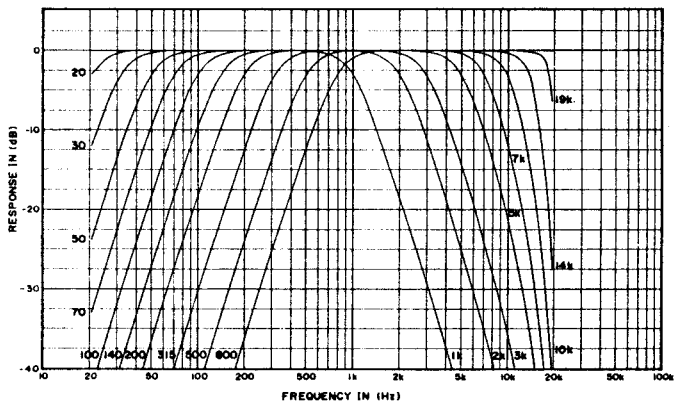
CHARACTERISTIC DIAGRAMS

ENGLISH

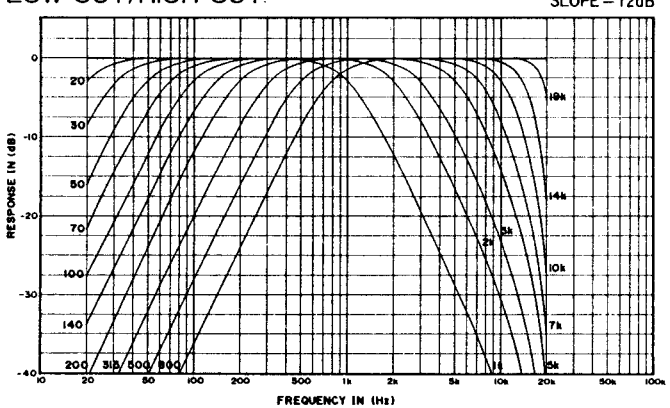
LOW CUT/HIGH CUT SLOPE = 6dB



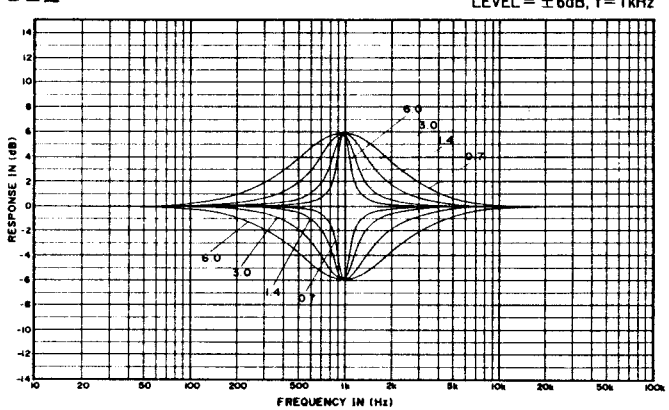
LOW CUT/HIGH CUT SLOPE = 18dB



LOW CUT/HIGH CUT SLOPE = 12dB

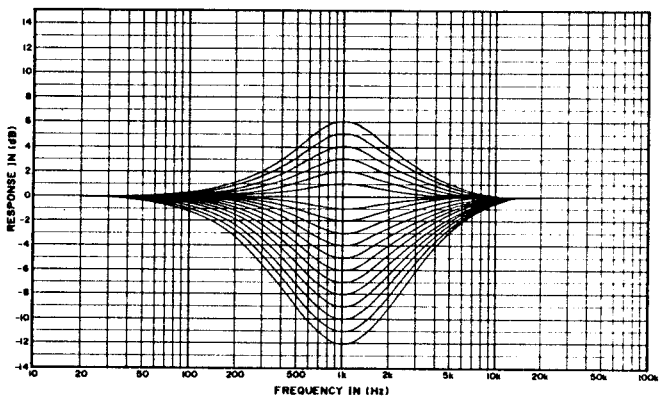


DEQ LEVEL = ±6dB, f = 1kHz



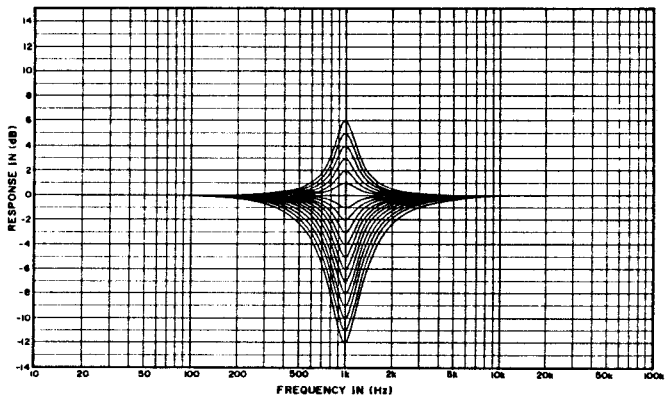
DEQ

Q=0.7, f=1kHz



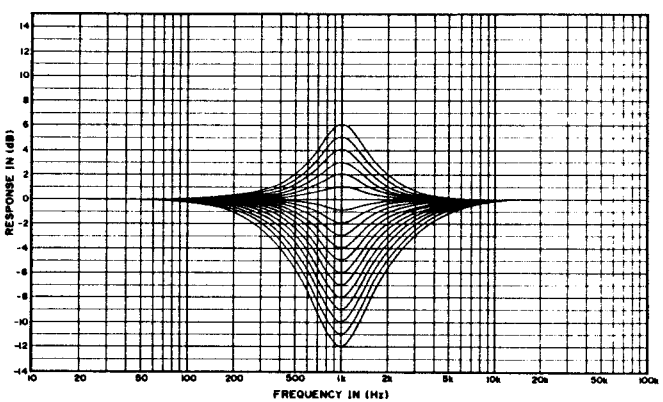
DEQ

Q=3.0, f=1kHz



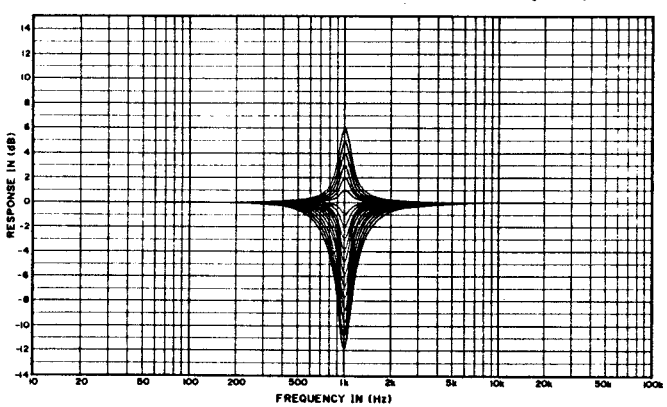
DEQ

Q=1.4, f=1kHz



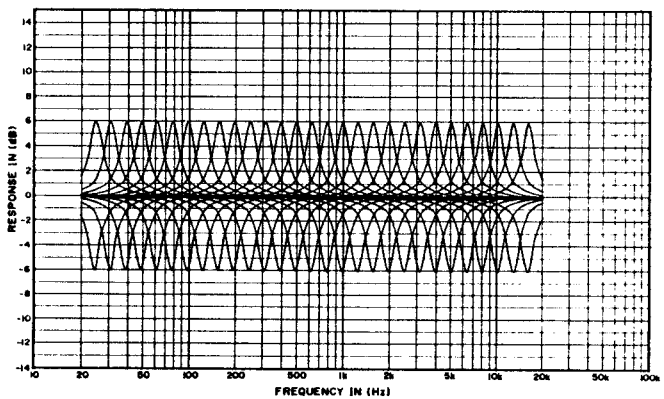
DEQ

Q=6.0, f=1kHz



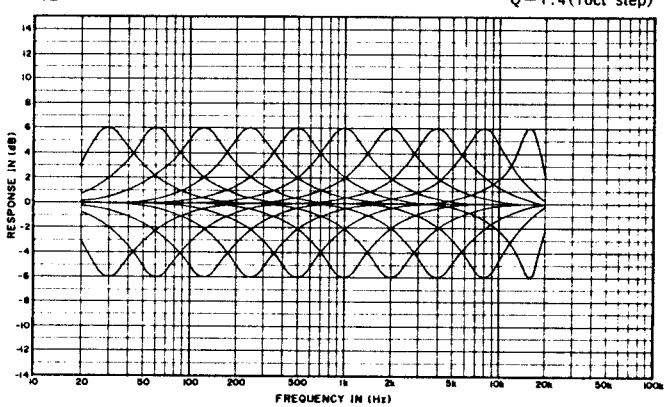
DEQ

Q=6.0(1/3oct step)



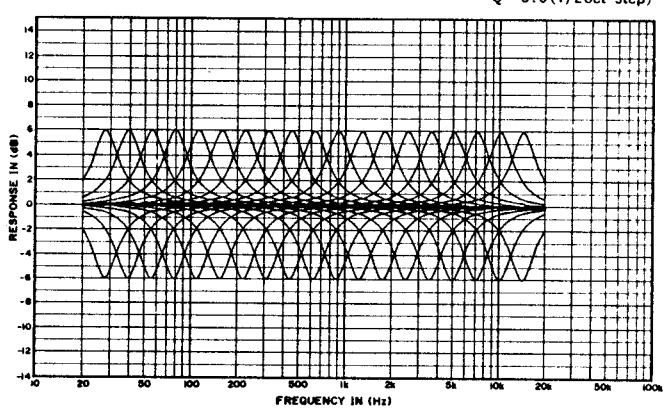
DEQ

Q=1.4(1oct step)



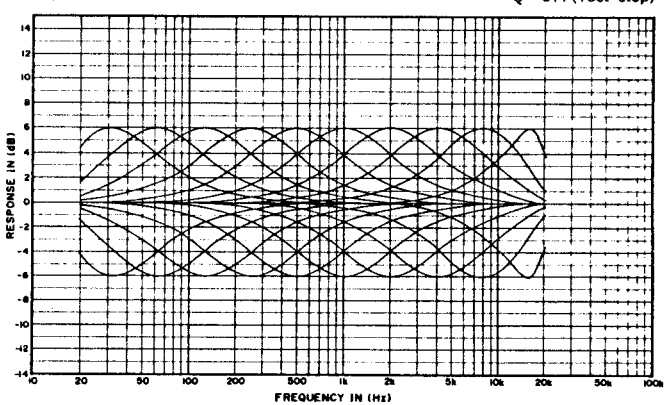
DEQ

Q=3.0(1/2oct step)

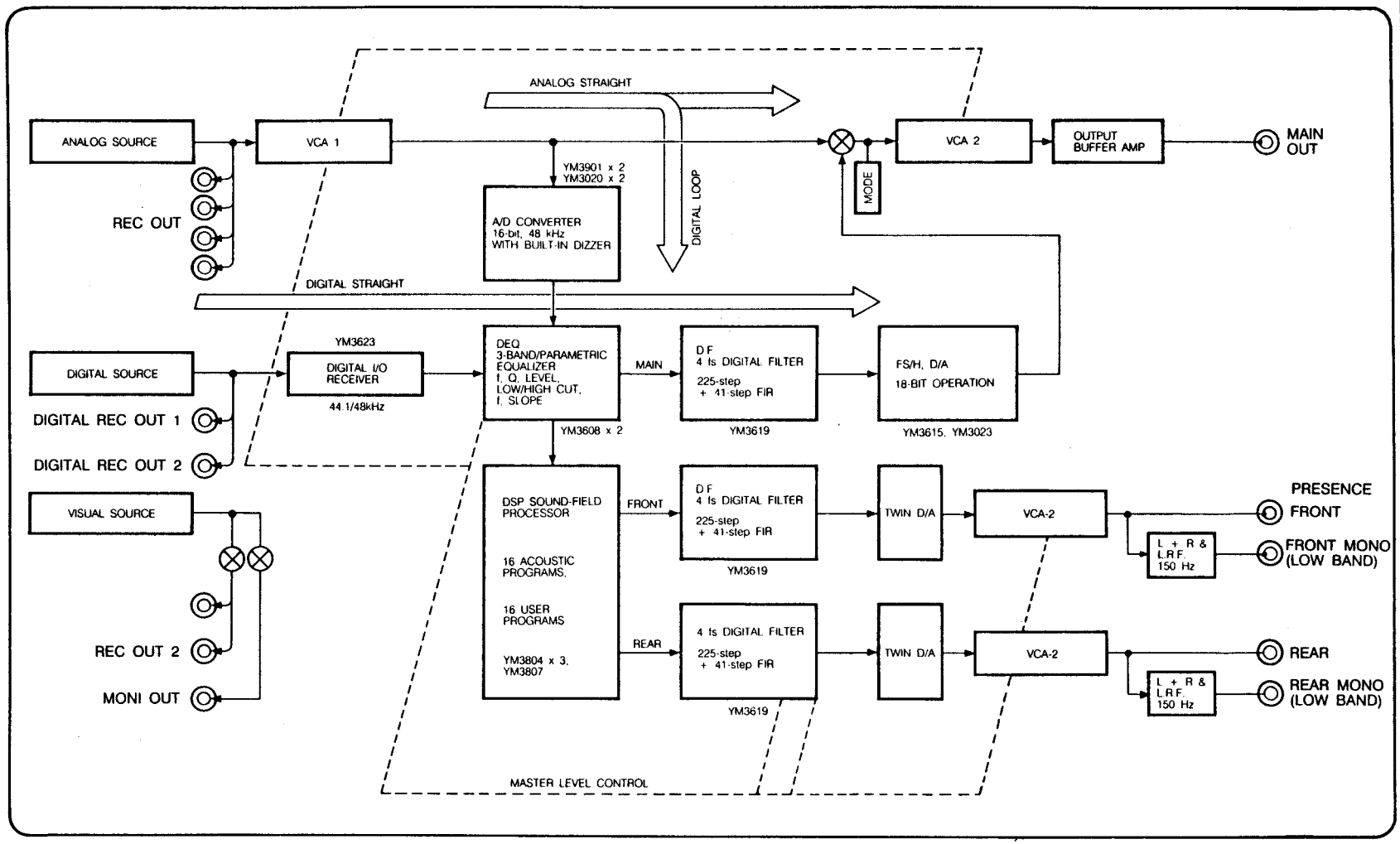


DEQ

Q=0.7(1oct step)



BLOCK DIAGRAM



TROUBLESHOOTING

ENGLISH

When this unit does not function correctly, check the following items. If the trouble still persists, or if the trouble is not mentioned below, turn the power switch off, unplug the power cord, and consult your dealer or nearest YAMAHA service station.

Symptom	Check Points	Remedy
Power is not turned on even when the POWER switch is pressed.	Power plug of the AC cord is not inserted firmly.	Re-plug the power plug firmly into the AC outlet.
No sound at all.	The input/recording output selector of the desired program source has not been selected.	Press the button for the program source to be listened to.
	The volume is set to the minimum position.	Turn the VOLUME control on the main unit clockwise, or operate the UP/DOWN button on the remote control transmitter to optimize the volume.
	The DSP MUTE buttons have been pressed on.	Press the MUTE buttons (MAIN, EFFECT) so that both of the indicators are off.
	Audio connection cords are not connected firmly.	Re-connect the connection cords firmly.
	A digital equipment with a sampling frequency of 38 kHz is connected.	When the digital equipment is equipped with an analog jacks, use the analog jacks.
Only the left or right sound is heard.	The BALANCE control is set to the fully left or right position.	Set the BALANCE control to the center click position.
	Audio connection cords are not connected firmly.	Re-connect the connection cords firmly.
The sound field cannot be reproduced by controlling the DSP, or the reproduced sound is not natural.	The DSP MUTE buttons have been pressed on.	Press the MUTE buttons (MAIN, EFFECT) so that both of the indicators are off.
	The input program source is monaural.	Programs THEATER 1, 2 and 3 cannot reproduce sound field from a monaural program. Use a different DSP program.
Humming noise is heard.	Audio connection cords are not connected properly.	Re-connect the connection cords firmly.
Remote control transmitter does not function.	The batteries in the remote control transmitter are exhausted.	Replace both batteries with new ones.
	Remote control transmitter is used from an incorrect distance or angle.	Operate it within 7 meters from the main unit and within 30° to the remote control sensor.
When the power of this unit is on, other equipment (TV, tuner, etc.) generate noise.	The distance between this unit and the equipment is too close.	This unit is digital equipment. Place it a relative distance from other equipment.

SPECIFICATIONS

ENGLISH

Inputs/outputs

Analog Inputs
- Input Jacks ..... 11 systems, each with L and R (CD, DAT1, DAT2, PHONO AMP, TUNER, TAPE1, TAPE2, VDP1, VDP2, VCR1, VCR2)
- Input Sensitivity/Impedance ..... 150 mV/47 kilohms

Digital Inputs
- Input jacks ..... 5 systems (CD, DAT1, DAT2, VDP1, VDP2)
- Sampling Frequencies ..... 44.1 kHz/48 kHz
- Input Sensitivity/Impedance ..... 0.5 Vp-p/75 ohms

Video Inputs
- Input Jacks ..... 4 systems (VDP1, VDP2, VCR1, VCR2)
- Input Sensitivity/Impedance ..... 1 Vp-p/75 ohms

Analog REC OUT
- Output Jacks ..... 6 systems (DAT1, DAT2, TAPE1, TAPE2, VCR1, VCR2)
- Output Voltage/Impedance ..... 150 mV/470 ohms

Digital REC OUT
- Output Jacks ..... 2 systems (DAT1, DAT2)
- Output voltage/Impedance ..... 0.5 Vp-p/75 ohms

Video REC OUT
- Output jacks ..... 2 systems (VCR1, VCR2)
- Output Voltage/Impedance ..... 1 Vp-p/75 ohms

Analog Outputs
- Output Jacks ..... • MAIN OUTPUT L, R • PRESENCE OUTPUT (FRONT L, R/REAR L, R) • MONO PRESENCE OUT (LPF fc=150 Hz, FRONT/REAR)
- Output Voltage/Impedance ..... 1.5 V/600 ohms (MAIN)

Video Outputs
- Output Jacks ..... 2 systems (VIDEO OUTPUT)
- Output Voltage/Impedance ..... 1 Vp-p/75 ohms

Digital Input Priority ..... Digital inputs are accepted in priority to analog inputs.

A/D Converter
- Resolution ..... 16-bit linear
- Sampling ..... 48 kHz

D/A Converter
- Resolution ..... 18-bit operation (MAIN), 16-bit linear (PRESENCE)
- Sampling ..... 4-fold oversampling of 44.1 kHz/48 kHz

DEQ (Digital Parametric Equalizer)

LOW
- Center Frequency fo ..... 20 to 500 Hz, 1/6 octave steps
- Variation Range ..... −12 to +6 dB
- Q 0.7/1.4/3.0/6.0

MID
- Center Frequency fo ..... 22 Hz to 18 kHz, 1/6 octave steps
- Variation Range ..... −12 to +6 dB
- Q 0.7/1.4/3.0/6.0

HIGH
- Center Frequency fo ..... 2 to 20 kHz, 1/6 octave steps
- Variation Range ..... −12 to +6 dB
- Q 0.7/1.4/3.0/6.0

LOW CUT
- Cutoff frequency fc ..... 14 to 900 Hz, 1/6 octave steps
- SLOPE ..... 6 dB/oct, 12 dB/oct, 18 dB/oct

HIGH CUT
Cutoff frequency fc ..... 1 to 19 kHz, 1 kHz steps
SLOPE ..... 6 dB/oct, 12 dB/oct, 18 dB/oct

DSP (Digital Sound-field Processor)
Preset programs ..... 16 programs
User memory ..... 16 user programs
(* User memories store DEQ data together with DSP data.)

General
Muting ..... −20 dB
Input Level
Variation Range ..... 0 to −6 dB, 0.1 dB steps
(* Can be set separately for each input source.)
Volume
Gain Tracking Error ..... ±0.2 dB (0 to −60 dB)
Frequency Response
Analog Input (DEQ OFF) ..... 15 Hz to 100 kHz, +0/−3 dB
Digital Input (DEQ OFF) ..... 15 Hz to 20 kHz, +0.5/−3 dB
Total Harmonic Distortion
Analog Input (DEQ OFF)
- MAIN OUT (2.5 V OUTPUT) ..... 0.003% at 20 Hz to 20 kHz
Digital Input (DEQ OFF)
- MAIN OUT (DIGITAL 0 dB) ..... 0.003% at 1 kHz

Input Sensitivity (New IHF)
Analog input (DEQ OFF) ..... 50 mV
Signal-to-Noise Ratio (New IHF)
Analog Input (Vol. −20 dB, input shorted, DEQ OFF) ..... 89 dB
Residual Noise (IHF-A-NETWORK) ..... 5 μV
Channel Separation (1 kHz)
Analog Input (Vol. −30 dB, input shorted, DEQ OFF) ..... 90 dB
Power Requirement
U.S.A. model ..... AC 120 V, 60 Hz
Europe model ..... AC 220/240 V, 50 Hz
Power Consumption ..... 90 W
AC Outlets
SWITCHED x 5 ..... Total 200 W max.
UNSWITCHED x 1 ..... 400 W max.
Dimensions (W x H x D) ..... 475 x 179 x 442 mm
(18-15/16" x 7-1/16" x 17-/8")
Weight ..... 25 kg
(55 lbs 2 oz)

* Design and specifications subject to change without notice.