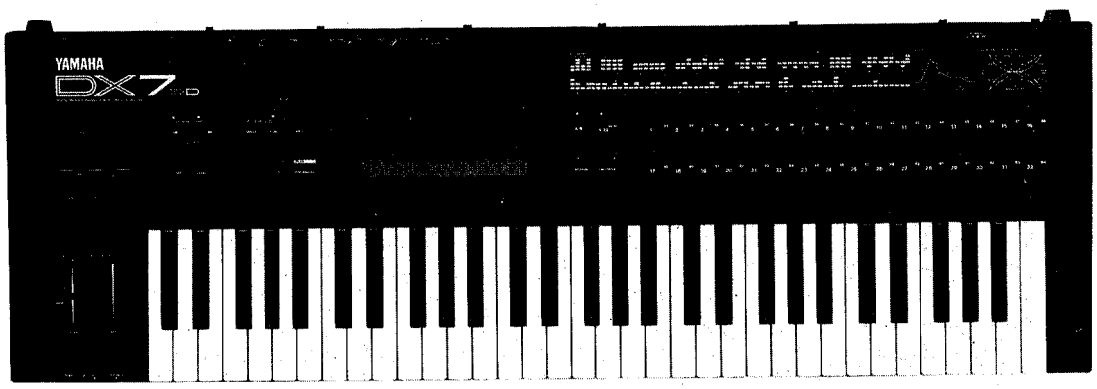
DIGITAL PROGRAMMABLE ALGORITHM SYNTHESIZER

DX7 II·FD/D

SERVICE MANUAL

DX7 II·FD



DX7 II·D

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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.

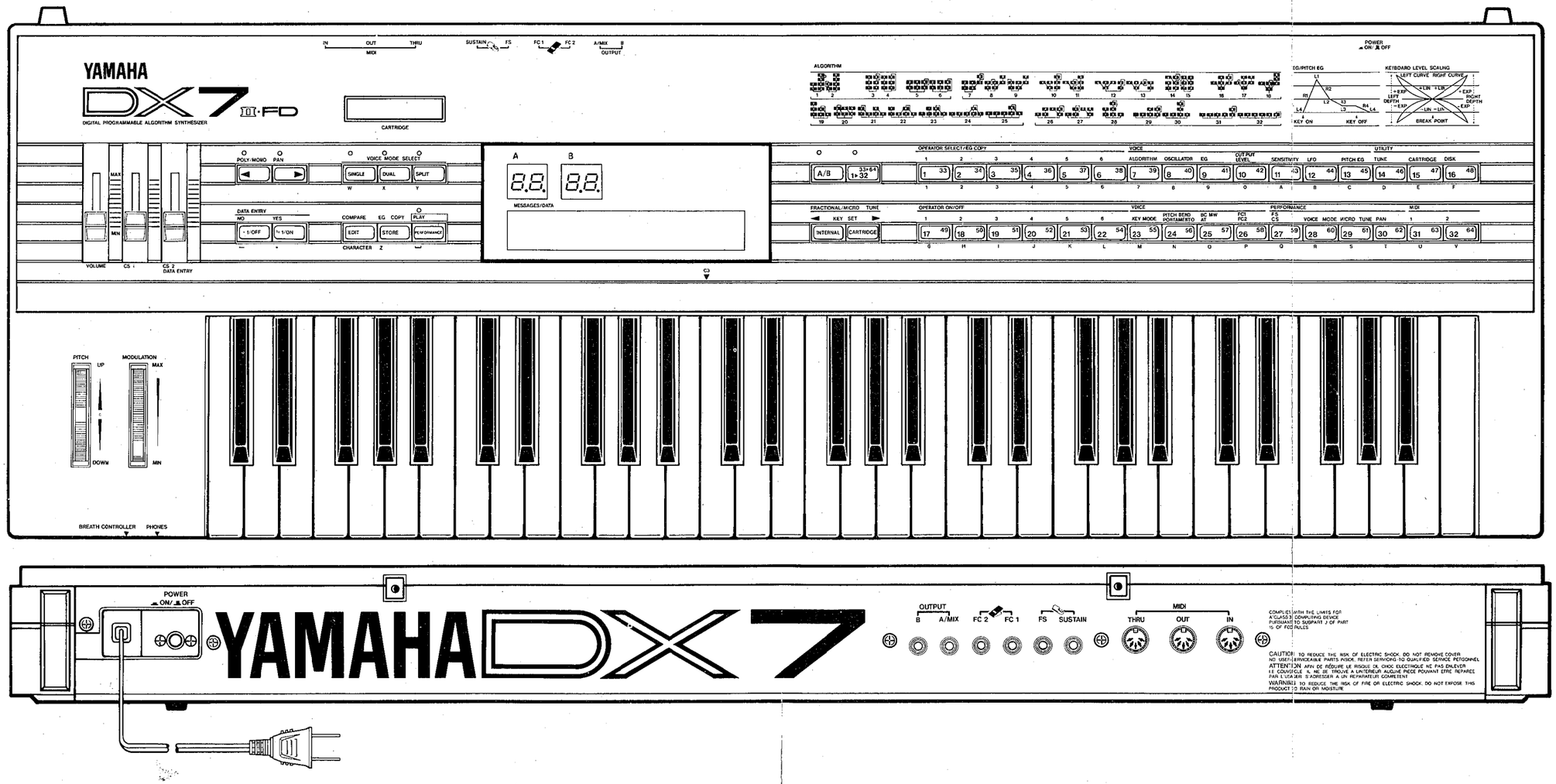
SPECIFICATIONS

- **Keyboard** — 61 keys (C1 ~ C6), with Initial/After touch
- **Tone Generator** — FM tone Generator (6 operators 32 algorythms)
- **Simultaneous Note Output (Reverse priority)**
  1-voice: 16 notes (Single play)
  2-voice: 8 notes (Dual play)
  2-voice: 16 notes (Split play)
- **Internal Memory** — 64 voices/32 performances, 2 micro tunings, 1 system set-up
- **External ROM Memory** — 128 voices/64 performances, micro tuning, fractional level scaling
- **External Memory** — RAM cartridge (Optional, RAM4) = Internal Memory
  *Micro floppy disk (Optional, MF2DD) = Internal Memory × 40, MIDI exclusive data
- **Control Sliders and switches**
  Volume slider, Continuous sliders CS1, CS2 (Data entry)
  Data entry switch × 2,
  Mode setting switch × 12,
  Voice switch × 32
- **Controls** — PITCH BEND WHEEL, MODULATION WHEEL
- **External Control Terminals**
  BREATH CONTROL, SUSTAIN, FOOT SWITCH (Sustain, Portamento, Key hold, Soft), FOOT CONTROL 1 (Volume, Modulation, Voice parameter), FOOT CONTROL 2 (Volume, Modulation). RAM·ROM CARTRIDGE SLOT
  MIDI IN—OUT—THRU
- **Output Terminals** — Output A/MIX-B, Headphones
- **Disk Drive** — 3.5″ Micro Floppy Disk Drive, built-in.
  2DD 1M Bytes (120K bytes when formatting)
- **Display** — LC: 40 letters × 2 lines (illuminated)
  LED: 7 segments × 2
- **Dimensions (W × H × D), Weight**
  999 × 85.8 × 333.7 mm,
  10.5 kg/11.2 kg* (*DX7II FD)
- **Power Supply, Power Consumption**
  U.S. & Canadian Models: 120V, 50/60Hz
  General Model : 110V/220V/240V 50Hz
- **Standard Accessories** — Music holder, ROM cartridge, 3.5″ Micro floppy disk (MF2DD)
- **Optional Accessories**

RAM Cartridge	RAM4
Flight Case	LC-7IIF
Hard Case	LC-7IIF
Soft Case	SC-7IIS
Cartridge Adaptor	ADP1

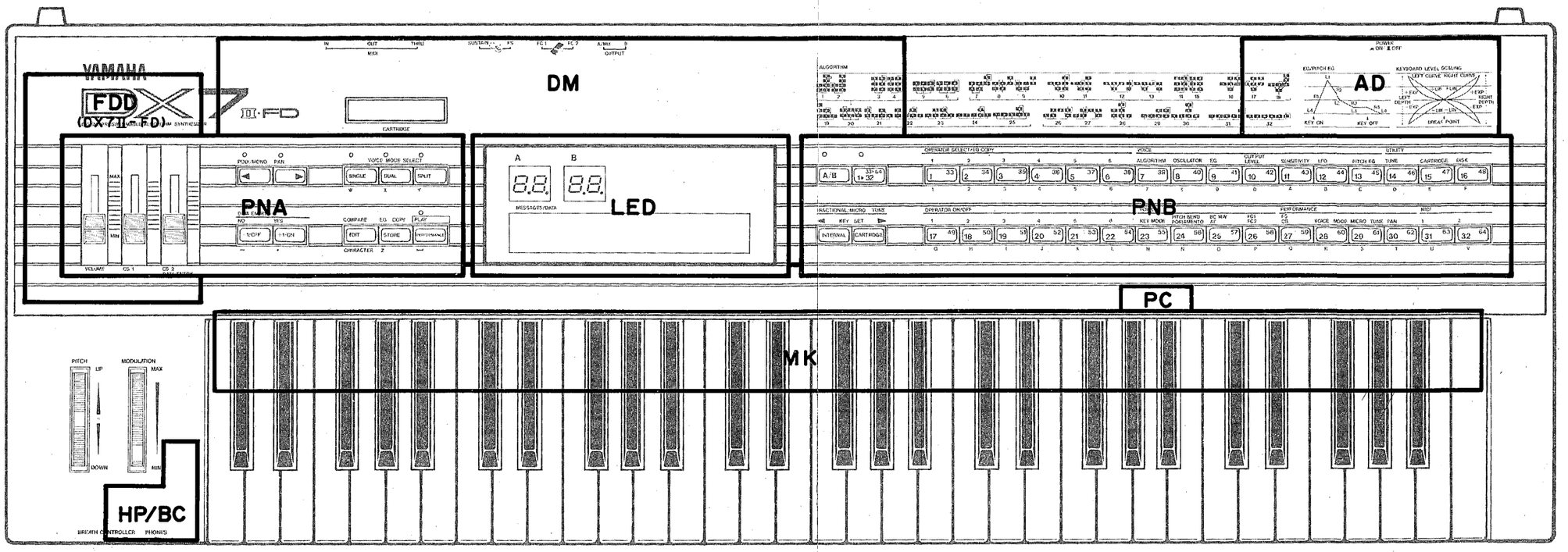
Foot Switch FC4/FC5, Foot Controller FC7, Breath Controller BC1, Stand LG-100, MIDI Cable MIDI 01/03/15, 3.5″ Micro Floppy Disk MF2DD.

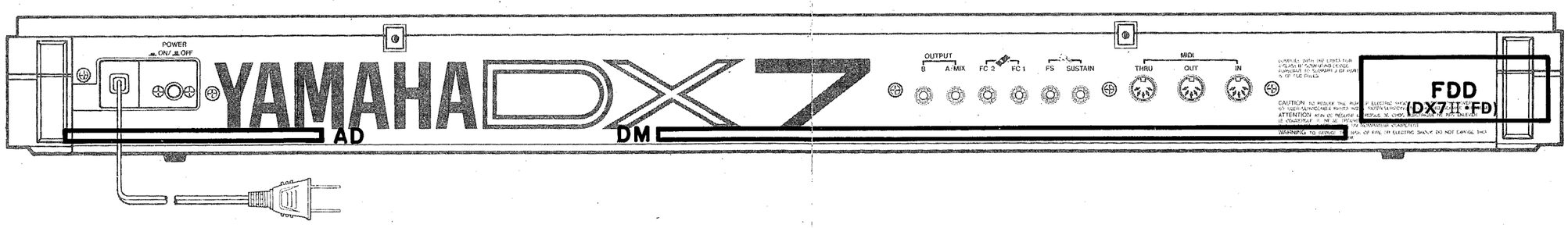
PANEL LAYOUT



DX7II·FD/D

■ CIRCUIT BOARDS LAYOUT





DX7II·FD/D

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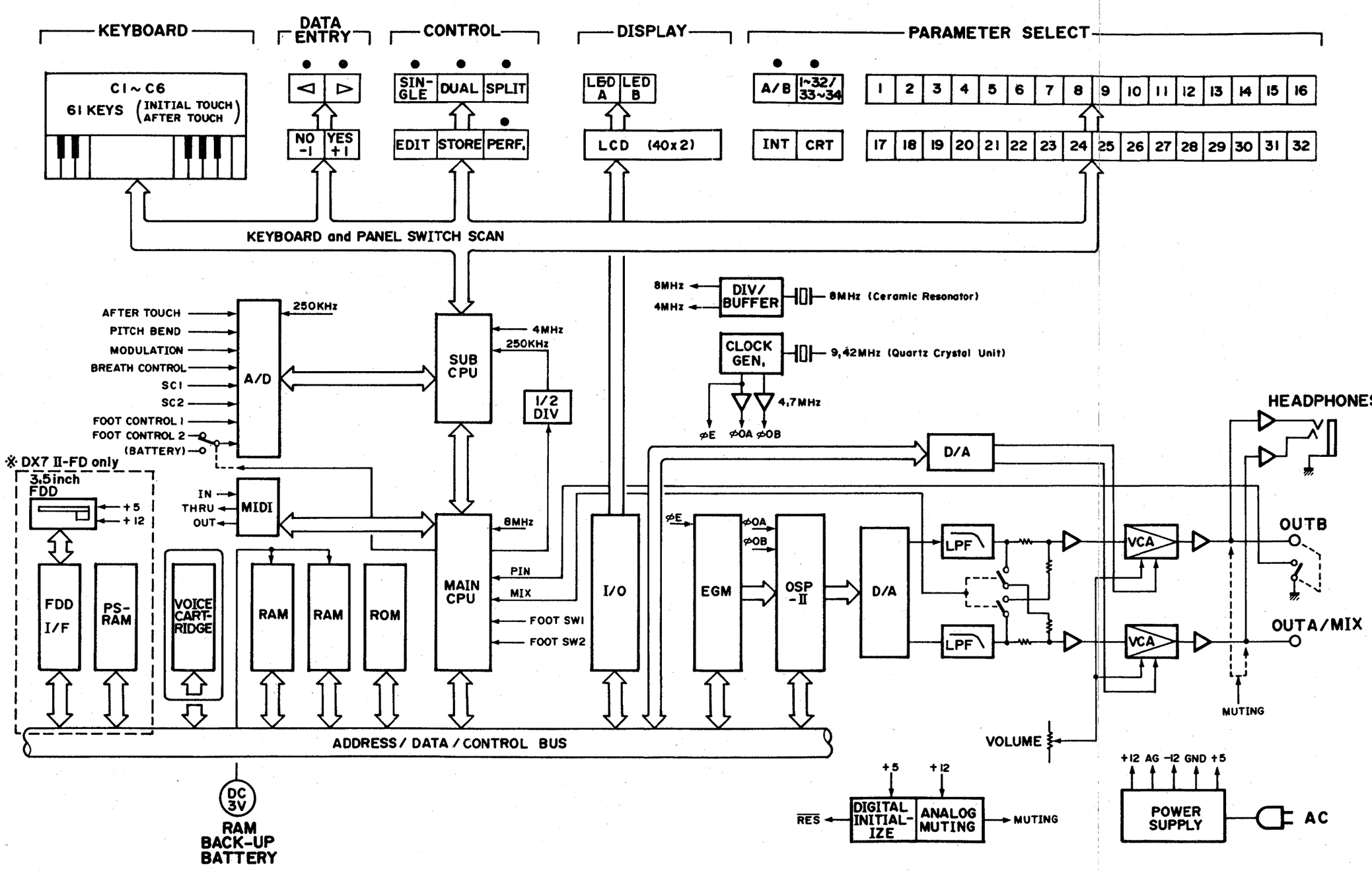
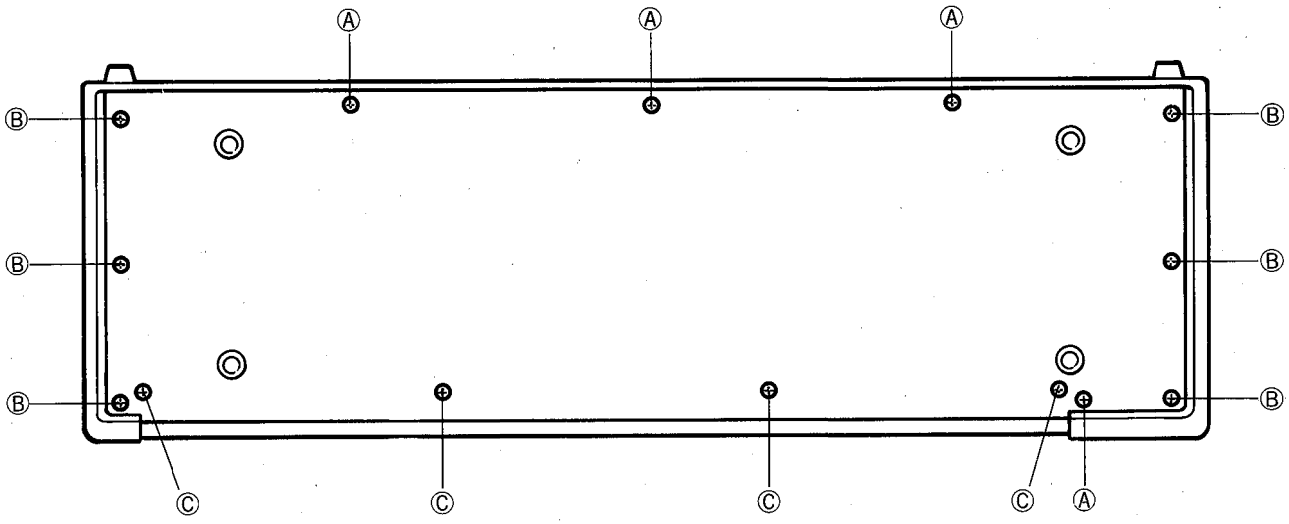
■ BLOCK DIAGRAM



■ DISASSEMBLY PROCEDURE

1. Bottom Panel Removal (Refer to fig. 1.)

Remove the 14 screws (Ⓐ 4 × 6 Bind tapping screw, 4 pcs. Ⓑ 4 × 12 Bind head screw, 6 pcs. Ⓒ 4 × 8 Bind head screw, 4 pcs.) and then remove the bottom panel as shown in figure 1.



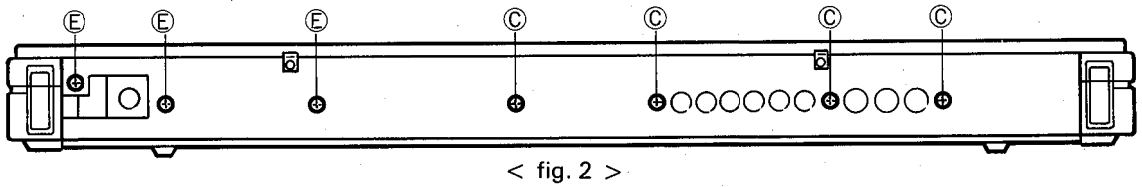
< fig. 1 >

2. DM Circuit Board and Power Supply Unit Removal (Refer to fig. 1 and fig. 2.)

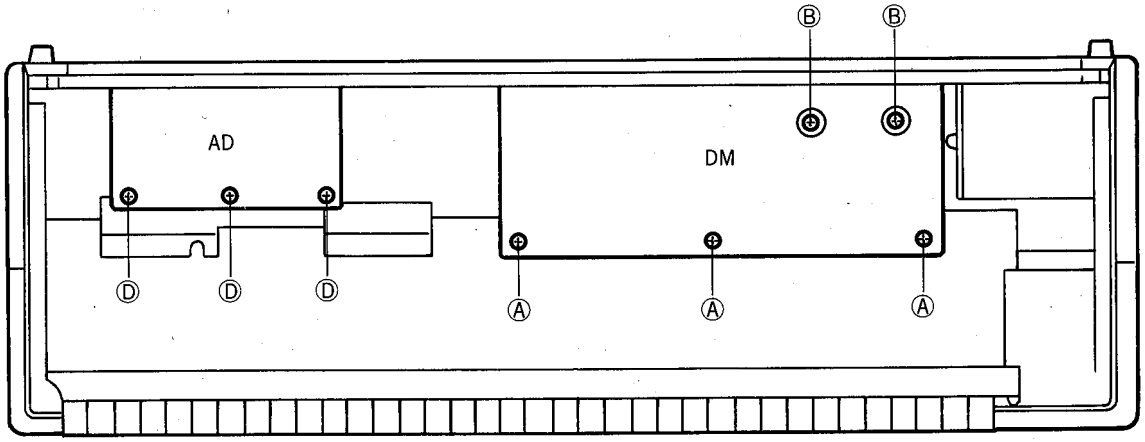
•Remove the bottom panel. (Refer to step 1).

2-1. To remove the DM circuit board, remove the 9 screws. (Ⓐ 4 × 8 Bind head screw, 3 pcs. Ⓑ 3 × 20 Bind tapping screw, 2 pcs. Ⓒ 4 × 12 Bind head screw, 4 pcs.).

2-2. To remove the power supply unit, remove the 6 screws. (Ⓓ 4 × 8 Bind head screw, 3 pcs. Ⓔ 4 × 12 Bind head screw, 3 pcs.).



< fig. 2 >



< fig. 3 >

3. Floppy Disk Drive (FDD) Assembly Removal (Refer to fig. 4). — *DX7II-FD model only —

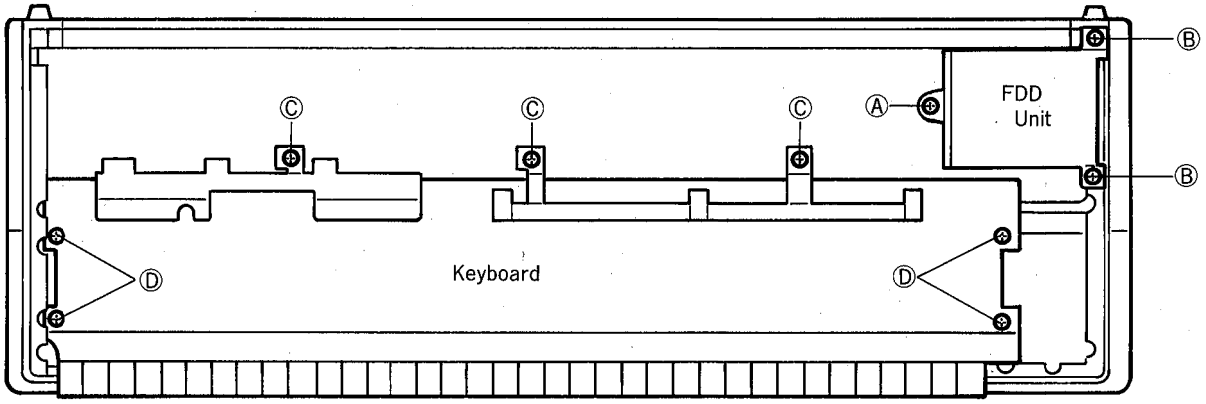
- •Remove the bottom panel. (Refer to step 1).
- •Remove the DM circuit board. (Refer to step 2-1).

Remove the 3 screws (Ⓐ 4 × 8 Bind tapping screw, 1 pc. Ⓑ 4 × 10 Bind tapping screw, 2 pcs.) and then remove the FDD assembly.

4. Keyboard Unit Removal (Refer to fig. 4).

- •Remove the bottom panel. (Refer to step 1).
- •Remove the DM circuit board and the power supply unit. (Refer to step 2).

Remove the 3 angle brackets fixing screws (Ⓒ 3 × 8 Bind tapping screws) and the 4 keyboard flame fixing screws (Ⓓ 4 × 16 Bind tapping screws) then remove the keyboard unit.

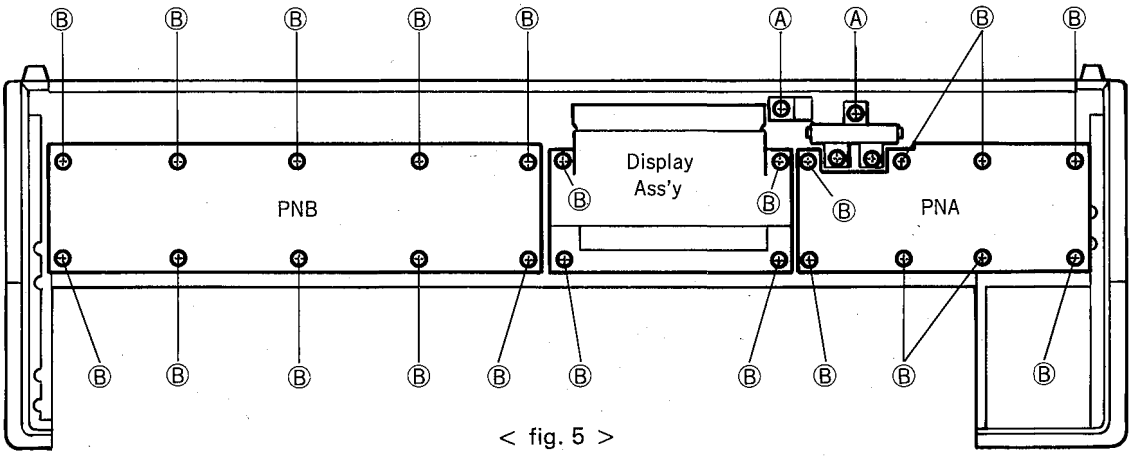


< fig. 4 >

5. PNA Circuit Board, PNB Circuit Board and LCD/LED Display Assembly Removal (Refer to fig. 5).

- •Remove the bottom panel. (Refer to step 1).
- •Remove the DM circuit board and the power supply unit. (Refer to step 2).
- •Remove the FDD assembly. (Refer to step 3). — *DX7II-FD model only —
- •Remove the keyboard unit. (Refer to step 4).

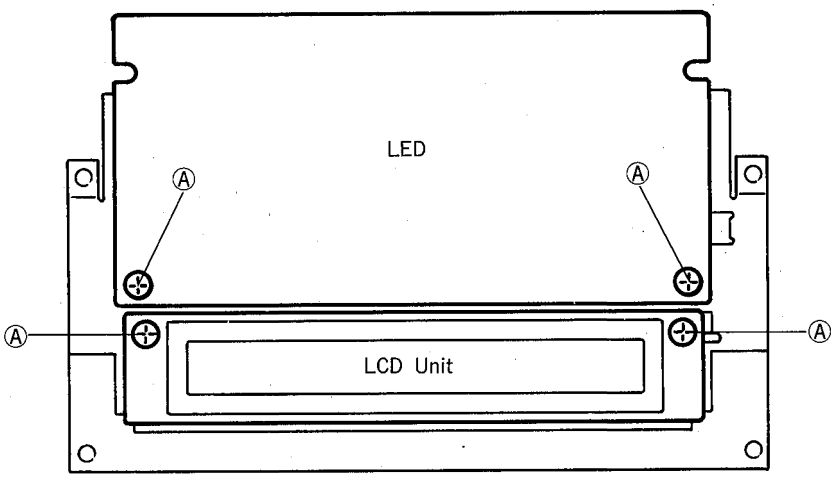
Remove the 5 screws (Ⓐ 4 × 8 Bind tapping screws) and then remove the cartridge guide assembly and the bushing.
Remove the 22 screws (Ⓑ 4 × 8 Bind tapping screws) and then remove the PNA circuit board, the PNB circuit board and the display assembly together.



< fig. 5 >

★ **Display Assembly/Disassembly**

Remove the filter which is attached with double-sided tape. (Be careful not to damage it). Remove the 4 screws (Ⓐ3 × 6 Flat head screws) and then remove the LCD unit and the LED circuit board from the chassis. (Refer to fig. 6).



< fig. 6 >

6. Wheel Assembly and Headphone (HP) Circuit Board Removal (Refer to fig. 7).

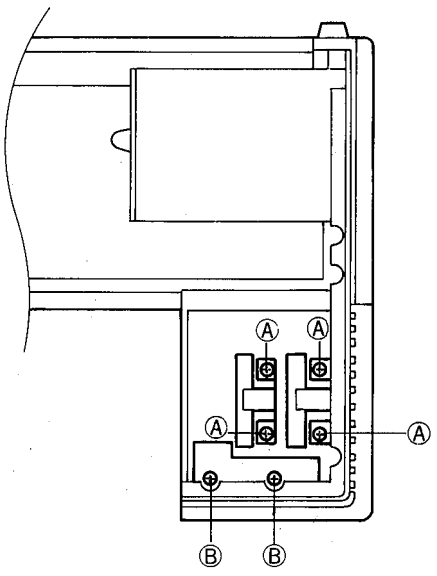
- •Remove the bottom panel. (Refer to step 1).
- •Remove the DM circuit board. (Refer to step 2-1).

6-1. To remove each wheel assembly, remove the 2 screws. (Ⓐ3 × 8 Bind tapping screws).

6-2. To remove the HP circuit board:

- •Remove the power supply unit. (Refer to step 2-2).
- •Remove the keyboard unit. (Refer to step 4).

Now remove the 2 screws (Ⓑ3 × 8 Bind tapping screws) and then remove the HP circuit board.



< fig. 7 >

■ PARAMETERS LIST

● Voice Parameters List

ALGORITHM 7 >ALG >FBL >OSC.SYNC >Transpose >Voice name	OSCILLATOR 8 40 >Mode >Coarse >Fine >Detune	EG 9 >RS >R1~R4 >L1~L4	OUTPUT LEVEL 10 >Scaling mode >Level >LD >LC >BP >RC >RD >OFST Fractional scaling
SENSITIVITY 11 >Velocity >AMS >PMS(ALL OP)	LFO 12 >Wave >Speed >Delay >Mode >PMD >AMD >SYNC	PITCH EG 13 45 >RNG >VEL >RS >R1~R4 >L1~L4	
KEY MODE 23 >Key assign mode >Unison detune	PITCH BEND PORTAMENTO 24 Pitch Bend >Range >Step >Mode Portamento >Mode >Step >Time Random pitch >Sense	BC MW AT 25 Mod.Wheel >P.MOD >A.MOD >EG.Bias Breath Control >P.MOD >A.MOD >EG.Bias >P.Bias After touch >P.MOD >A.MOD >EG.Bias >P.Bias	FC1 FC2 26 Foot control 1 >CS 1 >P.MOD >A.MOD >EG.Bias >VOL Foot control 2 >P.MOD >A.MOD >EG.Bias >VOL MIDI IN control >P.MOD >A.MOD >EG.Bias >VOL

● **PERFORMANCE Parameters List**

FS CS 27 59	VOISE MODE 28 60	MICRO TUNE 29 61	PAN 30 62
Sustain foot switch >A >B Foot switch >Select >A >B >Range (>Select=softのとき) Continuous slider 1 >Select >A >B Continuous slider 2 >Select >A >B	>Voice mode >Total volume >Balance >Dual Detune >Split point	>Micro tuning table select >Key >A >B >EG forced damping Note shift >A >B >Performance name	PAN >Mode >Range >Select PAN EG >R1～R4 >L1～L4

■ INITIALIZING

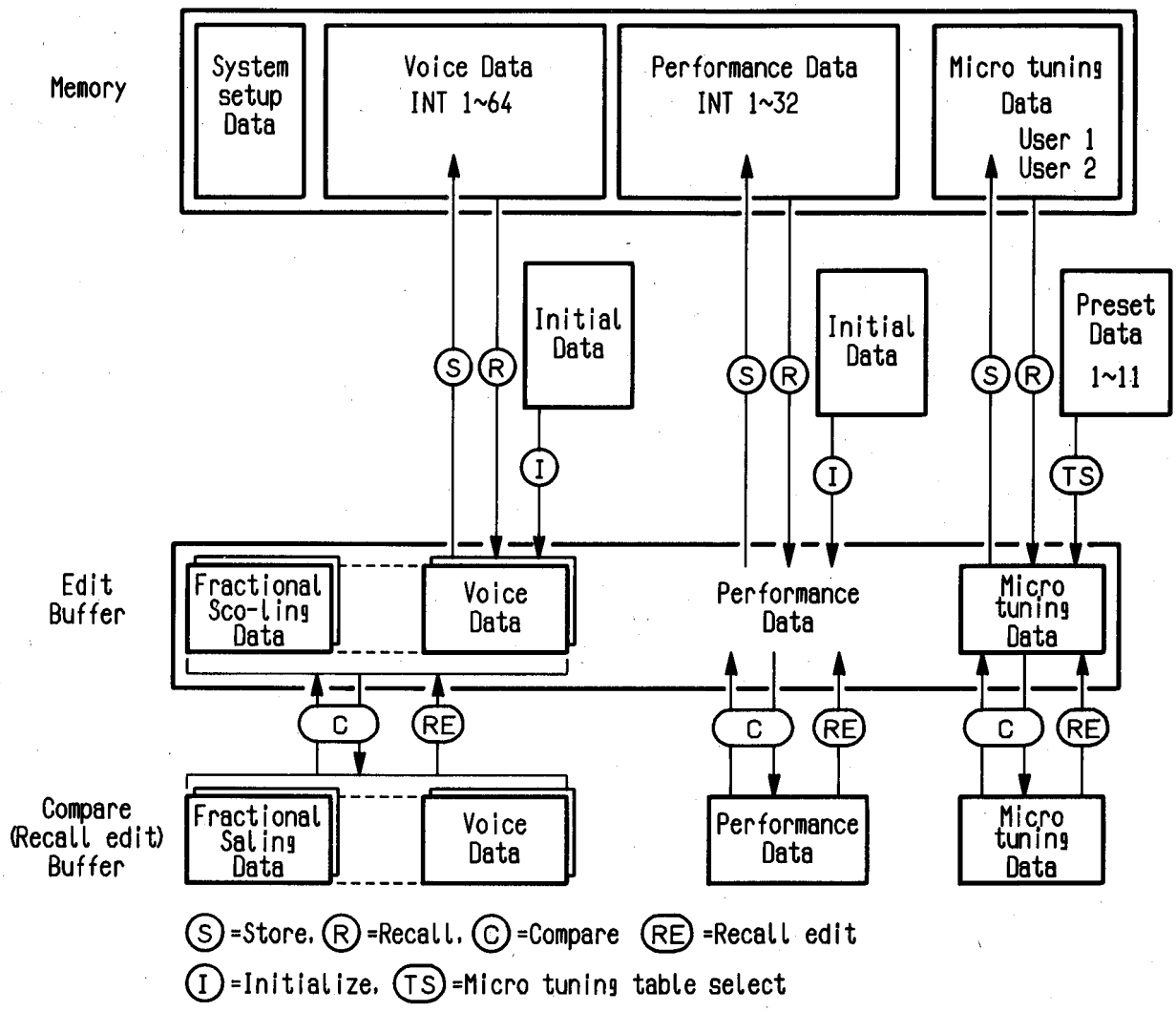
(1) Press [PERFORMANCE] to enter PERFORMANCE mode.
(2) Press [EDIT] to enter EDIT mode.
(3) Then push [14 46] repeatedly until the following message appears.

Initialize >Voice A >Voice B >Performance

(4) Move the cursor to the kind of data you want to initialize, the press YES .
The LCD display will ask you to reconfirm Are you sure?
(5) If you are, answer [YES] again.
(6) Initialization is thus Completed !

■ MEMORY CONFIGURATION

The chart shows the data flow.



■ ERROR MESSAGES

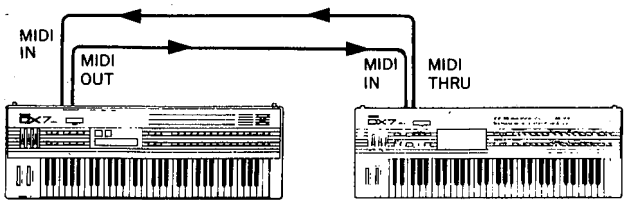
(1) Internal and Cartridge Data Access

LCD Display	ERROR Message
Memory protected !	This message will be displayed when Memory Protect is set to ON, protecting data such as voice, PERFORMANCE, and Micro tuning in the internal or cartridge memories. To store data in the internal memory, turn off the internal Memory Protect function. To store data in the cartridge, set the cartridge Memory Protect switch to OFF.
Memory protected ! (CRT/fractional)	Cartridge Memory Protect is set to ON for fractional scaling data when storing voices using fractional scaling. Set Memory Protect to OFF for the cartridge, and turn the memory protect switch of the cartridge OFF as well.
Cartridge not ready !	The cartridge is either not inserted or is improperly inserted. Reinsert the cartridge correctly into the slot before carrying out such operations as data access, store, save or load with the cartridge.
Cartridge not ready ! (CRT/fractional)	The cartridge for fractional scaling data is not inserted, or improperly inserted, when carrying out operations such as data access, store, save or load of voice data using fractional scaling. Reinsert a RAM cartridge formatted for fractional scaling.
Cartridge format err ! Format err !	The desired data cannot be accessed due to the inappropriate bank format of the cartridge for storing or saving data or improper bank specification. Make sure that the bank format is appropriate for the specified bank. Re-formatting may be necessary.
Cartridge format err ! (CRT/fractional)	The bank format of the cartridge is not for fractional scaling when storing voice data using fractional scaling. The cartridge not for fractional scaling data is inserted or the desired data cannot be accessed due to the improper bank specification when loading voice data using fractional scaling. Make sure that the bank format is appropriate for the specified bank. Re-formatting may be necessary.

(2) Data Access

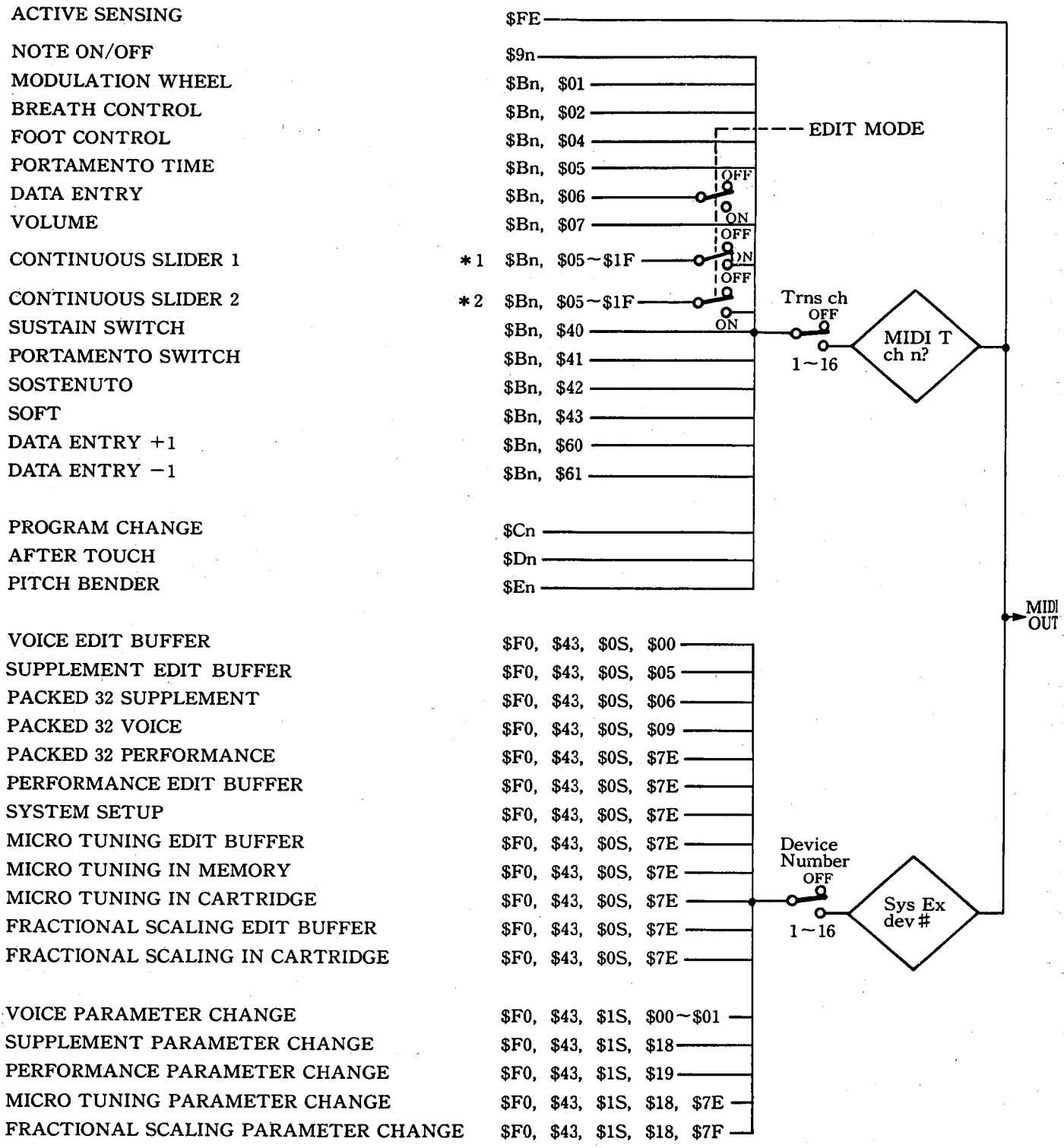
LCD Display	ERROR Message
**Disk err File not found! Retry? y/n	Attempting to read a disk with no data. Insert a disk containing data and press [+1/ON] to continue or [−1/OFF] to stop.
**Disk err Disk space full! Retry? y/n	No disk memory space available. No more data can be stored. Use another formatted disk and press [+1/ON] to continue or [−1/OFF] to stop.
**Disk err Unformat disk! Retry? y/n	An operation other than formatting was attempted with an unformatted disk inserted. Insert a formatted disk and press [+1/ON] to continue or [−1/OFF] to stop.
**Disk err Disk protected! Retry? y/n	Data writing or formatting has been attempted with a disk that is protected. Take out the disk and slide the memory protect to OFF, the reinsert it and press [+1/ON] to continue or [−1/OFF] to stop.
**Disk err Illegal changed! Retry? y/n	Duplication operation is attempted using the original disk. Press [+1/ON] to continue or [−1/OFF] to stop.
**Disk err Can't read/write! Retry? y/n	Abnormal data reading or writing has occured, or an operation was carried out without a disk inserted. In the former case, press [+1/ON] a few times. If the problem persists, the cause may be one of the following: (Press [−1/OFF] to abort the operation.) (1) The floppy disk is deformed—data cannot be accessed. (2) The disk drive head is dirty—data cannot be accessed. For (2), cleaning the head should solve the problem. For any other causes, please contact a certified serviceperson.
**Disk err Illegal disk! Retry? y/n	The disk format is not compatible with the DX7II FD. Insert a disk formatted by the DX7II FD and press [+1/ON] to continue or [−1/OFF] to stop.
**Disk err Directory full! Retry? y/n	The disk is full and has no room for additional data storage. Insert a new disk and press [+1/ON] to continue the operation, or press [−1/OFF] to stop and create more storage area on the same disk by deleting existing files.
**Disk err File exist! Retry? y/n	Back-up was attempted on a disk which already contains data. Press [+1/ON] to erase existing data and write new data or press [−1/OFF] to abort data writing.

(3) MIDI Data Reception

LCD Display	ERROR Message
**MIDI data error! **MIDI checksum error!	Abnormal MIDI data reception has occured. Repeat the operation. The display will indicate whether the transmitting MIDI device can be turned ON after the receiving device has been turned ON.
**MIDI receive buffer full!	Indicates a single reception of bulk data which exceeds the maximum storage capacity. This rarely occurs. The display will indicate if a loop connection is produced. 
**MIDI bulk rejected by memory protect!	32 voice data, 32 performance data and 2 micro tuning data are not received because the internal memory protect function is set to ON. Set it to OFF.
**MIDI bulk rejected by dev# conflict!	No data is transmitted because of a mismatch of the device No. with the transmitting device. Match the No. to the transmitting device. • The LCD display will indicate [f] when the transmission of fractional scaling data is attempted with an inappropriate cartridge installed. • The LCD display will indicate [T] when the performance mode, jn which micro tuning data is used, is implemented with an inappropriate cartridge installed.

■ MIDI DATA FORMAT

[1] Transmission Requirements



*1 BALANCE $Bn, $08 in EDIT MODE
*2 DATA ENTRY $Bn, $06 in EDIT MODE

[2] Transmission Data

[2]-1 Channel Information

Transmission is possible only when 1~ 16 is specified as the transmission channel.

1) Channel voice message

1 Key ON/OFF

Status	1 0 0 1 n n n n	(9n)	n=channel No.
Note No.	0 k k k k k k k		k=36(C1)~96(C6)
Velocity	0 v v v v v v v	(v=0)	Key ON
	0 0 0 0 0 0 0 0	(v=0)	Key OFF

2 Control change

Status	1 0 1 1 n n n n	(Bn)	n=channel No.
Control No.	0 c c c c c c c		
Control Value	0 v v v v v v v		

Control No.

c=1	Modulation wheel	v=0~127
c=2	Breath control	v=0~127
c=4	Foot control	v=0~127
c=5	Portamento time	v=0~127
c=6	Data entry slider	v=0~127
c=7	Volume	v=0~127
c=5~c=31	Continuous slider	v=0~127
c=64	Sustain SW	v=0: OFF, 127: ON
c=65	Portamento SW	v=0: OFF, 127: ON
c=66	Sostenuto	v=0: OFF, 127: ON
c=67	Soft	v=0: OFF, 127: ON
c=96	Data entry +1	
c=97	Data entry −1	

3 Program change

Status	1 1 0 0 n n n n	(Cn)	n=channel No.
Program No.	0 p p p p p p p		p=0~63: INTERNAL p=64~127: CARTRIDGE

4 After touch

Status	1 1 0 1 n n n n	(Dn)	n=channel No.
Value	0 v v v v v v v		v=0~127

5 Pitch bender

Status	1 1 1 0 n n n n	(En)	n=channel No.
Value (LSB)	0 u u u u u u u		
Value (MSB)	0 v v v v v v v		
Resolution 7bit			

The transmission data are as follows:

MSB		LSB		
00000000	(00)	00000000	(00)	Min.
01000000	(40)	00000000	(00)	Mid.
01111111	(7F)	01111110	(7E)	Max.

[2]-2 System Information

1) System real time message

Active sensing

Status	1 1 1 1 1 1 1 0	(FE)

2) System exclusive message

Transmission is possible only when the device No. is set to 1~16.

1 Parameter change

Status	1 1 1 1 0 0 0 0	(F0)
ID No.	0 1 0 0 0 0 1 1	(43)
Substatus/ device No.	0 0 0 1 n n n n	(1n)
Parameter group No.	0 g g g g g h h	
Parameter No.	0 p p p p p p p	
Data	0 d d d d d d d 0 d d d d d d d	Single or multiple bytes
EOX	1 1 1 1 0 1 1 1	(F7)

There are seven parameter group Nos. and parameter Nos.

Parameter	g	h	p	No. of data byte
Voice	0	0	0~127	1
	0	1	0~28	1
Supplement Note 3)	6	0	0~73	1
Performance	6	1	0~52	1
System set-up	6	1	64~	1
Micro tuning	6	0	126	3 Note 1)
Fractional scaling	6	0	127	4 Note 2)

NOTE 1

Data bytes

0kkkkkkk	key number		total of 3 bytes
0hhhhhhh	data (high)	0-84 binary	
01111111	data (low)	0-127 binary	

NOTE 2

Data bytes

00000ppp	operator number		total of 4 byte
00kkkkkk	key group number		
0hhhhhhh	data (high)	0-1 binary	
01111111	data (low)	0-127 binary	

NOTE 3

Under the Supplement parameter change, DX7 function parameter change will be transmitted along with the above.

● **Fractional Scaling Parameter Change**

Operator number

P	Operator
0	op 6
1	op 5
2	op 4
3	op 3
4	op 2
5	op 1

Key group number

K	Key	Data
0	offset	−128~127 (Complement of 2)
1	C#-2~ C-1	0 ~256 (Binary)
2	C#-1~D#-1	
3	E-1 ~F#-1	
4	G-1 ~ A-1	
5	A#-1~ C0	
6	C#0 ~ D#0	
7	E0 ~ F#0	
8	G0 ~ A0	
9	A#0 ~ C1	
10	C#1 ~ D#1	
11	E1 ~ F#1	
12	G1 ~ A1	
13	A#1 ~ C2	
14	C#2 ~ D#2	
15	E2 ~ F#2	
16	G2 ~ A2	
17	A#2 ~ C3	
18	C#3 ~ D#3	
19	E3 ~ F#3	
20	G3 ~ A3	
21	A#3 ~ C4	
22	C#4 ~ D#4	
23	E4 ~ F#4	
24	G4 ~ A4	
25	A#4 ~ C5	
26	C#5 ~ D#5	
27	E5 ~ F#5	
28	G5 ~ A5	
29	A#5 ~ C6	
30	C#6 ~ D#6	
31	E6 ~ F#6	
32	G6 ~ A6	
33	A#6 ~ C7	
34	C#7 ~ D#7	
35	E7 ~ F#7	
36	G7 ~ A7	
37	A#7 ~ C8	
38	C#8 ~ D#8	
39	E8 ~ F#8	
40	G8	

2 Bulk data

For { Voice edit buffer / Supplement edit buffer / Packed 32 supplement / Packed 32 voice }

Status	1 1 1 1 0 0 0 0	(F0)
ID No.	0 1 0 0 0 0 1 1	(43)
Substatus/ device No.	0 0 0 0 n n n n	(0n)
Format No.	0 f f f f f f f	
Byte count (MSB)	0 b b b b b b b	
Byte count (LSB)	0 b b b b b b b	
Data	0 d d d d d d d	
	↓	
	0 d d d d d d d	
Checksum	0 e e e e e e e	
EOX	1 1 1 1 0 1 1 1	(F7)

Format No.	Data	Byte count
0	Voice edit buffer	155
5	Supplement edit buffer	49
6	Packed 32 supplement	1120
9	Packed 32 voice	4096

● **When using universal Bulk Damp**

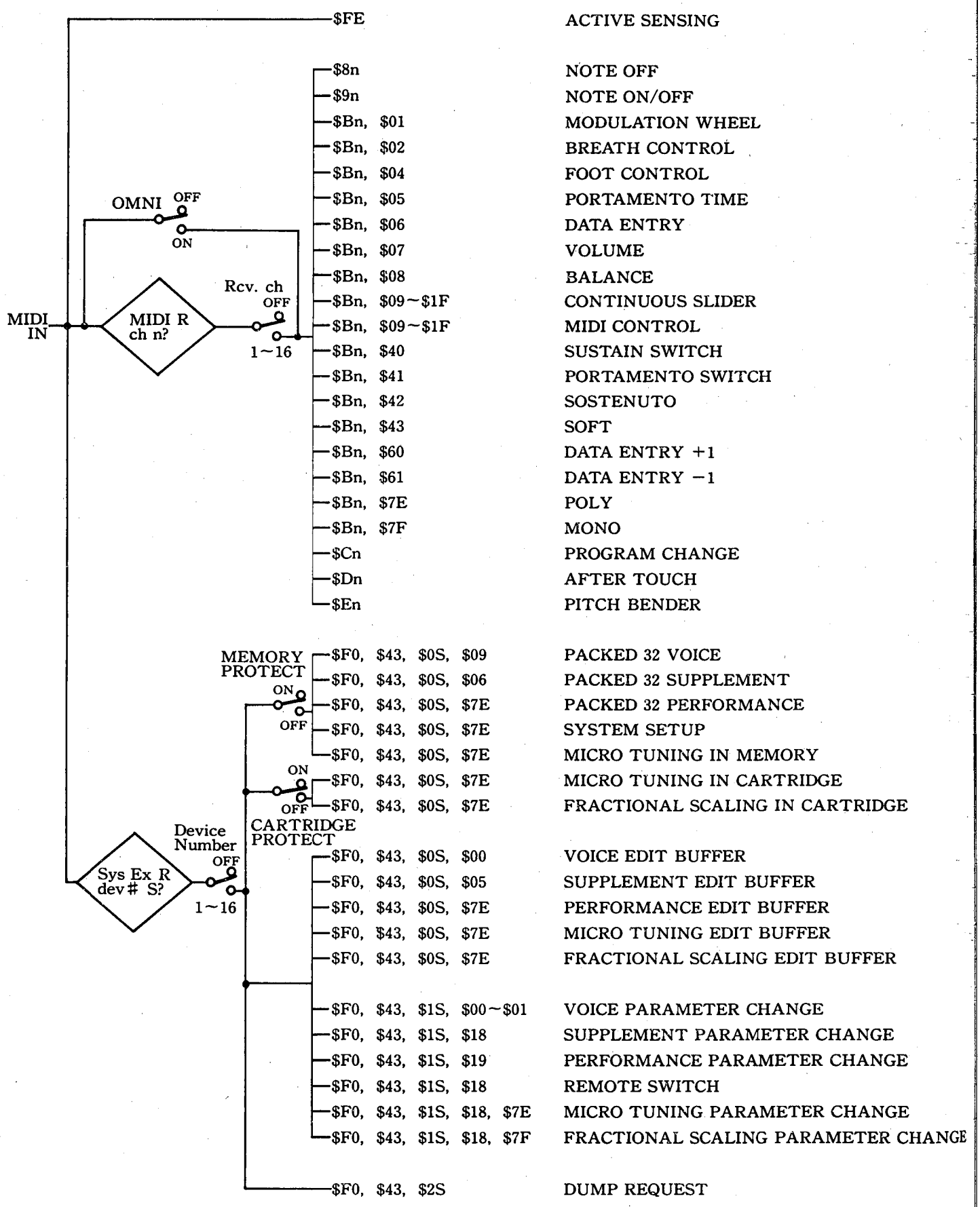
Status	1 1 1 1 0 0 0 0	(F0)
ID No.	0 1 0 0 0 0 1 1	(43)
Substatus/ device No.	0 0 0 0 n n n n	(0n)
Format No.	0 1 1 1 1 1 1 0	(7E)
Byte count (MSB)	0 b b b b b b b	
Byte count (LSB)	0 b b b b b b b	
Classification	0 a a a a a a a	ASCII 'L
name	0 a a a a a a a	'M
(4 bytes)	0 a a a a a a a	'␣
	0 a a a a a a a	'␣
Data format	0 m m m m m m m	ASCII
name (6 bytes)	↓	
	0 m m m m m m m	
Data	0 d d d d d d d	
	↓	
	0 d d d d d d d	
Checksum	0 e e e e e e e	
EOX	1 1 1 1 0 1 1 1	(F7)

Repeat group

Data	Byte count	Classification name	Data format name	No. of repeats
DX7 II Performance Edit Buffer	61	LM␣␣	8973P E	1
DX7 II Packed 32 Performance	1642	LM␣␣	9873P M	1
DX7 II System Set-up	112	LM␣␣	8973 S␣	1
Micro Tuning Edit Buffer	266	LM␣␣	MCRYE	1
Micro Tuning with Memory #x	266	LM␣␣	MCRYMx	2
Micro Tuning Cartridge	266	LM␣␣	MCRYC␣	64
Fractional Scaling Edit Buffer	502	LM␣␣	FKSYE␣	1
Fractional Scaling in Cartridge with Memory #	502	LM␣␣	FKSYC␣	32

Note 1) The x of MCRYMx is a memory No. expressed in binary form, 0 or 1.
Note 2) When the number of repeats is 64, the data group from byte count to checksum will be transmitted 64 times.

[3] Reception Requirements



[4] Reception Data

[4]-1 Channel Information

There are two types of MIDI reception channels for channel messages: A and B.

Single mode : Only A is effective
Dual mode : Only A is effective
Split mode : A, B independent
The split point function is effective when A=B, assigning A to the lower half and B to the upper half.

1) Channel voice message

1 Key OFF

Status	1 0 0 0 n n n n	(8n)	n=channel No.
Note No.	0 k k k k k k k		k=0(C-2)~127(G8)
Velocity	0 v v v v v v v		Ignore vs

2 Key ON/OFF

Status	1 0 0 1 n n n n	(9n)	n=channel No.
Note No.	0 k k k k k k k		k=0(C-2)~127(G8)
Velocity	0 v v v v v v v		v=1~127 Key ON
	0 0 0 0 0 0 0 0		Key OFF

3 Control change

Status	1 0 1 1 n n n n	(Bn)
Control No.	0 c c c c c c c	
Control Value	0 v v v v v v v	

c=1	Modulation wheel	v=0~127
c=2	Breath control	v=0~127
c=4	Foot control	v=0~127
c=5	Portamento time	v=0~127
c=6	Data entry slider	v=0~127
c=8	Balance	v=0~127
c=9-31	Continuous slider	v=0~127
c=9-31	MIDI control	v=0~127
c=64	Sustain SW	v=0~63: OFF, 64~127: ON
c=65	Portamento SW	v=0~63: OFF, 64~127: ON
c=66	Sosutenuto	v=0~63: OFF, 64~127: ON
c=67	Soft	v=0~63: OFF, 64~127: ON
c=96	Date entry +1	
c=97	Data entry −1	

The continuous sliders can be assigned to certain internal effects.
MIDI control can be assigned in the same way as foot control.

4 Program change

Status	1 1 0 0 n n n n	(Cn)	n=channel No.
Program No.	0 p p p p p p p		p=0~127

0~31 select internal PERFORMANCE combinations in PERFORMANCE mode.
32~63 select cartridge PERFORMANCE combinations. Values over 63 repeat this order of selection (INT 1~32 → CRT 1~32).
In Single, Dual or Split mode, 0~63 select INT voices, 64~127 CRT voices.

5 After touch

Status	1 0 1 1 n n n n	(Dn)	n=channel No.
Value	0 v v v v v v v		v=0~127

6 Pitch bender

Status	1 1 1 0 n n n n	(En)	n=channel No.
Value (LSB)	0 u u u u u u u		
Value (MSB)	0 v v v v v v v		

Operates with only the MSB data.

MSB

00000000	Min.
01000000	Mid.
01111111	Max.

2) Channel mode message

1 Poly/All note off

1 0 1 1 n n n n	(Bn)
0 1 1 1 1 1 1 0	(7E) Poly/All note off
0 0 0 0 0 0 0 0	

2 Mono/All note off

1 0 1 1 n n n n	(Bn)
0 1 1 1 1 1 1 1	(7F) Mono/All note off
0 m m m m m m m	Set to the Mono mode with only m=1 recognized. Ignore when m=1.

[4]-2 System Information

1) System real time messages

Active sensing
Status 1 1 1 1 1 1 1 0 (FE)

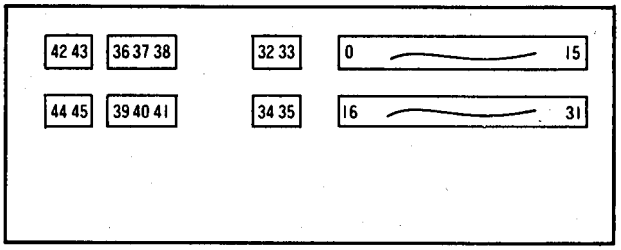
Upon reception of the code, sensing will start. When there is no status byte or data for 300 msec, the MIDI reception buffer is cleared and the on-going sound turned OFF.

2) System exclusive messages

1 Parameter change (Switch remote)

Status	1 1 1 1 0 0 0 0	(F0)
ID No.	0 1 0 0 0 0 1 1	(43)
Substatus/ device No.	0 0 0 1 n n n n	(1n)
Parameter group No.	0 0 0 1 1 0 1 1	(1B)
Switch No.	0 m m m m m m m	
Data	0 d d d d d d d	d=0: OFF d=127: ON
EOX	1 1 1 1 0 1 1 1	(F7)

All the panel switches are controlled.
The switch numbers are follows:



2 Parameter change
Same as for transmission

3 Bulk data
Same as for transmission

4 Dump request

For
- Voice edit buffer (f=0)
- Supplement edit buffer (f=5)
- Packed 32 supplement (f=6)
- Packed 32 voice (f=9)

Status	1 1 1 1 0 0 0 0	(F0)
ID No.	0 1 0 0 0 0 1 1	(43)
Substatus/ device No.	0 0 1 0 n n n n	(2n)
Format No.	0 f f f f f f f	f=0, 5, 6, 9
EOX	1 1 1 1 0 1 1 1	(F7)

- **Universal bulk dump**

Status	1 1 1 1 0 0 0 0	(F0)
ID No.	0 1 0 0 0 0 1 1	(43)
Substatus/ device No.	0 0 1 0 n n n n	(2n)
Format No.	0 1 1 1 1 1 1 0	(7E)
Classification name (ASCII 4 letters)	0 a a a a a a a ↓ 0 a a a a a a a	
Data format name (ASCII 6 letters)	0 m m m m m m m ↓ 0 m m m m m m m	
EOX	1 1 1 1 0 1 1 1	

Classification name and data format name are same as for transmission.

[Digital Programmable Algorithm Synthesizer] Date : 11/21, 1986
Model DX7-2 MIDI Implementation Chart Version : 1.0

Function ...		Transmitted	Recognized	Remarks
Basic Channel	Default	1 - 16	1 - 16	memorized
	Changed	1 - 16	1 - 16	
Mode	Default	3	1, 2, 3, 4	memorized
	Messages	x	POLY, MONO(M=1)	
	Altered	XXXXXXXXXXXXX	x X2	
Note Number		36 - 96 X1	0 - 127 X2	
	True voice	XXXXXXXXXXXXX	1 - 127	
Velocity	Note ON	o 9nH,v=1-127	o v=1-127	
	Note OFF	x 9nH,v=0	x	
After Touch	Key's	x	x	
	Ch's	o X1	o X2	
Pitch Bender		o X1	o 0-12 semi X2	7 bit resolution
Control Change	1	o X1	o X2	Modulation wheel
	2	o X1	o X2	Breath control
	4	o X1	o X2	Foot Controller
	5	x	o X2	Portamento time
	6	o X1	x	Data entry knob
	7	o X1	o X2	Volume
	8/10	x / x	o / o X2	Balance / Pan
	64	o X1	o X2	Sustain foot sw
	65	o X1	o X2	Portamento f sw
	66	o X1	o X2	Sostenuto
	67	o X1	o X2	Soft
	96/97	o / o X1	o / o X2	Data entry +1/-1
	5-31	o X1	o (11-31) X2	Continuous slidr
Prog Change		o 0 - 127 X1	o 0 - 127 X2	
	True #	XXXXXXXXXXXXX	0 - 127	64-127:Cartridge
System Exclusive		o X3	o X3	Voice parameters
System Common	Song Pos	x	x	
	Song Sel	x	x	
	Tune	x	x	
System Real Time	Clock	x	x	
	Commands	x	x	
Aux Mes- sages	Local ON/OFF	x	x	
	All Notes OFF	x	o (126,127)	
	Active Sense	o	o	
	Reset	x	x	

Notes: X1 = transmit if transmit channel is not off.
X2 = receive if receive channel is not off.
X3 = transmit/receive if device number is not off.

Mode 1 : OMNI ON, POLY Mode 2 : OMNI ON, MONO o : Yes
Mode 3 : OMNI OFF, POLY Mode 4 : OMNI OFF, MONO x : No

■LSI DATA TABLE

• HD6805S1A33P (IG105300) CPU

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	Vss		Ground	15	B3	I/O	Port B
2	$\overline{INT}$	I	Interrupt	16	B4	I/O	
3	Vcc		DC Supply	17	B5	I/O	
4	EXTAL	I	Clock	18	B6	I/O	
5	XTAL	I		19	B7	I/O	
6	NUM		Ground (not user's application)	20	A0	I/O	Port A
7	TIMER	I	Timer control	21	A1	I/O	
8	C0	I/O	Port C	22	A2	I/O	
9	C1	I/O		23	A3	I/O	
10	C2	I/O		24	A4	I/O	
11	C3	I/O		25	A5	I/O	
12	B0	I/O	Port B	26	A6	I/O	
13	B1	I/O		27	A7	I/O	
14	B2	I/O		28	$\overline{RES}$	I	Reset

• HD63B03YP (XA444001) MAIN-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	V15	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 A	I	Address data in
10	CLK	I	Clock data in	24	ADD B	I	
11	Vcc		Supply power (+5V)	25	ADD C	I	
12	REF(+)		Reference voltage (+)	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	

• YM2604 (XA489001) OPSII (Operator-S)

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	Vss	I	DC supply (0V)	33	DA7	O	Digital code for analog convert
2	D6	I/O	Data buses	34	DA8	O	
3	D7	I/O		35	DA9	O	
4	$\overline{DS}$	I	–	36	DA10	O	
5	$\overline{WR}$	I	Read write control	37	DA11	O	
6	–	–	Non connection	38	DA12	O	
7	–	–		39	DA13	O	
8	–	–		40	DA14	O	
9	SH1	O	Sample and hold data	41	DA15	O	
10	SH2	O		42	DA16	O	
11	SYNC	O		43	E1	I	Envelope data (from EGS)
12	F1	I	Frequency data (from EGS)	44	E2	I	
13	F2	I		45	E3	I	
14	F3	I		46	E4	I	
15	F4	I		47	E5	I	
16	F5	I		48	E6	I	
17	Vss	I	DC supply (0V)	49	E7	I	
18	F6	I	Frequency data (from EGS)	50	E8	I	
19	F7	I		51	E9	I	
20	F8	I		52	E10	I	
21	F9	I		53	E11	I	
22	F10	I		54	E12	I	
23	F11	I		55	KON	I	Key ON data
24	F12	I		56	D0	I/O	Data buses
25	F13	I		57	D1	I/O	
26	F14	I		58	D2	I/O	
27	DA2	O	Digital code for analog convert	59	D3	I/O	
28	DA3	O		60	D4	I/O	
29	DA4	O		61	D5	I/O	
30	DA5	O		62	VDD	I	DC supply (+5V)
31	DA6	O		63	ϕ1	I	Master clock pulse
32	Vss	I		64	ϕ2	I	

• YM3609 (XA898001) Envelope Generator

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	Vcc		Power supply	33	Vss		Ground
2	NC			34	ϕ2	I	Clock IN
3	E6	O	Envelope data	35	$\overline{TEST}$	I	Test pin
4	E7	O		36	D0	I	Data bus
5	E8	O		37	D1	I	
6	E9	O		38	D2	I	
7	E10	O		39	D3	I	
8	E11	O		40	NC		
9	E12	O		41	NC		
10	NC			42	NC		
11	NC			43	D4	I	Data bus
12	NC			44	D5	I	
13	KON	O	Key on data	45	D6	I	
14	F1	O	Frequency data	46	D7	I	
15	F2	O		47	NC		
16	F3	O		48	A0	I	Address bus
17	F4	O		49	A1	I	
18	F5	O		50	A2	I	
19	F6	O		51	A3	I	
20	F7	O		52	A4	I	
21	F8	O		53	NC		
22	F9	O		54	NC		
23	NC			55	$\overline{CE1}$	I	Chip enable
24	NC			56	$\overline{CE2}$	I	
25	NC			57	NC		
26	F10	O	Frequency data	58	NC		
27	F11	O		59	$\overline{SYNC}$	I	Synchro pulse
28	F12	O		60	E1	O	Envelope data
29	F13	O		61	E2	O	
30	F14	O		62	E3	O	
31	$\overline{IC}$	I	Initial clear	63	E4	O	
32	Vcc		Power supply	64	E5	O	

• PCM54HP (XA566001) Digital Analog Converter

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	Vpot		Not used	15	DA4		Bit 13
2	DA16		Bit 1 (MSB)	16	DA3		Bit 14
3	DA15		Bit 2	17	DA2		Bit 15
4	NC		Not used	18	LSB		Bit 16
5	DA14		Bit 3	19	V_0		Voltage Output
6	DA13		Bit 4	20	FBR		Not used
7	DA12		Bit 5	21	INV		Summing Junction
8	DA11		Bit 6	22	GND		Common
9	DA10		Bit 7	23	I_0		Current Output
10	DA9		Bit 8	24	NC		Not Used
11	DA8		Bit 9	25	OFF·S		Not Used
12	DA7		Bit 10	26	+Vcc		+15V
13	DA6		Bit 11	27	ADJ		Not Used
14	DA5		Bit 12	28	−Vcc		−15V

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

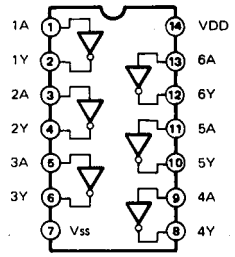
PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	$\overline{CS}$	I	Chip select	15	Vcc		Power supply
2	R/$\overline{W}$	I	Read/Write control	16	STEP	O	Step pulse
3	A0	I	Address bus	17	DIRC	O	Direction control
4	A1	I		18	CLK	I	Clock IN
5	DAL0	I/O	Data access lines	19	$\overline{RD}$	I	Read data
6	DAL1	I/O		20	MO	O	Motor ON
7	DAL2	I/O		21	WG	O	Write gate
8	DAL3	I/O		22	WD	O	Write data
9	DAL4	I/O		23	$\overline{TR00}$	I	Track 00 signal
10	DAL5	I/O		24	$\overline{IP}$	I	Index pulse
11	DAL6	I/O		25	$\overline{WPRT}$	I	Write protect
12	DAL7	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

• μPD8255AC-2 (XA052001) I/O PORT A-D

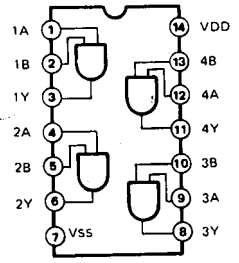
PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	PA3		Port A	40	PA4		Port A
2	PA2			39	PA5		
3	PA1			38	PA6		
4	PA0			37	PA7		
5	$\overline{RD}$		Read control	36	$\overline{WR}$		Write control
6	$\overline{CS}$		Chip Select	35	RST		Reset
7	GND		DC Supply (0V)	34	D0	I/O	Data bus
8	A1		Port address	33	D1	I/O	
9	A0			32	D2	I/O	
10	PC7		Port C	31	D3	I/O	
11	PC6			30	D4	I/O	
12	PC5			29	D5	I/O	
13	PC4			28	D6	I/O	
14	PC0			27	D7	I/O	
15	PC1			26	Vcc		DC Supply
16	PC2			25	PB7		Port B
17	PC3			24	PB6		
18	PB0		Port B	23	PB5		
19	PB1			22	PB4		
20	PB2			21	PB3		

■IC BLOCK DIAGRAM

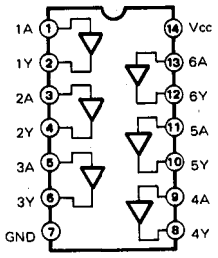
- **HD7405** (IG105500)
  TC40H004P (IG051000)
  Hex Inverter



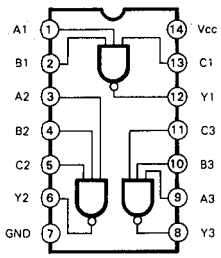
- **SN74HC08N** (IR000850)
  Quad 2 Input AND



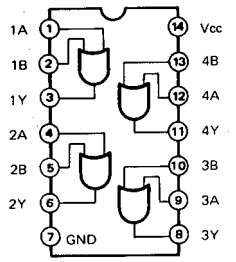
- **HD74LS14P** (IG049600)
  Hex Inverter



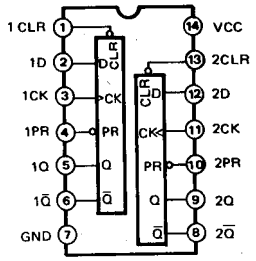
- **TC40H010P** (iG100200)
  Triple 3 Input NAND



- **SN74HC32N** (IR003250)
  TC40H032P (IG052800)
  Quad 2 Input OR

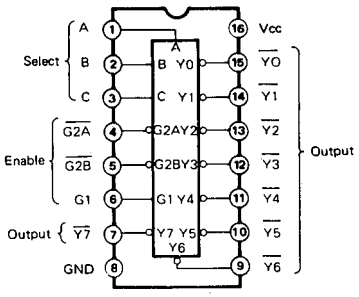


- **TC40H074P** (IG051100)
  Dual D-Type Flip-Flop

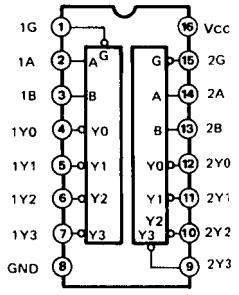


INPUTS				OUTPUTS	
PR	CLR	CLK	D	Q	Q
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H	H
H	H	↑	H	H	L
H	H	↑	L	L	H
H	H	L	X	Q_0	$\bar{Q}_0$

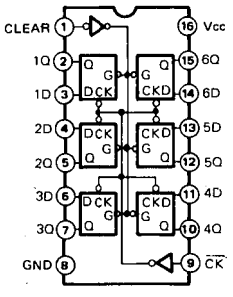
- **TC74HC138P** (IR013800)
  TC40H138P (IG111900)
  3 to 8 Demultiplexer



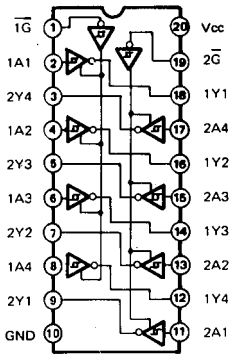
- **TC40H139P** (IG078300)
  Dual 2 to 4 Demultiplexer



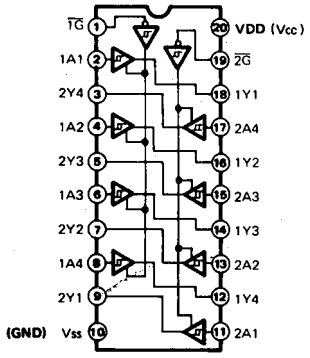
- **HD74LS174P** (IG050000)
  TC40H174P (IG064100)
  Hex D-Type Flip-Flop



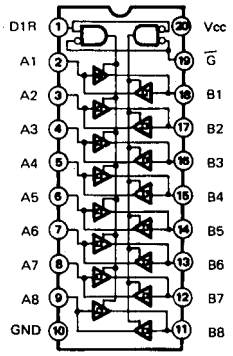
- **TC40H240P** (IG068100)
  Octal Bus Inverter



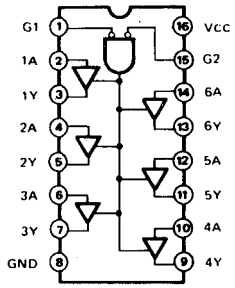
- **HD74LS244P** (IG060000)
  Octal 3-State Bus Buffer



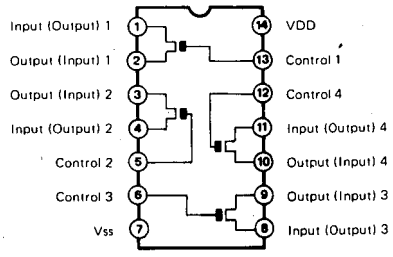
- **MC74HC245N** (IR024570)
  Octal 3-State Bus Transceiver



- **HD74LS365AP** (IG103200)
  Hex 3-State Bus Buffer



- **TC4066BP** (IG001270)
  Quad Bilateral Switch



- **NJM4558DV** (IG001390)
  Dual Operation Amplifier