

MUSIC SYNTHESIZER

SY77

SERVICE MANUAL

SY77



■ CONTENTS (目次)

SPECIFICATIONS (総合仕様).....	2
PANEL LAYOUT (パネルレイアウト).....	4
CIRCUIT BOARD LAYOUT (ユニットレイアウト).....	6
BLOCK DIAGRAM (ブロックダイアグラム).....	8
DISASSEMBLY PROCEDURE (分解手順).....	10
ASSEMBLY PRECAUTIONS (組立時の注意事項).....	15
LSI PIN DESCRIPTION (LSI端子機能表).....	17
IC BLOCK DIAGRAM (ICブロック図).....	23
CIRCUIT BOARDS (シート基板図).....	25
ERROR MESSAGES (エラーメッセージ).....	44
TEST PROGRAM (テストプログラム).....	48/72
MIDI DATA FORMAT (MIDIデータフォーマット).....	94
MIDI IMPLEMENTATION CHART.....	111
PARTS LIST	

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

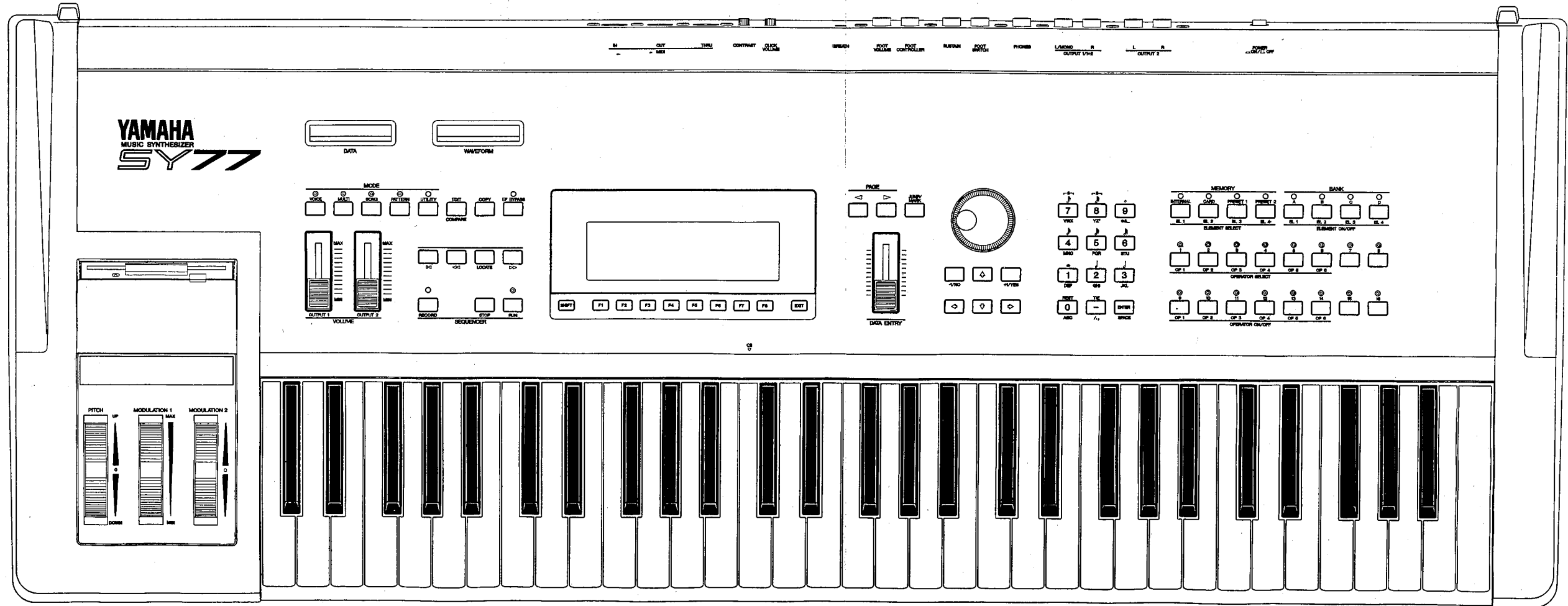
- **Tone generator:** Realtime Convolution and Modulation (RCM)
AWM2: 16 bit linear waveform data, maximum 48k Hz sampling frequency
AFM: 6 operators, 45 algorithms, 3 feedback loops, 16 waveforms, modulation from AWM output
Filter: Time variant IIR (infinite impulse response) digital filters, 2 filters for each element (maximum of 8 filters per voice)
Maximum simultaneous notes: 16 notes AWM + 16 notes AFM
Maximum simultaneous timbres: 16
Note assignment: Last note priority, DVA (dynamic voice allocation)
- **Keyboard:** 61 notes, key velocity sensitivity, channel aftertouch
- **DSP effects:** (reverb effect + modulation effect) × 2
Reverb effects: 40 types
Modulation effects: 4 types
- **Sequencer:** Tracks: 16 (15 tracks + 1 pattern track)
Songs: 1
Resolution: 1/96 of a quarter note (for internal clock)
Maximum simultaneous notes: 32
Capacity: approximately 16,000 notes
Patterns: 99
Recording: realtime/step/punch in
- **Memory:** Preset memory: 128 voices, 16 multis
Internal memory: 64 voices, 16 multis
Waveform memory: 2 Mwords (4 Mbytes), 112 sounds
Card slots: synthesizer data × 1, waveform data × 1
Disk: 3.5" floppy disk drive (713K byte formatted)
- **Controllers:** Wheels: PITCH, MODULATION 1, MODULATION 2
Slider: OUTPUT 1, OUTPUT 2, DATA ENTRY
Knobs: LCD contrast, click volume
Dial: data entry dial
Panel switches: MODE × 5, EDIT/COMPARE, COPY/SAVE, EF.BYPASS, SEQUENCER × 7, SHIFT, function × 8, EXIT, PAGE < >, JUMP/MARK, cursor Δ ∇ < >, -1/NO, +1/YES, numeric keypad 0-9, MEMORY × 4, BANK × 4, voice select × 16
- **Display:** LCD: 240 × 64 pixels (backlit)
LED: red × 11, red/green × 21
- **Terminals:** Audio output: OUTPUT 1 (L/MIX, L/MONO, R/MIX R), OUTPUT 2 (L, R), PHONES Controller: BREATH, FOOT VOLUME, FOOT CONTROLLER, SUSTAIN, FOOT SWITCH
MIDI: IN, OUT, THRU
- **Power requirements:** U.S. & Canadian models: 120V
European & Australian models: 220-240V
- **Power consumption:** U.S. & Canadian models: 28W
European & Australian models: 28W
- **Dimensions:** 1046 (W) × 407 (D) × 119 (H) mm
- **Weight:** 17kg
- **Output level:** Headphones: -1dBm
Output terminals: -10dBm
- **Accessory:** Floppy disk (3.5 inch) × 1
Plug cover × 1

総合仕様

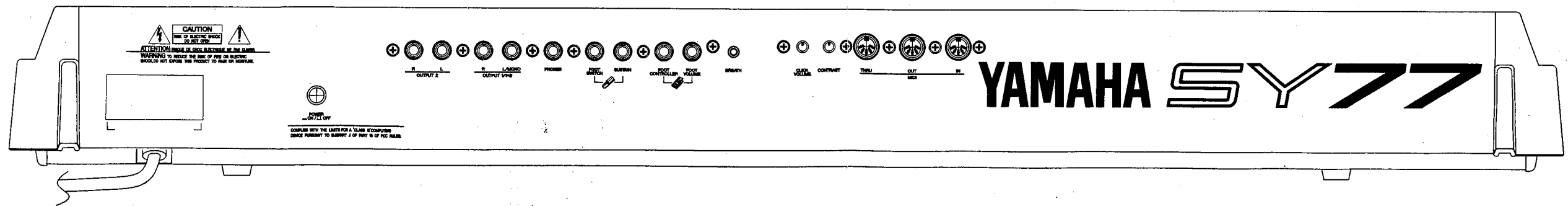
- 音源
 - 音源形式 : RCM音源
(Realtime Convolution and Modulation)
 - AWM2 : 16ビットリニア波形、サンプリング周波数最大48kHz
1音(エレメント)につき1オクターブ 12dBのデジタルフィルターを2個搭載
 - AFM : 6オペレータ、45アルゴリズム、3系統フィードバック、16波形
AWM2の出力波形による変調が可能
1音(エレメント)につき1オクターブ 12dBのデジタルフィルターを2個搭載
- フィルター : 時変形デジタルフィルター×最大8/ボイス
: 各フィルターはLPF,HPFの切り替えができ、この組合せによりBPFやロールオフ24dBのLPFとしても使用可能
: レゾナンス可変で発振領域までカバー
- 最大同時発音数 : AWM2 : 16音 + AFM : 16音
- 最大同時音色数 : 16
- 発音形式 : 後着優先、DVA
- 鍵盤 : 61キー/イニシャル&チャンネルアフタータッチ付き
- エフェクタータイプ : (リバーブ系+モジュレーション系)×2
 - リバーブ系 : 40タイプ
 - モジュレーション系 : 4タイプ
- シーケンサー
 - トラック数 : 16トラック(含むパターントラック1)
 - ソング : 1
 - 分解能 : \downarrow /96(内部クロック時)
 - 最大同時発音数 : 32
 - 最大記憶音数 : 約16000音
 - パターン数 : 99
 - 録音方式 : リアルタイム/ステップ/パンチイン
- プリセットメモリー : ボイス : 128+マルチ : 16
- インターナルメモリー : ボイス : 64+マルチ : 16
- 波形用メモリー : 2Mワード(4Mバイト)
: 楽器音×92
: リズム×20
- カードスロット : 音色パラメータ用×1
MCD64 : 1バンク
※ 1バンク : 64ボイス+16マルチ+1システム
: 波形用×1(512Kワード)
- 3.5インチFDD : 1(フォーマット時713KB)
- Wheel : ピッチベンド、モジュレーション1、モジュレーション2
- スライダーボリューム : アウトプットボリューム1・2、データエントリー
- ロータリーボリューム : LCDコントロール、クリックボリューム
- ダイヤル : データエントリー
- パネルスイッチ
 - Mode : 5 Voice, Multi, Song, Pattern, Utility
 - Edit : 2 Edit/Compare, Copy
 - Effect bypass : 1
 - Memory select : 4 Preset 1, Preset 2, Internal, Card
 - Bank select : 4 A~D
 - Voice select : 16 1~16
Page : 3 Page+, Page-, Jump/Mark
テンキー : 12 0~9, Enter, -
 - Data Entry : 2 Inc, Dec
 - カーソル : 4 ←, →, ↑, ↓
 - Function : 10 Function 1~8, Shift, Exit
 - Sequencer : 7 Run, Stop, Rec, Top, Rew, FF, Auto, Locate
- LCD : 240×64Dots(バックライト付き)
- LED : Red×11
: Red/Green×21
- 音声出力 : 4 Output 1(L/Mix L/Mono, R/Mix R), Output 2(L,R)
- ヘッドフォン : 1
- コントローラー : 6 Foot control, Foot volume, Foot switch, Sustain switch, Breath control
- MIDI : 3 IN, OUT, THRU
- ヘッドフォン出力レベル : -1dBm
- リア出力端子レベル : -10dBm
- 電源電圧 : 100V
- 消費電力 : 20W
- 寸法 : 1046(W)×407(D)×119(H)mm
- 重量 : 17kg
- 付属品 : デモディスク1枚
(3.5インチフロッピーディスク)
: プラグカバー 1個

■ PANEL LAYOUT (パネルレイアウト)

● Front Panel (フロントパネル)

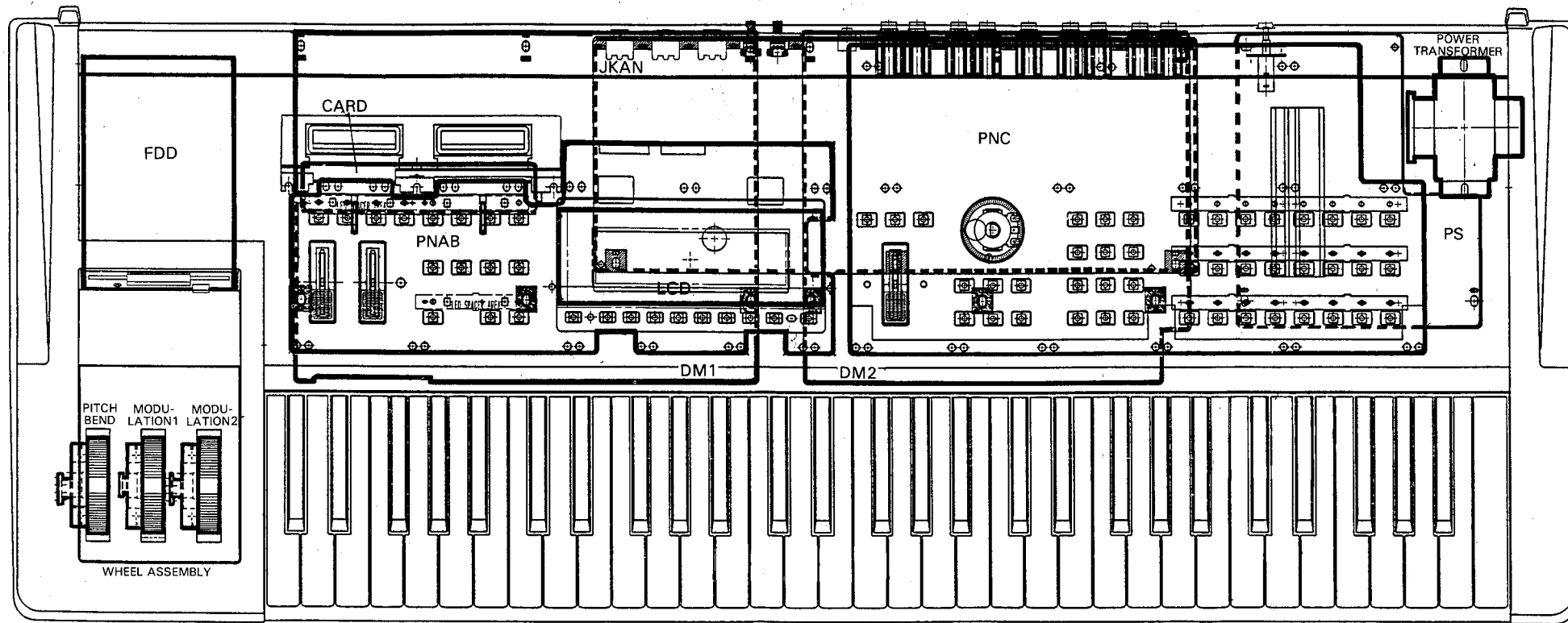


● Rear Panel (リアパネル)

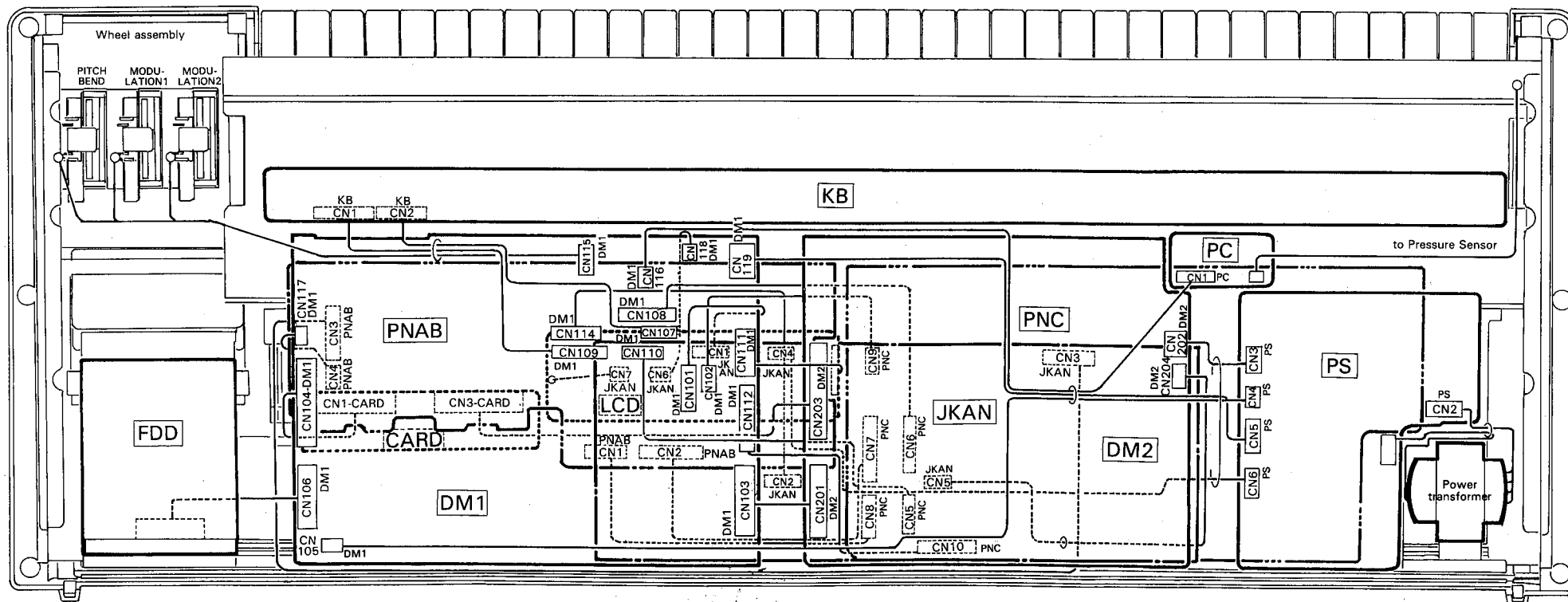


SY77

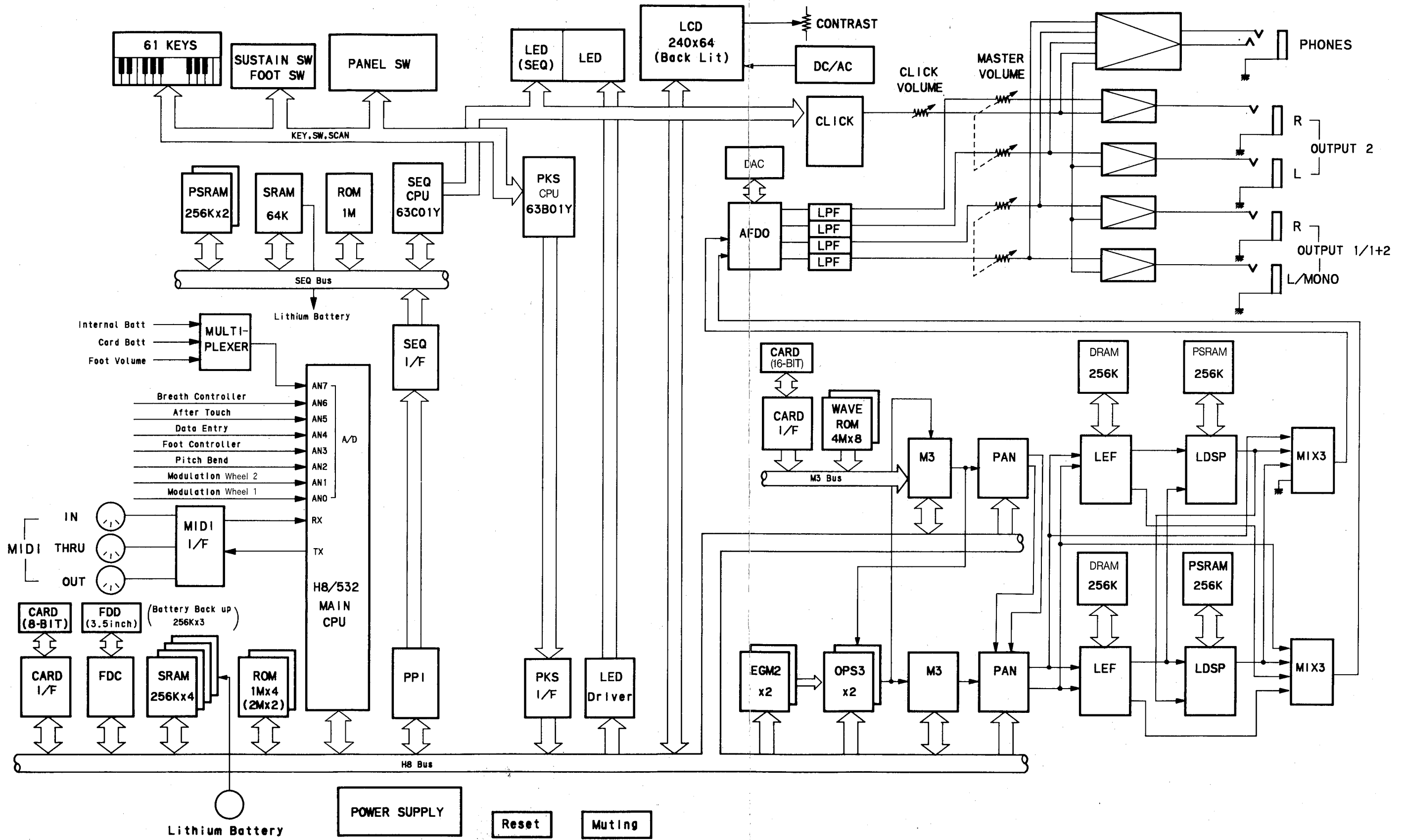
■ CIRCUI BOARD LAYOUT (ユニットレイアウト)



● Wiring (配線図)



■ BLOCK DIAGRAM (ブロックダイアグラム)



SY77

DISASSEMBLY PROCEDURE (分解手順)

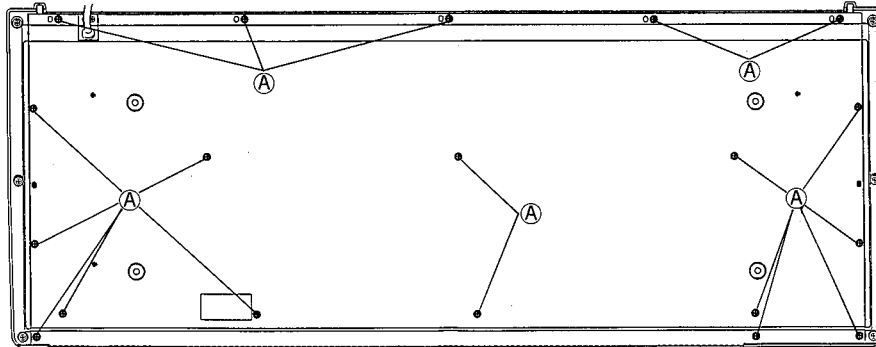
1. Bottom Cover Assembly (refer to fig. 1.)

1-1. Remove the nineteen (19) screws ① (4.0 × 10 bonding head tapping screw), the Bottom cover assembly can be removed.

This will give you access to the DM1, DM2, PS circuit boards, Floppy disk drive unit and Wheel assembly.

1. 底板 Ass'y の外し方 (図 1 参照)

1-1. ①のネジ19本(4×10ボンディングBタイトネジ)を外して取り外します。



(fig. 1)

2. DM1 Circuit Board (refer to fig.2)

2-1. Remove the Bottom cover assembly. (see procedure 1.)

2-2. Remove the six (6) screws ② (4.0 × 10 bind head tapping screw), the DM1 circuit board can be raised.

After the connectors have been disconnected, the DM1 circuit board can be taken out of the unit completely.

2. DM1 シートの外し方 (図 2 参照)

2-1. 底板 Ass'y を外します。(1項参照)

2-2. ②のネジ 6 本(4×10バインドタッピングネジ)と束線を外して取り外します。

3. DM2 Circuit Board (refer to fig.2)

3-1. Remove the Bottom cover assembly. (see procedure 1.)

3-2. Remove the six (6) screws ③ (4.0 × 10 bind head tapping screw), the DM2 circuit board can be raised.

After the connectors have been disconnected, the DM2 circuit board can be taken out of the unit completely.

3. DM2 シートの外し方 (図 2 参照)

3-1. 底板 Ass'y を外します。(1項参照)

3-2. ③のネジ 6 本(4×10バインドタッピングネジ)と、束線を外して取り外します。

4. PS Circuit Board (refer to fig. 2.)

4-1. Remove the Bottom cover assembly. (see procedure 1.)

4-2. Remove the screw ④ (4.0 × 10 bonding head tapping screw) to remove the AC panel.

4-3. The PS circuit board can be removed by removing the four (4) screws ⑤ (4.0 × 10 bind head tapping screw) and disconnecting the connectors.

4. PS シートの外し方 (図 2 参照)

4-1. 底板 Ass'y を外します。(1項参照)

4-2. ④のネジ 1 本(4×10ボンディングBタイトネジ)を外し、ACパネルを外しておきます。

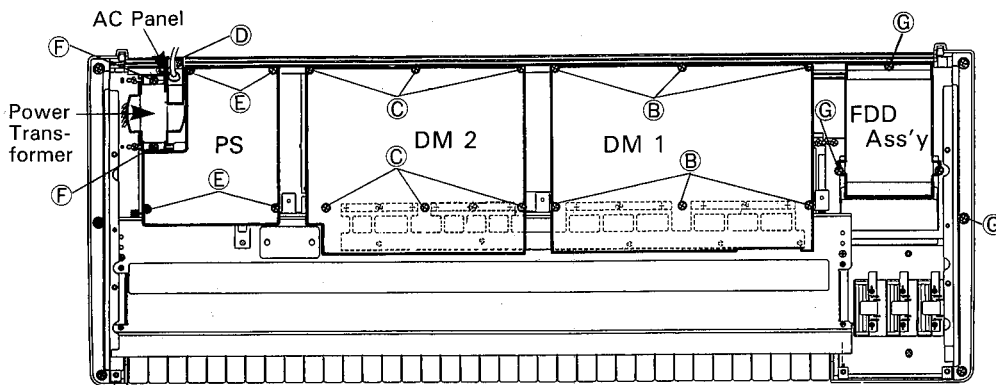
4-3. ⑤のネジ 4 本(4×10バインドタッピングネジ)と、束線を外して取り外します。

5. Power Transformer (refer to fig. 2.)

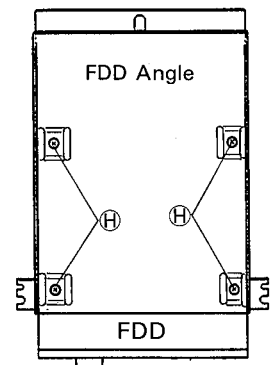
- 5-1. Remove the Bottom cover assembly. (see procedure 1.)
- 5-2. Remove the PS circuit board. (see procedure 4.)
- 5-3. Remove the two (2) screws ⑥ (4.0×10 bind head tapping screw) to remove the Power transformer.

6. Floppy Disk Drive Unit (refer to fig.2 and fig. 3)

- 6-1. Remove the Bottom cover assembly. (see procedure 1.)
- 6-2. Remove the three (3) screws ③ (4.0×10 bind head tapping screw) and disconnect the connectors, the Floppy disk drive unit can be taken out of the SY77 unit.
- 6-3. To remove the FDD holder from the Floppy disk drive unit, remove the four (4) screws ④ (3.0×6 bind head tapping screw).



(fig. 2)



(fig. 3)

5. 電源トランスの外し方 (図2参照)

- 5-1. 底板Ass'yを外します。(1項参照)
- 5-2. PSシートを外します。(4項参照)
- 5-3. ⑥のネジ2本(4×10バインドタッピングネジ)を外します。

6. FDDの外し方 (図2, 3参照)

- 6-1. 底板Ass'yを外します。(1項参照)
- 6-2. ③のネジ3本(4×10バインドタッピングネジ)と束線を外して、FDD Ass'yを取り外します。FDD金具は④のネジ4本(3×6バインド小ネジ)を外して取り外します。

7. CARD Circuit Board (refer to fig. 4)

- 7-1. Remove the Bottom cover assembly. (see procedure 1.)
- 7-2. Remove the DM1 circuit board. (see procedure 2.)
- 7-3. After the three (3) screws ① (4.0×10 bind head tapping screw) have been removed, the CARD circuit board can be removed.

8. JKAN Circuit Board (refer to fig. 4 and fig. 5)

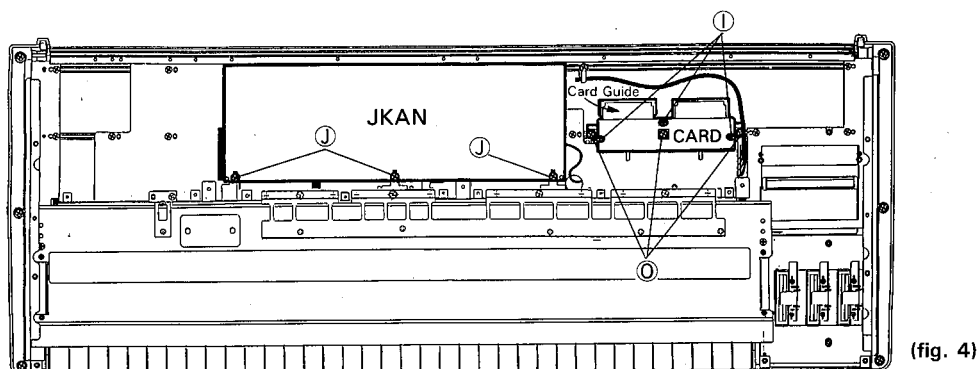
- 8-1. Remove the Bottom cover assembly. (see procedure 1.)
- 8-2. Remove the DM1 and DM2 circuit boards. (see procedures 2 and 3.)
- 8-3. Remove the ten (10) screws ⑧ (4.0×10 bonding head tapping screw) on the rear panel and three (3) screws ⑨ (4.0×10 bind head tapping screw), the JKAN circuit board can be removed.

7. CARDシートの外し方 (図4参照)

- 7-1. 底板Ass'yを外します。(1項参照)
- 7-2. DM1シートを外します。(2項参照)
- 7-3. ①のネジ3本(4×10バインドタッピングネジ)と、束線を外して取り外します。

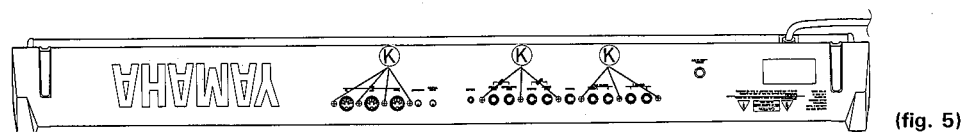
8. JKANシートの外し方 (図4, 5参照)

- 8-1. 底板Ass'yを外します。(1項参照)
- 8-2. DM1シートとDM2シートを外します。
(2と3項参照)
- 8-3. ⑧のネジ3本(4×10バインドタッピングネジ)と、リアパネル側より止めている⑩のネジ10本(4×10ボンディングBタイトネジ)と、束線を外して取り外します。



(fig. 4)

• Rear View



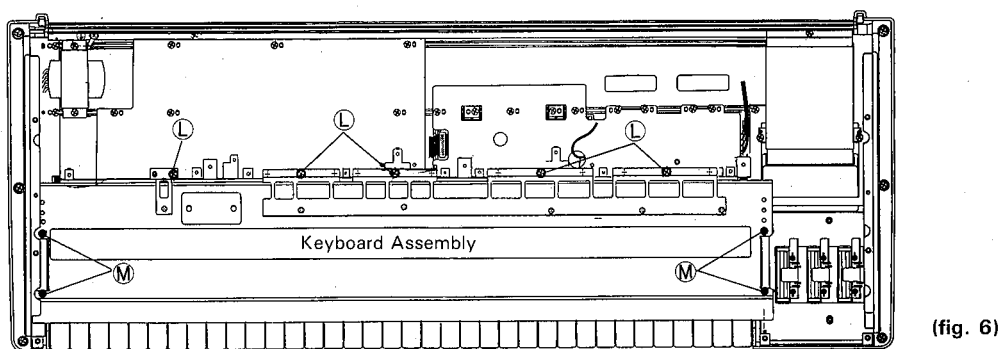
(fig. 5)

9. Keyboard Assembly (refer to fig. 6.)

- 9-1. Remove the Bottom cover assembly. (see procedure 1.)
- 9-2. Remove the DM1 and DM2 circuit boards. (see procedures 2 and 3.)
- 9-3. Remove the PS circuit board. (see procedure 4.)
- 9-4. The Keyboard assembly can be removed by removing the five (5) screws **L** (4.0 × 10 bind head tapping screw) and four (4) screws **M** (4.0 × 16 bind head tapping screw).

9. 鍵盤Ass'yの外し方 (図6参照)

- 9-1. 底板Ass'yを外します。(1項参照)
- 9-2. DM1シートとDM2シートを外します。
(2と3項参照)
- 9-3. PSシートを外します。(4項参照)
- 9-4. **L**のネジ5本(4×10バインドタッピングネジ)と
Mのネジ4本(4×16バインドタッピングネジ)を
外して取り外します。



(fig. 6)

10. PNAB and PNC Circuit Boards (refer to fig. 4 and fig.7)

- 10-1. Pull out the knobs on the Control panel.
- 10-2. Remove the Bottom cover assembly. (see procedure 1.)
- 10-3. Remove the DM1 and DM2 circuit boards. (see procedures 2 and 3.)
- 10-4. Remove the PS circuit board. (see procedure 4.)
- 10-5. Remove the JKAN circuit board. (see procedure 8.)
- 10-6. Remove the Keyboard assembly. (see procedure 9.)
- 10-7. Remove the fourteen (14) screws **N** (4.0 × 10 bind head tapping screw) to remove the Center angle bracket.

10. PNABシートとPNCシートの外し方 (図4, 7参照)

- 10-1. パネル表側より、スライドボリューム類のつまみを抜きとっておきます。
- 10-2. 底板Ass'yを外します。(1項参照)
- 10-3. DM1シートとDM2シートを外します。
(2と3項参照)
- 10-4. PSシートを外します。(4項参照)
- 10-5. JKANシートを外します。(8項参照)
- 10-6. 鍵盤Ass'yを外します。(9項参照)
- 10-7. **N**のネジ14本(4×10バインドタッピングネジ)を外して、センターアングルを取り外します。

10-8. PNAB circuit board removal

10-8-1. Remove the CARD circuit board. (see procedure 6.)

10-8-2. Remove the three (3) screws ① (4.0×10 bind head tapping screw) to remove the Card guide.

10-8-3. After the seven (7) screws ② (4.0×10 bind head tapping screw) have been removed, the PNAB circuit board can be removed.

* The PNAB circuit board is connected to the PNC circuit board with wire harnesses.

10-9. PNC circuit board removal

10-9-1. After the eight (8) screws ③ (4.0×10 bind head tapping screw) have been removed, the PNC circuit board can be removed.

10-8. PNABシートの外し方

10-8-1. CARDシートを外します。(6項参照)

10-8-2. ①のネジ3本(4×10バインドタッピングネジ)を外してカードガイドを取り外します。

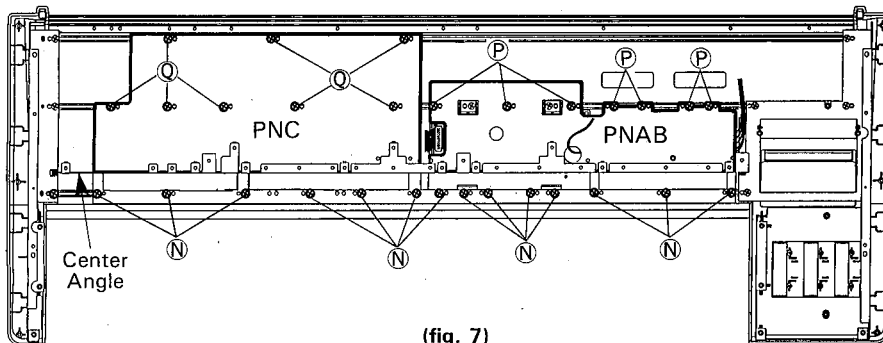
10-8-3. ②のネジ7本(4×10バインドタッピングネジ)を外せばPNABシートが外れます。

※束線も一緒に外す場合は、PNCシートも外して行って下さい。

10-9. PNCシートの外し方

10-9-1. ③のネジ8本(4×10バインドタッピングネジ)を外して取り外します。

※束線も一緒に外す場合は、PNABシートも外して行って下さい。



(fig. 7)

11. LCD Circuit Board (refer to fig. 8)

11-1. Remove the Bottom cover assembly. (see procedure 1.)

11-2. Remove the DM1 and DM2 circuit boards. (see procedures 2 and 3.)

11-3. Remove the PS circuit board. (see procedure 4.)

11-4. Remove the JKAN circuit board. (see procedure 8.)

11-5. Remove the Keyboard assembly. (see procedure 9.)

11-6. Remove the PNAB circuit board. (see procedure 10.)

11-7. The LCD circuit board can be removed by removing the four (4) screws ④ (3.0×8 bind head tapping screw).

11. LCDシートの外し方 (図8参照)

11-1. 底板Ass'yを外します。(1項参照)

11-2. DM1とDM2シートを外します。(2と3項参照)

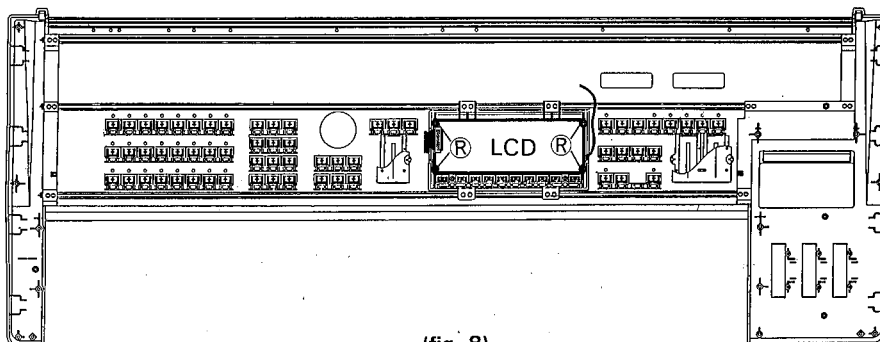
11-3. PSシートを外します。(4項参照)

11-4. JKANシートを外します。(8項参照)

11-5. 鍵盤Ass'yを外します。(9項参照)

11-6. PNABシートを外します。(10項参照)

11-7. ④のネジ4本(3×8バインドタッピングネジ)を外せばLCDシートが外れます。



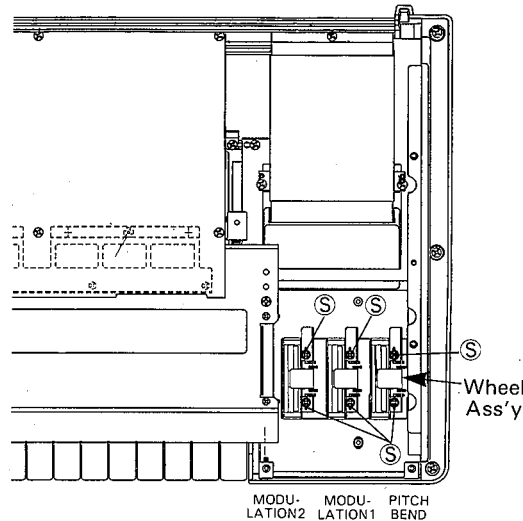
(fig. 8)

12. Wheel Assembly (refer to fig. 9)

- 12-1. Remove the Bottom cover assembly. (see procedure 1.)
- 12-2. After the six (6) screws ⑤ (3.0×8 bonding head tapping screw) have been removed, the Wheel assembly can be removed.

12. ホイールAss'yの外し方 (図9参照)

- 12-1. 底板を外します。
- 12-2. ⑤のネジ6本(3×8ボンディングBタイトネジ)と束線を外して取り外します。



(fig. 9)

13. Rotary Encoder Knob (Data Entry)

- 13-1. Remove the Bottom cover assembly. (see procedure 1.)
- 13-2. Remove the DM1 and DM2 circuit boards. (see procedures 2 and 3.)
- 13-3. Remove the PS circuit board. (see procedure 4.)
- 13-4. Remove the JKAN circuit board. (see procedure 8.)
- 13-5. Remove the Keyboard assembly. (see procedure 9.)
- 13-6. Remove the PNC circuit board. (see procedure 10.)
- 13-7. Pull out the Rotary encoder knob on the PNC circuit board.

13. ロータリーエンコーダツマミ(データエントリー)の外し方

- 13-1. 底板Ass'yを外します。(1項参照)
- 13-2. DM1とDM2シートを外します。(2と3項参照)
- 13-3. PSシートを外します。(4項参照)
- 13-4. JKANシートを外します。(8項参照)
- 13-5. 鍵盤Ass'yを外します。(9項参照)
- 13-6. PNCシートを外します。(10項参照)
- 13-7. PNCシートから、ロータリーエンコーダツマミを外します。

■ ASSEMBLY PRECAUTIONS (組立時の注意事項)

When assembling the unit, be sure to route and fix all wire harnesses at their original positions. If they are not placed correctly, excessive noise may be produced from the output connectors. Special care is required for the following harnesses.

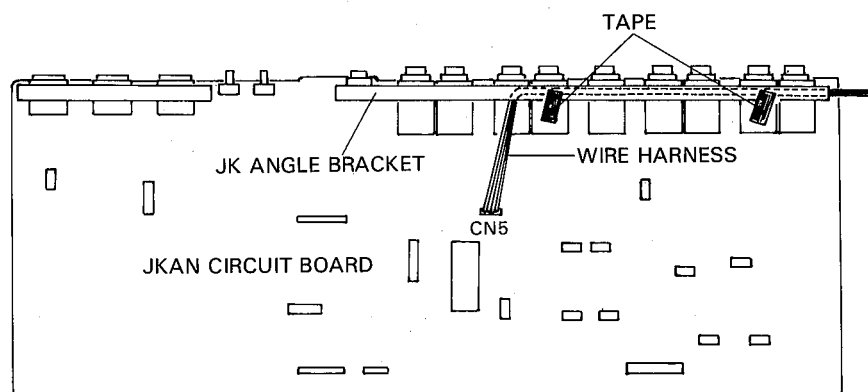
1. JKAN Circuit Board Wire Harness

Route the wire harness between the JK angle bracket and connectors, then attach tape as shown in the figure below.

本体を組み立てる際、全ての束線は必ず元の位置に固定して下さい。もし束線が元の位置に固定されないと、規定値以上のノイズが出力端子より発生する可能性があります。特に下記束線には注意が必要です。

1. JKANシート束線

下図のようにJKアングルとコネクタ間に束線を通し、そしてテープを貼って下さい。



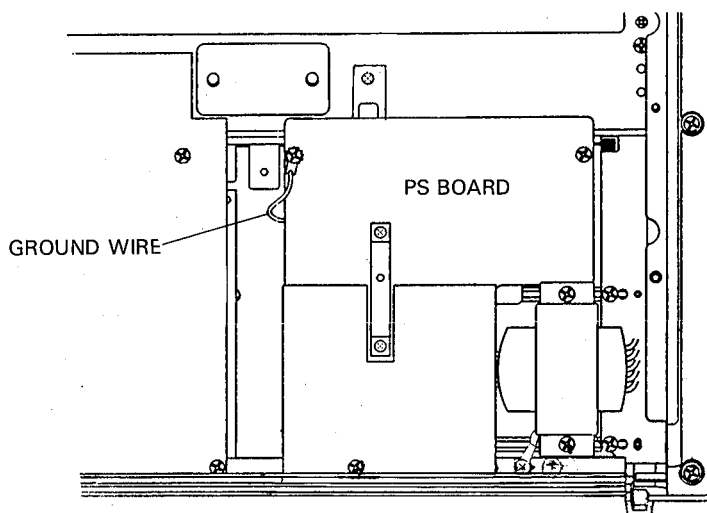
(Fig. 1)

2. PS Board Ground Wire

This ground wire, together with the PS board, should be fixed to the chassis with a screw.

2. 電源ユニットのグラウンド線

このグラウンド線はPSシートと共にネジでシャーシに固定して下さい。



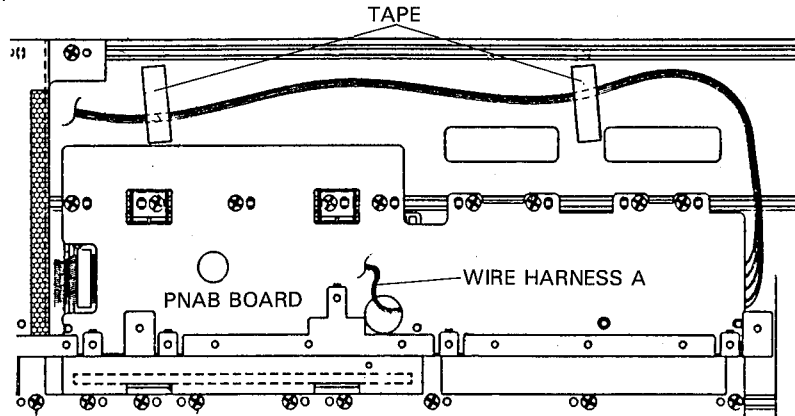
(Fig. 2)

3. PNAB Circuit Board Wire Harness

Route this wire harness as far as possible away from harness A (power supply line for the EL panel), then attach tape as shown in the figure below.

3. PNABシート束線

この束線は出来るだけ束線Aより離し、そして下図のようにテープを貼って下さい。



(Fig. 3)

LSI PIN DESCRIPTION (LSI端子機能表)

• HD6475328CP-10 <H8/532> (XG944B00) CPU (Central Processing Unit)

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	XTAL	I	Clock	43	P50/A8	O	Address bus
2	Vss	I	Ground	44	P51/A9	O	
3	P10/ ϕ	O	System clock	45	P52/A10	O	
4	P11/E	O	Enable	46	P53/A11	O	
5	P12/BACK	O	Bus acknowledge	47	P54/A12	O	
6	P13/BREQ	I	Bus request	48	P55/A13	O	
7	P14/WAIT	I	Wait	49	P56/A14	O	
8	P15/IRQ0	I	Interrupt request 0	50	P57/A15	O	
9	P16/IRQ1	I	Interrupt request 1	51	P60/A16	O	
10	P17/TMO	O	8-bit timer output	52	P61/A17	O	
11	P20/AS	O	Address strobe	53	P62/A18	O	
12	P21/R/W	O	Read/Write	54	P63/A19	O	
13	P22/DS	O	Data strobe	55	Vcc	Power supply	
14	P23/RD	O	Read control	56	P70/TMCI	I	8-bit timer clock input
15	P24/WR	O	Write control	57	P71/FTI1	I	Free running timer input capture (8-bit timer counter reset input)
16	Vcc	I	Power supply	58	P72/FTI2	I	
17	MDO	I	Mode control	59	P73/FTI3/TMRI	I	
18	MD1	I					
19	MD2	I	Free running timer output compare B/ Free running timer counter clock	60	P74/FTO1/FTCI1	O/I	
20	STBY	I		Standby	61	P75/FTO2/FTCI2	O/I
21	RES	I	Reset	62	P76/FTO3/FTCI3	O/I	
22	NMI	I	Non-maskable interrupt	63	P77/FTOA1	O	Free running timer output compare A1
23	NC	I	Ground	64	Vss	Ground	
24	Vss	I					
25	P30/D0	I/O	Data bus	65	AVss	Analog ground	
26	P31/D1	I/O					
27	P32/D2	I/O					
28	P33/D3	I/O					
29	P34/D4	I/O					
30	P35/D5	I/O					
31	P36/D6	I/O					
32	P37/D7	I/O					
33	P40/A0	O	Address bus	66	P80/ANO	Port 8	
34	P41/A1	O					
35	P42/A2	O					
36	P43/A3	O					
37	P44/A4	O					
38	P45/A5	O					
39	P46/A6	O					
40	P47/A7	O					
41	Vss	I	Ground	67	P81/AN1	Analog power supply	
42	Vss	I					
				74	AVcc	Free running timer output compare A2	
				75	P90/FTOA2	O	Free running timer output compare A3
				76	P91/FTOA3	O	Pulse width
				77	P92/PW1	O	
				78	P93/PW2	O	
				79	P94/PW3	O	Transmit data Receive data
				80	P95/TXD	O	
				81	P96/RXD	I	Serial clock
				82	P97/SCK	I/O	
				83	Vss	Ground	
				84	EXTAL	I	Clock

• HD63C01Y0F64 (XF148A00) CPU (SEQ.)

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	Vss	I	Ground	33	Vcc	I	DC Supply (+5V)
2	XTAL	I	Clock (8MHz)	34	A15	O	Address bus
3	EXTAL	I					
4	MP0	I	Mode program	35	A14	O	
5	MP1	I					
6	RES	I	Reset	36	A13	O	
7	STBY	I	Stand-by mode signal	37	A12	O	
8	NMI	I	Non-maskable interrupt	38	P11	O	
9	P20/TIN	I/O	Port 2	39	P10	O	
10	P21/TOUT1	I/O					
11	P22/SCLK	I/O					
12	P23/RX	I/O					
13	P24/TX	I/O					
14	P25/TOUT2	I/O					
15	P26/TOUT3	I/O					
16	P27/TCLK	I/O					
17	P50/IRQ1	I/O	Port 5	40	A9	O	
18	P51/IRQ2	I/O					
19	P52/MR	I/O					
20	P53/HALT	I/O					
21	P54/IS	I/O					
22	P55/OS	I/O					
23	P56	I/O					
24	P57	I/O					
25	P60	I/O	Port 6	41	A8	O	
26	P61	I/O					
27	P62	I/O					
28	P63	I/O					
29	P64	I/O					
30	P65	I/O					
31	P66	I/O					
32	P67	I/O					
				42	Vss	Ground	
				43	A7	O	
				44	A6	O	
				45	A5	O	
				46	A4	O	
				47	A3	O	
				48	A2	O	
				49	A1	O	
				50	A0	O	
				51	D7	I/O	
				52	D6	I/O	
				53	D5	I/O	
				54	D4	I/O	
				55	D3	I/O	
				56	D2	I/O	
				57	D1	I/O	
				58	D0	I/O	
				59	BA	O	Bus available
				60	LIR	O	Load instruction resistor
				61	R/W	O	Read/Write control
				62	WR	O	Write
				63	RD	O	Read
				64	E	O	Enable

• **YM3413 (XE449A00) LDSP (Digital Signal Processor)**

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION	
1	VDD		DC supply (+5V)	21	A5	O	Address bus	
2	D7	I/O		22	A6	O		
3	D6	I/O	Data bus	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	S10	I	Serial data input	30	A14	O		
11	S11	I		31	A15	O		
12	SYW	I	Sync pulse	32	A16	O		
13	WE	O	Write enable	33	SO0	O		Serial data output
14	OE	O	Output enable	34	XCLK	I		
15	A0	O	Address bus	35	IC	I		Initial Clear
16	A1	O		36	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	I	Clock	

• **YM3415 (XE450A00) LEF (Effect Processor)**

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION	
1	VDD		Power supply	21	A7	O	Address bus	
2	S10	I	Serial data input	22	A6	O		
3	S11/TST1	I		23	A5	O		
4	SO0	O	Serial data input	24	A4	O		
5	SO1	O		25	A3	O		
6	XCLK	I	Clock	26	A2	O		
7	CDO	O	CD data output	27	A1	O		
8	CDI	I	CD data input	28	A0	O		
9	CRS/CE	I	CD counter reset	29	RAS	O		DRAM control
10	WR	I	Write control	30	CAS	O		DRAM control
11	A/D	I	Address/data parameter select	31	WE	O	WE signal	
12	PDO	I/O	Data bus	32	OE	O	OE signal	
13	PD1	I/O		33	D3	I/O		
14	PD2	I/O		34	D2	I/O		
15	PD3	I/O		35	D1	I/O		
16	PD4	I/O		36	D0	I/O		
17	PD5	I/O		37	TST2	I	Internal test	
18	PD6	I/O		38	SYW	I	Sync pulse	
19	PD7	I/O		39	CLK	I	Clock	
20	Vss		Ground	40	IC	I	Initial clear	

• **YM3029 (XF237A00) AFDO (Floating Point Converter)**

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	DVDD		Digital power supply (+5V)	15	SHA	I	Sample and hold input (Channel A)
2	LE	O	Latch enable	16	EXG		Exponent ground
3	DAB	O	Channel A/B data output	17	EXG		
4	SYW	I	Sync pulse	18	EXI	I	Exponent input
5	CLK	I	Clock	19	EXO	O	Exponent output
6	φ1	O	Clock for DAC	20	AVSS		Analog power supply (-5V)
7	DGND		Digital ground	21	AVDD		Analog power supply (+5V)
8	ADV V		Analog power supply (+5V)	22	SI1	I	Serial data input 1 (Channel A)
9	AVSS		Analog power supply (-5V)	23	VLA0	I	Volume level select (Channel A)
10	SHB	I	Sample and hold input (Channel B)	24	VLA1	I	
11	CH4	O	Output (Channel 4)	25	SI2	I	Serial data input 2 (Channel B)
12	CH3	O	Output (Channel 3)	26	VLB0	I	Volume level select (Channel B)
13	CH2	O	Output (Channel 2)	27	VLB1	I	
14	CH1	O	Output (Channel 1)	28	4/2	I	Channel number select (4 or 2-channel)

• YM7102 (XG996A00) PAN (Panning Processor)

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION	
1	A0	I	Address bus	41	L8/ACC8	O	L channel data	
2	D7	I/O		42	L9/ACC9	O		
3	D6	I/O		43	L10/ACC10	O		
4	D5	I/O	Data bus	44	L11/ACC11	O		
5	D4	I/O		45	L12/ACC12	O		
6	D3	I/O		46	L13/ACC13	O		
7	D2	I/O		47	L14/ACC14	O		
8	D1	I/O		48	L15/ACC15	O		
9	D0	I/O	Data from OPS	49	R0/ACC16	O		R channel data
10	IN1	I		50	R1/ACC17	O		
11	IN0	I		51	R2/ACC18	O		
12	S12	I	Data from PAN (cathcade input)	52	R3/ACC19	O		
13	S11	I		53	R4	O		
14	TEGSS	I		54	R5	O		
15	TEGS2	I	Test pin	55	R6	O		
16	TEGS1	I		56	R7	O		
17	TEGS0	I		57	R8	O		
18	NC			58	R9	O		
19	CDO	O	Control data for DSP	59	R10	O		
20	CRS	O		60	R11	O		
21	S1	O	Signal to DSP	61	R12	O		
22	S2	O		62	R13	O		
23	SYW	O	Sync pulse for DSP	63	R14	O		
24	DSPCLK	O	Clock for DSP	64	R15	O		
25	MODE	I	Output mode (L:16bits DAC H:20bits DAC)	65	NC			
26	IC	I	Initial clear	66	TTIM	I	Test pin	
27	SYNC	I	Sync pulse	67	TEG1	I		
28	ϕ_M	I	Clock	68	TEG0	I		
29	Vss		Ground	69	TRD	I		
30	Vss			70	CS2	I	Chip select	
31	Vdd		Power supply	71	CS1	I		
32	Vdd			72	Vdd		Power supply Chip select	
33	L0/ACC0	O		73	CS0	I		
34	L1/ACC1	O	L channel data	74	A7	I	Address bus	
35	L2/ACC2	O		75	A6	I		
36	L3/ACC3	O		76	A5	I		
37	L4/ACC4	O		77	A4	I		
38	L5/ACC5	O		78	A3	I		
39	L6/ACC6	O		79	A2	I		
40	L7/ACC7	O		80	A1	I		

• μ PD71055C (XB361001) PPI (Programmable Peripheral Interface)

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	PO3	I/O	Port 0	21	P13	I/O	Port 2
2	PO2	I/O		22	P14	I/O	
3	PO1	I/O		23	P15	I/O	
4	PO0	I/O		24	P16	I/O	
5	RD	I	Read control	25	P17	I/O	DC Supply
6	CS	I	Chip Select	26	Vdd		
7	GND		DC Supply (0V)	27	D7	I/O	
8	A1	I	Port address	28	D6	I/O	Data bus
9	A2	I		29	D5	I/O	
10	P27	I/O	Port 2	30	D4	I/O	
11	P26	I/O		31	D3	I/O	
12	P25	I/O		32	D2	I/O	
13	P24	I/O		33	D1	I/O	
14	P20	I/O		34	D0	I/O	
15	P21	I/O		35	RESET	I	Reset Write control
16	P22	I/O		36	WR	I	
17	P23	I/O	Port 0	37	P07	I/O	
18	P10	I/O		38	P06	I/O	
19	P11	I/O		39	P05	I/O	
20	P12	I/O		40	P04	I/O	

• YM7103 (XG993A00) EGM2 (Envelope Generator)

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	A0	I	Address bus	41	NC		Key on data
2	D7	I/O		42	KON	O	
3	D6	I/O		43	E0	O	
4	D5	I/O		44	E1	O	
5	D4	I/O		45	E2	O	
6	D3	I/O		46	E3	O	
7	D2	I/O		47	E4	O	
8	D1	I/O		48	E5	O	
9	D0	I/O		49	E6	O	
10	NC			50	E7	O	
11	TST10	O	51	E8	O	Envelope data, Pitch data (portament), Pitch envelope data	
12	TST9	O	52	E9	O		
13	TST8	O	53	E10	O		
14	TST7	O	54	E11	O		
15	TST6	O	55	E12	O		
16	TST5	O	56	E13	O		
17	TST4	O	57	NC			
18	TST3	O	58	NC			
19	TST2	O	59	NC			
20	TST1	O	60	NC			
21	TST0	O	61	NC			
22	ϕ M0	O	Clock	62	NC		
23	XTAL	O		63	NC		
24	EXTAL	I	Quartz crystal	64	NC		
25	IC	I	Initial clear	65	NC		
26	SYO	O	Sync pulse	66	NC		
27	SYI	I	Sync pulse	67	NC		
28	ϕ M1	I	Clock	68	NC		
29	Vss		Ground	69	NC		
30	Vss			70	NC		
31	NC			71	TRD	I	Test pin
32	VDD		Power supply	72	VDD		Power supply
33	NC			73	CS0	I	Chip select
34	NC		74	CS1	I		
35	NC		75	CS2	I		
36	TEGS2	I	Test pin	76	A5	I	Address bus
37	TEGS1	I		77	A4	I	
38	TEGS0	I	78	A3	I		
39	TSO1	O	79	A2	I		
40	TSO0	O	80	A1	I		

• WD37C65B-JM00 (XH129A00) FDC (Floppy Disk Controller)

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	RD	I	Read control	23	XT2	I	XTAL osc. in
2	WR	I	Write control	24	DRV	I	Drive type
3	CS	I	Chip select	25	XT1	O	XTAL osc. drive
4	A0	I	Register select	26	XT1	I	XTAL osc. in
5	DACK	I	DMA acknowledge	27	PCVAL	I	Precompensation value
6	TC	I	Terminal Count	28	HS	O	Head select (Side select)
7	DB0	I/O	Data bus	29	WE	O	Write enable
8	DB1	I/O		30	WD	O	Write data
9	DB2	I/O		31	DIRC	O	Direction control
10	DB3	I/O		32	STEP	O	Step pulse
11	DB4	I/O		33	DS1	O	Drive select 1
12	DB5	I/O		34	Vss		Ground
13	DB6	I/O		35	DS2	O	Drive select 2
14	DB7	I/O		36	M01/DS3	O	Motor ON 1/Drive select 3
15	DMA	O	Direct memory access request	37	M02/DS4	O	Motor ON 2/Drive select 4
16	IRQ	O	Interrupt request	38	HDL	O	Head loaded
17	DCHGEN	I	Disk change enable	39	RPM/RWC	O	Revolutions per minute/Reduced write current
18	LDOR	I	Load operations register	40	DCHG	I	Disk change
19	LDCR	I	Load control register	41	WP	I	Write protected
20	RST	I	Reset	42	TROO	I	Track 00 signal
21	RDD	I	Read disk data	43	IDX	I	Index
22	XT2	O	XTAL osc. drive	44	Vcc		Power supply

• YM7107 (XG994A00) OPS3 (Operator)

PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	A0	I	Address bus	41	DA8	O	D/A signal (straight binary) (MSB) Sample and hold Channel distribution Serial data (2 compl. 16bits LSB first)
2	D7	I/O		42	DA9	O	
3	D6	I/O		43	DA10	O	
4	D5	I/O	44	DA11	O		
5	D4	I/O	45	DA12	O		
6	D3	I/O	46	DA13	O		
7	D2	I/O	47	DA14	O		
8	D1	I/O	48	DA15	O		
9	D0	I/O	49	SH1	O		
10	E13	I	50	SH2	O		
11	E12	I	51	SC0	O		
12	E11	I	52	SC1	O		
13	E10	I	53	SC2	O		
14	E9	I	54	SO0	O		
15	E8	I	55	SO1	O		
16	E7	I	56	NC			
17	E6	I	57	NC			
18	E5	I	58	NC			
19	E4	I	59	NC			
20	E3	I	60	NC			
21	E2	I	61	NC			
22	E1	I	62	NC			
23	E0	I	63	NC			
24	KON	I	64	NC			
25	IC	I	65	NC			
26	NC		66	NC			
27	SYNC	I	67	NC			
28	ϕ_M	I	68	Vss			
29	Vss		69	SI0	I		
30	Vss		70	SI1	I		
31	VDD		71	NC			
32	VDD		72	VDD			
33	DA0	O	73	CS0	I		
34	DA1	O	74	CS1	I		
35	DA2	O	75	CS2	I		
36	DA3	O	76	A4			
37	DA4	O	77	A3			
38	DA5	O	78	A2			
39	DA6	O	79	A1			
40	DA7	O	80	Vss			

• HD637B01Y (XG950A00) CPU (PKS)

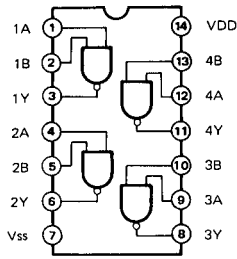
PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	Vss		Ground	33	Vcc		DC Supply (+5V)
2	XTAL	I	Clock (8MHz)	34	P47	O	Port 4
3	EXTAL	I		35	P46	O	
4	MP0	I	Mode program	36	P45	O	
5	MP1	I		37	P44	O	
6	RES	I	Reset	38	P43	O	
7	STBY	I	Stand-by mode signal	39	P42	O	
8	NMI	I	Non-maskable interrupt	40	P41	O	
9	P20	I/O	Port 2	41	P40	O	
10	P21	I/O		42	Vss		
11	P22	I/O		43	P17	O	
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	49	P11	O		
18	P51	I/O	50	P10	O		
19	P52	I/O	Port 5	51	P37	I/O	
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	Port 3	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	
28	P63	I/O		60	P73	O	
29	P64	I/O	Port 7	61	P72	O	
30	P65	I/O		62	P71	O	
31	P66	I/O		63	P70	O	
32	P67	I/O		64	E	O	

• YM7119 (XG995A00) M3 (AWM Tone generator & Digital Filter)

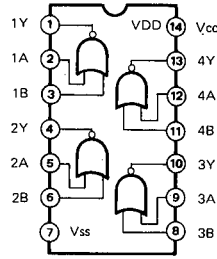
PIN NO.	NAME	I/O	FUNCTION	PIN NO.	NAME	I/O	FUNCTION
1	INDV0	O	Individual output 0 (8 channels)	65	WA8	O	Wave memory address bus
2	INDV1	O	Individual output 1 (8 channels)	66	WA9	O	
3	OPZ	I	MELIN input select (⊕ OPZ, ⊙ PÂN)	67	WA10	O	
4	DIOUT0	O	Stereo output (L & R)	68	WA11	O	
5	DIOUT1	O	Assignable output (ch.0 & ch.4)	69	WA12	O	
6	DIOUT2	O	Assignable output (ch.1 & ch.5)	70	WA13	O	
7	DIOUT3	O	Assignable output (ch.2 & ch.6)	71	WA14	O	
8	DIOUT4	O	Assignable output (ch.3 & ch.7)	72	NC		
9	MELIN	I	MEL formatted signal input	73	WA15	O	
10	LSB/MSB	I	Individual output mode select	74	WA16	O	
11	TTPAD0	I/O	(⊕ MSB first, ⊙ LSB first)	75	WA17	O	
12	TTPAD1	I/O	Test pin	76	WA18	O	
13	NC			77	WA19	O	
14	TTPAD2	I/O		78	WA20	O	
15	TTPAD3	I/O		79	WA21	O	
16	TTPAD4	I/O		80	WA22	O	
17	TTPAD5	I/O		81	WA23	O	
18	NC			82	A0	I	
19	TTPAD6	I/O		83	A1	I	
20	TTPAD7	I/O		84	A2	I	
21	NC			85	A3	I	
22	TTPAD8	I/O	86	A4	I		
23	TTPAD9	I/O	87	A5	I		
24	NC		88	D0	I/O		
25	TTPAD10	I/O	89	NC			
26	TTPAD11	I/O	90	D1	I/O		
27	DIINO	I	Individual input 0 (8 channels)	91	D2	I/O	
28	DIIN1	I	Individual input 1 (8 channels)	92	D3	I/O	
29	WD0	I/O	Wave memory data	93	D4	I/O	
30	WD1	I/O		94	D5	I/O	
31	WD2	I/O		95	D6	I/O	
32	WD3	I/O		96	D7	I/O	
33	NC			97	S/HSC0	I	
34	WD4	I/O		98	S/HSC1	I	
35	WD5	I/O		99	S/HSC2	I	
36	WD6	I/O		100	S/HSC3	I	
37	WD7	I/O		101	S/HEN	O	
38	WD8	I/O		102	S/H0	O	
39	WD9	I/O	103	S/H1	O		
40	NC		104	S/H2	O		
41	NC		105	S/HRCA	I		
42	WD10	I/O	106	S/HRCB	I		
43	WD11	I/O	107	IC	I		
44	NC		108	Vss			
45	WD12	I/O	109	XTAL	O		
46	WD13	I/O	110	EXTAL	I		
47	WD14	I/O	111	NC			
48	Vss		112	FCLKOUT	O		
49	Vdd		113	FCLKIN	I		
50	WD15	I/O	114	NC			
51	MSBW	O	Wave data MSB write signal	115	CLK3	O	
52	LSBW	O	Wave data LSB write signal	116	Vdd		
53	OE	O	Output enable for wave data	117	SYWIN	I	
54	ODD/EVEN	I	Odd/Even select on 2 chips mode	118	CLKMEL	O	
55	SINGLE/DUAL	I	Wave memory single/dual mode	119	NC		
56	WA0	O	select (⊕: dual-2 chips mode, ⊙: single-1 chip mode)	120	DACLE	O	
57	WA1	O	Wave memory address bus	121	SYWOUT	O	
58	WA2	O		122	SYW64	O	
59	WA3	O		123	IRQ	O	
60	WA4	O		124	CS	I	
61	WA5	O		125	R/W	I	
62	WA6	O		126	CHPIN	I	
63	WA7	O		127	CHPOUT	O	
64	NC			128	KSYNC	I	

■ IC BLOCK DIAGRAM (ICブロック図)

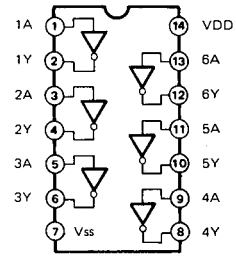
- **74F00PC** (IG063690)
Quad 2 Input NAND



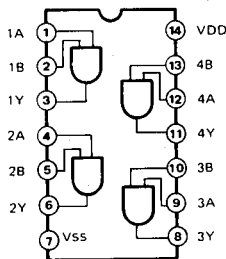
- **SN74HC02N** (IR000250)
Quad 2 Input NOR



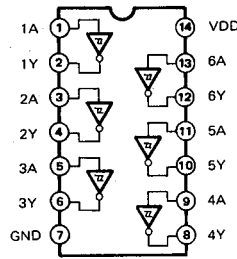
- **SN74LS04N** (IG027020)
- **SN74HC04N** (IG142250)
- **SN74HC04NSR** (XD830A00)
- **HD74LS05P** (IG052600)
Hex Inverter



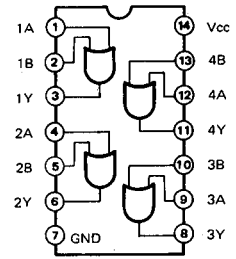
- **SN74ALS08N** (XA876001)
Quad 2 Input AND



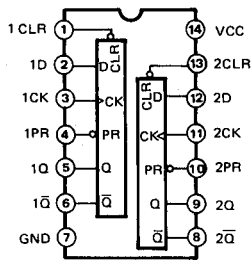
- **SN74HC14N** (IR001450)
Hex Inverter



- **74F32PC** (IG058990)
- **SN74HC32N** (IR003250)
- **SN74ALS32N** (XA055001)
- **SN74LS32N** (IG049850)
Quad 2 Input OR

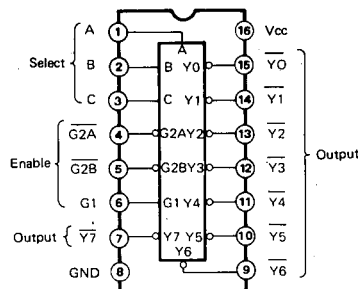


- **SN74HC74N** (IR007450)
- **SN74ALS74N** (XA196A00)
Dual D-Type Flip-Flop

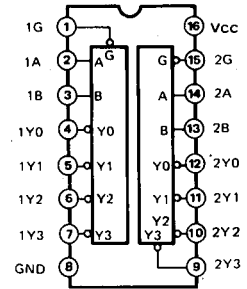


INPUTS				OUTPUTS	
PR	CLR	CLK	D	Q	Q-bar
L	H	X	X	H	L
H	L	X	X	L	H
L	L	X	X	H	H
H	H	f	H	H	L
H	H	f	L	L	H
H	H	L	X	Q _o	Q _o

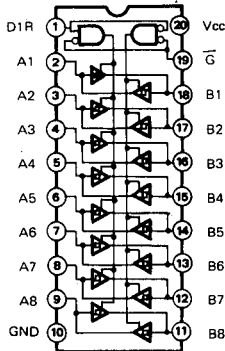
- **74F138PC** (IG120090)
- **SN74ALS138N** (IG149600)
- **SN74HC138N** (IR013850)
3 to 8 Demultiplexer



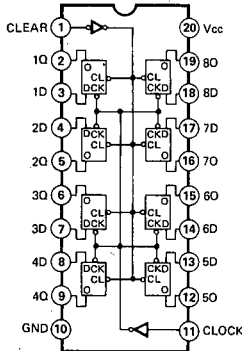
- **SN74HC139N** (IR013950)
Dual 2 to 4 Demultiplexer



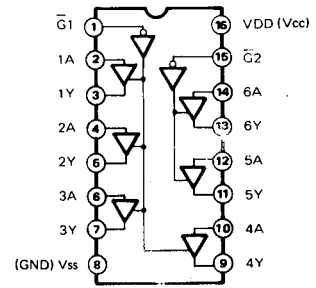
- **SN74ALS245AN** (IG149900)
 - **TC74HC245P** (IR024500)
 - **SN74LS245** (IG044600)
- Octal 3-State Bus Transceiver



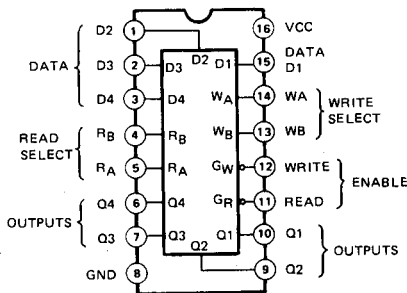
- **SN74HC273N** (IR027350)
- Octal D-Type Flip-Flop



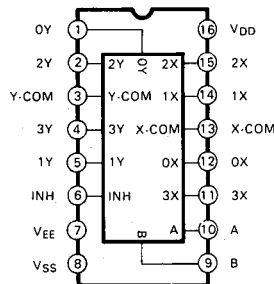
- **SN74HC367N** (IR036750)
- Hex 3-State Bus Buffer



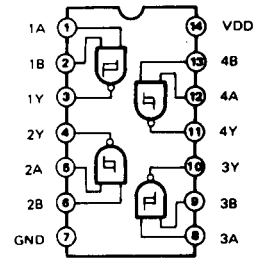
- **HD74LS670P** (IG115300)
- 4-4 Register Files (3-States)



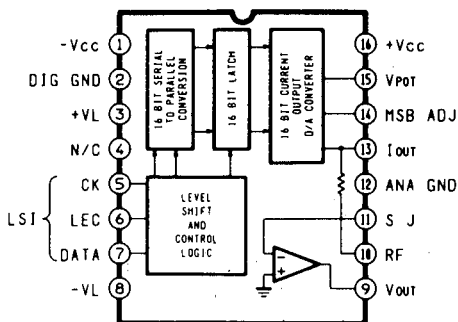
- **TC74HC4052AP** (IR405200)
- Differential 4-Channel Multiplexer/Demultiplexer



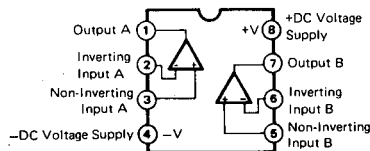
- **TC4093BP** (IG043300)
- Quad 2-Input NAND Schmitt Trigger



- **PCM56P** (XB637001)
- Digital Analog Converter



- **M5238P** (XA013001)
 - **RC4558D-V** (IG001390)
 - **NJM4556** (IG042500)
- Dual Operational Amplifier



SY77