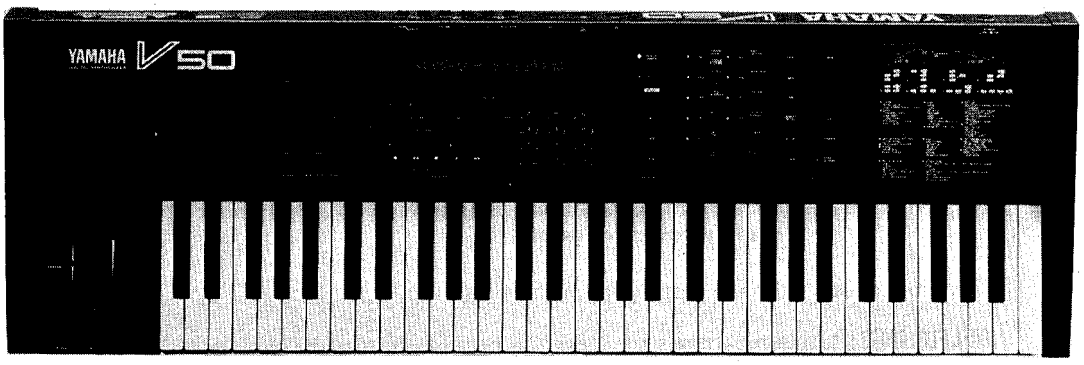
DIGITAL SYNTHESIZER

V50

SERVICE MANUAL



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LM 006900

YAMAHA CORP.
HAMAMATSU. JAPAN
2.98K-955 Ⓟ ⓘ Printed in Japan '89.3

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 inherent 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, 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 changes in specification 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.

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.

ADVARSEL!

Lithiumbatteri. Eksplosionsfare.

Udskiftning må kun foretages af en sagkyndig, og som beskrevet i servicemanualen.

■ SPECIFICATIONS

● Synthesizer section

Keyboard:	61-note (C1 – C6), velocity and pressure sensitive
Tone generators:	4-operator 8-algorithm FM, 8 selectable waveforms
Polyphony:	16 notes maximum simultaneous, last note priority, 8-voice multi-timbral
Internal memory:	100 internal voices 100 preset voices 100 internal performances 100 preset performances 12 (3 types × 4 each) performance effects (delay, pan, chord) 2 micro tuning (octave, full) program change table system setup

● Sequencer section

Tracks:	8 (maximum 16 note polyphony/track, maximum 32 note total polyphony for all tracks)
Songs:	8
Resolution:	192th note (internal clock) 96th note (MIDI clock) 32nd note (step record)
Internal memory:	64Kbyte (approximately 16,000 notes)

● Rhythm section

Tone generation:	PCM
Polyphony:	8 notes
Internal memory:	100 preset patterns 100 internal patterns

● Other

Digital effects:	32 types (parameters programmable for each voice and performance)
Terminals:	OUTPUT L/MONO, OUTPUT R, VOLUME, FC, FS, START/STOP, MIDI IN, OUT, THRU, BREATH CONTROL, PHONES
Display:	40 character 2 line, backlit
Power consumption:	25 W
Power requirements:	USA and Canadian model; 120 V 60Hz General model; 220 – 240 V 50 Hz
Dimensions (W × D × H):	1002 mm × 326 mm × 98 mm (3' 3 1/2" × 1' 7/8" × 3' 7/8")
Weight:	11.2 Kg (24 lbs 11 oz)

■ 総合仕様

●操作スイッチ

PITCH BEND WHEEL, MODULATION WHEEL, VOLUME, DATA ENTRY/TEMPO
ファンクションキー８個
SEQ, RHYTHM, JOB, REC, BWD, STOP, START, FWD
-, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, -1/NO, +1/YES
PERFORMANCE, SINGLE, INT, CARD, PRESET
TR1, TR2, TR3, TR4, TR5, TR6, TR7, TR8, RHY およびブランクキー３個
CARD, MIDI, DISK, MEMORY PROTECT, SETUP, OTHERS
DEMO, STORE/COPY, COMPARE, EFFECT BYPASS

●リアーパネル

OUTPUT L/MONO, OUTPUT R, VOLUME, FC, FS, START/STOP
MIDI IN, OUT, THRU

●フロントパネル

BREATH CONTROL
PHONES

●ディスプレイ

LCD(40文字×２行、バックライト付き)

●電源

AC100V 50/60 Hz

●消費電力

15W

●寸法

1002mm× 326mm× 98mm (W×D×H)

●重量

11.0 Kg

★仕様および外観は、改良のため予告なく変更することがあります。

●シンセサイザー部

鍵盤	61鍵 (C1～C6)	
	イニシャルタッチ、アフタータッチ付き	
音源方式	４オペレータ、８アルゴリズム FM音源	
発音数	最大同時16音 後着優先 (最大８音色同時発音可能)	
内部メモリー	インターナルボイス	100 種類
	プリセットボイス	100 種類
	インターナルパフォーマンス	100 種類
	プリセットパフォーマンス	100 種類
	ﾊﾟﾌｫｰﾏﾝｽｴﾌｪｸﾄﾃﾞｰﾀ (delay, pan, chord)	12 種類 (３種×４)
	マイクロチューニング (octave, full kbd)	2 種類
	プログラムチェンジテーブル	1 種類
	システムセットアップ	1 種類
外部メモリー	カード	
	ディスク(3.5インチ 2DD)	

●シーケンサー部

トラック	８トラック (16音ポリ／トラック、32音ポリ／全トラック)
ソング	８ソング
入力方式	リアルタイム (リプレース、オーバーダブ) 、ステップ、パンチイン
分解能	192分音符 (内部クロック使用時)
	96分音符 (MIDIクロック使用時)
	32分音符 (ステップ録音時)
内部メモリー	64 Kbyte (約 16000音) (ノンバックアップ)
外部メモリー	ディスク(3.5インチ 2DD)

●リズムマシン部

音源方式	PCM音源	
発音数	最大同時８音	
入力方式	リアルタイム、ステップ	
分解能	192分音符 (内部クロック使用時)	
	96分音符 (MIDIクロック使用時)	
内部メモリー	プリセットパターン	100 種類
	インターナルパターン (ノンバックアップ)	100 種類
外部メモリー	カード	
	ディスク(3.5インチ 2DD)	

●エフェクト部

デジタルエフェクト	32種類内蔵 (パラメーターは、各ボイス、パフォーマンス毎に設定可能)

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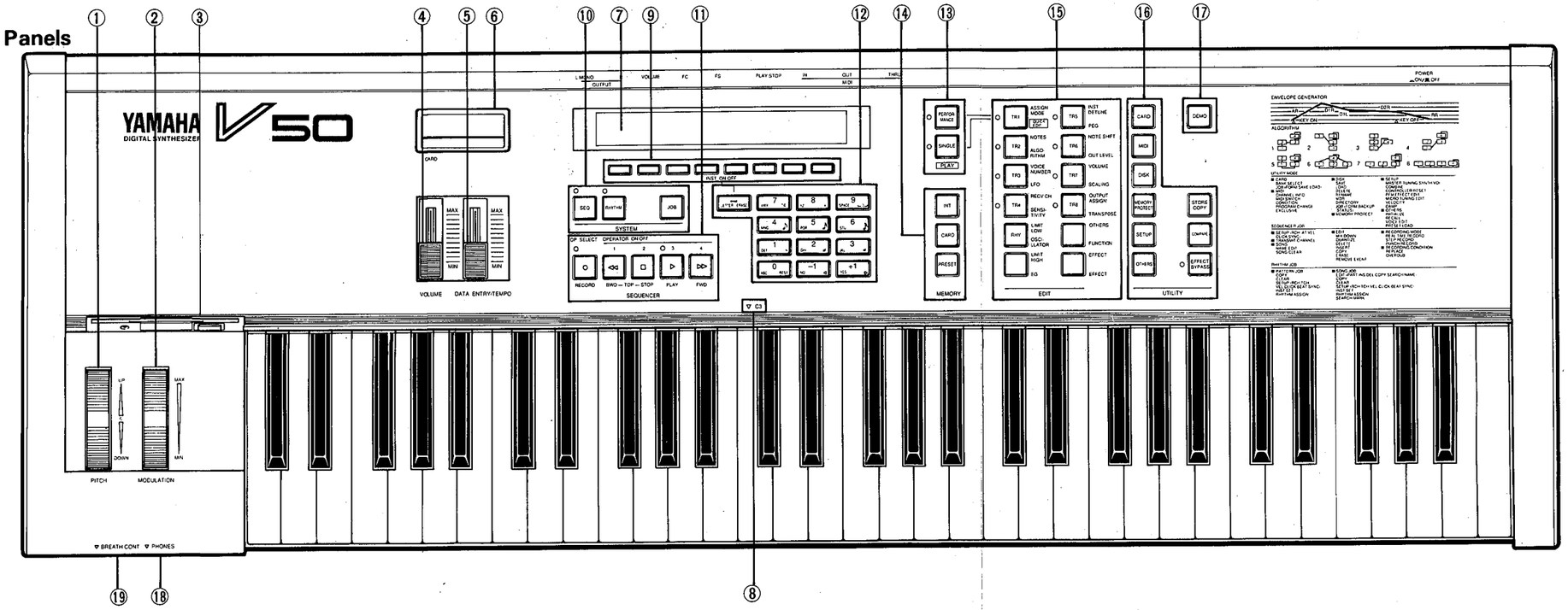
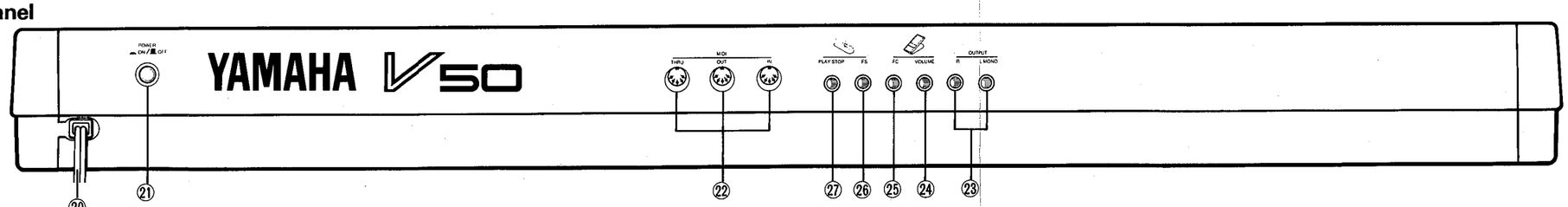
■ PANEL LAYOUT（パネルレイアウト）

● Front Panels



● Rear Panel



● Front panels

① Pitch bend wheel (PITCH)
② Modulation wheel (MODULATION)
③ Floppy disk drive
④ Volume slider (VOLUME)
⑤ Data entry slider (DATA ENTRY/TEMPO)
⑥ Card slot (CARD)
⑦ Display
⑧ C3 key mark
⑨ Function keys
⑩ System keys (SYSTEM)
⑪ Sequencer, rhythm machine keys (SEQUENCER)
⑫ Numeric keys
⑬ Play keys (PLAY)
⑭ Memory keys (MEMORY)
⑮ Edit keys (EDIT)
⑯ Utility keys (UTILITY)
⑰ Demo key (DEMO)
⑱ Headphone output (PHONES)
⑲ Breath controller jack (BREATH CONT)

●フロントパネル

① ピッチベンドホイール(PITCH)
② モジュレーションホイール(MODULATION)
③ フロッピーディスクドライブ
④ ボリュームスライダー(VOLUME)
⑤ データエントリースライダー(DATA ENTRY/TEMPO)
⑥ カードスロット(CARD)
⑦ ディスプレイ
⑧ C3キーマーク
⑨ ファンクションキー
⑩ システムキー(SYSTEM)
⑪ シーケンサー, リズムマシンキー(SEQUENCER)
⑫ テンキー
⑬ プレイキー(PLAY)
⑭ メモリーキー(MEMORY)
⑮ エディットキー(EDIT)
⑯ ユーティリティーキー(UTILITY)
⑰ デモキー(DEMO)
⑱ ヘッドホン端子(PHONES)
⑲ ブレスコントローラ端子(BREATH CONT)

● Rear panel

⑳ Power cable
㉑ Power switch (POWER)
㉒ MIDI terminals (MIDI IN, OUT, THRU)
㉓ Audio Outputs (L/MONO, R)
㉔ Volume pedal jack (VOLUME)
㉕ Foot controller jack (FC)
㉖ Foot switch jack (FS)
㉗ Sequencer switch jack (PLAY/STOP)

● リアパネル

⑳ 電源コード
㉑ パワースイッチ(POWER)
㉒ MIDI端子(MIDI IN, OUT, THRU)
㉓ アウトプット端子(L/MONO, R)
㉔ ボリュームペダル端子(VOLUME)
㉕ フットコントローラ端子(FC)
㉖ フットスイッチ端子(FS)
㉗ シーケンサースイッチ端子(PLAY/STOP)

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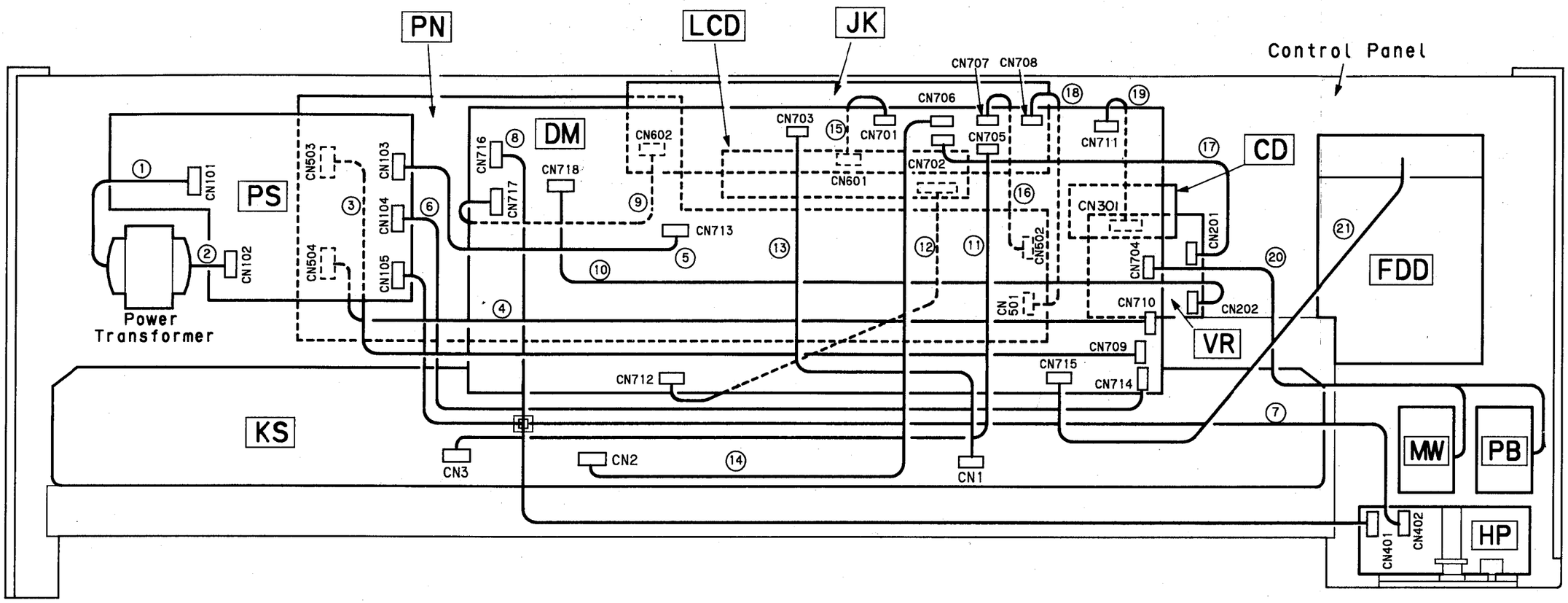
■CIRCUIT BOARD LAYOUT & WIRING（ユニットレイアウト&結線図）



※Circuit boards are located on the under side of the Control panel.
（各シートは、コントロールパネルの裏側に取り付けられています。）

WIRING

No.	Pins	Destination	Remarks
1	4	PS-CN101 ↔ Power Transformer	
2	5	PS-CN102 ↔ Power Transformer	
3	14	DM-CN709 ↔ PN-CN503	
4	15	DM-CN710 ↔ PN-CN504	
5	8	DM-CN713 ↔ PS-CN103	
6	4	DN-CN714 ↔ PS-CN104	
7	2	PS-CN105 ↔ HP-CN402	
8	5	DM-CN716 ↔ HP-CN401	
9	4	DM-CN717 ↔ JK-CN602	
10	9	DM-CN718 ↔ VR-CN202	
11	12	DM-CN705 ↔ KS-CN3	
12	15	DM-CN712 ↔ LCD	
13	4	DM-CN703 ↔ KS-CN1	
14	11	DM-CN706 ↔ KS-CN2	
15	13	DM-CN701 ↔ JK-CN601	
16	12	DM-CN707 ↔ PN-CN502	
17	3	DM-CN702 ↔ VR-CN201	
18	6	DM-CN708 ↔ PN-CN501	
19	40	DM-CN711 ↔ CD-CN301	Flat Cable
20	5	DM-CN704 ↔ PB/MW	
21	26	DM-CN715 ↔ FDD	Flat Cable

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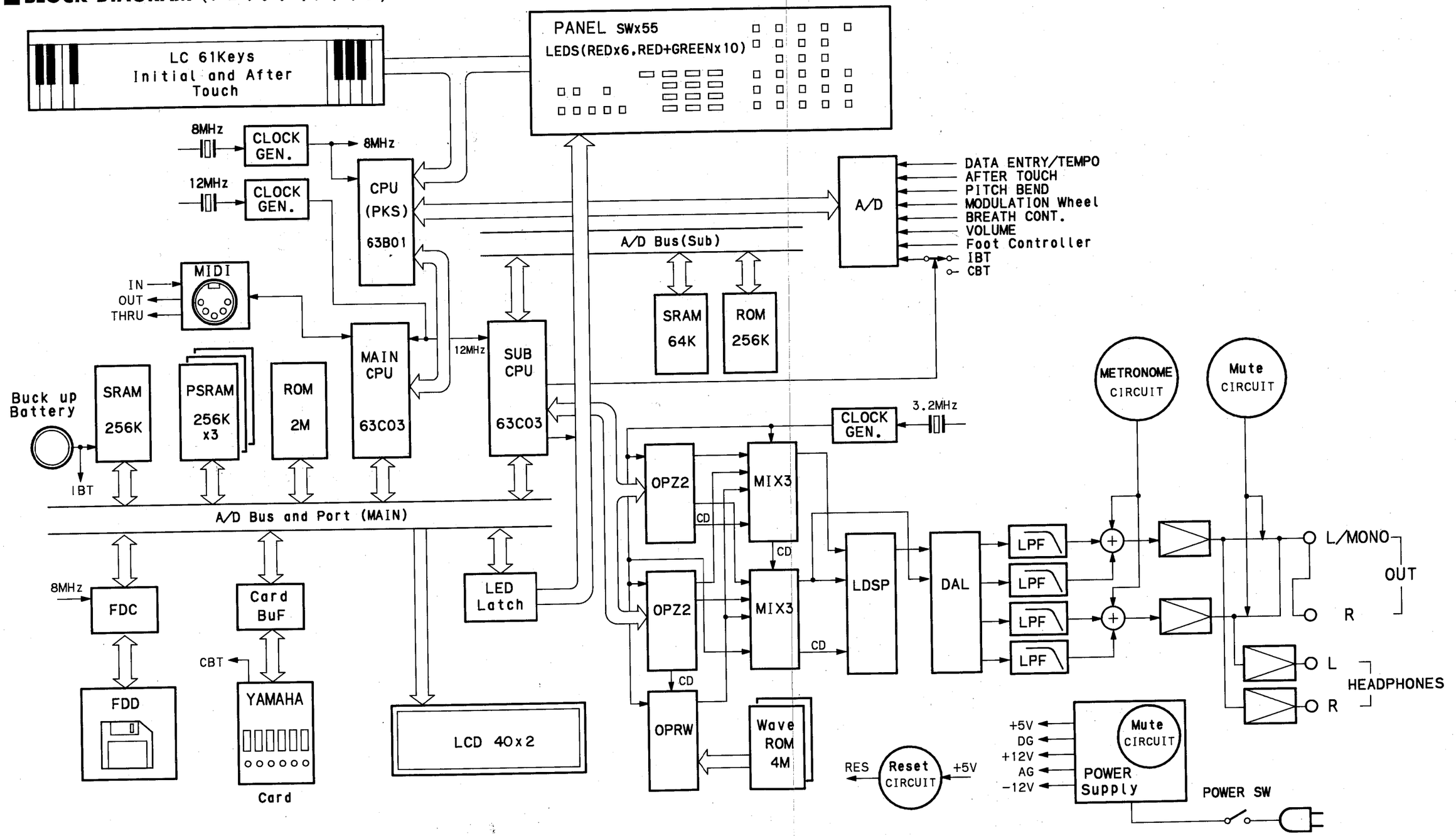
■BLOCK DIAGRAM（ブロックダイアグラム）



■LSI DATA TABLE (LSI端子機能表)

• HD63B01Y (XD681001) CPU

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	Vss		Ground	33	Vcc		DC Supply (+5V)
2	XTAL	I	Clock (8MHz)	34	P47	O	Port 4
3	EXTAL	I		35	P46	O	
4	MP0	I	Mode program	36	P45	O	
5	MP1	I		37	P44	O	
6	$\overline{RES}$	I	Reset	38	P43	O	
7	$\overline{STBY}$	I	Stand-by mode signal	39	P42	O	
8	$\overline{NMI}$	I	Non-maskable interrupt	40	P41	O	
9	P20	I/O	Port 2	41	P40	O	
10	P21	I/O		42	Vss		Ground
11	P22	I/O		43	P17	O	Port 1
12	P23	I/O		44	P16	O	
13	P24	I/O		45	P15	O	
14	P25	I/O		46	P14	O	
15	P26	I/O		47	P13	O	
16	P27	I/O		48	P12	O	
17	P50	I/O	Port 5	49	P11	O	
18	P51	I/O		50	P10	O	
19	P52	I/O		51	P37	I/O	Port 3
20	P53	I/O		52	P36	I/O	
21	P54	I/O		53	P35	I/O	
22	P55	I/O		54	P34	I/O	
23	P56	I/O		55	P33	I/O	
24	P57	I/O		56	P32	I/O	
25	P60	I/O	Port 6	57	P31	I/O	
26	P61	I/O		58	P30	I/O	
27	P62	I/O		59	P74	O	Port 7
28	P63	I/O		60	P73	O	
29	P64	I/O		61	P72	O	
30	P65	I/O		62	P71	O	
31	P66	I/O		63	P70	O	
32	P67	I/O		64	E	O	Enable

• HD63C01Y0F64P (XF148A00) CPU

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	Vss	I	Ground	33	Vcc		DC Supply (+5V)
2	XTAL	I	Clock (8MHz)	34	A15	O	Address bus
3	EXTAL	I		35	A14	O	
4	MP0	I	Mode program	36	A13	O	
5	MP1	I		37	A12	O	
6	$\overline{RES}$	I	Reset	38	A11	O	
7	$\overline{STBY}$	I	Stand-by mode signal	39	A10	O	
8	$\overline{NMI}$	I	Non-maskable interrupt	40	A9	O	
9	P20	I/O	Port 2	41	A8	O	
10	P21	I/O		42	Vss		Ground
11	P22	I/O		43	A7	O	Address bus
12	P23	I/O		44	A6	O	
13	P24	I/O		45	A5	O	
14	P25	I/O		46	A4	O	
15	P26	I/O		47	A3	O	
16	P27	I/O		48	A2	O	
17	P50	I/O	Port 5	49	A1	O	
18	P51	I/O		50	A0	O	
19	P52	I/O		51	D7	I/O	Data bus
20	P53	I/O		52	D6	I/O	
21	P54	I/O		53	D5	I/O	
22	P55	I/O		54	D4	I/O	
23	P56	I/O		55	D5	I/O	
24	P57	I/O		56	D2	I/O	
25	P60	I/O	Port 6	57	D1	I/O	
26	P61	I/O		58	D0	I/O	
27	P62	I/O		59	$\overline{BA}$	O	Bus available
28	P63	I/O		60	$\overline{LIR}$	O	Load instruction resistor
29	P64	I/O		61	R/$\overline{W}$	O	Read/Write control
30	P65	I/O		62	$\overline{WR}$	O	Write
31	P66	I/O		63	$\overline{RD}$	O	Read
32	P67	I/O		64	E	O	Enable

• M58990P-1 (IG106100) Analog Digital Converter

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	IN3	I	Analog data in	15	2-6	O	Digital data output
2	IN4	I		16	REF(−)		Reference voltage (−)
3	IN5	I		17	2-8	O	Digital data output
4	IN6	I		18	2-4	O	
5	IN7	I		19	2-3	O	
6	START	I	Start data in	20	2-2	O	
7	EOC	O	End of conversion data output	21	2-1	O	
8	2-5	O	Digital data output	22	ALE	I	Address latch enable data in
9	OE	I	Output enable data in	23	ADD C	I	Address data in
10	CLK	I	Clock data in	24	ADD B	I	
11	REF (+)		Reference voltage (+)	25	ADD A	I	
12	Vcc		Supply power (+5V)	26	IN 0	I	Analog data in
13	GND		Supply power (0V)	27	IN 1	I	
14	2-7	O	Digital data output	28	IN 2	I	

• WD1772PH-02 (XB623001) Floppy Disk Controller/formatter

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	$\overline{CS}$	I	Chip select	15	Vcc		Power supply
2	R/$\overline{W}$	I	Read/Write control	16	STEP	O	Step pulse
3	A0	I	Address bus	17	DIRC	O	Direction control
4	A1	I		18	CLK	I	Clock IN
5	D0	I/O	Data access lines	19	$\overline{RD}$	I	Read data
6	D1	I/O		20	MO	O	Motor ON
7	D2	I/O		21	WG	O	Write gate
8	D3	I/O		22	$\overline{WD}$	O	Write data
9	D4	I/O		23	$\overline{TR00}$	I	Track 00 signal
10	D5	I/O		24	$\overline{IP}$	I	Index pulse
11	D6	I/O		25	$\overline{WPRT}$	I	Write protect
12	D7	I/O		26	$\overline{DDEN}$	I	Double density request
13	$\overline{MR}$	I	Master reset	27	DRQ	O	Data request
14	Vss		Ground	28	INTRQ	O	Interrupt request

• YM2424 (XF171A00) OPZ2 (FM Tone Generator)

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	Vss		Ground	13	D_2	I/O	Data bus
2	$\overline{IRQ}$	O	Interrupt request	14	D_3	I/O	
3	$\overline{IC}$	I	Initial clear	15	D_4	I/O	
4	A0	I	Address bus	16	D_5	I/O	
5	$\overline{WR}$	I	Write control	17	D_6	I/O	
6	$\overline{RD}$	I	Read control	18	D_7	I/O	
7	$\overline{CS}$	I	Chip select	19	SYW	O	Synchronization signal
8	So_1	O	Serial data output	20	CDO	O	CD output
9	CRS	O	CD counter reset	21	SDO	O	Serial data output
10	D_0	I/O	Data bus	22	V_{DD}		DC supply
11	Vss		Ground	23	$\phi 1$	I	Synchro pulse
12	D_1	I/O	Data bus	24	ϕM	I	Clock

• YM3017 (XA800001) DAC Logic

Pin No.	Name	I/O	Function	Pin No.	Name	I/O	Function
1	VDD		Digital Power supply	13	to Buff	O	Analog output to buffer amp.
2	SYN	I	System synchro pulse	14	MP	I	Middle point 1/2 VDD bias
3	DGND		Digital ground	15	RC	O	Bias compensation
4	CLK	I	Clock	16	RB	O	Bias-R
5	$\overline{CRASH}$	O	Crash detect	17	AGND		Analog ground
6	ZERO4	O	Zero detect	18	AVDD		Analog power supply
7	OUT4	O	Analog signal output	19	LMTER	I	Limiter Enable
8	OUT3	O		20	IN1	I	Digital data input
9	OUT2	O		21	IN2	I	
10	OUT1	O		22	SEL1	I	Data shift
11	AS	I	Chip test	23	SEL2	I	
12	COM	I	Analog input from buffer amp.	24	$\overline{IC1}$	I	Initial clear

• YM3413 (XE449A00) LDSP (L-Digital Signal Processor)

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	VDD		DC supply	21	A5	O	Address bus
2	D7	I/O	Data bus	22	A6	O	
3	D6	I/O		23	A7	O	
4	D5	I/O		24	A8	O	
5	D4	I/O		25	A9	O	
6	D3	I/O		26	A10	O	
7	D2	I/O		27	A11	O	
8	D1	I/O		28	A12	O	
9	D0	I/O		29	A13	O	
10	SI0	I	Serial data input	30	A14	O	
11	SI1	I		31	A15	O	
12	SYN	I	Synchro pulse	32	A16	O	
13	$\overline{WE}$	O	Write enable	33	OUT	O	Serial data output
14	$\overline{OE}$	O	Output enable	34	XCLK		Clock
15	A0	O	Address bus	35	$\overline{IC}$	I	Initial Clear
16	A1	O		36	$\overline{CRS}$	I	CD counter reset
17	A2	O		37	CDI	I	CD input
18	A3	O		38	CDo	O	CD output
19	A4	O		39	SO1	O	Serial data output
20	Vss		Ground	40	CLK		Clock

• YM3602 (XA802001) OPRW (Operator)

Pin No.	Name	I/O	Function	Pin No.	Name	I/O	Function
1	V_{DD}	I	Power supply +5V	40	SYW	I	31-62Y64
2	CDO	O	Cascade output pin for serial control data	39	$\overline{CS}$	O	Chip select
3	CDI	I	CD data input terminal	38	CLK	I	Master clock 3.2MHz
4	$\overline{CRS}$	I	CD counter reset	37	XCLK	I	Control data transmit clock
5	XMD	I	When CDI and XCLK are asynchronous, this is 'H'	36	$\overline{IC}$	I	Initial clear
6	D7	I	Data bus for external memory	35	A18	O	Address bus for external memory
7	D6	I		34	A17	O	
8	D5	I		33	A16	O	
9	D4	I		32	A15	O	
10	D3	I		31	A14	O	
11	D2	I		30	A13	O	
12	D1	I		29	A12	O	
13	D0	I		28	A11	O	
14	SOUT	O	Serial signal output	27	A10	O	
15	SRIN	I	Serial signal input	26	A9	O	
16	A0	O	Address bus for external memory	25	A8	O	
17	A1	O		24	A7	O	
18	A2	O		23	A6	O	
19	A3	O		22	A5	O	
20	V_{SS}	I	Power supply ground	21	A4	O	

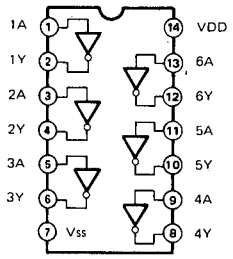
• MIX3 (IG156010) Mixer

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	M1	I	Serial input 1	9	$\overline{RES}$	I	Reset (Initial clear)
2	M2	I	Serial input 2	10	NC		Not used
3	M3	I	Serial input 3	11	MXO	O	Serial output
4	M4	I	Serial input 4	12	MXC	I	Cascade input, unused, GND
5	$\underline{CDI}$	I	Control data input	13	SYW	I	Synchronization signal input
6	$\overline{CRS}$	I	CD synchronization signal input (Counter reset)	14	XCLK	I	Clock input
				15	CLK	I	Master clock
7	CDO	O	Control data output	16	VDD	I	+5 V
8	VSS	I	GND				

■IC BLOCK DIAGRAM (ICブロック図)

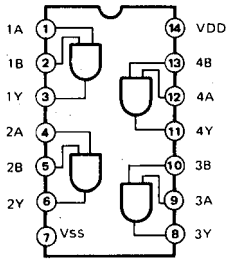
- **SN74HC04N** (IR000450)
- **TC40H004P** (IG051000)

Hex Inverter



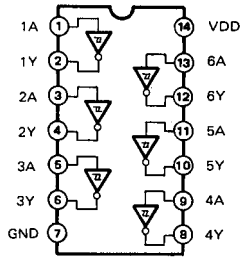
- **SN74HC08N** (IR000850)

Quad 2 Input AND



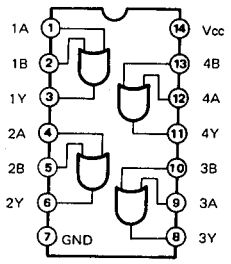
- **M74HC14P** (IR001480)

Hex Inverter



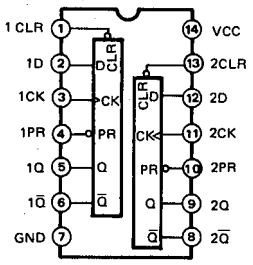
- **SN74HC32N** (IR003250)

Quad 2 Input OR



- **SN74HC74N** (IR007450)

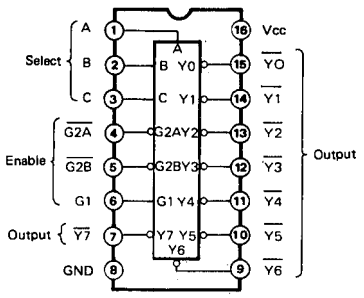
Dual D-Type Flip-Flop



INPUTS				OUTPUTS	
PR	CLR	CLK	D	Q	Q̄
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H	H
H	H	↑	H	H	L
H	H	↑	L	L	H
H	H	L	X	Q_0	$\bar{Q}_0$

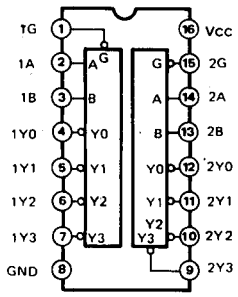
- **SN74HC138N** (IR013850)

3 to 8 Demultiplexer



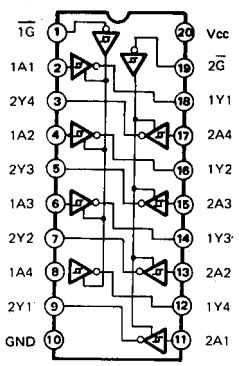
- **SN74HC139N** (IR013950)

Dual 2 to 4 Demultiplexer



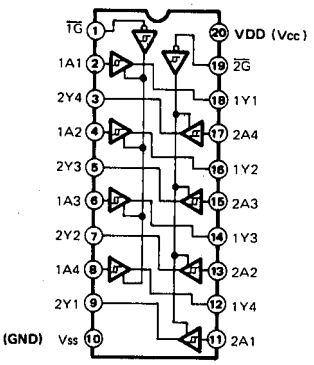
- **HD74LS240P** (IG044500)

Octal Bus Inverter

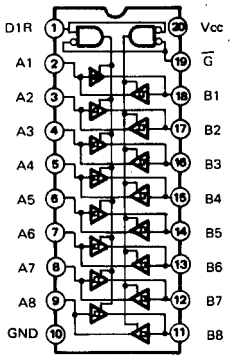


- **HD74LS244P** (IG060000)
- **M74HC244P** (IR024480)

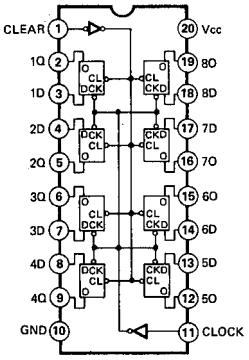
Octal 3-State Bus Buffer



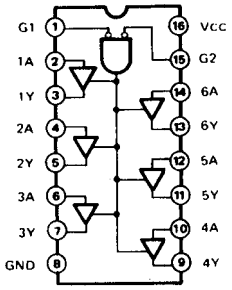
- **SN74HC245N** (IR024550)
  Octal 3-State Bus Transceiver



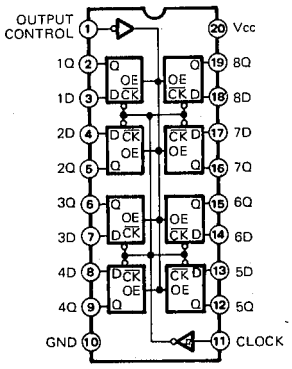
- **MC74HC273** (IR027370)
  Octal D-Type Flip-Flop



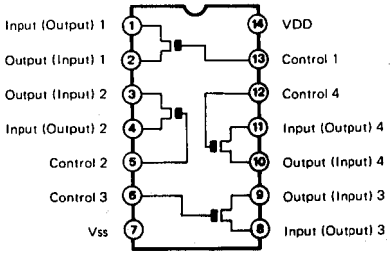
- **TC74HC365P** (IR036500)
  Hex 3-State Bus Buffer



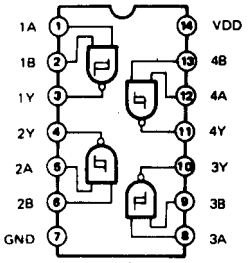
- **TC74HC374P** (IR037400)
  Octal 3-State D-Type Flip-Flop



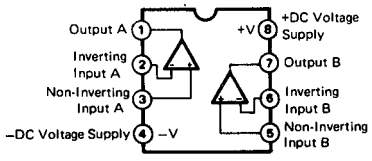
- **TC4016BP** (IG001690)
  Quad Bilateral Switch



- **TC4093BP** (IG043300)
  Quad 2-Input NAND Schmitt Trigger



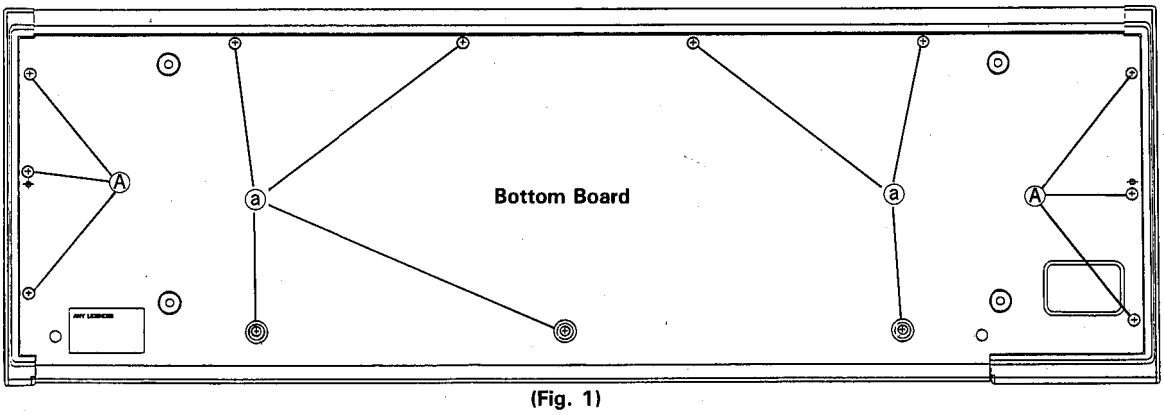
- **NJM4558DV** (IG001390)
- **NJM4560ED** (IG040000)
- **NJM4556** (IG042500)
- **NJM353** (XF228A00)
  Dual Operational Amplifier



■ DISASSEMBLY PROCEDURE（分解手順）

1. Removal of Bottom Board
After the 6 bind head tapping screws Ⓐ (3 × 12) and 7 bonding tapping screws ⓐ (3 × 8) have been removed, the bottom board can be removed. (Fig. 1)

1．底板の外し方
バインドタッピングネジⒶ(3 ×12) 6本とボンディングタッピングネジⓐ(3 × 8) 7本を外し、底板を外します。(Fig. 1)



(Fig. 1)

2. Removal of DM Circuit Board
2-1. Remove the bottom board. (→1.)
2-2. After the 3 bonding tapping scrwes Ⓑ (3 × 8) have been removed, the DM circuit board can be removed. (Fig. 2)

2．DMシートの外し方
2-1. 底板を外します。(→1.)
2-2. ボンディングタッピングネジⒷ(3 × 8) 3本を外し、DMシートを外します。(Fig. 2)

3. Removal of JK Circuit Board
3-1. Remove the bottom board. (→1.)
3-2. Remove the DM circuit board. (→2.)
3-3. Remove the 4 bonding tapping screws Ⓒ (3 × 8) and remove the JK circuit board assembly. (Fig. 2)
3-4. Remove the 5 bind head tapping screws Ⓓ (3 × 6), 6 angle bracket, U Ⓔ and then remove the angle bracket, JK from the JK circuit board. (Fig. 3, 4)

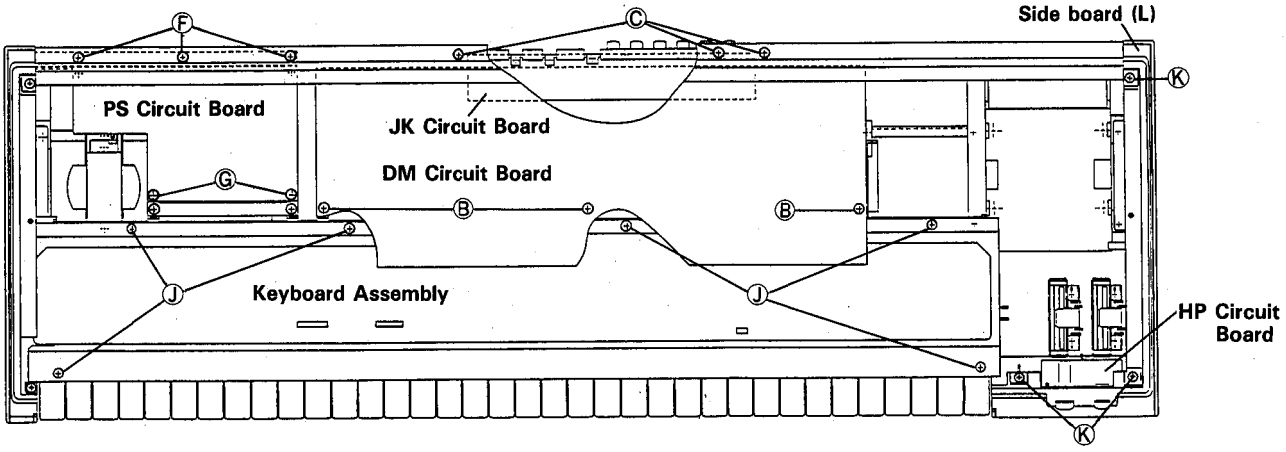
3．JKシートの外し方
3-1. 底板を外します。(→1.)
3-2. DMシートを外します。(→2.)
3-3. ボンディングタッピングネジⒸ(3 × 8) 4本を外し、JKシートAss'yを外します。(Fig. 2)
3-4. バインドタッピングネジⒹ(3 × 6) 5本とU字金具Ⓔ6個を外し、JKシートからJKアングルを外します。(Fig. 3、4)

4. Removal of PS Circuit Board
4-1. Remove the bottom board. (→1.)
4-2. Remove the 3 bonding tapping screws Ⓕ (3 × 8), 2 bind head screws Ⓖ (3 × 8) and remove the power supply assembly. (Fig. 2, 5)
4-3. Remove the 2 bind head screws Ⓗ (3 × 10) and remove the angle bracket, TR. (Fig. 5)
4-4. Remove the 2 bind head screws Ⓘ (3 × 8) and then remove the AC panel from the PS circuit board. (Fig. 5)

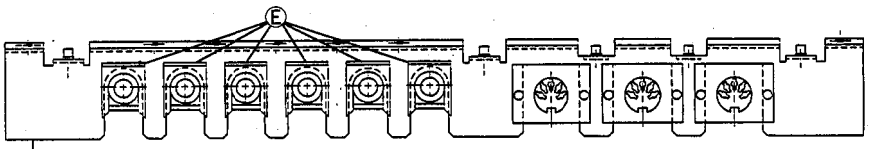
4．PSシートの外し方
4-1. 底板を外します。(→1.)
4-2. ボンディングタッピングネジⒻ(3 × 8) 3本とバインド小ネジⒼ(3 × 8) 2本を外し、電源Ass'yを外します。(Fig. 2、5)
4-3. バインド小ネジⒽ(3 ×10) 2本を外し、電源Ass'yからアングルを外します。(Fig. 5)
4-4. バインド小ネジⒾ(3 × 8) 2本を外し、PSシートからACパネルを外します。(Fig. 5)

5. Removal of Keyboard Assembly
5-1. Remove the bottom board. (→1.)
5-2. Remove the DM circuit board. (→2.)
5-3. After the 6 bonding tapping screws Ⓙ (3 × 8) have been removed, the keyboard assembly can be removed. (Fig. 2)

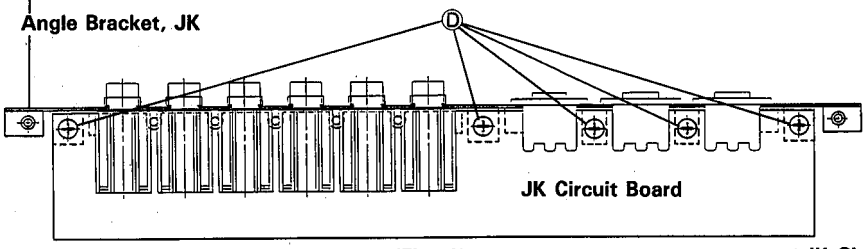
5．鍵盤Ass'yの外し方
5-1. 底板を外します。(→1.)
5-2. DMシートを外します。(→2.)
5-3. ボンディングタッピングネジⒿ(3 × 8) 6本を外し、鍵盤Ass'yを外します。(Fig. 2)



(Fig. 2)

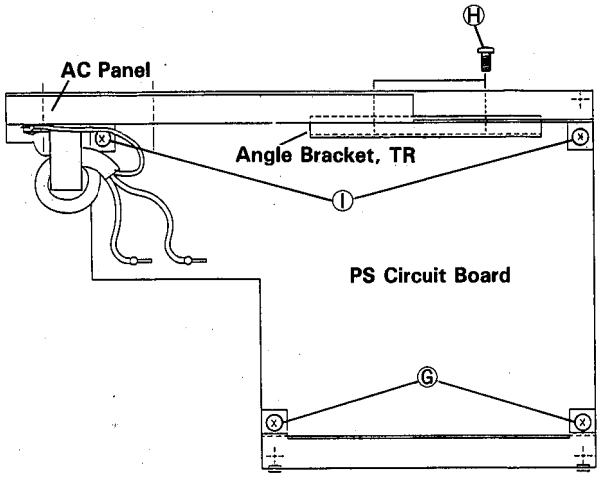


(Fig. 3)



(Fig. 4)

< JK Circuit Board Assemlby >



(Fig. 5)

< Power Supply Assembly >

6. Removal of HP Circuit Board
6-1. Remove the bottom board. (→1.)
6-2. Remove the 3 bind head tapping screws Ⓚ (4 × 12) and remove the side board (L). (Fig. 2)
6-3. After the 2 bonding tapping screws Ⓛ (3 × 8) have been removed, the HP circuit board can be removed. (Fig. 6)

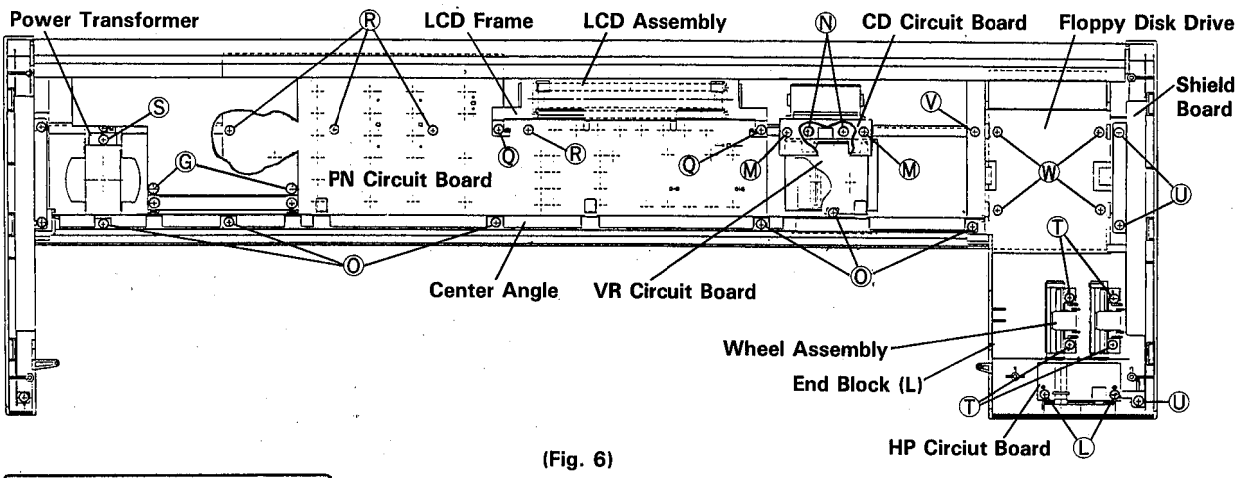
7. Removal of CD Circuit Board
7-1. Remove the bottom board. (→1.)
7-2. Remove the DM circuit board. (→2.)
7-3. After the 2 bonding tapping screws Ⓜ (3 × 8) have been removed, the CD circuit board can be removed. (Fig. 6)

8. Removal of VR Circuit Board
8-1. Remove the bottom board. (→1.)
8-2. Remove the DM circuit board. (→2.)
8-3. Remove the keyboard assembly. (→5.)
8-4. Remove the CD circuit board. (→7.)
8-5. Remove the 2 bonding tapping screws Ⓝ (3 × 8) and remove the escutcheon, CD. (Fig. 6)
8-6. Remove the 6 bonding tapping screws Ⓞ (3 × 8), 2 bind head screws Ⓖ (3 × 8) and remove the center angle with the VR circuit board assembly. (Fig. 6)
8-7. Pull out the knob Ⓟ and then remove the escutcheon, SVR from the VR circuit board. (Fig. 7)

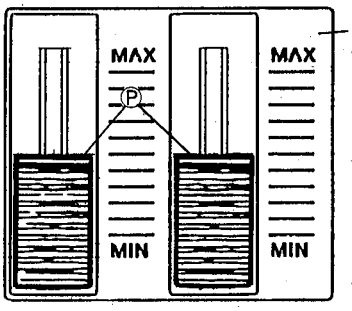
6．HPシートの外し方
6-1．底板を外します。(→1.)
6-2．バインドタッピングネジⓀ(4×12) 3本を外し、側板(左)を外します。(Fig. 2)
6-3．ボンディングタッピングネジⓁ(3×8) 2本を外し、HPシートを外します。(Fig. 6)

7．CDシートの外し方
7-1．底板を外します。(→1.)
7-2．DMシートを外します。(→2.)
7-3．ボンディングタッピングネジⓂ(3×8) 2本を外し、CDシートを外します。(Fig. 6)

8．VRシートの外し方
8-1．底板を外します。(→1.)
8-2．DMシートを外します。(→2.)
8-3．鍵盤Ass'yを外します。(→5.)
8-4．CDシートを外します。(→7.)
8-5．ボンディングタッピングネジⓃ(3×8) 2本を外し、CDエスカッションを外します。(Fig. 6)
8-6．ボンディングタッピングネジⓄ(3×8) 6本とバインド小ネジⒼ(3×8) 2本を外し、センターアングルを外すと、VRシートAss'yも一緒に外れます。(Fig. 6)
8-7．ツマミⓅを引き抜き、VRシートからSVRエスカッションを外します。(Fig. 7)



(Fig. 6)



< VR Circuit Board Assembly > (Fig. 7)

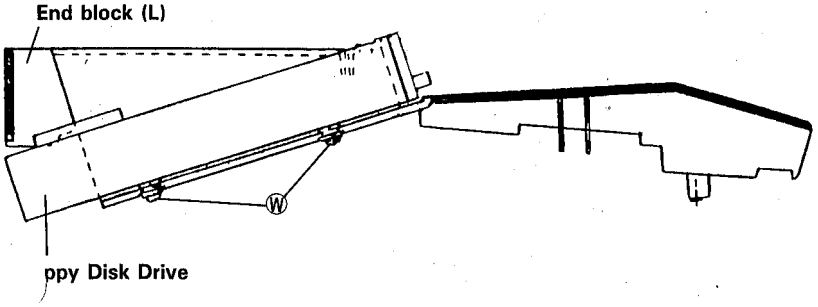
9. Removal of LCD Assembly
9-1. Remove the bottom board. (→1.)
9-2. Remove the DM circuit board. (→2.)
9-3. After the 2 bonding tapping screws Ⓠ (3 × 8) have been removed, the LCD frame can be removed with the LCD assembly. (Fig. 6)

10. Removal of PN Circuit Board
10-1. Remove the bottom board. (→1.)
10-2. Remove the DM circuit board. (→2.)
10-3. Remove the power supply assembly. (→4-2.)
10-4. Remove the keyboard assembly. (→5.)
10-5. Remove the center angle. (→8-6.)
10-6. Remove the LCD frame. (→9-3.)
10-7. After the 4 bonding tapping screws Ⓡ (3 × 8) have been removed, the PN circuit board can be removed. (Fig. 6)

11. Removal of Power Transformer
11-1. Remove the bottom board. (→1.)
11-2. Remove the DM circuit board. (→2.)
11-3. Remove the keyboard assembly. (→5.)
11-4. Remove the center angle. (→8-6.)
11-5. After the 1 bonding tapping screw Ⓢ (3 × 8) has been removed, the power transformer can be removed. (Fig. 6)

12. Removal of Wheel Assembly
12-1. Remove the bottom board. (→1.)
12-2. After the 4 bonding tapping screws Ⓣ (3 × 8), have been removed, the wheel assembly can be removed. (Fig. 6)

13. Removal of Floppy Disk Drive
13-1. Remove the bottom board. (→1.)
13-2. Remove the DM circuit board. (→2.)
13-3. Remove the keyboard assembly. (→5.)
13-4. Remove the center angle. (→8-6.)
13-5. Remove the HP circuit board. (→6.)
13-6. Remove the 3 bonding tapping screws Ⓤ (3 × 8) and remove the shield board (L). (Fig. 6)
13-7. Remove the 1 bonding tapping screw Ⓥ (3 × 8) and remove the end block (L). (Fig. 6)
13-8. After the 4 cup screws Ⓦ (3 × 11) have been removed, the floppy disk drive can be removed from the end block (L). (Fig. 6, 8)



(Fig. 8)

9．LCD Ass'yの外し方
9-1．底板を外します。(→1.)
9-2．DMシートを外します。(→2.)
9-3．ボンディングタッピングネジⓆ(3×8) 2本を外し、LCDフレームを外すと、LCD Ass'yも一緒に外れます。(Fig. 6)

10．PNシートの外し方
10-1．底板を外します。(→1.)
10-2．DMシートを外します。(→2.)
10-3．電源Ass'yを外します。(4-2.)
10-4．鍵盤Ass'yを外します。(→5.)
10-5．センターアングルを外します。(→8-6.)
10-6．LCDフレームを外します。(→9-3.)
10-7．ボンディングタッピングネジⓇ(3×8) 4本を外し、PNシートを外します。(Fig. 6)

11．トランスAss'yの外し方
11-1．底板を外します。(→1.)
11-2．DMシートを外します。(→2.)
11-3．鍵盤Ass'yを外します。(→5.)
11-4．センターアングルを外します。(→8-6.)
11-5．ボンディングタッピングネジⓈ(3×8) 1本を外し、トランスAss'yを外します。(Fig. 6)

12．ホイールAss'yの外し方
12-1．底板を外します。(→1.)
12-2．ボンディングタッピングネジⓉ(3×8) 4本を外し、ホイールAss'yを外します。(Fig. 6)

13．FDDの外し方
13-1．底板を外します。(→1.)
13-2．DMシートを外します。(→2.)
13-3．鍵盤Ass'yを外します。(→5.)
13-4．センターアングルを外します。(→8-6)
13-5．HPシートを外します。(→6.)
13-6．ボンディングタッピングネジⓊ(3×8) 3本を外し、シールド板(左)を外します。(Fig. 6)
13-7．ボンディングタッピングネジⓋ(3×8) 1本を外し、拍子木(左)を外します。(Fig. 6)
13-8．段付きカップネジⓌ(3×11) 4本を外し、FDDを外します。(Fig. 6、8)