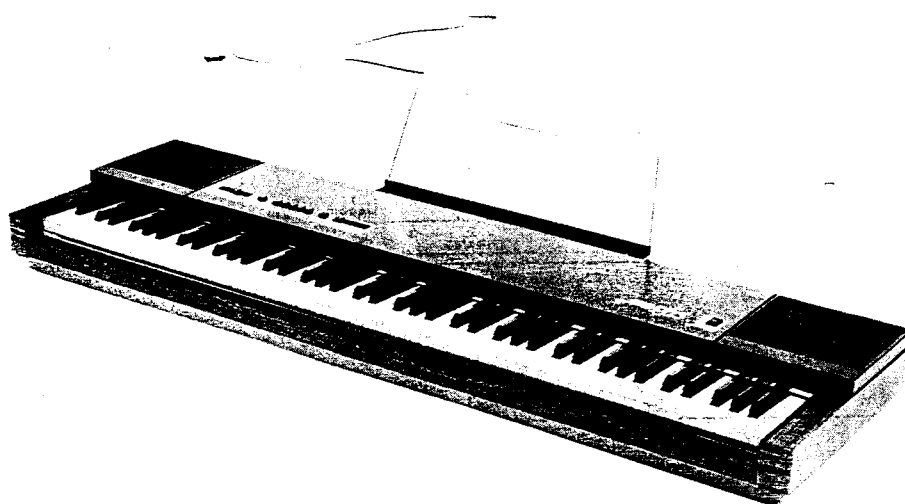


# ELECTRONIC PIANO

# Pf15

## SERVICE MANUAL



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SINCE 1887



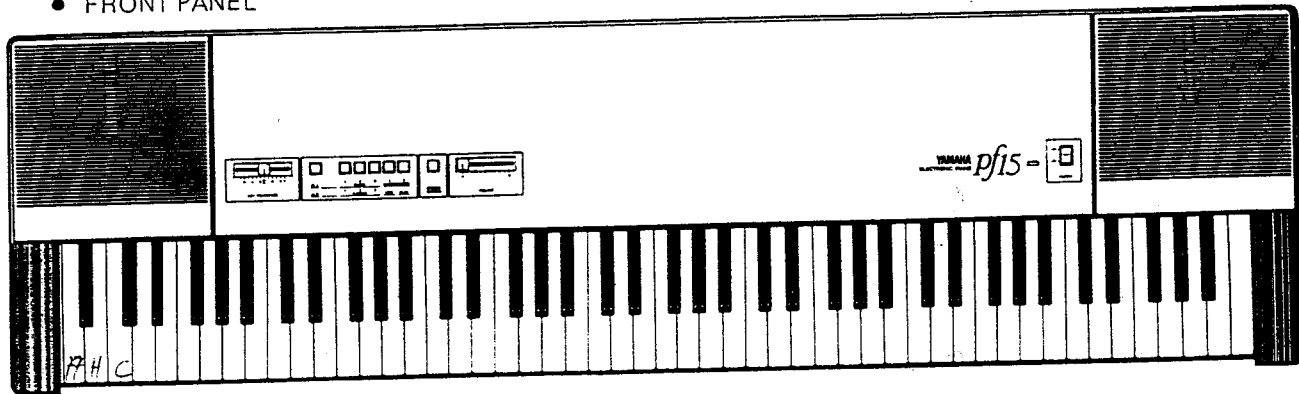
**YAMAHA**

NIPPON GAKKI CO., LTD. HAMAMATSU, JAPAN

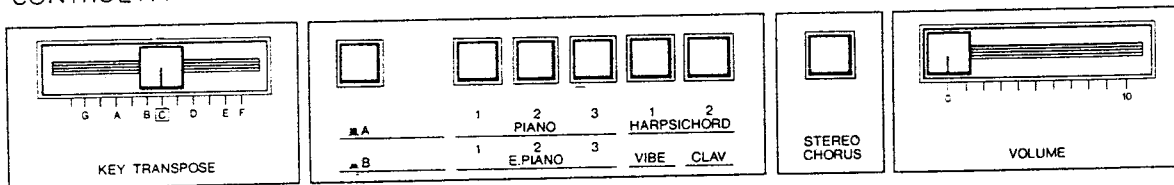
'83.4 2.3K Printed in Japan

## PANEL LAYOUT

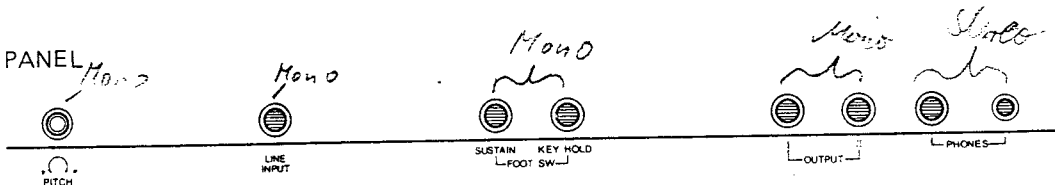
### • FRONT PANEL



### • CONTROL PANEL



### • REAR PANEL



## SPECIFICATIONS

Keyboard	88 keys
Range by KEY TRANSPOSE lever position	
"C" = A <sub>1</sub> ~ C <sub>7</sub>	
"F#" = D <sub>1</sub> # ~ F <sub>6</sub> #	
"F" = Do ~ C <sub>7</sub> (Notes above C <sub>7</sub> drop one octave for transpositions above C.)	
Number of sounds produced simultaneously	up to 16
PITCH Control	436-447 Hz
SUSTAIN	ON/OFF (with foot pedal)
KEY HOLD	ON/OFF (with foot pedal)
KEY TRANSPOSE	
TONE SELECT	A/B Selection Switch
	PIANO 1, 2, 3/HARPSICHORD 1, 2/E. PIANO 1, 2, 3/VIBE/CLAV
STEREO CHORUS	ON/OFF
Speakers	12 cm x 2 (4 ohms)
Internal Amp Output	5 W x 2 (max)
<b>Rear Panel</b>	
LINE INPUT	Std mono jack (600 ohms, -15 dB max)
OUTPUT I, II	Std mono jack (600 ohms, -10 dB max vol.)
HEADPHONES	Std stereo jack x 1 (8 ohms)/Stereo minijack x 1 (8 ohms)
Pedal Connection	Std mono jack x 2
Power Requirements	General Model: 110-120/220-240 V, 50/60 Hz U. S. and Canadian models : 120 V, 50/60 Hz
Power Consumption	General Model: 45 W U. S. Model: 30 W Canadian Model: 40 W
Dimensions (W x H x D)	1,321 x 130 x 390 mm
Weight	32 kg
Accessories	FC-4 foot pedal (1), Score Stand, Dust Cover

## DISASSEMBLY PROCEDURE

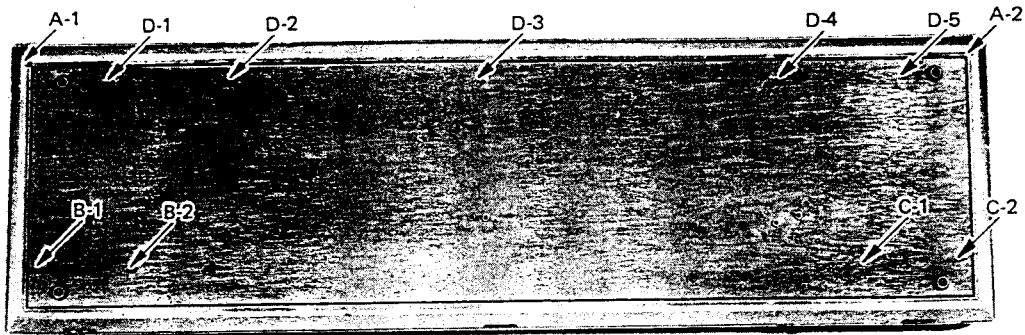


photo 1

### ■ Opening or Closing the Panel

Remove the two retaining ( A -1, 2) screws from the bottom, lift the panel and open it (photo 1).

### ■ Speaker Box Removal

Remove the two retaining screws ( B -1, 2, C -1, 2) each from the left and right sides of the bottom (photo 1).

### ■ Keyboard Unit Removal

1) Remove the five retaining screws ( D -1 ~ 5) from the bottom (photo 1).

2) Remove the keyboard unit by removing the DM board and removing the six retaining screws marked with circles (photo 2).

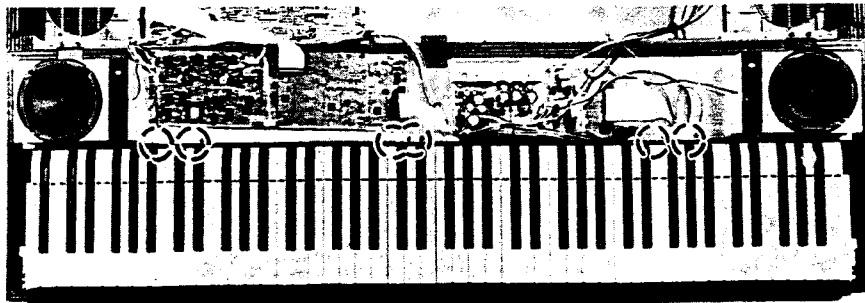


photo 2

■ White and Black Key Removal

1) Remove the keyboard spacer by removing the six retaining screws marked with circles (photo 3).

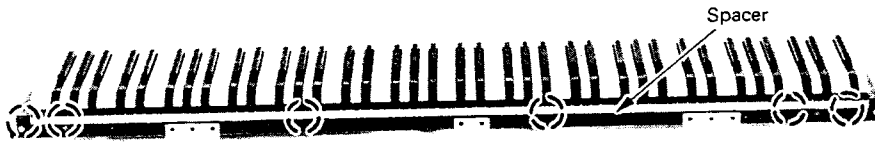


photo 3

● Remove the white keys, before removing the black keys.

2) Push the supporting pointed shaft in the direction indicated by the arrow and lift the key together with the supporting pointed shaft and remove it.

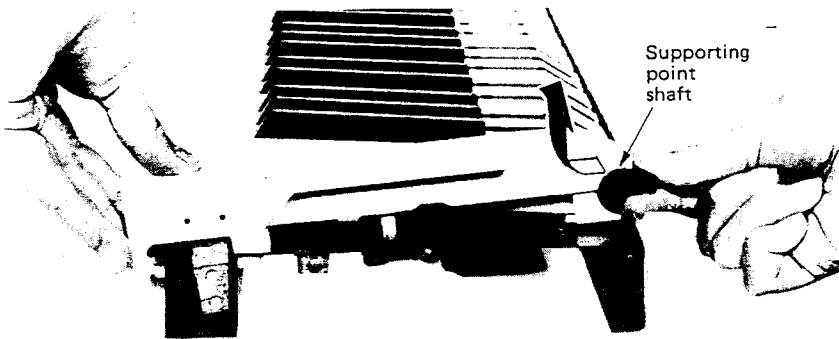


photo 4

Notes On Installation:

● Install the black keys, before installing the white keys.

Remount the supporting pointed shaft to the key. Inlay the flat key spring to the gutter and push it in the direction indicated by the arrow to install it (photo 5).

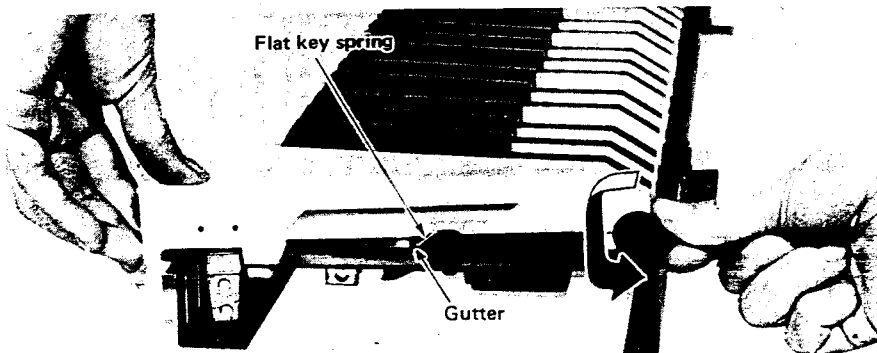
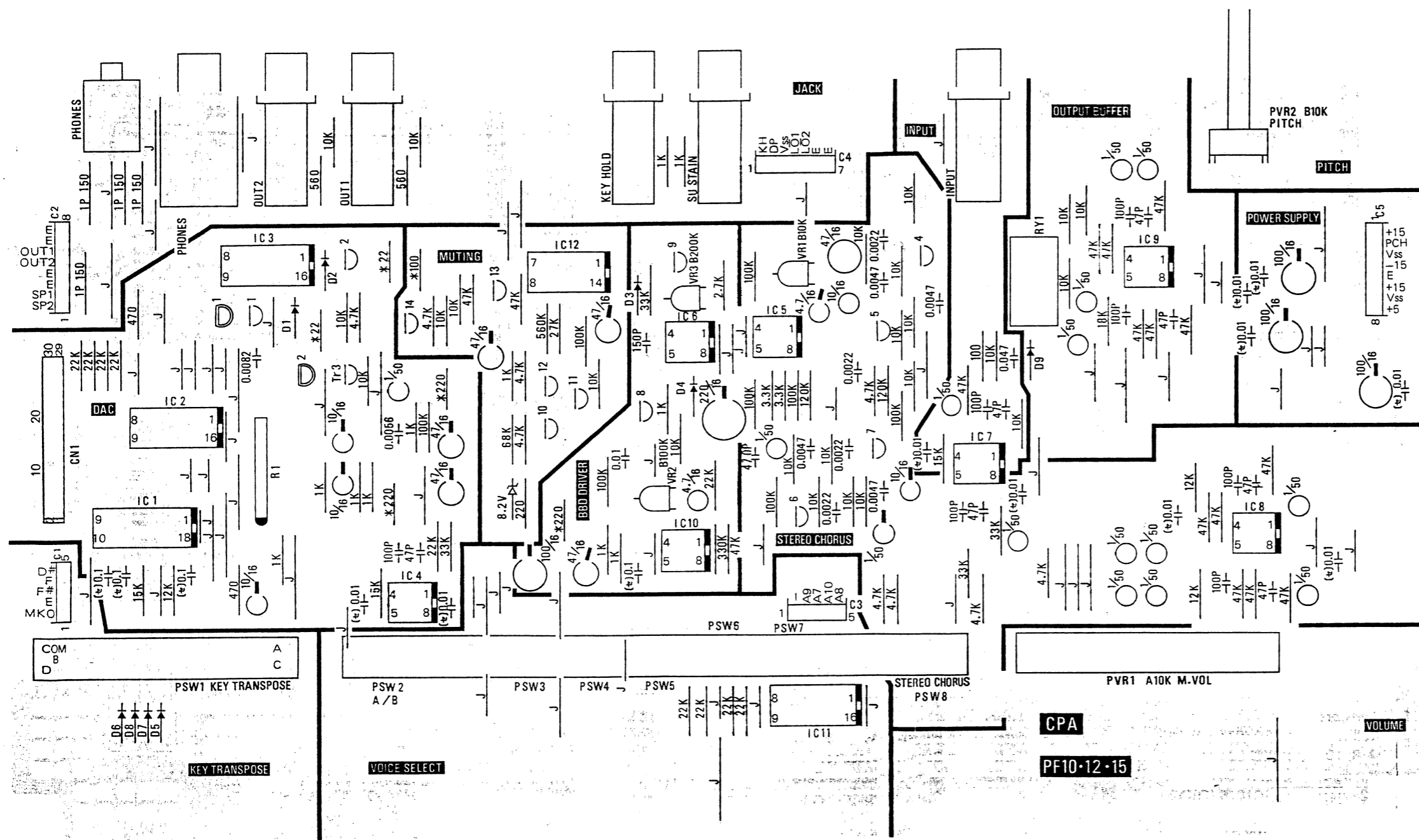


photo 5

# CPA CIRCUIT BOARD & WIRING



- Note)
- Circuit Board : LC90260
  - Transistors  
 Tr1, 3 ~ 9, 13 : 2SC1815 (O)(Y)  
 Tr2, 10 ~ 12 : 2SA1015 (O)(Y)  
 Tr14 : 2SA509 (O)(Y)
  - IC's  
 IC1 :  $\mu$ PC610D  
 IC2 : TC4051BP  
 IC3 : TC4053BP  
 IC11 : TC4050BP  
 IC5 : MN3007  
 IC6 : MN3101  
 IC4, 7 ~ 10 : NJM4558DV  
 IC12 : TC4069UBP
  - Diodes  
 D1 ~ 9 : 1S1555  
 ZD1 : RD8.2EB2
  - FET's  
 FET1, 2 : 2SK105 (F)
  - Capacitors  
 (t)Mark : Ceramic Capacitor  
 0.1(t)Mark : Semi-Conductive Ceramic Capacitor 0.1 $\mu$ F/25V
  - Resistors  
 \* Mark : Flame Proof Resistor  
 R1 : R-2R Ladder Resistor Network H Z237
  - RELAY : RZ12

C1

Pin No.	Pin Name	Wire Color	Destination
1	MKO	BR	DM-MKO (C1-10)
2	E	YE	DM-E (C1-7)
3	F	RE	DM-F (C1-9)
4	F	OR	DM-F (C1-8)
5	D	GR	DM-D (C1-6)

C2

Pin No.	Pin Name	Wire Color	Destination
1	SP2	RE	SP2-T2
2	SP1	WH	SP1-T2
3	E	BL	SP2-T1
4	E	BL	SP1-T1
5	OUT2	VI	DC-OUT2 (C1-7)
6	OUT1	SB	DC-OUT1 (C1-5)
7	E	WH	DC-E (C1-6)
8	E	GY	DC-E (C1-8)

C3

Pin No.	Pin Name	Wire Color	Destination
1	-	-	-
2	A9	VI	DM-A9 (C1-4)
3	A7	WH	DM-A7 (C1-2)
4	A10	BE	DM-A10 (C1-5)
5	A8	GY	DM-A8 (C1-3)

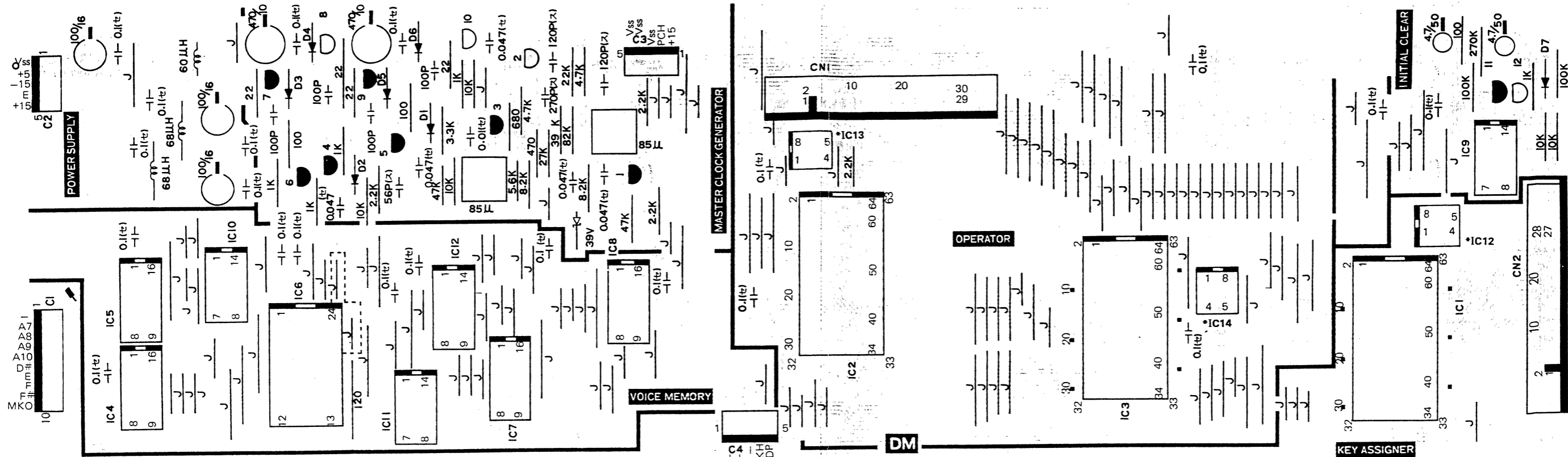
C4

Pin No.	Pin Name	Wire Color	Destination
1	KH	OR	DM-KH (C4-4)
2	DP	YE	DM-DP (C4-9)
3	Vss	BL/WH	EP4
4	LO1	S OR	DC-LO1 (C1-11)
5	LO2	S VI	DC-LO2 (C1-3)
6	E	S OR S	DC-E (C1-2)
7	E	S VI	DC-E (C1-4)

C5

Pin No.	Pin Name	Wire Color	Destination
1	+15	GG	DM-+15 (C3-1)
2	PCH	SB	DM-PCH (C3-2)
3	*Vss	PK	DM-Vss (C3-3)
4	-15	YE	DC-15 (C6-7)
5	E	BL	DC-E (C6-5)
6	+15	BR	DC-15 (C6-2)
7	Vss	BL/WH	DC-Vss (C2-2)
8	+5	BE	DC-+5 (C7-5)

DM CIRCUIT BOARD & WIRING



**C1**

Pin Name	Wire Color	Destination
A7	WH	CPA-A7 (C3-3)
A8	GY	CPA-A8 (C3-5)
A9	VI	CPA-A9 (C3-2)
A10	BE	CPA-A10 (C3-4)
D#	GR	CPA-D# (C1-5)
E#	YE	CPA-E# (C1-2)
F#	OR	CPA-F# (C1-4)
MKO	BR	CPA-MKO (C1-1)

**C3**

Pin No.	Pin Name	Wire Color	Destination
1	*+15	GG	CPA-+15 (C5-1)
2	PCH	SB	CPA-PCH (C5-2)
3	*Vss	PK	CPA-Vss (C5-3)
4	*Vss	-	-
5	*Vss	-	-

**C4**

Pin No.	Pin Name	Wire Color	Destination
1	-	-	-
2	-	-	-
3	-	-	-
4	KH	OR	CPA-KH (C4-1)
5	DP	YE	CPA-DP (C4-2)

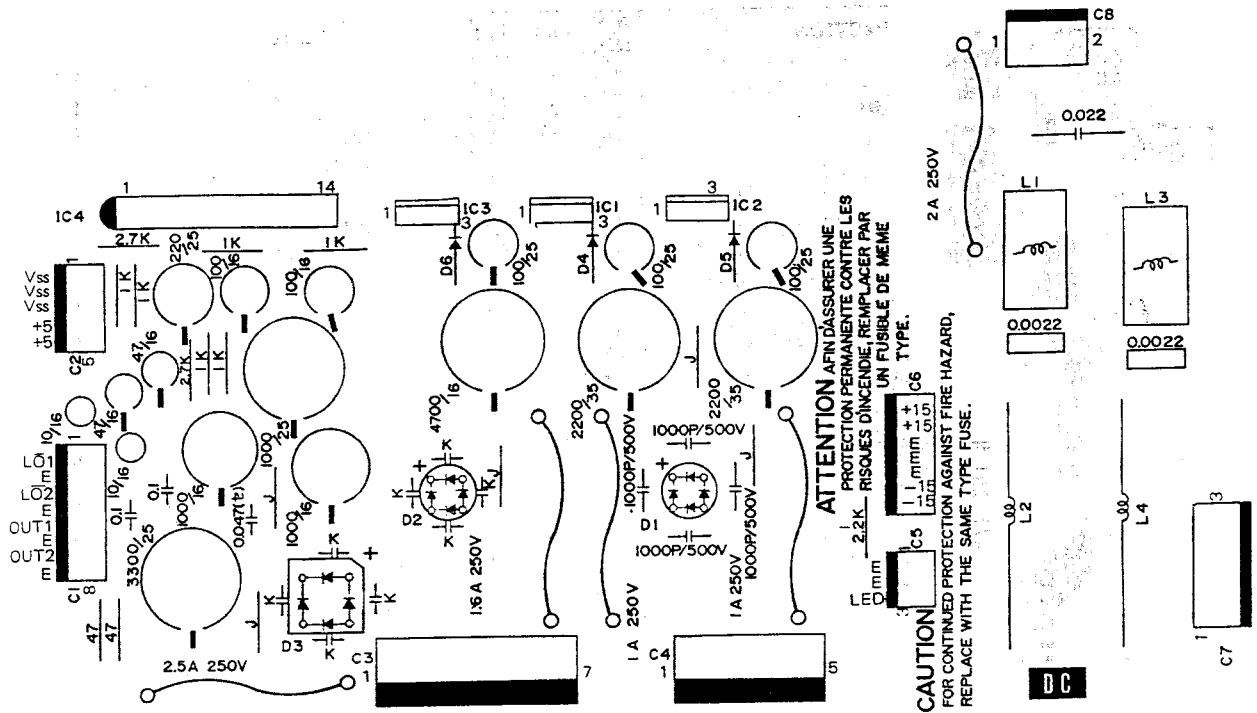
**C2**

Pin Name	Wire Color	Destination
Vss	BL/WH	DC-Vss (C2-1)
+5	BE	DC-+5 (C2-4)
-15	YE	DC--15 (C6-6)
E	BL	DC-E (C6-3)
+15	BR	DC-+15 (C6-1)

Note)

- Transistors
  - Tr1, 11 : 2SA1015 (O)(Y)
  - Tr2, 8, 10 : 2SC752 (Y)
  - Tr3 ~ 7, 9 : 2SA1164
  - Tr12 : 2SC1815 (O)(Y)
- IC's
  - IC1 : YM2005
  - IC2, 3 : YM2003
  - IC4, 5 : HD74LS163
  - IC6 : PROM # 39
  - IC7, 8 : HD74LS174
  - IC9 : TC4011BP
  - IC10 : HD74LS11
  - IC11 : HD74LS00
  - IC12 ~ 14 : iG07950
  - IC15 : HD74LS367
- Diodes
  - D1 ~ 8 : 1S1555
  - ZD1 : RD39EB1
- Capacitors
  - (ス) Mark : Polystyrene Capacitor
  - (セ) Mark : Ceramic Capacitor
  - 0.1(セ)Mark : Semi-Conductive Ceramic Capacitor 0.1μF/25V
- Coils
  - L1, 2 : 85μH Master Coil
  - L3 : 60μH Choke Coil
  - L4, 5 : 68μH Choke Coil

# DC CIRCUIT BOARD & WIRING



C1

Pin No.	Pin Name	Wire Color	Destination
1	LO1	SOR	CPA-LO1 (C4-4)
2	E	SORS	CPA-E (C4-6)
3	LO2	S VI	CPA-LO2 (C4-5)
4	E	S VI S	CPA-E (C4-7)
5	OUT1	SB	CPA-OUT1 (C2-6)
6	E	WH	CPA-E (C2-7)
7	OUT2	VI	CPA-OUT2 (C2-5)
8	E	GY	CPA-E (C2-8)

C2

Pin No.	Pin Name	Wire Color	Destination
1	Vss	BL/WH	DM-Vss (C2-1)
2	Vss	BL/WH	CPA-Vss (C5-7)
3	Vss	-	-
4	+5	BE	DM-+5 (C2-2)
5	+5	BE	CPA-+5 (C5-8)

C6

Pin No.	Pin Name	Wire Color	Destination
1	+15	BR	DM-+15 (C2-5)
2	+15	BR	CPA-+15 (C5-6)
3	E	BL	DM-E (C2-4)
4	E	BL	EPT
5	E	BL	CPA-E (C5-5)
6	-15	YE	DM-15 (C2-3)
7	-15	YE	CPA-15 (C5-4)

Note)

- IC's
  - IC1 :  $\mu$ PC7815H
  - IC2 :  $\mu$ PC7915H
  - IC3 :  $\mu$ PC14305
  - IC4 : LA4440
- Diodes
  - D1 ~ D2 : 1D4B1
  - D3 : S2VB20
  - D4 ~ D6 : W03B
- Capacitors
  - C1 : 0.022 PME265
  - C2, 3 : 0.0022 Murata
  - C4 ~ C7 : 1000P/500V (Ceramic)
  - C8 ~ C15 : 1000P (Ceramic)
- Coils
  - L1, 3 : SN8S309
  - L2, 4 : CK6

## LSI DATA TABLES

## KAS (YM2005)

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	VSS	-	Ground (0V)	33	$\overline{F}$	0	//
2,3	NC			34	$\overline{G}$	0	//
4	$\overline{T3}$	0	INITIAL TOUCH DATA	35	$\overline{G}$	0	//
5	$\overline{T4}$	0	//	36	$\overline{A}$	0	//
6	$\overline{T5}$	0	//	37	$\overline{A}$	0	//
7	$\overline{T6}$	0	//	38	$\overline{B}$	0	//
8	$\overline{T7}$	0	//	39	$\overline{C}$	0	//
9	$\overline{T8}$	0	//	40	$\overline{IC}$	I	INITIAL CLEAR
10	$\overline{T9}$	0	//	41	BRO	I	Octave Block Data (Make)
11	$\overline{T10}$	0	//	42	MK0	I	// (Break)
12	SY	0	System sync signal IY16	43	BR1	I	//
13	TEST	I	Test terminal	44	MK1	I	//
14	LD	I	Sustain control input ON H	45	BR2	I	//
15	KH	I	Key-hold control input ON H	46	MK2	I	//
16	TS	I	Touch curb selection ME key H, FS key L	47	BR3	I	//
17	VSS	-	Ground (0V)	48	MK3	I	//
18	A2	0	Channel occupation data	49	BR4	I	//
19	$\overline{D1}$	0	Decay Data	50	MK4	I	//
20	$\overline{DP}$	0	Damp data	51	BR5	I	//
21	$\overline{B3}$	0	Block data	52	MK5	I	//
22	$\overline{B2}$	0	//	53	BR6	I	//
23	$\overline{B1}$	0	//	54	MK6	I	//
24	$\overline{N4}$	0	Note data Parallel Key Code data	55	BR7	I	//
25	$\overline{N3}$	0	//	56	MK7	I	//
26	$\overline{N2}$	0	//	57	$\overline{E1}$	I	Envelope Data for Truncate
27	$\overline{N1}$	0	//	58	$\overline{E2}$	I	//
28	$\overline{C}$	0	Key scan	59	$\overline{E3}$	I	//
29	$\overline{D}$	0	//	60	$\overline{E4}$	I	//
30	$\overline{D}$	0	//	61	EE	I	Envelope END Data
31	$\overline{E}$	0	//	62	VDD	-	+5 DC SUPPLY
32	$\overline{F}$	0	//	63	$\phi 1$	I	Master clock (2.22MHz)
				64	$\phi 2$	I	//

## OP (YM2003)

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	VSS	-	Ground (0V)	33	$\overline{N4}$	I	//
2	$\overline{E4}$	0	Envelope Data for Truncate	34	$\overline{N3}$	I	//
3	$\overline{E3}$	0	//	35	$\overline{N2}$	I	//
4	$\overline{E2}$	0	//	36	$\overline{N1}$	I	//
5	$\overline{E1}$	0	//	37	TEST	I	Test terminal Not used
6	$\overline{T10}$	I	Initial Touch Data	38	$\overline{T1}$	I	Not used
7	NC	-	Not used	39	$\overline{IC}$	I	INITIAL CLEAR
8	$\overline{T9}$	I	Initial Touch Data	40	SY	I	System sync signal IY16
9	$\overline{T8}$	I	//	41	$\overline{SI}$	I	Serial input of waveform data
10	$\overline{T7}$	I	//	42	$\overline{SO}$	O	Serial output of final waveform data
11	$\overline{T6}$	I	//	43	Y	O	Sampling hold timing signal
12	$\overline{T5}$	I	//	44	S3	O	Output to DAC Exponent 3 bits
13	$\overline{T4}$	I	//	45	S2	O	//
14	$\overline{T3}$	I	//	46	S1	O	//
15	$\overline{T2}$	I	Not used	47	BT11	O	Output to DAC Mantissa
16	$\overline{T1}$	I	//	48	BT10	O	//
17	NC	-	Not used	49	BT9	O	//
18	DP	I	Damp Data	50	BT8	O	//
19	$\overline{D1}$	I	Decay Data	51	BT7	O	//
20	A2	I	Channel Occupation Data	52	BT6	O	//
21	DIN1	I	VOICE Data	53	BT5	O	//
22	DIN2	I	//	54	BT4	O	//
23	DIN3	I	//	55	BT3	O	//
24	DIN4	I	//	56	BT2	O	//
25	DIN5	I	//	57	BT1	O	//
26	DIN6	I	//	58	EE	O	Envelope END Data
27	DIN7	I	//	59	NC	-	Not used
28	DIN8	I	//	60	NC	-	//
29	LOAD	I	Voice Data sync signal	61	NC	-	//
30	$\overline{B3}$	I	Key code data	62	VDD	-	+5V DC Supply
31	$\overline{B2}$	I	//	63	$\phi 1$	I	Master clock (2.22MHz)
32	BT	I	//	64	$\phi 2$	I	//



# TECHNICAL GUIDE

## 1. KAS

The KAS-IC (YM2005) contains the Key Assigner (Key Coder and Channel Processor) and Initial Touch generator on 1 chip.

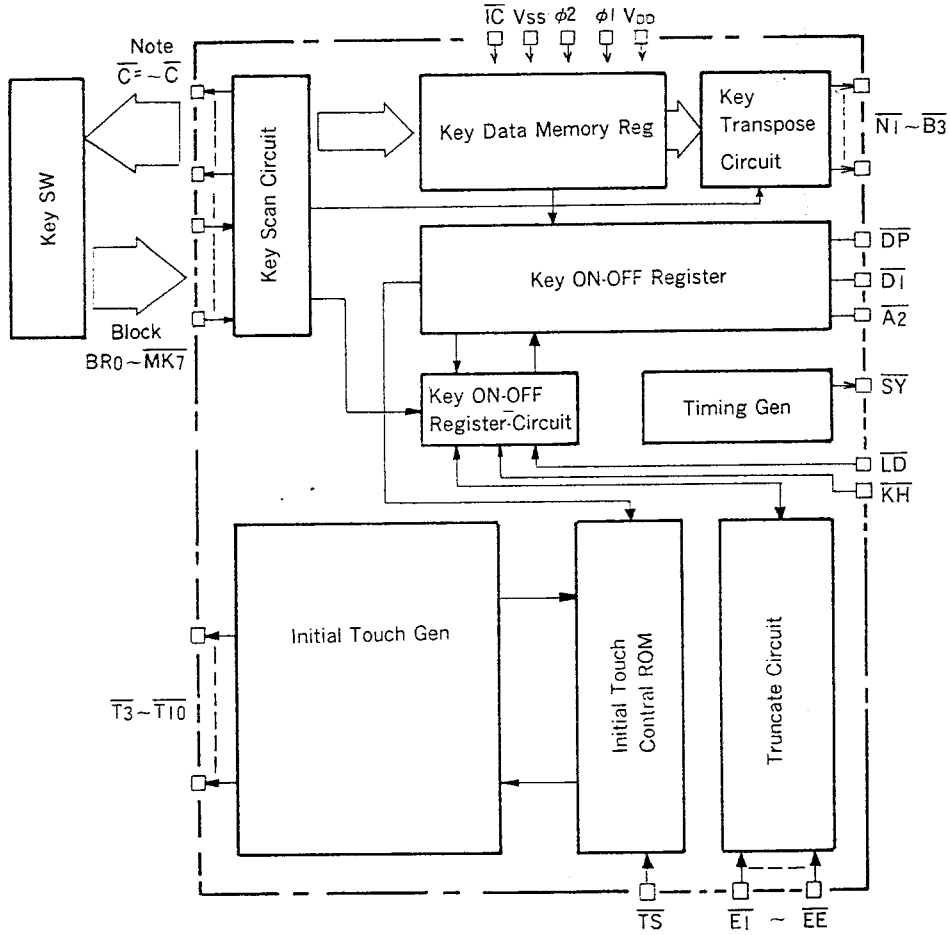


fig.1 KAS (YM2005) Block Diagram

As shown in Fig.1, the Key Scan Circuit detects which key is depressed by continuity of the Note terminal and the Block terminal through the keyboard-switch.

In the same way, the Key Scan Circuit detects where the transpose switch is positioned.

### Reference

The Key Scan Circuit detects the connection with the Note terminal and the Block terminal according to all notes depressed on the keyboard or the setting of the transposition, and latches this data by using the rising edge of the  $\phi B$  clock pulse.

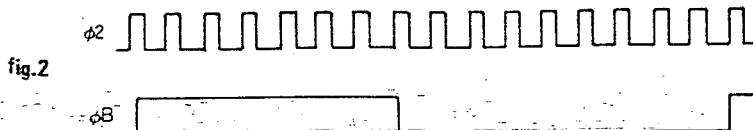


fig.2

■ **Acception of the Key Data**

The Key Scan Circuit detects the keying events for the depressed key. The Key Data Memory Register can accept the Key data for 16 note data with first-note priority. Therefore, pf15 can produce up to 16 notes. Hence, the Key Data which is stored in the Key Memory Register consists of 7 bits. (Note Data 4 bits and Block Data 3 bits)

■ **Data shift by transposition**

The Key Scan Circuit detects the operation of the transposition and transmits data to shift the Key Data; namely it transmits the Transpose Data to the Key Transpose Circuit. Consequently, the Key Data which is transmitted from the Data Memory Register, is shifted by the transposition. In this way, the Key Data, reflected in the transposition outputs from KAS, is fed to OP.

■ **Control for the transposition and the keyboard note limit**

The Key Scan Circuit detects the transposition and the keyboard note limit through the Diode Matrix of the MKO and C#, D#, E, F, and F# terminal.

Chart 1 Diode Matrix

VS. MKO	
C#	Key Limit
D#	Transpose A
E	// B
F	// C
F#	// D

As shown in Chart 2, models can be limited by MKO and C# terminal connections.

Chart 2

Diode	Key Limit
none	88 Key (A-1 ~ C7)
same	76 Key (E0 ~ G6)

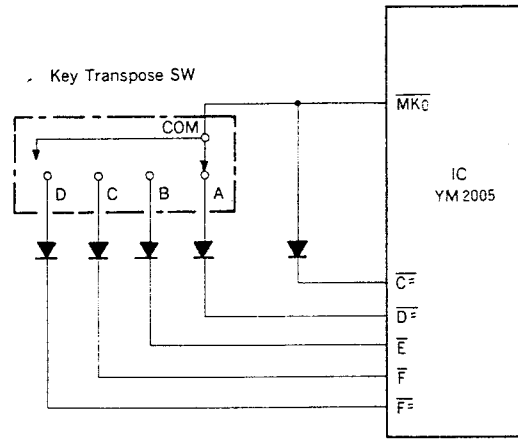


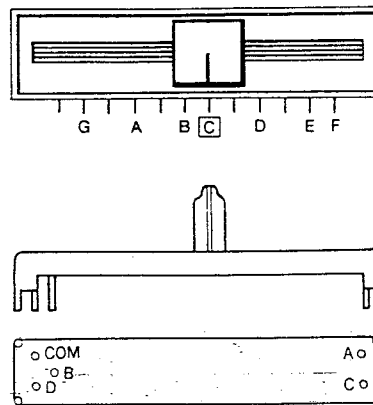
fig.3 Key transposition

Use of MKO, D#, E, F and F# can produce a 12-stage key transposition. A slide code switch is shown in Fig.4, which is used as the transpose SW; the relationship of the common terminal and the 4 terminals from A ~ D are shown in Chart 3.

Chart 3

DCBA	Transpose switch
0000	F# 6
0001	G 5
0011	G# 4
0010	A 3
0110	A# 2
0111	B Flat a tone (B <sup>b</sup> , A <sup>#</sup> )
0101	C
0100	C# Sharp a tone (C)
1100	D 2
1101	D# 3
1111	E 4
1110	F 5

1...+5V  
0...0V



When the Transpose switch set to the C# to F position with the pf15 model, only the C7 key (the highest key) produces sound, 1 octave lower.

fig.4 Transpose switch

■ Initial-touch Control

There is a "make" and "break" contact on the keyboard switch; the initial touch generator produces initial touch data when the time duration of transition from the "break" contact to "make" contact is detected, which is sent to the envelope control section of the OP to control the sound volume.

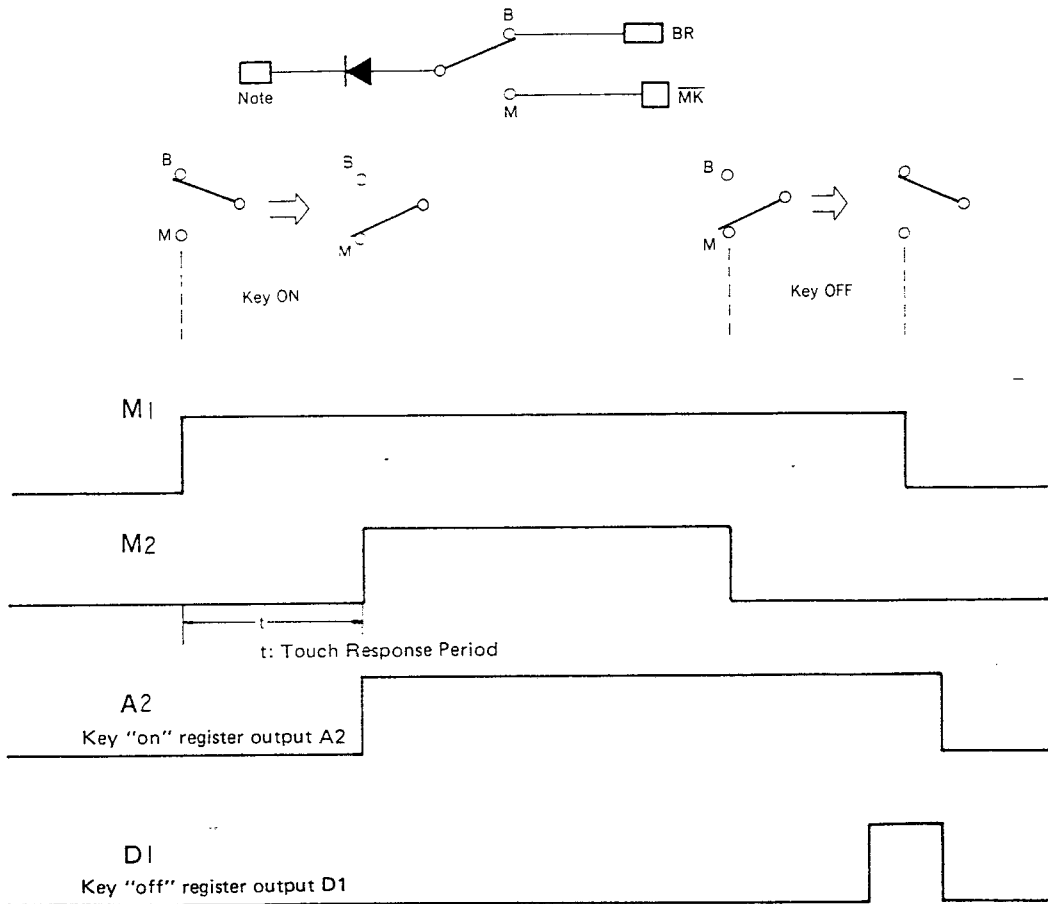


fig.5 Initial-touch timing

The "on - off" register produces and outputs A2 and D1 data based on M1 and M2 data. Also, it feeds touch response period data (t) to the initial touch control ROM. It is counted in the initial touch control ROM and based on the calculation of the initial touch generator, is fed to OP as initial touch volume data.

The initial touch control ROM stores the touch response curve (Key scaling) which varies the counting speed of the initial Touch Generator. By H or L data received from  $\overline{TS}$ , the ROM produces the two touch response curves for 2 types of keyboards.

### ■ Truncate Operation

When all 16 channels of the Key Data Memory Register (for all 16 keys) are occupied, and then some keys are released, depressing a 17th key will detect and clear the channel for that key which is decaying the fastest, and force-feeds the data of the 17th key into that channel at the moment when the sound level of the fastest decaying key drops to  $-84\text{dB}$ . The decaying states for all 16 keys are detected by reference to the envelope data fed from the  $\overline{E1}$  to  $\overline{E6}$  terminal of OP.

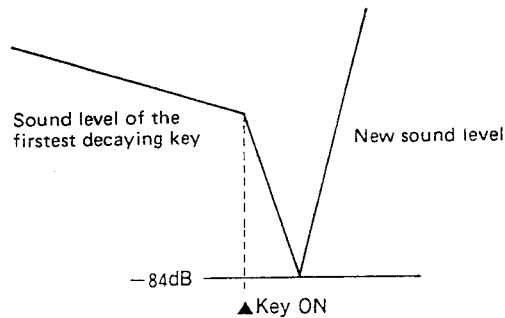


fig.6

### ■ Key Data Memory Register

Register which accepts by the 16 channels and stores the key data of the depressed keys accepted by the key "on-off" register circuit. The key note data is composed of 4 bits, the block data, 3 bits.

### ■ Key ON/OFF Register Circuit

Determines whether key data from the key scan circuit can be accepted or not, and stores key data in the key data memory register.

### ■ Truncate Circuit

Detects the most decayed envelope channel, and indicates that channel to the key "on/off" register circuit.

$\overline{E1} \sim \overline{E4}$  (4 bit) and envelope ending data are fed from the OP (YM2003). Because this envelope data is sent alternately by both the modulator and the carrier, the circuit accepts only the carrier data necessary for truncation.

### ■ KEY ON/OFF Register

Based on information from the key "on-off" register circuit, data is stored and/or cleared at the key on register (data is distributed to the channels by A2 key on, which has been applied continuously until the sound stops), the key off register (D1 ... operates while channel sound is attenuating) or the damp register (operates while channel sound is attenuating or damped).

### ■ Timing Generator

Produces timing clock pulses controlling the system,  $\overline{SY}$  (synchro pulse  $\overline{Y16}$ ) and clock pulses  $\phi A$ ,  $\phi B$ .

## 2. OP

The OP-IC (YM2003) contains the VRG, EG, EC, PG, OP, ACC, and ADD on 1 chip as shown in fig.7.

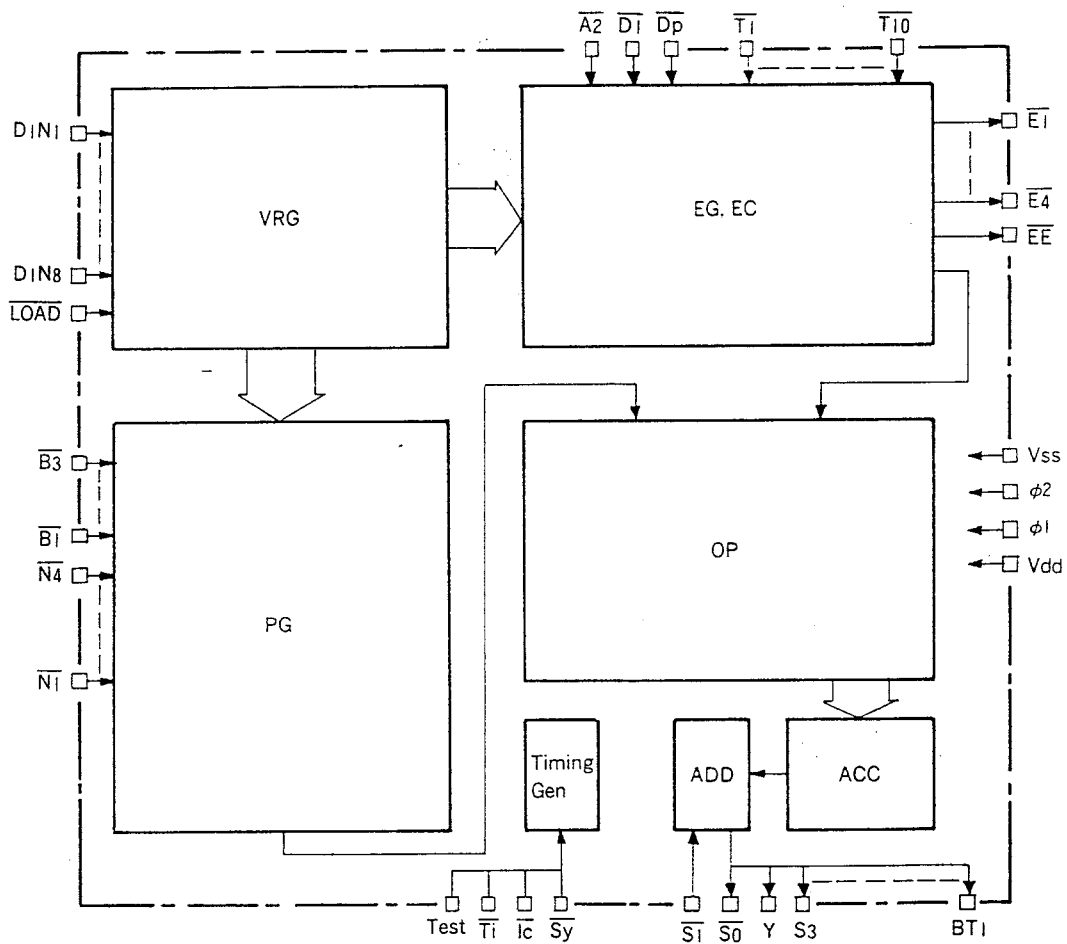


fig.7 OP (YM2003) Block Diagram

Figure 7 is an OP-IC block diagram. Though the OP-IC is in practicality only one IC, it performs multiple purposes; namely, not only for carrier but also for the modulator to perform on a time sharing basis.

The first half of the 32 bit time (16 bits) conducts modulator calculation; the second or last 16 bits are for carrier calculation.

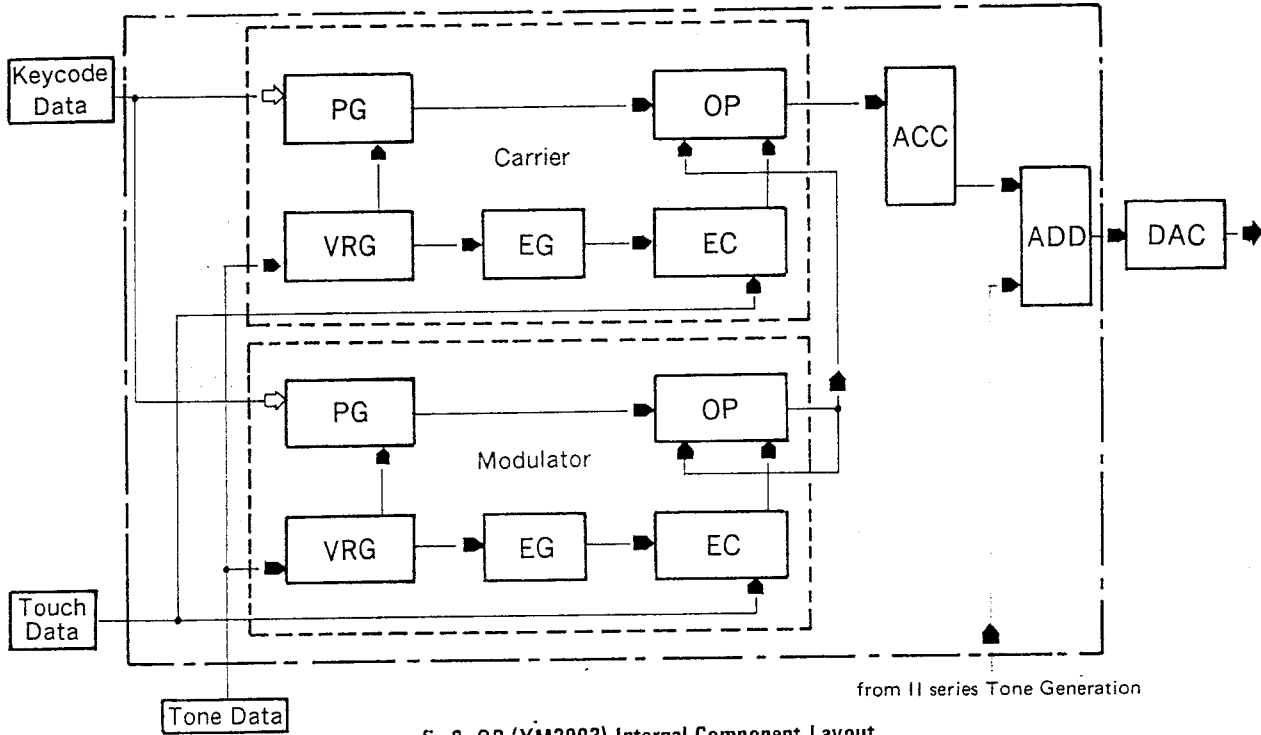


fig.8 OP (YM2003) Internal Component Layout

- PG (Phase Generator) . . . . . Phase readout data generation circuit
- OP (Operator) . . . . . Sine table memory circuit
- VRG (Voice Register) . . . . . Tonal color parameter conversion circuit
- EC (Envelope Generator) . . . . . Envelope generator circuit
- ACC (Accumulator) . . . . . Accumulator
- ADD (Adder) . . . . . Adder. Digital Mixing
- DAC (Digital Analog Converter) . . . . . Digital analog converter

■ PG (Phase Generator)

Inputs key data (Note 4 bit, Block 3 bit) fed by KAS IC, generates phase data corresponding to the key depressed.

■ OP (Operator)

From the value obtained by adding modulation data to the phase data supplied by the phase generator, it produces a tone signal by reading out a sine table, and outputs values which activate envelope data received from the EC.

■ EG (Envelope Generator)

Inputs key "on-off" data A2, D1, Dp from the KAS IC, generates envelope phase data based on VRG rate, level and mode signals.

- A2: Indicates sound production
- D1: Indicates key off during sound production
- Dp: Indicates damp mode
- Rate: Sets envelope rise and fall speed
- Level: Sets initial level, D.K. level
- Mode: Sets sound sustaining power and diminishing power (damping/attenuation)

### ■ EC (Envelope Controller)

Generates final envelope phase data by adding the EG basic envelope data, Initial Touch data from KAS IC and Total level from VRG.

### ■ VRG (Voice Register)

Accepts the data in 1 serial line of 64 bits for the inputted signal of Din 1 to Din 8 terminal, latches this data on load signal, and VRG makes a parallel conversion and temporary buffer memory.

By the data selected, the VRG is activated or turned off by the data/signals (KC, S) input.

Dm: Serial data signal (64 bit length x 8)

Load: Latch timing signal

KC: Key code signal (from KAS)

S: Envelope state signal (from EG)

### ■ ACC (Accumulator)

Adds in 16 channel part of the A (14 bit) data fed from OP, outputs it as 1 bit serial data.

A: Frequency, modulated signal

### ■ ADD (Adder)

Adds internal ACC output signal and Serial Waveform (phase) data which is input to  $\overline{S1}$  terminal from external OP, and carries out code conversion for supply to 11 bit DAC. (Refer to fig. 9)

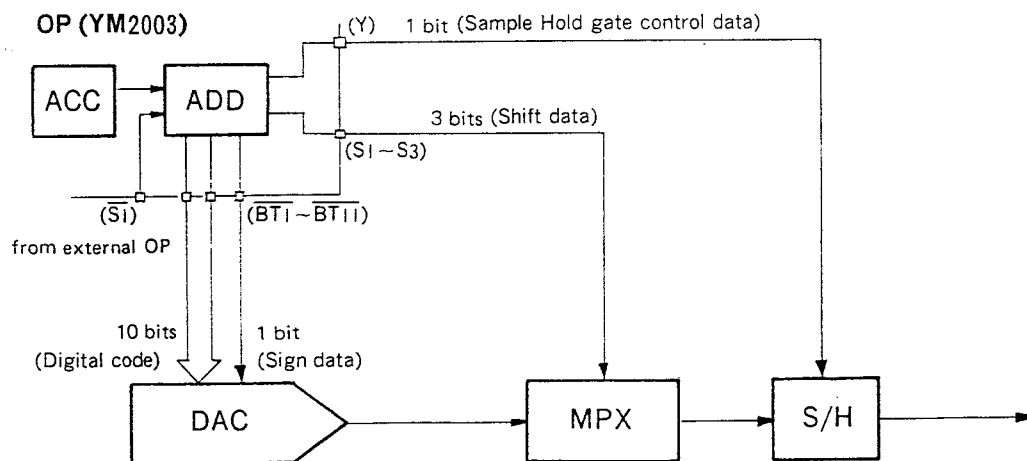


fig.9

## Pf15 PART LIST

## A. Electronic Components (電気部品)

Ref. No.	Part No.	Description	品 名	Remarks	ランク
*	NA 810940	Circuit Board, DC	D C シ ー ト	J	
*	NA 810950	Circuit Board, DC	"	UL	
*	NA 810960	Circuit Board, DC	"	USA	
*	NA 810970	Circuit Board, DC	"	G	
*	NA 810920	Circuit Board, CPA	C P A シ ー ト		
*	NA 811310	Circuit Board, DM	D M シ ー ト		
	iG 001240	IC	TC4011BP	I C	
	iG 001390	IC	NJM4558DV	"	
	iG 001740	IC	TC4050BP	"	
	iG 001770	IC	TC4051BP	"	
	iG 026910	IC	HD74LS00	"	
	iG 033300	IC	$\mu$ PC14305H	"	
	iG 033500	IC	$\mu$ PC610D	"	
	iG 037500	IC	MN3101	"	
	iG 050000	IC	HD74LS174P	"	
	iG 050400	IC	HD74LS367P	"	
	iG 055100	IC	TC4053BP	"	
	iG 063900	IC	$\mu$ PC7815H	"	
	iG 070000	IC	HD74LS163P	"	
	iG 077500	IC	$\mu$ PC7915H	"	
*	iG 079500	IC	iG07950	"	
	iG 089300	IC	MN3007	"	
	iG 089400	IC	LA4440	"	
*	iG 098900	IC	HD74LS11	"	
*	iN 003910	IC	PROM #39	"	
*	iT 200300	IC	YM20030	"	
*	iT 200500	IC	YM20050	"	
	iG 001720	IC	TC4069UBP	"	
	iA 101570	Transistor	2SA1015 (O)(Y)	ト ラ ン ジ ス タ	
	iA 116400	Transistor	2SA1164 (Y)	"	
	iC 075220	Transistor	2SC752 (Y)	"	
	iC 181570	Transistor	2SC1815 (O)(Y)	"	
	iA 050910	Transistor	2SA509 (Y)	"	
	iE 101200	FET	2SK105 (F)	F E T	
	iF 000040	Diode	1S1555	ダ イ オ ー ド	
	iF 003450	Diode	1S133	"	
	iH 000470	Diode	1D4B1	"	
	iH 000720	Diode	W03B	"	
	iF 003350	Zener Diode	RD39EB1	ツェナーダイオード	
	iF 003340	Zener Diode	RD8.2EB2	"	
	iH 001120	Diode Bridge	S2VB20	ダイオードブリッジ	
	iF 001280	LED	SLB26UR	L E D	
*	HQ 410140	Slide Variable Resistor	A10K	スライドボリューム	
	HT 370110	SemiVariable Resistor	B200K	半固定ボリューム	
	HT 370020	Semi-Variable Resistor	B10K V8K4-1	"	
	HT 370030	SemiVariable Resistor	B100K	"	
	HS 300020	Rotaly Variable Resistor	B10K	ロータリーボリューム	
	HL 315150	Metal Oxide Film Resistor	1P 150M	サンキーン抵抗	

\* : New Parts

ランク : Japan only



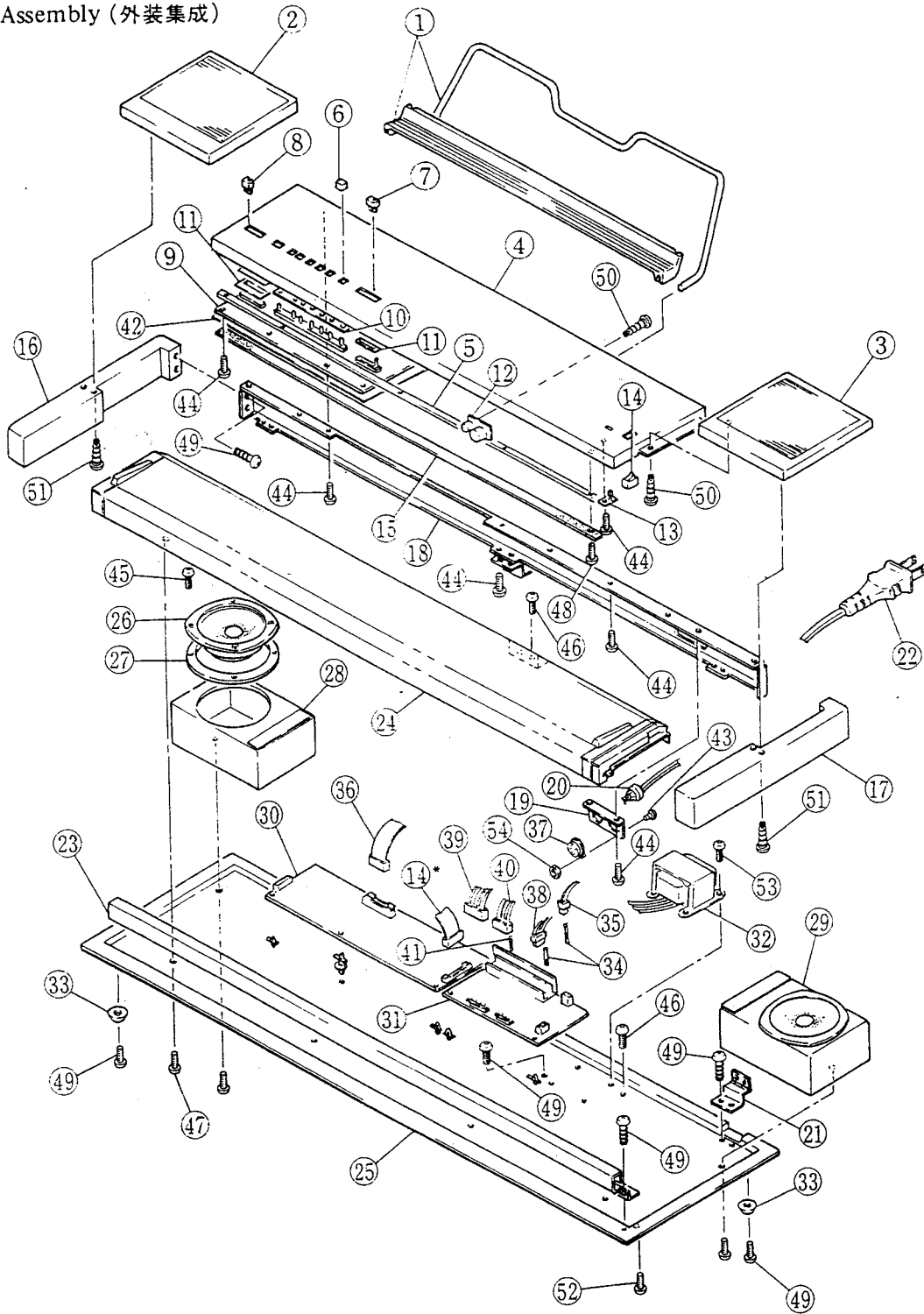
Ref. No.	Part No.	Description	品名	Remarks	ランク
	HV 554220	Flame Proof Carbon Resistor	22Ω	不燃化カーボン抵抗	
	HV 555220	Flame Proof Carbon Resistor	220Ω	"	
	HV 555100	Flame Proof Carbon Resistor	100Ω	"	
	HZ 002370	Resistor Network		R 2 R ラダ抵抗	
	FS 685100	Ceramic Capacitor	0.1μ	半導体セラコン	
	FD 651560	Polystyrene Capacitor	56P	スチコン	
	FD 652120	Polystyrene Capacitor	120P	"	
	FD 652270	Polystyrene Capacitor	270P	"	
	FR 164220	Spark Suppressor Capacitor	0.022μ	スパークキラコン	
	FZ 002850	Spark Suppressor Capacitor	0.0022μ	"	J, U, C
	FJ 236470	Electrolytic Capacitor	4.7μF 16V	ケミコン	
	UJ 137100	Electrolytic Capacitor	10μF 16V	"	
	UJ 137470	Electrolytic Capacitor	47μF 16V	"	
	UJ 138100	Electrolytic Capacitor	100μF 16V	"	
	UJ 138220	Electrolytic Capacitor	220μF 16V	"	
	UJ 166100	Electrolytic Capacitor	1μF 50V	"	
	UJ 166470	Electrolytic Capacitor	4.7μF 50V	"	
	UJ 159220	Electrolytic Capacitor	2200μF 25V	"	
	UJ 128470	Electrolytic Capacitor	470μF 10V	"	
	UJ 139100	Electrolytic Capacitor	1000μF 16V	"	
	UJ 148100	Electrolytic Capacitor	100μF 25V	"	
	UW 848220	Electrolytic Capacitor	220μF 25V	"	
	UW 849100	Electrolytic Capacitor	1000μF 25V	"	
	UW 949330	Electrolytic Capacitor	3300μF 25V	"	
	UK 166100	Bipolar Electrolytic Capacitor	1μF 50V	B P ケミコン	
	UK 137100	Bipolar Electrolytic Capacitor	10μF 16V	"	
	UK 166470	Bipolar Electrolytic Capacitor	4.7μF 25V	"	
	GE 300160	Choke Coil	60μH	チョークコイル	
	GE 300350	Choke Coil	68μH	"	
	GE 900490	Coil	SN8S309	コイル	
	GE 900530	Coil	CK6	"	
	GE 900540	Master Coil	85μH	マスターコイル	
	KA 401190	Slide Cord Switch		スライドコードスイッチ	
	KA 905340	Push Switch		プッシュスイッチ	
	KB 000330	Fuse	1A 250V	ヒューズ	J
	KB 000350	Fuse	2A 250V	"	J
	KB 000420	Fuse	2.5A 250V	"	J
	KB 000690	Fuse	T2.5A 250V	"	G
	KB 001060	Fuse	1A 250V	"	U, C
	KB 001240	Fuse	2A 250V	"	U, C
	KB 001770	Fuse	T1A 250V	"	G
	KB 002620	Fuse	T1.6A 250V	"	G

\* : New Parts

ランク : Japan only

Ref. No.	Part No.	Description	品 名	Remarks	ランク
	KB 002680	Fuse	2.5A 250V	ヒューズ	U, C
	KB 002690	Fuse	1.6A 250V	"	U, C
	KB 002700	Fuse	1.6A 250V	"	J
	LB 201530	Fuse Holder Pin		ヒューズホルダーピン	
	CB 072880	Insulation Bush		絶縁ブッシュ	
	LB 201910	Connector, L	2P	Lコネクター	
	LB 301470	Connector, L	3P	"	
	LB 300730	Connector, NH	3P	NHコネクター	
	LB 500250	Connector, NH	5P	"	
	LB 500370	Connector, NH	5P	"	
	LB 602460	Connector, NH	7P	"	
	LB 602470	Connector, NH	10P	"	
	LB 602490	Connector, NH	8P	"	
	LB 603000	Connector, NH	7P	"	
	LB 603010	Connector, NH	8P	"	
	LB 602430	Connector Frat Cable	30P	コネクターフラットケーブル	
	iL 000690	Isolation Base		放熱シート	
	BA 808040	Heat Sink		放熱板	
	BA 808090	Heat Sink		"	
	LB 301780	Phone Jack	STEREO	ジャック(ステレオ)	
	LB 301790	Phone Jack	STEREO	" (ステレオミニ)	
	LB 202330	Phone Jack	MONO	" (モノラル)	
	MZ 816630	Flat Cable Assembly	30P	フラットケーブルAss'y	
	EA 026086	Pan Head Screw	M2.6 x 8	ナベ小ネジ	
	ED 030106	Bind Head Screw	M3 x 10 ZMC2Y	バインド小ネジ	
	Ei 040106	Bind Head Tapping Screw	4 x 10 ZMC2Y	バインドタッピンネジ	
	EV 200266	Plain Washer	M2.6 ZMC2Y	平座金	
	EV 300266	Spring Lock Washer	M2.6 ZMC2Y	バネ座金	
	EV 420046	Toothed Lock Washer	B4S ZMC2Y	歯付座金	
	4000300	Relay	RZ-11		

B. Cabinet Assembly (外装集成)



Ref. No.	Part No.	Description	品名	Remarks	ランク
1	NB 826360	Music Stand Assembly	譜面板 Ass'y		
2	CB 827450	Speaker Grill	スピーカーグリル(左)		
3	CB 827720	Speaker Grill	" (右)		
4	AA 825800	Control Panel	コントロールパネル		
5	AA 825820	Key Clamper	鍵盤押え		

• : New Parts

ランク : Japan only

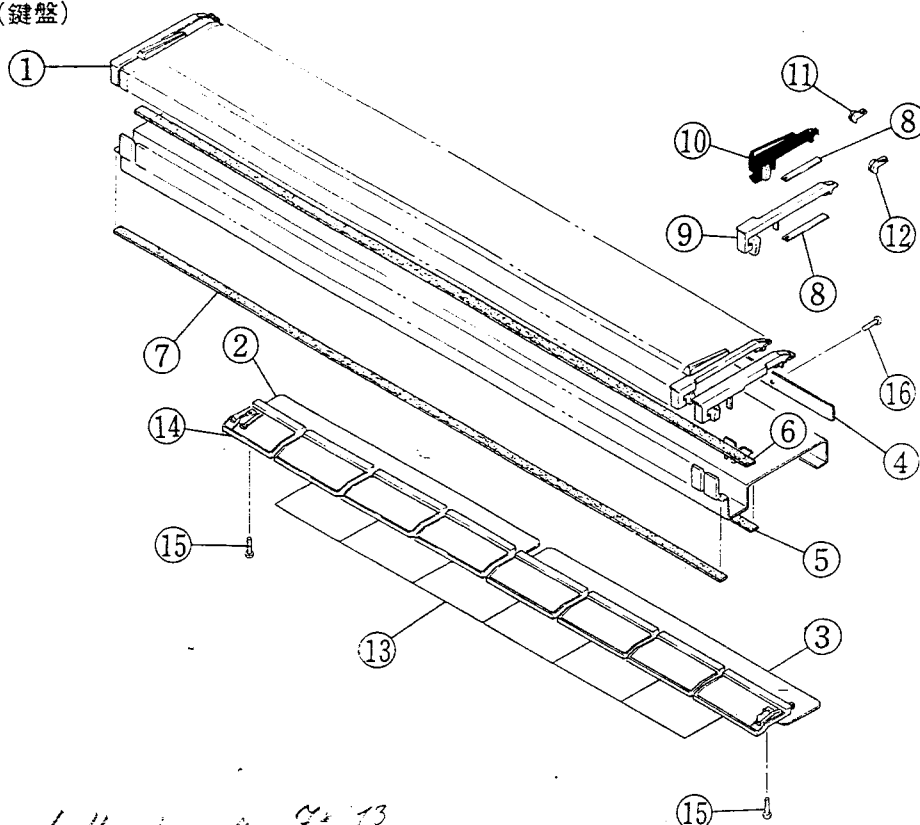
Ref. No.	Part No.	Description	品 名	Remarks	ランク
6	CB 826600	Knob	ツ マ ミ	Push	
7	CB 826610	Knob	〃	VR	
8	CB 827730	Knob	〃	DSW	
9	NA 810920	Circuit Board, CPA	C P A シ ー ト		
10	CA 803500	Dust-Proof Cover, B	防塵クロス (B)		
11	CB 827710	Escutcheon, VR	VRエスカッション		
12	CB 827850	Music Panel Bush	譜面板ブッシュ		
13	NA 810630	LED Assembly	L E D Ass'y		
14	KA 101120	Power Switch	パワースイッチ		
	LB 300720	Connector, L	2P Lコネクター (白)		
14*	MZ 817070	Frat Cable	30P, 20P フラットケーブル		
15	CC 015790	Felt	フェルト		
16	DA 822580	Side Board Assembly	Left 側板集成 (左)		
17	DA 822590	Side Board Assembly	Right 〃 (右)		
18	AA 825810	Back Top Board	背 面 板		
19	AA 825680	VS Board	V S 板	J	
	AA 825690	VS Board	- 〃	U.C	
	AA 825700	VS Board	〃	G	
20	CB 068630	Cord Bush	コードブッシュ	J	
	CB 806850	Cord Bush	〃	U.C	
	CB 072750	Cord Bush	〃	G	
21	AA 825830	Hinge	蝶 番		
22	MG 000600	AC Cord	電 源 コ ー ド	J	
	MG 000100	AC Cord	〃	U	
	MG 000270	AC Cord	〃	C	
	MG 000860	AC Cord	〃	G	
23	AA 825840	Front Board	口 板		
24	NB 827390	Keyboard Assembly	鍵 盤 Ass'y		
25	DA 822600	Bottom Board Assembly	底 板 集 成		
26	JA 125200	Speaker	ス ピ ー カ ー		
27	CB 827790	Speaker Packing	スピーカーパッキン		
28	DA 822610	Speaker Box Assembly	Left スピーカーボックス集成(左)		
29	DA 822620	Speaker Box Assembly	Right 〃 (右)		
30	NA 811310	Circuit Board, DM	D M シ ー ト		
31	NA 810940	Circuit Board, DC	D C シ ー ト	J	
	NA 810950	Circuit Board, DC	〃	U	
	NA 810960	Circuit Board, DC	〃	C	
	NA 810970	Circuit Board, DC	〃	G	
32	GA 830910	Power Transformer	電 源 ト ラ ン ス	G	
	GA 830810	Power Transformer	〃	U.C	
	GA 830710	Power Transformer	〃	J	
33	CB 801270	Seip Fitting	ゴ ム 足		
	LB 500240	Housing	5P ハウジング		
	LB 602440	Housing	7P 〃		
	LB 602480	Housing	8P 〃		
	LB 602450	Housing	10P 〃		
	BB 004430	Contact	コ ン タ ク ト		
34	LB 100670	Contact	ソケットコンタクト		
35	LB 201430	Connector, L	3P ハウジング		
36	MZ 816630	Frat Cable	30P フラットケーブル		
37	LB 202510	Voltage Selector	電 圧 切 換 器	G	
38	LB 300770	Connector, L	3P Lコネクター		

\* : New Parts

ランク : Japan only



C. Keyboard Assembly (鍵盤)



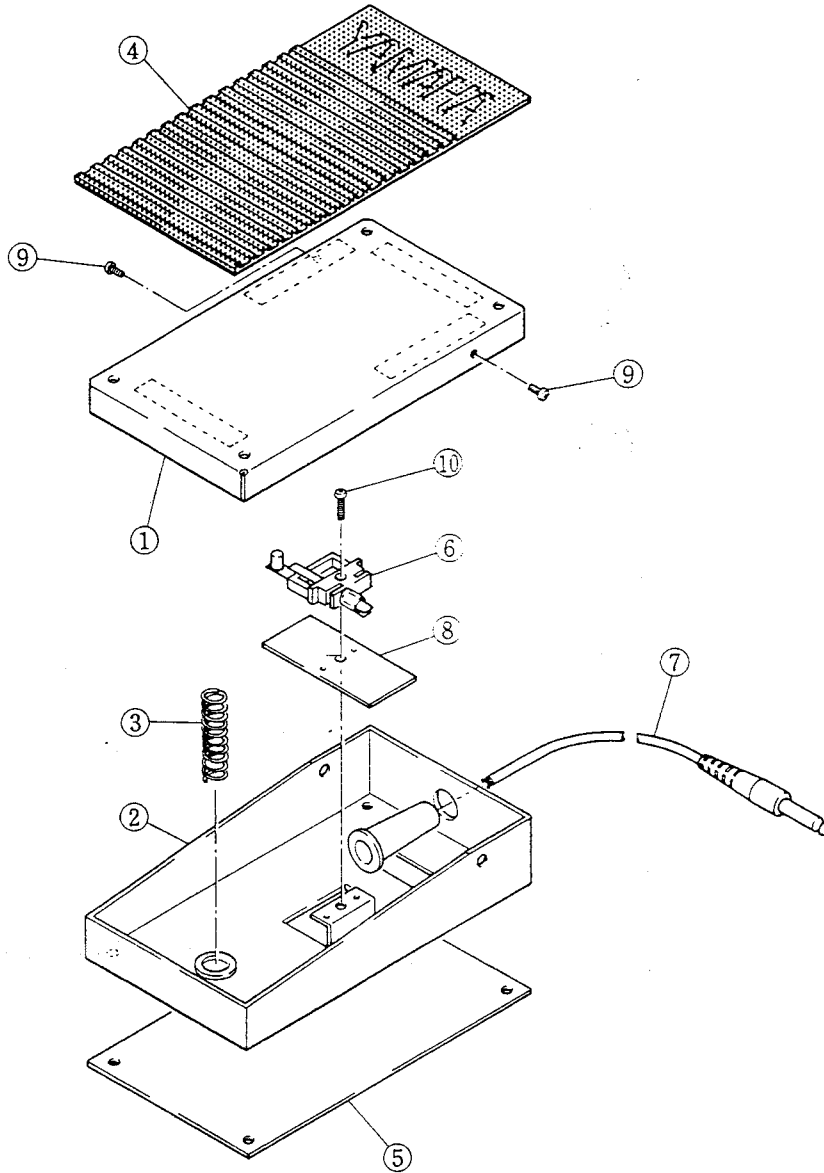
*Tastenkontakte kommt 42 13  
42 14*

af. o.	Part No.	Description	品名	Remarks	ランク
1	NB 827390	Keyboard Assembly	鍵盤 Ass'y		
2	NB 110010	Switch Unit, L	スイッチユニット		
3	NB 110020	Switch Unit, H	"		
4	CB 048340	Lock Flate	ロックプレート		
5	CC 030600	Felt, Keyboard Frame	フェルト		
6	CC 040240	Felt, Keyboard Frame	"		
7	CC 030670	Felt, Keyboard Frame	"		
8	AA 057990	Key Spring	鍵バネ		
9	NB 109890	White Key, C	白鍵	<i>96 S. Nr. 1956 NB109899</i>	
	NB 109900	White Key, D	"	<i>NB109901</i>	
	NB 109910	White Key, E	"	<i>NB109911</i>	
	NB 109920	White Key, F	"	<i>NB109921</i>	
	NB 109930	White Key, G	"	<i>NB109931</i>	
	NB 109940	White Key, A	"	<i>NB109941</i>	
	NB 109950	White Key, B	"	<i>NB109951</i>	
	NB 109960	White Key, A'	"	<i>A Task Links</i>	
	NB 109970	White Key, C'	"	<i>Letzk rechts</i>	
10	NB 110000	Black Key	黒鍵	<i>NB110001</i>	
11	CB 048330	Supporting Point Shaft	支点軸 (黒)	Black	
12	CB 048320	Supporting Point Shaft	" (白)	White	
13	NB 107120	Switch Assembly	スイッチ Ass'y	12Q	
14	NB 107160	Switch Assembly	"	4D	
	IF 003450	Diode	ダイオード	1S133	
	LB 606130	Contact	コネクター	20P	
	LB 920300	Contact	"	30P	
15	Ei 330166	Bind Head Tapping Screw	バインドタッピングネジ	M3 x 16 ZMC2-BL	
16	Ei 030066	Bind Head Tapping Screw	バインドタッピングネジ	3 x 6 ZMC2-Y	

ランク: Japan only

\* : New Parts

D. Sustainer Pedal (サステナーペダル)

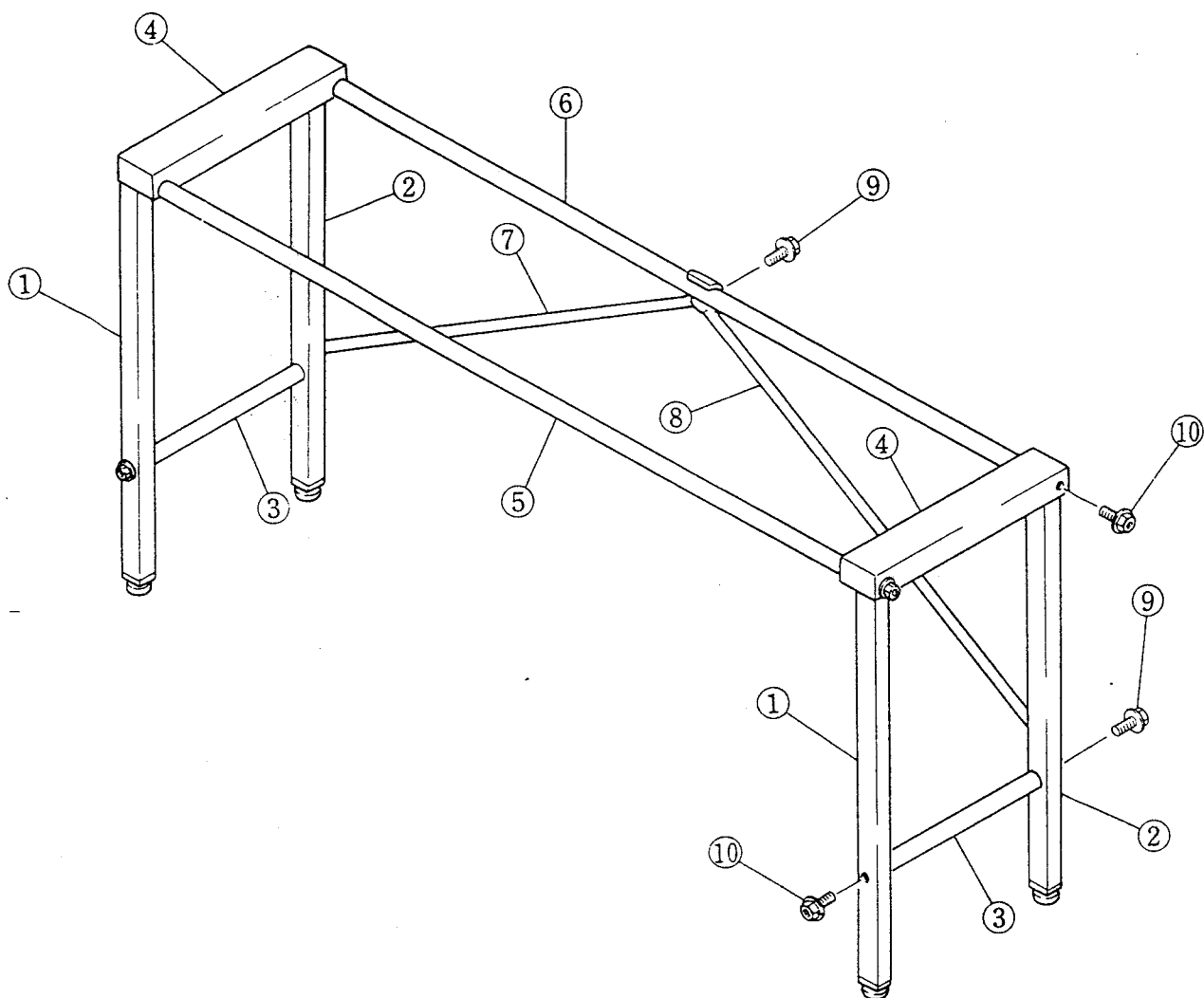


Ref. No.	Part No.	Description	品名	Remarks	ランク
1	AA 812880	Upper Case, Foot Pedal	ペダル上蓋		030
2	AA 812890	Bottom Case, Foot Pedal	ペダル底蓋		030
3	AA 812900	Spring	ペダルバネ		010
4	CB 815140	Rubber Mat, Upper	上蓋マット		030
5	CB 815150	Rubber Mat, Bottom	底蓋マット		030
6	NB 037150	Switch Assembly	スイッチアッセンブリー	1B	030
7	Mi 801120	Cord with Phone Plug	プラグ付コード		050
8	CA 800450	Washer	ファイバーワッシャー	CP-30	010
9	EK 003520	Pan Head Screw	段付小ネジ	M3 x 6 (6.5) ZMC2-BI	010
10	EA 030120	Pan Head Screw	ナベ小ネジ	M3 x 12 ZMC2-Y	010

\* : New Parts

ランク : Japan only

## E. Keyboard Stand ( キーボード スタンド ) LG - 50



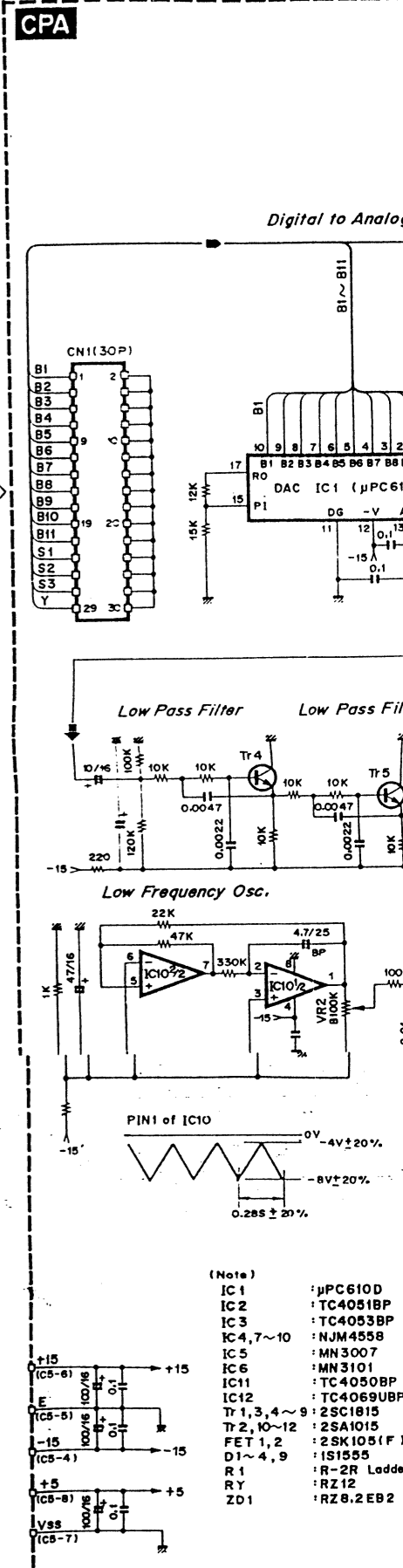
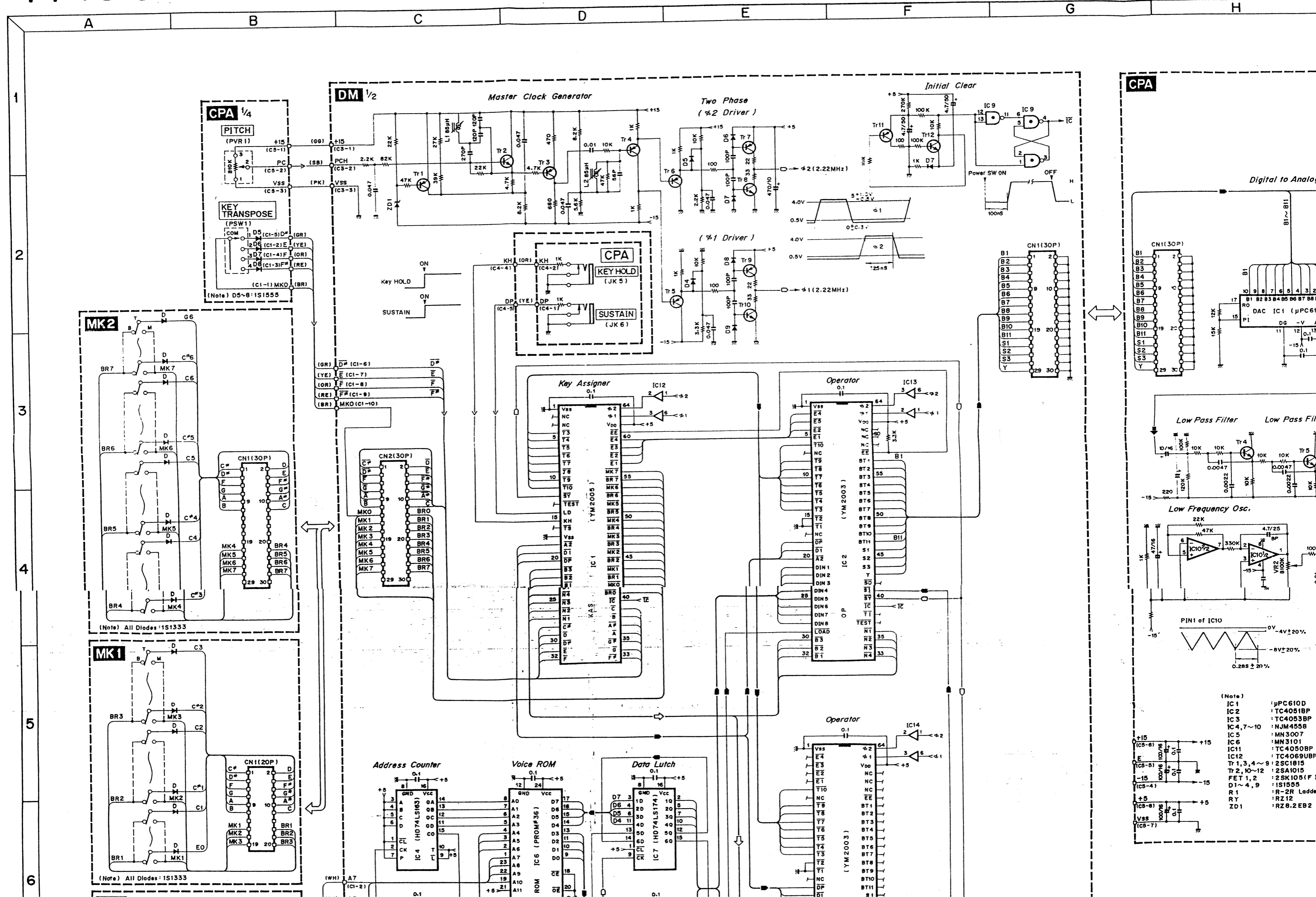
Q'ty. No.	Part No.	Description	品名	Remarks	ランク
1	AA 826510	Front Leg	前脚		08*
2	AA 826530	Rear Leg	後脚		08*
3	AA 826580	Leg Stay	脚ステー		05*
4	AA 826490	Stand	受台		07*
5	AA 826550	Side Stay	横ステー		07*
6	AA 826570	Side Stay - With metal plate	横ステー金具付		09*
7	AA 826600	Reinforcements Stay	補強用ステー		07*
8	AA 826660	Reinforcements Stay - with Nut	補強用ステーナット付		08*
9	EX 800050	Flange Bolt	6 x 12 ZMC2-BL	十字穴付フランジ付六角ボルト	01*
10	EX 800060	Flange Bolt	8 x 35 ZMC2-BL	"	01*

\* : New Parts

ランク : Japan only



# PF 15 OVERALL CIRCUIT DIAGRAM 006897



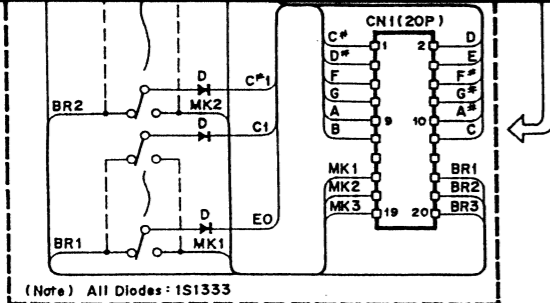
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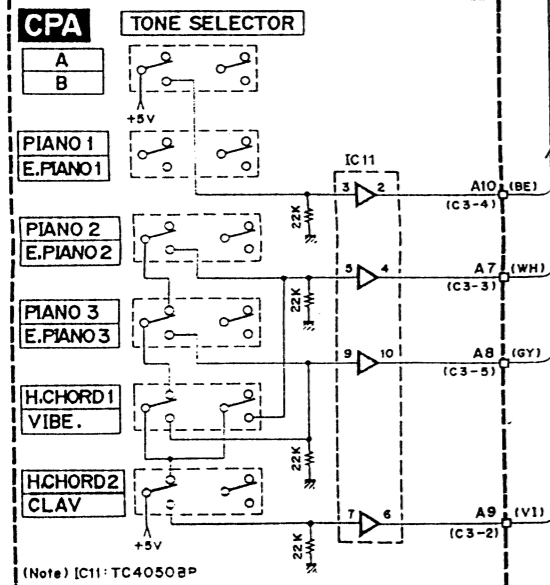
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9

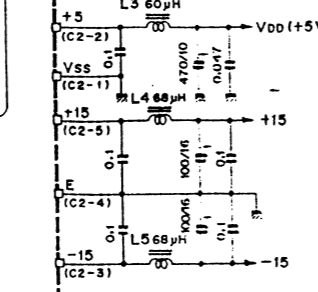
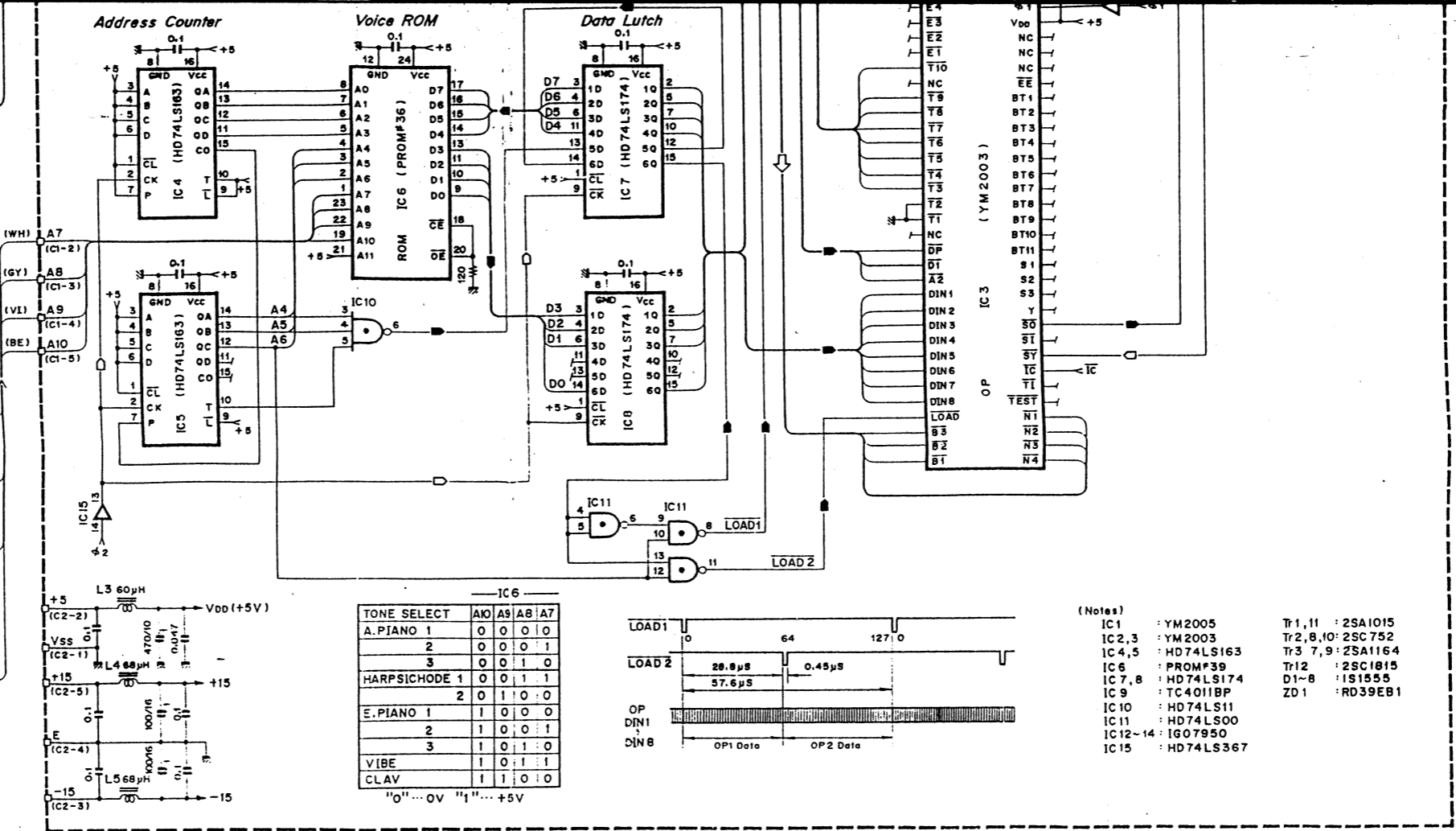
10



(Note) All Diodes: 1S1333



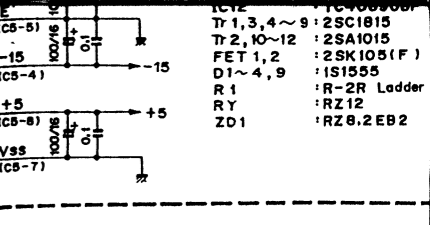
(Note) IC11: TC4050BP



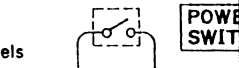
TONE SELECT	A10	A9	A8	A7
A.PIANO 1	0	0	0	0
2	0	0	0	1
3	0	0	1	0
HARPSICHODE 1	0	0	1	1
E.PIANO 1	1	0	0	0
2	1	0	0	1
3	1	0	1	0
VIBE	1	0	1	1
CLAV	1	1	0	0

"0" ... 0V "1" ... +5V

- (Notes)
- IC1 : YM2005
  - IC2,3 : YM2003
  - IC4,5 : HD74LS163
  - IC6 : PROM\*39
  - IC7,8 : HD74LS174
  - IC9 : TC4011BP
  - IC10 : HD74LS11
  - IC11 : HD74LS00
  - IC12-14 : IGO7950
  - IC15 : HD74LS367
  - T1,11 : 2SA1015
  - T2,8,10 : 2SC752
  - T3,7,9 : 2SA1164
  - T12 : 2SC1815
  - D1-8 : 1S1555
  - ZD1 : RD39EB1



US/Canadian Models



(Note) L1, L3: SN8S309 (GE) L2, L4: CK6 (GE)

DM

CPA

DC

C1

Pin No.	Pin Name	Wire Color	Destination
1	-	-	-
2	A7	WH	CPA-A7 (C3-2)
3	A8	GY	CPA-A8 (C3-3)
4	A9	VI	CPA-A9 (C3-4)
5	A10	BE	CPA-A10 (C3-5)
6	D#	GR	CPA-D# (C3-6)
7	E	YE	CPA-E (C3-7)
8	F	OR	CPA-F (C3-8)
9	F#	RE	CPA-F# (C3-9)
10	MKO	BR	CPA-MKO (C3-10)

C3

Pin No.	Pin Name	Wire Color	Destination
1	+15	GG	CPA+15 (C5-1)
2	PCH	SB	CPA-PCH (C5-2)
3	VSS	PK	CPA-VSS (C5-3)
4	VSS	-	-
5	VSS	-	-

C1

Pin No.	Pin Name	Wire Color	Destination
1	MKO	BR	DM-MKO (C1-10)
2	E	YE	DM-E (C1-7)
3	F#	RE	DM-F# (C1-9)
4	F	OR	DM-F (C1-8)
5	D#	GR	DM-D# (C1-6)

C3

Pin No.	Pin Name	Wire Color	Destination
1	-	-	-
2	A9	VI	DM-A9 (C1-4)
3	A7	WH	DM-A7 (C1-2)
4	A10	BE	DM-A10 (C1-5)
5	A8	GY	DM-A8 (C1-3)

C5

Pin No.	Pin Name	Wire Color	Destination
1	+15	GG	DM+15 (C3-1)
2	PCH	SB	DM-PCH (C3-2)
3	VSS	PK	DM-VSS (C3-3)
4	-15	YE	DC--15 (C6-7)
5	E	YE	DC-E (C6-5)
6	+15	ER	DC+15 (C6-2)
7	VSS	BL, WH	DC-VSS (C2-2)
8	+5	BE	DC+5 (C2-5)

C1

Pin No.	Pin Name	Wire Color	Destination
1	L01	SOR	CPA-L01 (C4-4)
2	E	SOR	CPA-E (C4-6)
3	L02	S V1	CPA-L02 (C4-5)
4	E	S V1	CPA-E (C4-7)
5	OUT1	SB	CPA-OUT1 (C2-6)
6	E	WH	CPA-E (C2-7)
7	OUT2	VI	CPA-OUT2 (C2-5)
8	E	GY	CPA-E (C2-8)

C6

Pin No.	Pin Name	Wire Color	Destination
1	-15	BR	DM--15 (C2-5)
2	-15	BE	CPA--15 (C5-6)
3	E	SL	DM-E (C2-4)
4	E	SL	EP1
5	E	SL	CPA-E (C5-5)
6	-15	VE	DM--15 (C2-3)
7	-15	YE	CPA--15 (C5-4)

C2

Pin No.	Pin Name	Wire Color	Destination
1	VSS	BL, WH	DC-VSS (C2-1)
2	+5	BE	DC+5 (C2-4)
3	-15	YE	DC--15 (C2-6)
4	E	BL	DC-E (C2-7)
5	+15	BR	DC+15 (C2-5)

C4

Pin No.	Pin Name	Wire Color	Destination
1	-	-	-
2	-	-	-
3	-	-	-
4	KH	OR	CPA-KH (C4-1)
5	DP	YE	CPA-DP (C4-2)

C2

Pin No.	Pin Name	Wire Color	Destination
1	SP2	RE	SP2-T2
2	SP1	WH	SP1-T2
3	E	BL	SP2-T1
4	E	BL	SP1-T1
5	OUT2	VI	DC-OUT2 (C1-7)
6	OUT1	SS	DC-OUT1 (C1-5)
7	E	WH	DC-E (C1-6)
8	E	GY	DC-E (C1-8)

C4

Pin No.	Pin Name	Wire Color	Destination
1	KH	OR	DM-KH (C4-4)
2	DP	YE	DM-DP (C4-5)
3	VSS	BL, WH	EP4
4	L01	SOR	DC-L01 (C1-1)
5	L02	S V1	DC-L02 (C1-3)
6	E	SOR	DC-E (C1-2)
7	E	S V1	DC-E (C1-4)

C2

Pin No.	Pin Name	Wire Color	Destination
1	VSS	BL, WH	DM-VSS (C2-1)
2	VSS	BL, WH	CPA-VSS (C5-7)
3	VSS	-	-
4	+5	BE	DM+5 (C2-2)
5	+5	BE	CPA+5 (C5-8)

A

B

C

D

E

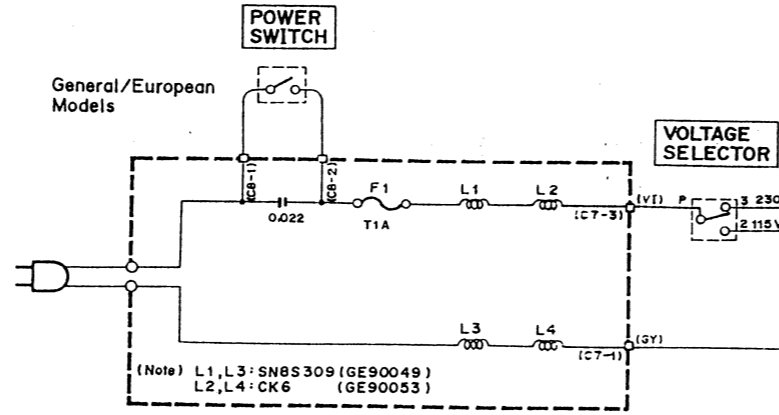
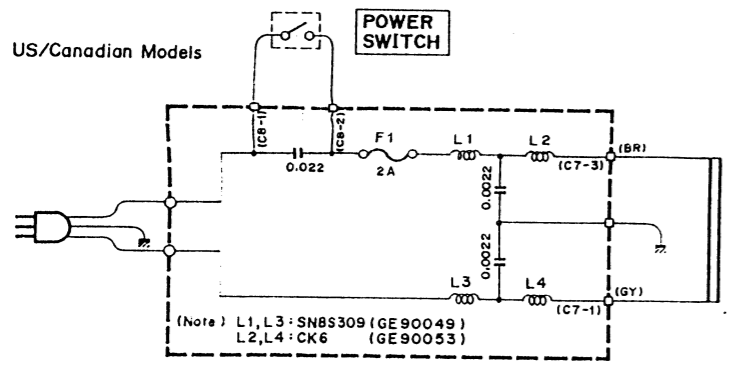
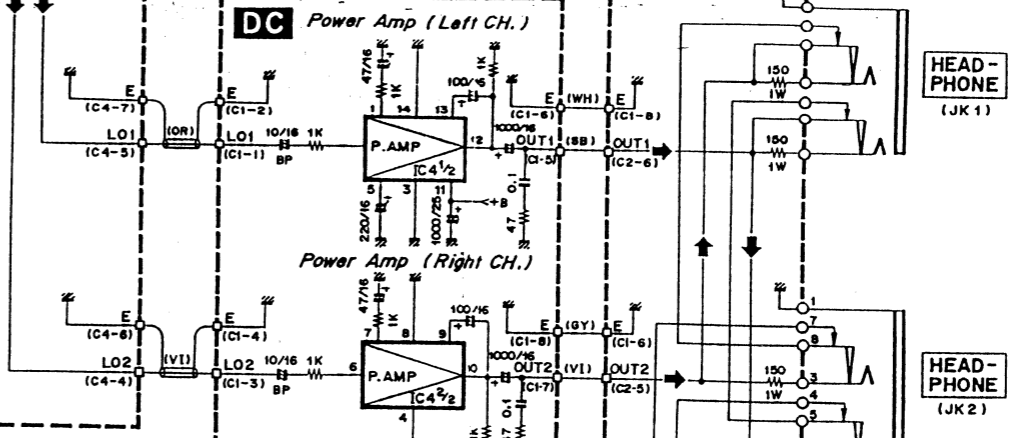
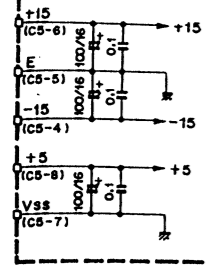
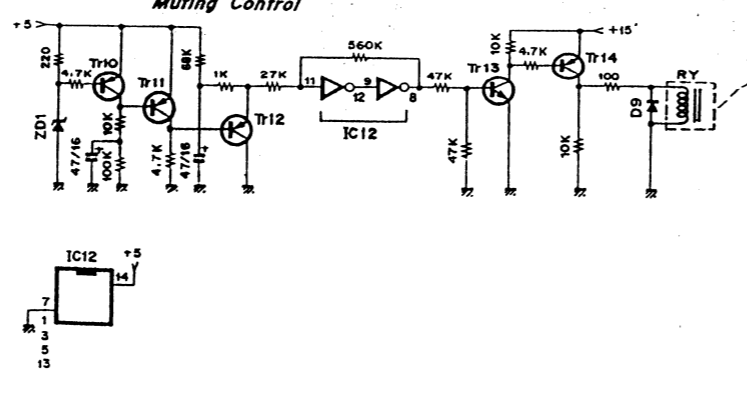
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G

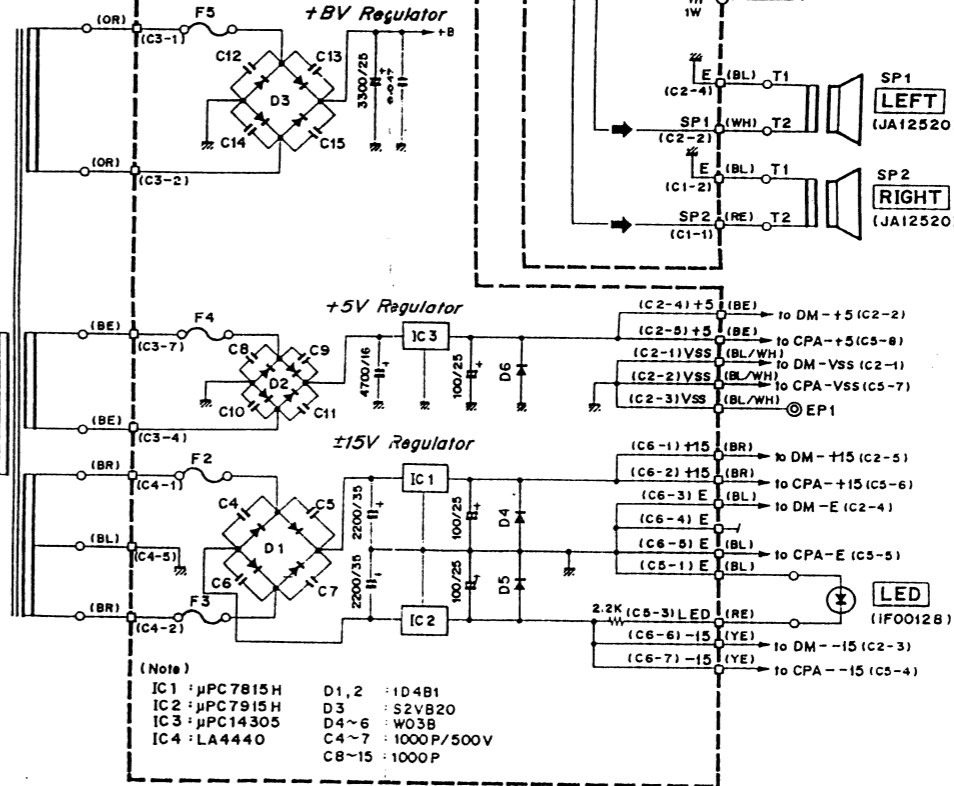
H



- (Note)
- IC1 :  $\mu$ PC610D
  - IC2 : TC4051BP
  - IC3 : TC4053BP
  - IC4,7~10 : NJM4558
  - IC5 : MN3007
  - IC6 : MN3101
  - IC11 : TC4050BP
  - IC12 : TC4069UBP
  - Tr 1,3,4~9 : 2SC1815
  - Tr 2,10~12 : 2SA1015
  - FET 1,2 : 2SK105(F)
  - D1~4,9 : 1S1555
  - R1 : R-2R Ladder Resistor Network (HZ237)
  - RY : RZ12
  - ZD1 : RZ9.2EB2



	US Canadian Models	General European Models
F2	1A	T1A
F3	1A	T1A
F4	1.6A	T1.6A
F5	2.5A	T2.5A

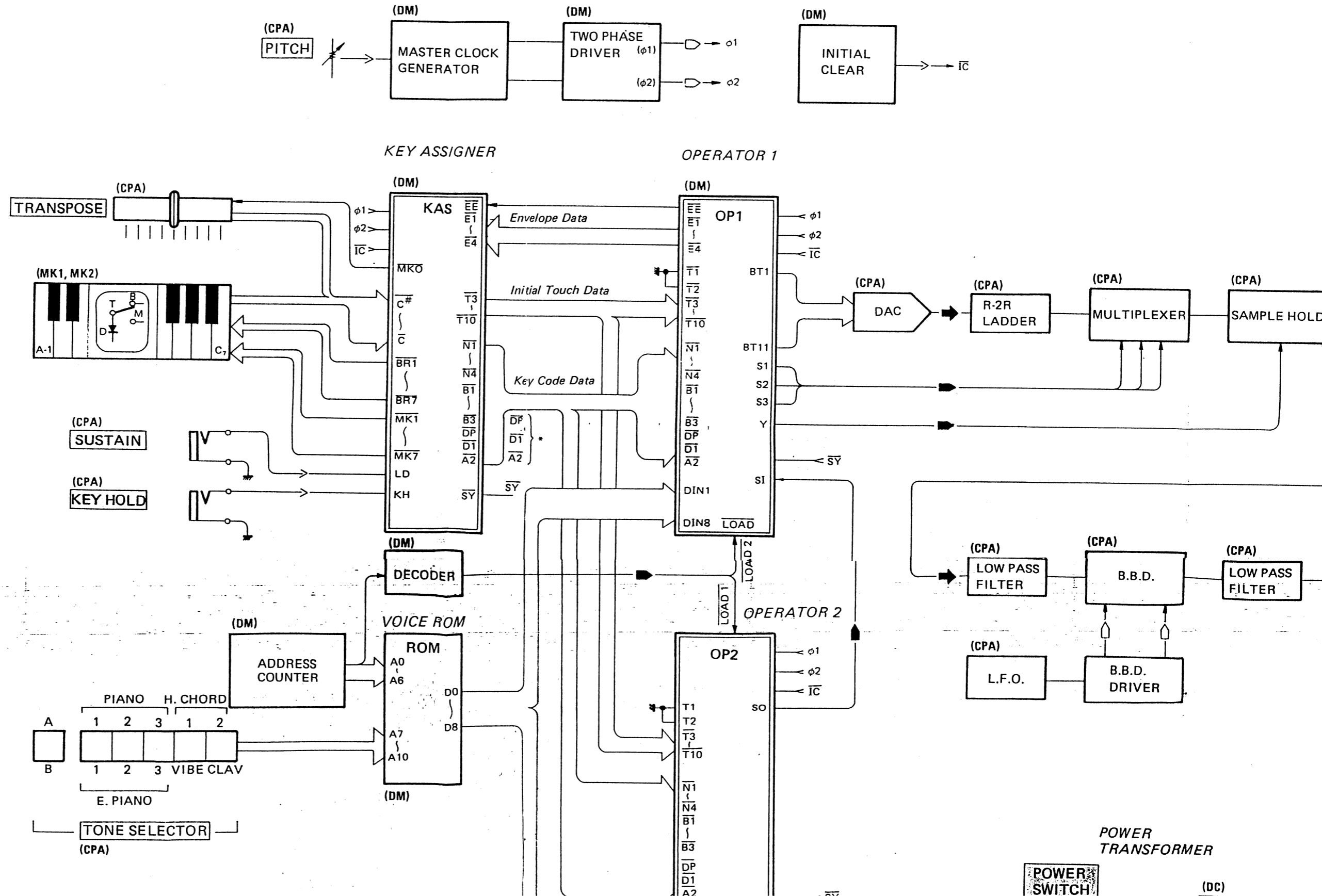
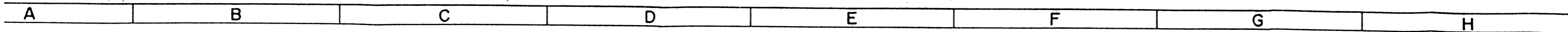


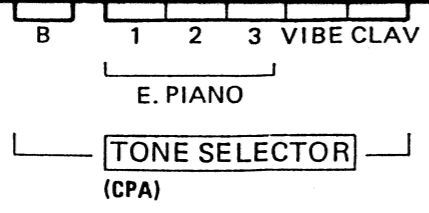
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SA1164  
SC1815  
1555  
39EB1

2

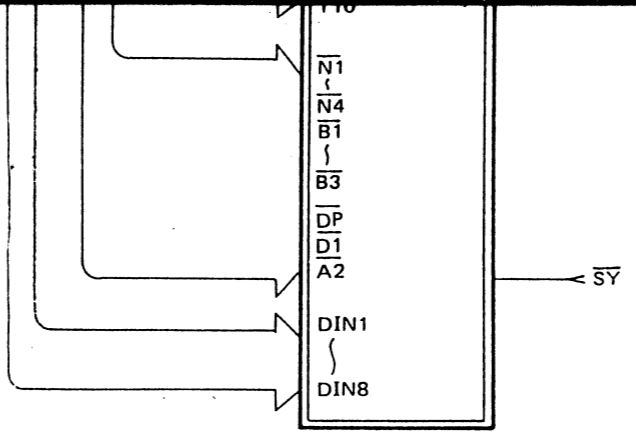
# 15 BLOCK DIAGRAM

006897

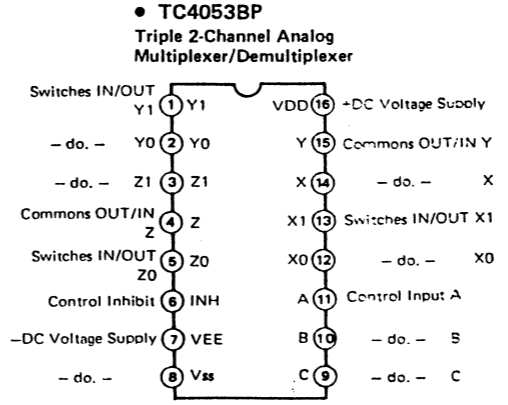
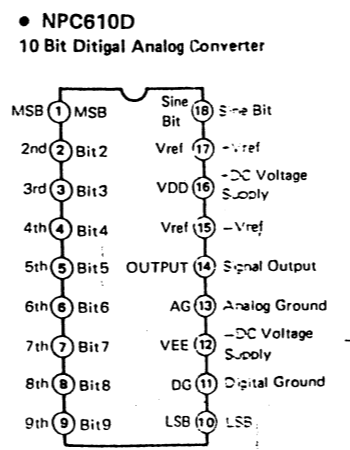
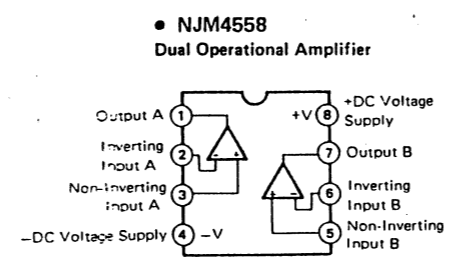
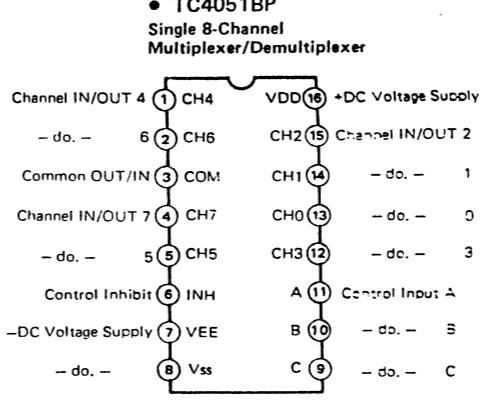
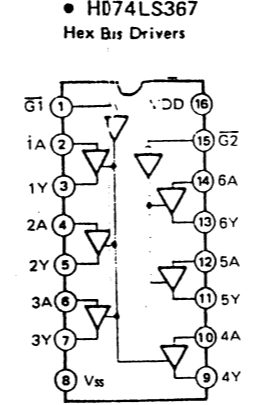
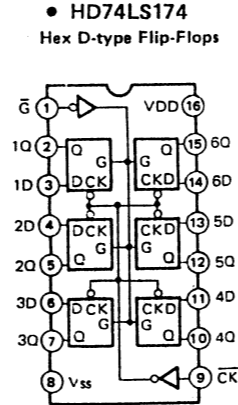
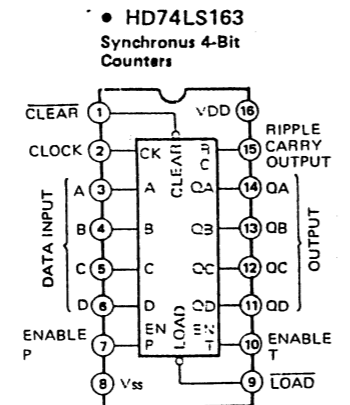
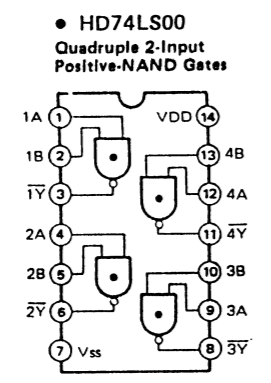
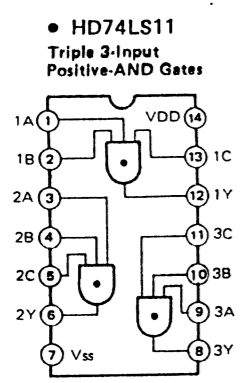
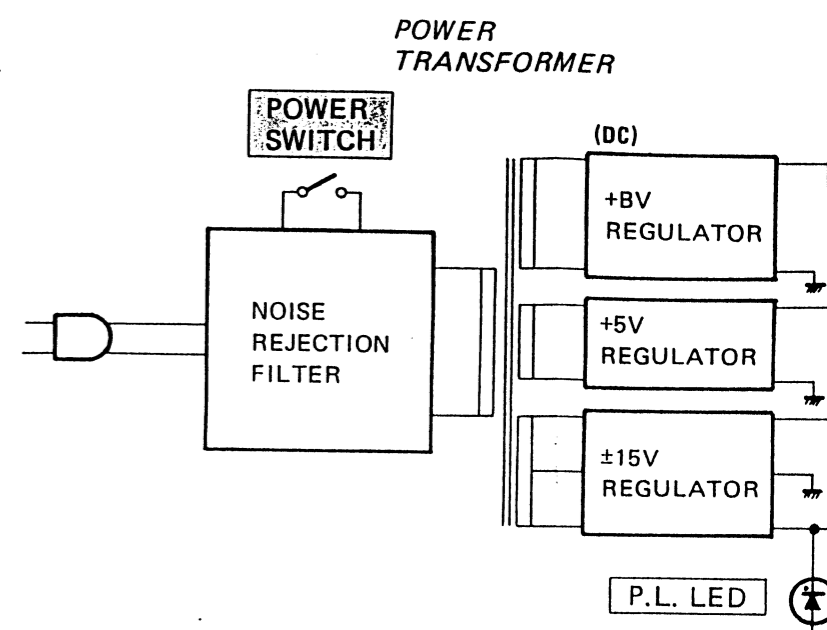




A10  
(DM)



$\overline{D1}$  : Decay Data  
 $\overline{DP}$  : Damp Data  
 $\overline{A1}$  : Channel Occupancy Data



6

7

8

9

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