

# S-10

## SERVICE NOTES *First Edition*

### SPECIFICATIONS

**KEYBOARD** : 49 keys, 4 octaves, Dynamics sensitive  
C scale

**QUICK DISK** : Front Loading Type  
1 Drive  
Capacity 32k words/side

**SAMPLING SYSTEM**  
Sampling Rate : 30kHz/15kHz  
Data Format : 12 bits, Linear  
Sampling Time : 4 sec (A → B → C → D)  
1 sec (A, B, C, D)  
@30kHz  
8 sec (A → B → C → D)  
2 sec (A, B, C, D)  
@15kHz

Wave Memory : 128k words  
4 Tone bank (32k words) A, B, C, D

Key Split : 0/1/3  
D/A Converter : 16 bits

**LFO** Rate : 0.085Hz - 12Hz  
Delay : 0 - 4.4 sec

**TUNE**  
Master Tune : ±100 cents  
Detune : ±50 cents  
Bank Tune : ±50 cents  
Loop Tune : ±50 cents

**DELAY**  
Delay Time : 0 - 1.7 sec

**AUTO BEND**  
ABEND Depth : 0 - -32 semitone

**ARPEGGIO**  
ARP Rate : 0.8Hz - 20Hz

**EXT-GATE-PLAY**  
TRG Gate Time : 0 - 12.7 sec

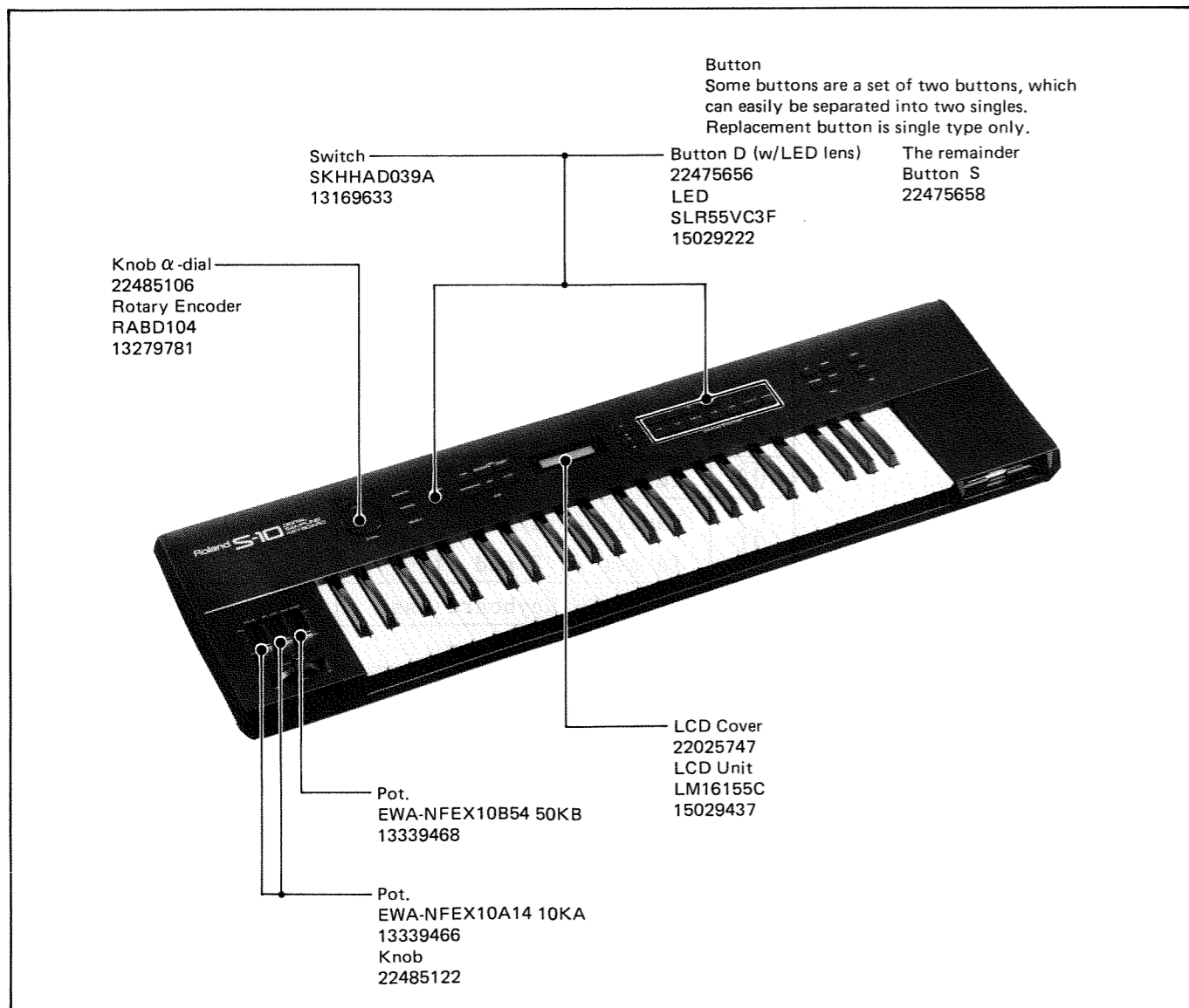
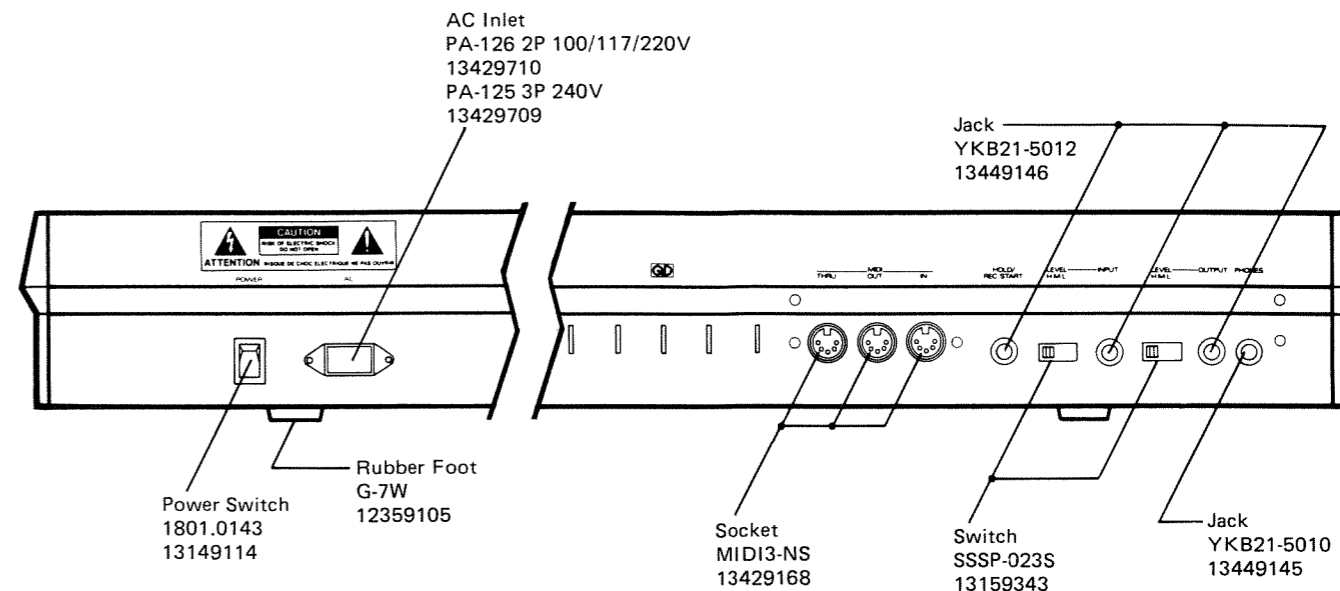
**INPUT** H : 0dBm  
M : -25dBm  
L : -50dBm

**OUTPUT** H : 0dB  
M : -15dB  
L : -30dB

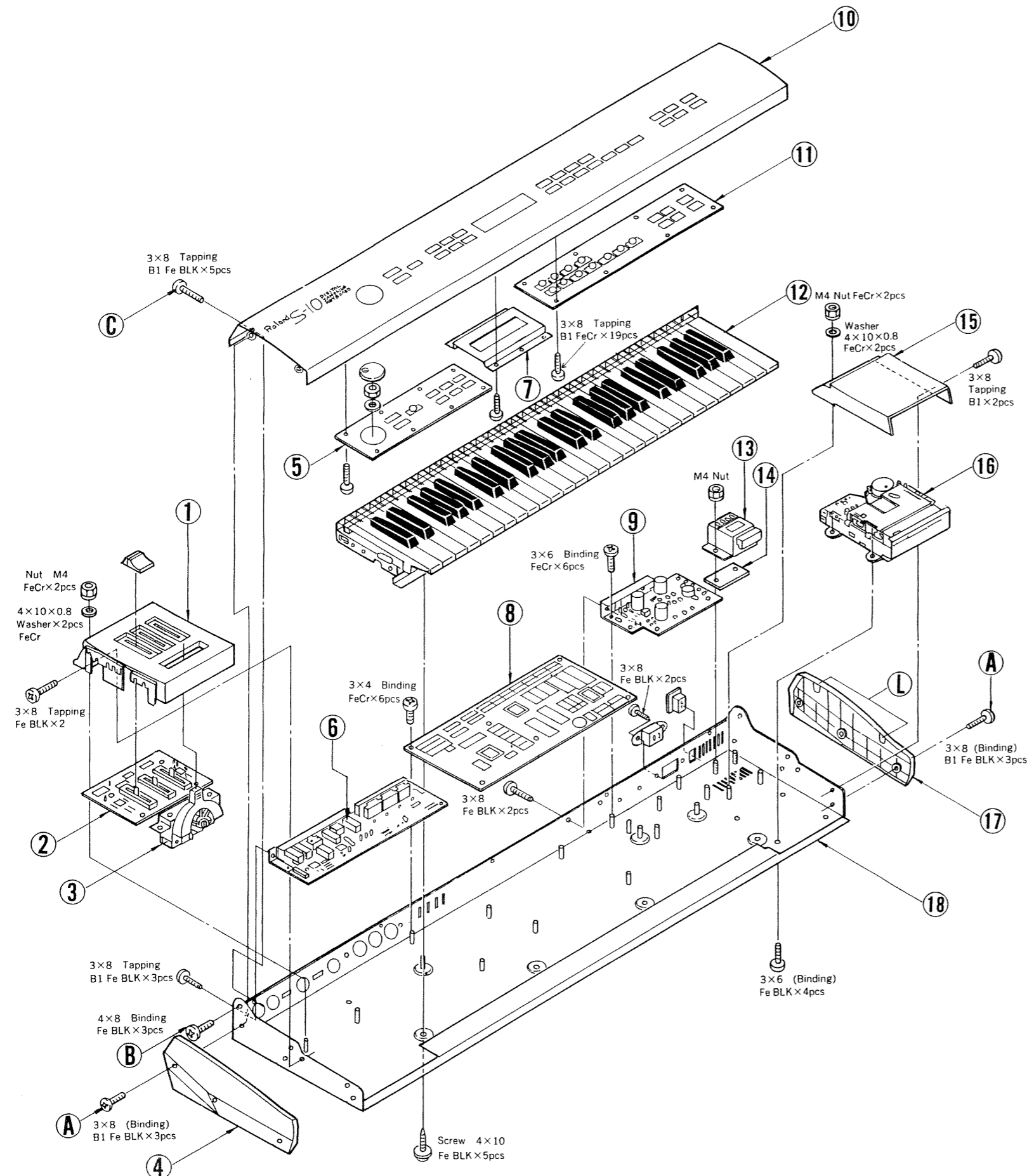
**Power Consumption** : 19W

**Dimensions** : 945(W) × 271(D) × 77(H) mm  
37-3/16" × 10-11/16" × 3"  
(without the QD Case)

**Weight** : 9.5kg/20 lb.



**EXPLODED VIEW 分解図**



**PANEL DISASSEMBLY**

1. Remove screws (A).
2. Grasp the top of side panel (4)(17).  
Note that the side panels have 2 "snap locks"(L) inside.  
Pull the side panel straight up off the chassis.
3. Remove screws (B).
4. Remove screws (C).

**パネル分解**

1. ビス(A)を取りはずす。
2. サイドパネル(4)(17)の上端をつかむ。  
(L)パネル内側上部にはロック用爪(L)がついているので、真っすぐ引上げる。

①	Bender Panel	22215770
②	Bender Board Assy	7616716000
③	Bender Assy PB-16	23275801
④	Side Panel, Left	21125242
⑤	Panel Board Assy (a set of 5 and 11)	7616705000
⑥	Output Board Assy	7616714000
⑦	Holder, LCD	22195872
⑧	Main Board Assy	7616713000
⑨	Power Supply Board Assy 100/117V 220/240V	7616709100 7616709400
⑩	Top Panel	22215508
⑪	Panel Board Assy (a set of 5 and 11)	7616705000
⑫	SK391-DW Keyboard Assy	7616720000
⑬	Power Transformer	22455456U0
⑭	Plate, P.T.	22125195
⑮	QD Panel (same as for S-50)	22215770
⑯	Quick Disk Drive D-281	12379537
⑰	Side Panel, Right	21125243
⑱	Chassis	22815549

# CHANGE INFORMATION

# 変更案内

## SOFTWARE REVISIONS

### NOTE

As shown below implementation of ROM revision does not all ways keep up with serial numbers.

SN	Ver.No.
680100   680149	2.00
680150   690649	1.07
690650   690849	2.00
690850   701349	1.07
701350   702449	2.01
702450   702849	2.04
702850   713849	2.01
Replacement for retrofit	2.02
	2.03
713850   715449	2.04
715450   725749	2.05
725750   726749	2.04
726750   726899	2.05
726900   727449	2.07
727450   728049	2.05
728050	2.07

VER. NO.	DESCRIPTION	改良点
1.07	Solve the problem of sound drop-outs occurring after MIDI ALL NOTES OFF. Add new feature: FILE NAME can be changed in SAVE mode.	MIDI ALL NOTES OFF 受信後の音抜け防止  SAVE時のファイル・ネーム変更を可能とする
2.00	Add new feature: MIDI EXCLUSIVE capability	MIDI EXCLUSIVE 機能追加
2.01	Fast ARPEGGIO sometimes drops notes. Ver. 2.01 cures this problem.	ARPEGGIO を速くすると音抜けを生じていた。これを防止
2.02	Minor improvement	小変更
2.03	Quicken the sound reproducing response to MIDI input.	MIDI 入力に対する発音タイミングを速める
2.04	Adjusting -100% level data (-5V) in WAVE MODIFY mode lets the data jump to (+)5%. The extreme notes will repeat less one time than they should with the setting of ARP MODE = U/D and ARP REPEAT = 2 or more. Ver. 2.04 solves this problem.	-100%のデータ(-5V)をWAVE MODIFY で LEVELアジャストすると(+5%となった。これを解決 ARP MODE = U/D ARP REPEAT = 2 以上の設定だと最高音と最低音が設定回数より1回少なく演奏された。この現象を取り除く
2.05	Repeating a key on the keyboard results in clicks due to DC drift. Ver. 2.05 eliminates this by assigning different module to each key strike.	同一キーを連打すると、DC変動による異音が発生した。キーが押される度に異なったモジュールがアサインされるようになる。
2.06	Not released	使用されない
2.07	Feeding GATE inputs equal to or more than the number of voices in EXT GATE PLAY mode silences the voices for the time set by TRG G-TIME. Ver. 2.07 cures this problem.	EXT-GATE PLAY モードに於て、ボイスの数以上のゲート入力があると、TRG G-TIMEで設定された時間内不鳴り、となった。これを解決

## ROMバージョンアップ

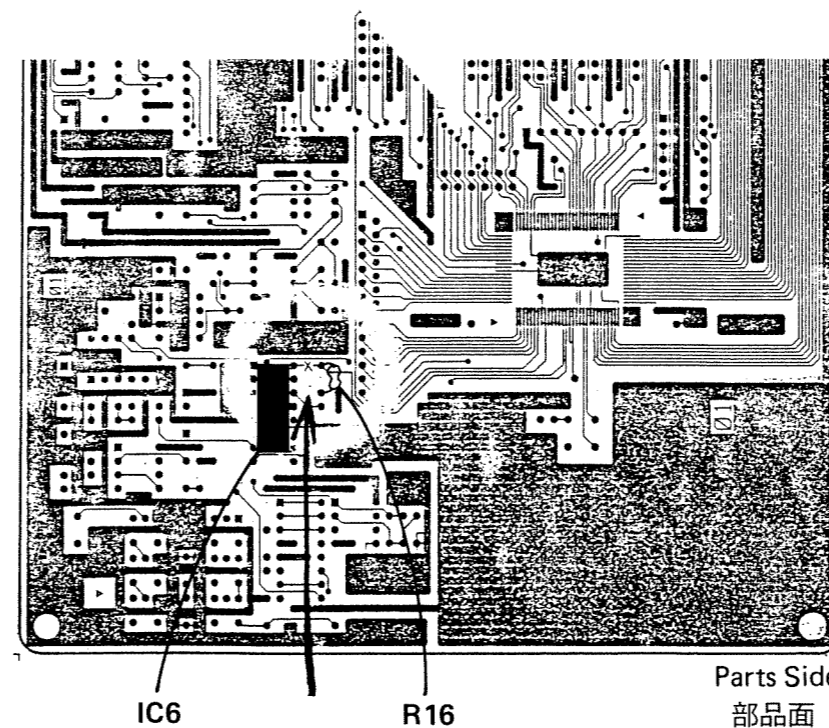
### 注

ROMのバージョンアップが、製番の進行と必ず一致するとは限りません。  
(左の対照表参照)

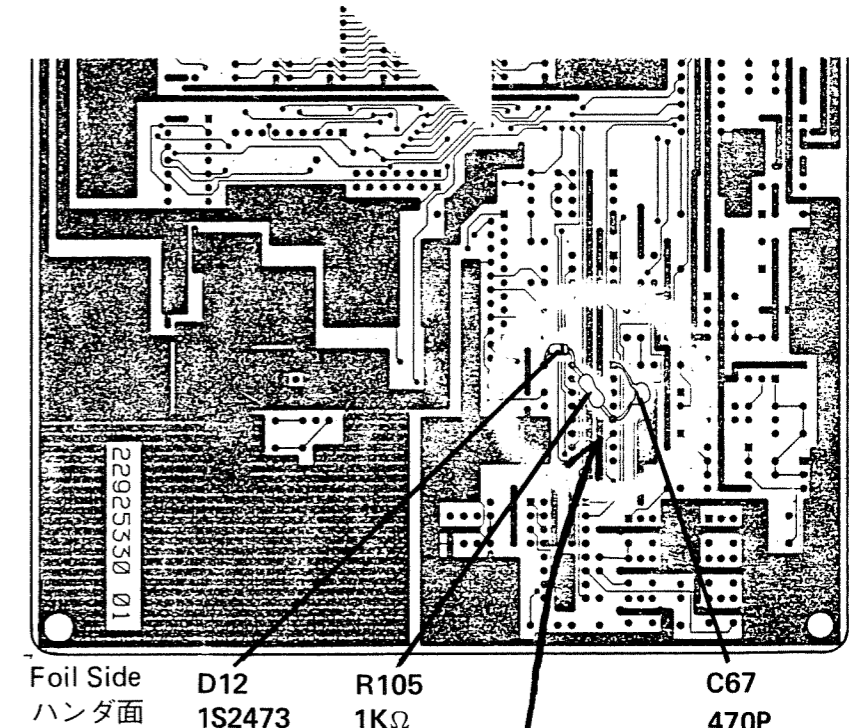
## HARDWARE IMPROVEMENTS

ECO No. 変更番号	EFF. SN 該当番号	CIRCUIT AFFECTED 該当回路	DESCRIPTION 目的、理由
1	701800 ↓	Power Supply Board Change R2, R9 330Ω to 220Ω 電源基板 R2, R9 値変更	To reduce Hum and Noise ハム及びノイズ軽減
2	702000 ↓	Main Board Add C32 10pF across XTAL 2 and GND of IC10 メイン基板 IC10のXTAL 2とGND間にC32 10pFを追加	To have positive RAS at TP-7 by stabilizing XTAL OSC  XTAL 発振回路を安定化し RAS(TP-7)を確実にする
3	702450   702849   713850 ↓	Main Board Add D12 1S2473, R105 1kΩ, C67 470pF between IC10 INH and IC6. See figure below. メイン基板 IC10のINHとIC6間に下図のごとくダイオード、C、R追加	Fatten INH pulse to increase S/N ratio during ENV release  ENV リリース時のノイズ軽減のためINHのパルス幅を広くする
4	725550 ↓ 725749 ↓ 726750 ↓	Power Supply Board Change fuse value:  電源基板 ヒューズ値変更	To have greater margin before a fuse blows.  IMPORTANT Mandatory with F4 With Products SN725750-726749 replace the fuses on the first occasion  注意 (特にF4) 重要変更です。製番 725750-726749 の製品は機会あり次第表中のヒューズに変更して下さい

	F2, F3	F4
100V 117V	GG5-1A	TSC-2A-N1
220V 240V	CEE-250mAT	CEE-1.6AT



Cut path between IC6 pin 16 and R16  
IC6の16番ピンとR16との間のパターンをカット



D12 1S2473  
R105 1kΩ  
C67 470P

R16: between IC6 pins 5 and 16  
D12: between IC6 pin 16 and R16  
C67: between IC6 pins 1 and 5  
IC6の16番ピンとR16との間に1S2473  
IC6の16番ピンと5番ピンとの間に1kΩ  
IC6の1番ピンと5番ピンとの間に470PF

MAIN BOARD ASSY 7616713000  
PCB 2292533001  
2292533002  
2292533003



**WIRING ASSEMBLY**

23485200 CC-M62-10P 1-410mm QD

**CONNECTOR**

(straight type)

13439260 5267-03A 3P wafer assy  
 13439261 5267-04A 4P wafer assy  
 13439262 5267-05A 5P wafer assy  
 13439263 5267-06A 6P wafer assy  
 13439265 5267-08A 8P wafer assy  
 13439269 5267-09A 9P wafer assy  
 13439277 5267-14A 14P wafer assy

(right angle type)

13439285 5268-03A 3P wafer assy  
 13439273 5268-06A 6P wafer assy  
 13439270 5268-08A 8P wafer assy  
 13439274 5268-09A 9P wafer assy

**HEAT SINK**

22465490 Power supply board

**BATTERY**

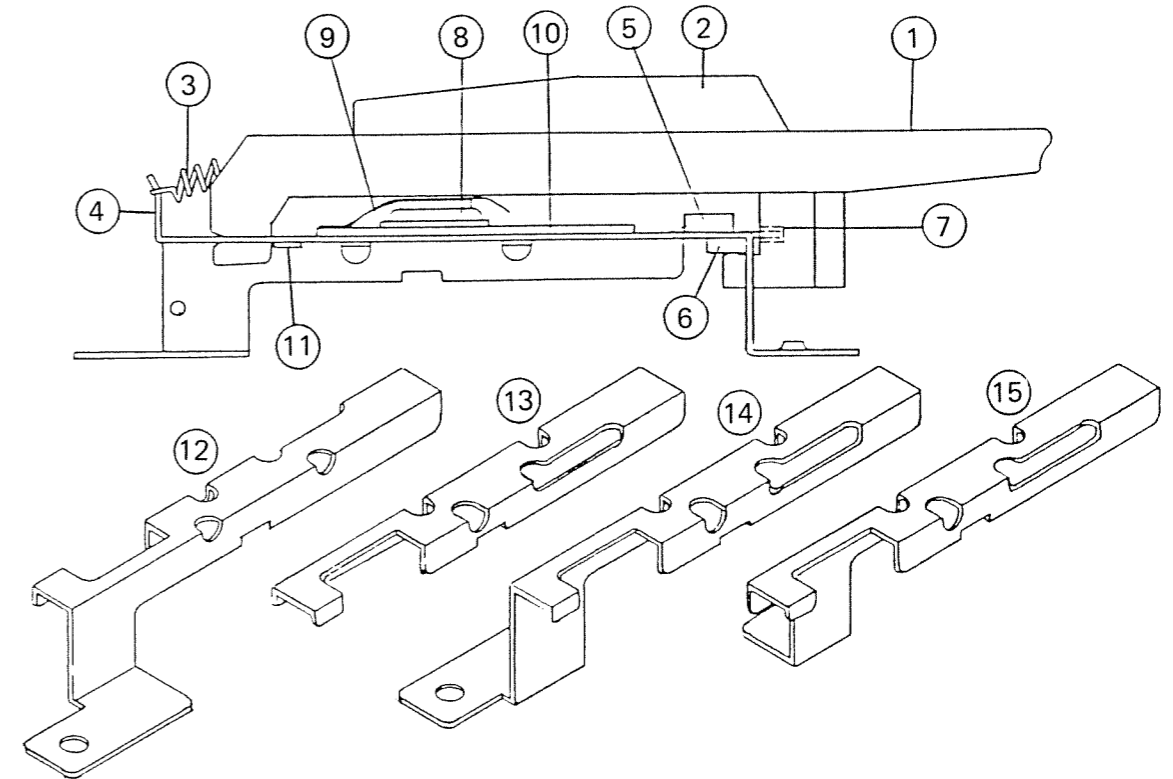
12569149H0 CR203216 Lithium

**QD SOFTWARE**

22375545 S9-S10-001 Drum set  
 22375546 S9-S10-002 Strings/chorus  
 22375547 S9-S10-003 Combination

**KEYBOARD SK-391-DW Parts List**

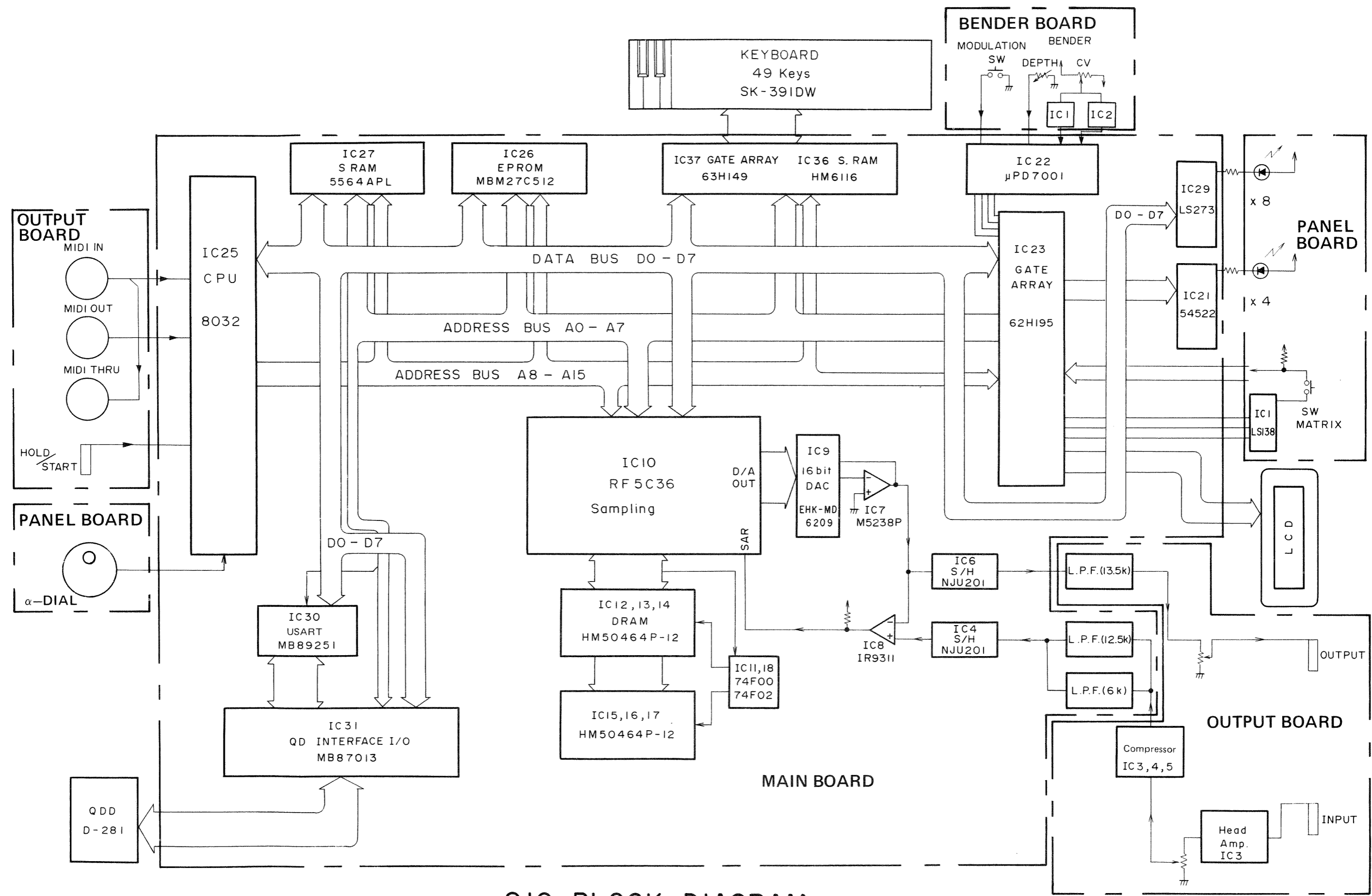
①	22575213	NATURAL KEY A	257-213
	22575214	NATURAL KEY D	257-214
	22575215	NATURAL KEY G	257-215
	22575216	NATURAL KEY C, F	257-216
	22575217	NATURAL KEY E, B	257-217
	22575218	NATURAL KEY C', F'	257-218
②	22575212	SHARP KEY	257-212
③	22175176	KEY SPRING	217-176 (NATURAL KEY)
	22175177	KEY SPRING	217-177 (SHARP KEY)
④	22815550	CHASSIS	281-550
⑤	22265146	FELT	226-146
⑥	22265463	FELT	226-463
⑦	22155716	GUIDE BUSHING	
⑧	22185218	KEY SWITCH 12P	218-218
	22185219	KEY SWITCH 13P	218-219
⑨	22245145	SWITCH COVER 32P	224-145
	22245148	SWITCH COVER 17P	224-148
⑩	7616122000	KEY SWITCH ASSY 32P	
	7616722000	KEY SWITCH ASSY 17P	
⑪	22135415	KEY STOPPER A	213-415
	22135416	KEY STOPPER B	213-416
	22135417	KEY STOPPER C	213-417
⑫	22035131	STAND B-JX	203-131
⑬	22125542	ANGLE A-JX	212-542
⑭	22035136	STAND S	203-136
⑮	22035130	STAND A-JX	203-130



BLOCK DIAGRAM

A  
B  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M  
N  
O  
P  
Q  
R  
S  
T  
U

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39



SIO BLOCK DIAGRAM

# CIRCUIT DESCRIPTIONS

# 回路解説

## 1. CPU Main Board IC25 8032

Major Tasks of the CPU;

- Keyboard Reading  
Transfers the velocity curve data to IC36 (SRAM HM6116). The key scanner IC37 (63H149) refers to this table for determining a key dynamics and writes it into IC36 together with the key number and the key event (on or off). The CPU reads these data through IC37.
- LED lighting, LCD driving, A/D conversion  
BENDER CV, RANGE, MOD on/off, IC27 (working RAM) reading/writing.
- IC10 (Sampling IC) reading/writing
- MIDI transmitting/receiving
- Rotary encoder reading

## 1. CPUメインボード IC25 8032A

CPUの主たる機能は次の通りです。

- 鍵盤読み込み  
CPUはIC36 (SRAM HM6116)へベロシティ・カーブ・データテーブルを転送する。  
キースキャンゲートアレイ IC37 63H149はこのテーブルを参照してキーのダイナミックスを決め、その他のキー情報(オン、オフ、キー・ナンバー)と共にRAM IC36へ書き込んで行く。CPUはこれらの情報をゲートアレイを通じて読み出す。
- LED点灯、LCD駆動、AD変換(BENDER CV, RANGE, MOD ON/OFF)、ワーキングRAM IC27への書き込み/読み出し
- サンプリングIC IC10(RF5C36)への書き込み/読み出し
- MIDIデータ送受信
- ロータリエンコーダーの読み込み

## 2. I/O Gate Array Main Board IC23 62H195

Most of addressing for I/O's and memories and some of the functions are done through I/O gate array IC23.

Shown below are the address map to be set by 62H195 and the block diagram of 62H195. (Fig. 1)

## 2. I/Oゲートアレイ メインボード IC23 62H195

上記のI/Oおよびメモリのアドレスの設定や動作の全部または一部は、I/Oゲートアレイを通じて行なわれます。62H195のブロックダイヤグラムおよびアドレスマップを下に示します。(Fig.1)

## 3. Sampling IC Main Board IC10 RF5C36

The Roland custom IC RF5C36 plays a key role in the sampling system. The process is illustrated mainly with the aid of photos, diagrams and charts.

NOTE (See Fig. 2)

The system clock for the sampling system is based on the Xtal connected across IC10 pins 70 and 71. Left under an unstable condition, X1 will sometimes cause TP7 (RAS) to be kept high. This problem will be found on earlier products. This can be solved by adding 10PF (C32) across main board IC10 pin 71 and the ground point.

## 3. サンプリング IC10 RF5C36

サンプリングICを中心とした音声データの流れの概略をブロック図、写真、チャート等を主体に説明します。

サンプリングシステムのシステムクロックは、IC10ピン70、71間に接続されているX1に基づいて発生します。このXtal回路が不安定な場合TP7 (RAS)がHになったままとなります。初期製品では発振安定用コンデンサC32 10PFがIC10ピン71とグランド間に入っていないためこのような現象を生じるものがあります。無い場合は取り付けして下さい。(Fig.2)

Fig. 1 (2. I/O Gate Array Main Board IC23 62H295)

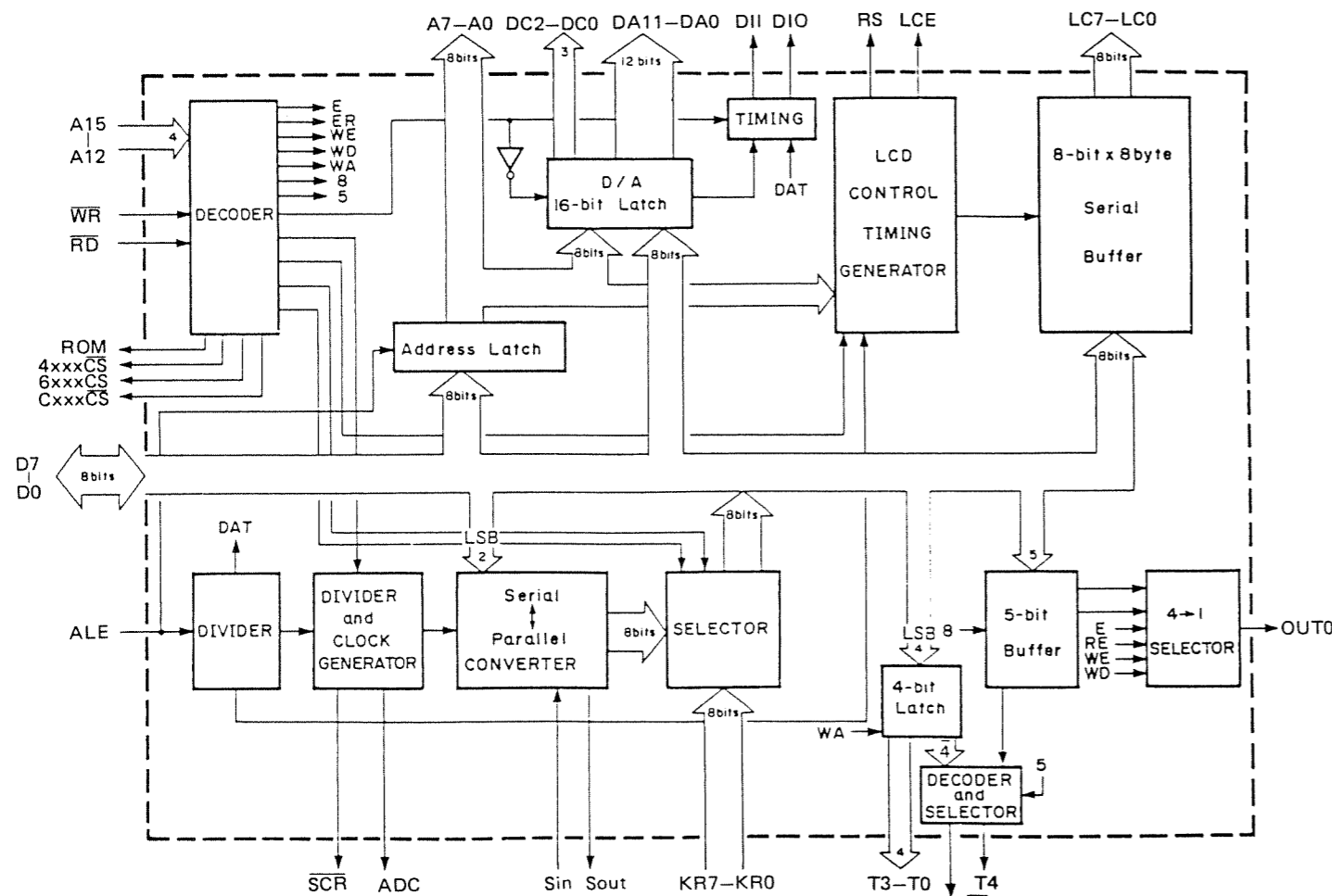


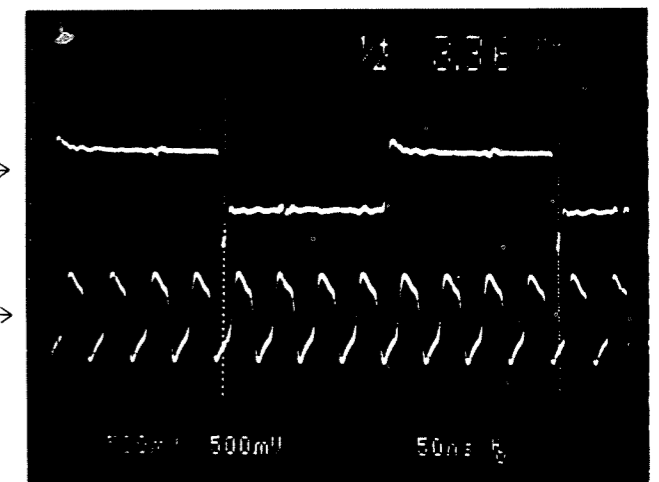
Fig. 2 (3. Sampling IC Main Board IC10 RF5C36)

	PSEN	RD	WR
FFFF			
F000		IC10 RF5C36 CS	IC10 RF5C36 CS
E000			
D000	ROM AREA		IC29 LED LATCH PULSE
C000		IC22 MPC7001 RD	IC29 μPC7001 WR
B000		SW SCAN SELECT	SW SCAN DATA
A000			
9000	EPROM		IC21 LED DATA
8000			LCD DATA
7000	MB27C512-25	IC27 SRAM 5564APL CS	IC27 SRAM 5564APL CS
6000		IC37 63H149 CS	IC37 63H149 CS
5000		IC31 MB87013 CS	IC31 MB87013 CS
4000			
3000			
2000			
1000			
0000			

Main board

TP7  
RAS CLK

IC10  
71 Pin



3-1. Loading From QD

(See Fig. 3)

3-2. Sampling External Audio Input

IC3b of the output board can accommodate input signals between -50dBm and 0dBm. The compressor consisting of IC3a, 4, 5, Q7, etc. relieves the subsequent digital circuits from overload.

3-1. QDからのデータロード

(Fig.3参照)

3-2. 外部音声入力のサンプリング

アウトプットボードのIC3bの許容入力は-50 ~ 0dBmです。

次段のIC3a、4、5、Q7はコンプレッサであって、過大入力を抑制します。

メインボード上ではサンプリングクロックの設定に応じてL1、またはL2の出力が選ばれます。

3-3. Reproducing Sampled Sound (See Fig. 5)

The sound data that the IC10 reads from DRAMs is in a 12 bit format. The IC10 processes this data with an ENVELOPE data to give a specific contour to the sound. The resulting is represented by an expanded 16 bit data and then applied to the DAC IC9. The DAC is configured to deliver each voice on every 8th low INH. The all DAC outputs are to be fed to one S/H circuit. The photo below shows where only one sound is being reproduced.

3-3. サンプルドデータの再生 (Fig.5参照)

RF5C36はDRAMから読み出した12 bit dataに対して、ENVELOPEデータに基づいた演算をなし、16bitデータとしてDACへ出力します。

DACの出力はD-INHのタイミングで行なわれ、8ボイスが時分割で同一回路にサンプリング/ホールドされて行きます。下の写真はボイス出力が1つだけの場合を示します。

Sampling Rate	IC4		OUTPUT
	Pin 8	Pin 9	
30kHz	L	H	L1
15kHz	H	L	L2

Fig. 3 (3-1. Loading From QD)

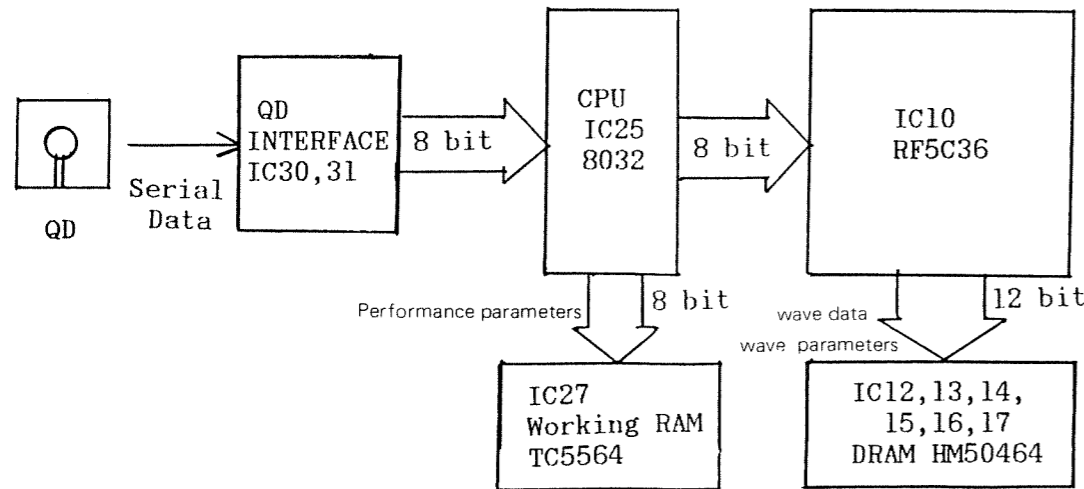


Fig. 4 (3-2. Sampling External Audio Input)

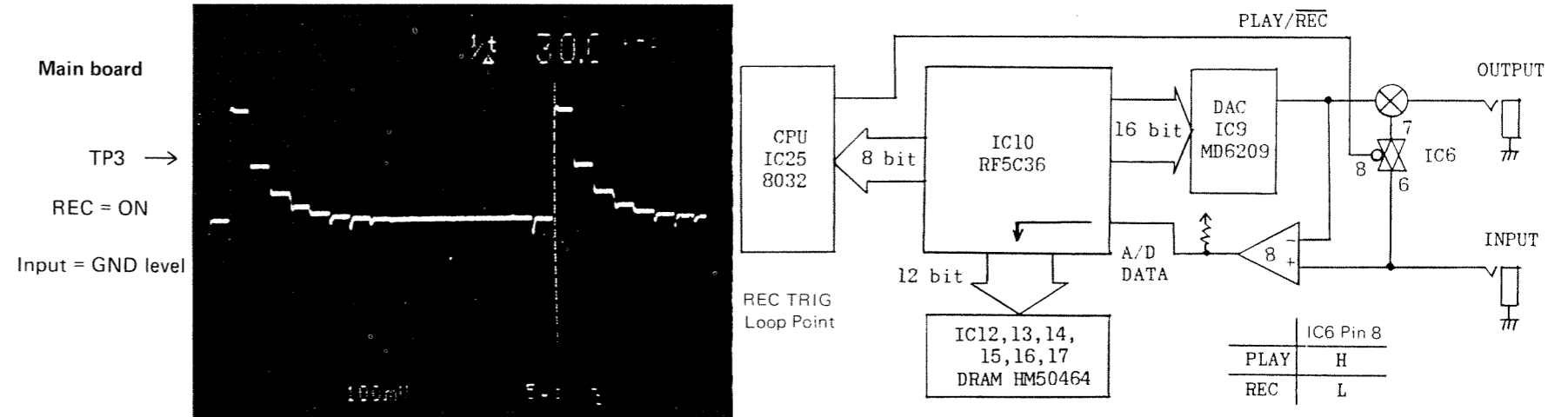
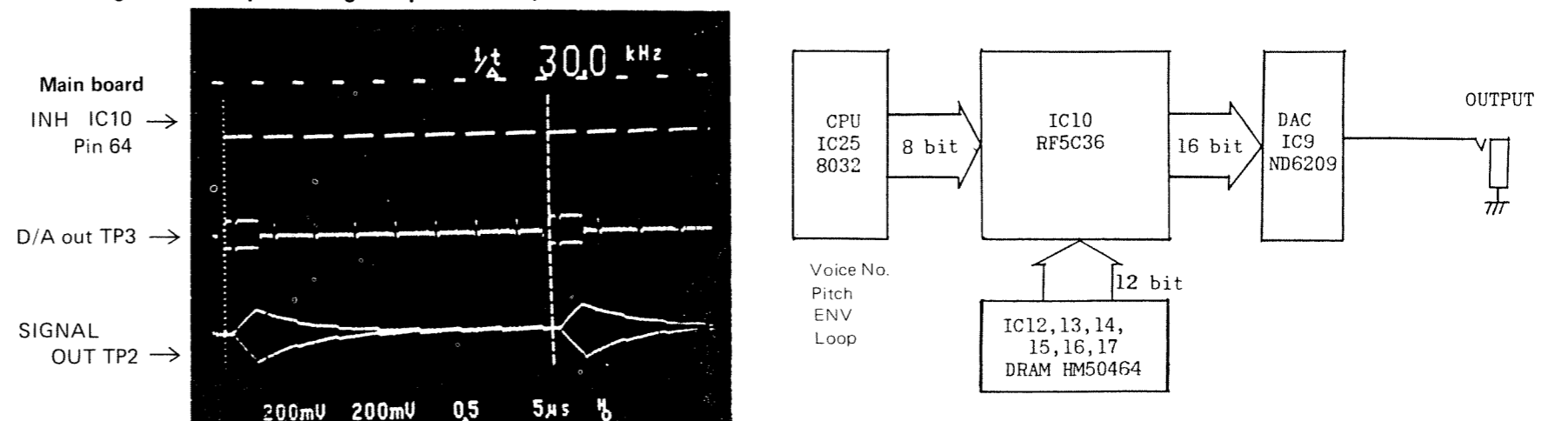


Fig. 5 (3-3. Reproducing Sampled Sound)





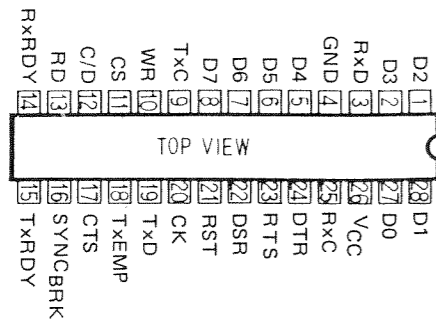
**QUICK DISK SYSTEM**

Data transfer between the CPU and the disk is accomplished through the QD interface consisting of IC USART and IC31 QD drive interface I/O.

**クイックディスクシステム**

QDインターフェイスはメインボード上のIC30 USARTとIC31 QDドライブ・インターフェイスI/Oから成っています。

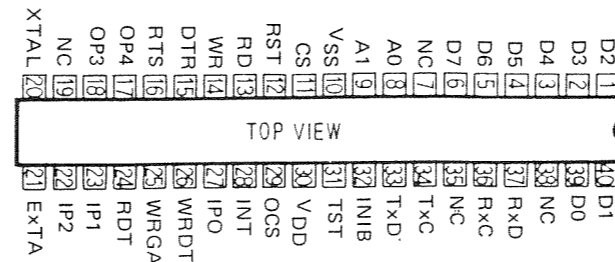
**USART MB89251A**



PIN NUMBER	PIN NAME	I/O	DESCRIPTION
3	RxD	I	(Receiver Data) This input is the data read from QD via IC31. QDから読み出されたデータ
25	RxC	I	(Receiver Clock) Controls the rate at which the data from QD is received. QDからの受信データと同期をとるための受信クロック
19	TxD	O	(Transmitter Data) This output is to be transmitted to QD. QDへの送信データ
9	TxC	I	(Trasmitter Clock) Controls the rate at which the data is to be transmitted to QD. QDへの送信データと同期をとるための送信クロック
10	WR	I	(Write) A "low" on this input informs the MB89251A that the CPU is writing data or controls to the MB89251A. CPUからのWRITE信号。LOWでMB89251Aへの書き込み可能
11	CS	I	(Chip Select) A "low" on this input selects the MB89251A. アドレスをデコードした信号。LOWでMB89251Aがセレクトされる
13	RD	I	(Read) A "low" on this input informs the MB89251A that the CPU is reading data or controls from the MB89251A. CPUからのREAD信号。LOWでMB89251A から読み込み可能。
14	RxRDY	O	(Receiver Ready) Not used 未使用
15	TxRDY	O	(Transmitter Ready) Not used 未使用
16	SYNC BRK	I/O	(Sync Break) Not used 未使用
17	CTS	I	( Clear to Send Data) Not used. Pulled low 未使用 LOW
18	TXEMP	O	(Transmitter Empty) Not used 未使用
20	CK	I	(Clock) A clock of 3.25MHz is used to generate internal device timing. 3.25MHz入力。
21	RST	I	(Reset) A "high" on this input forces the MB89251A into idle mode. HIGHでRESET。LOWで通常動作。
22	DSR	I	(Data Set Ready) Used to confirm the position of the read/write head. Should be set to low only when the read/write head is positioning over a read/write sector. QDのヘッド位置を知るための入力。ヘッドが読み書き可能な位置にある時にLOWが入力されること。
23	RTS	O	(Request to Send) Not used 未使用
24	DTR	O	(Data Terminal Ready) A "low" on this ouptput is used when recording is performed on QD. To be inverted at IC31 output, pin 25 WRGA. QDに書き込む時にLOWを出力。DTR信号はIC31(MB87013)内部のインバタを通してピン25のWRGAからQDドライブに加えられる
26	VCC	-	+5V
4	GND	-	

**QD DRIVE INTERFACE ADAPTER**

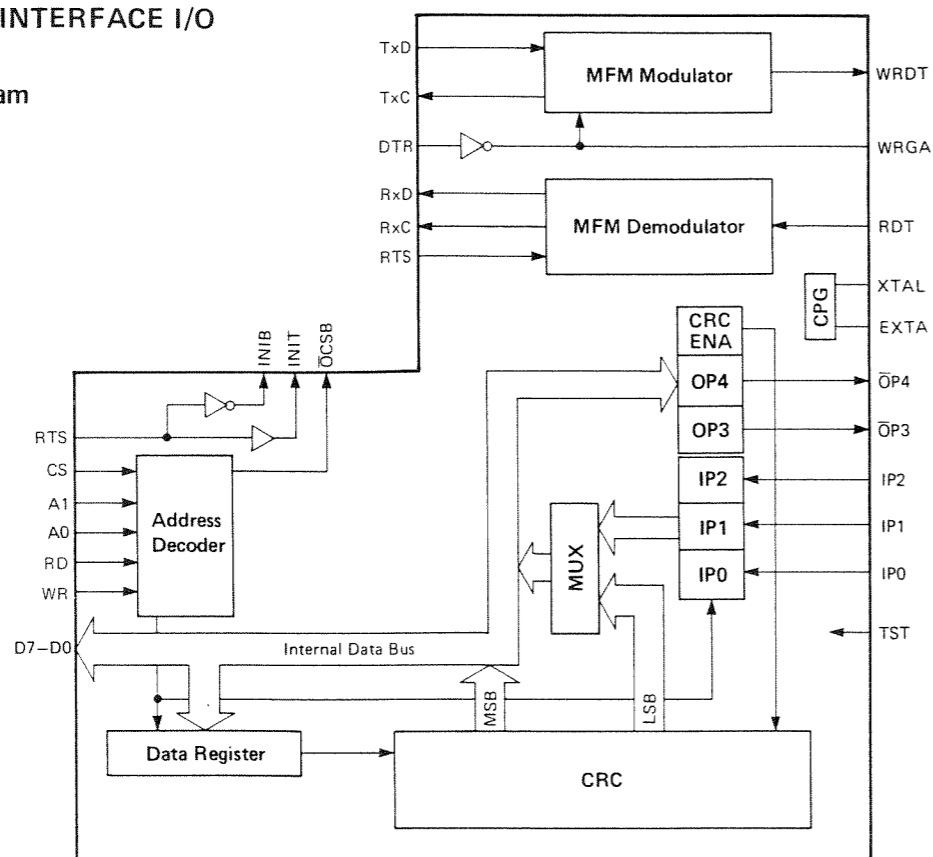
**MB87013**



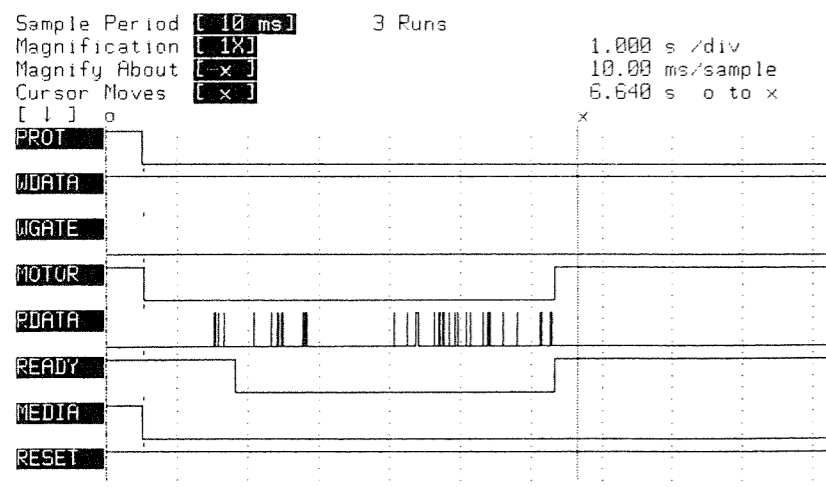
PIN NUMBER	PIN NAME	I/O	DESCRIPTION																																																																						
1-6, 39, 40	D7-D0	I/O	Data Bus: To be connected to the CPU data bus. データバス、CPUのデータバスに接続。																																																																						
12	RST	I	Reset: A low on this input resets the MB87013. リセット入力端子。LOWでMB87013はリセットされる。																																																																						
13	RD	I	Read: Can be used to enable data onto the data bus from MB87013. Active low. MB87013からデータを読み出す為の、アクティブ・ローのリードパルス入力端子。																																																																						
14	WR	I	Write: Used to write data into the MB87013 register. Active low. MB87013ヘデータを書き込む為の、アクティブ・ローのライトパルス入力端子。																																																																						
11	CS	I	Chip Select: Can be used in conjunction with a low RD, low WR, A0 and A1 to gain access to internal registers. チップ・セレクト入力端子。RD、WR、A0、A1と組合せMB87013の内部レジスタへアクセスすると出来る。 <table border="1" style="margin-left: 20px;"> <thead> <tr> <th>CS</th> <th>A1</th> <th>A0</th> <th>RD</th> <th>WR</th> <th>DATA BUS</th> <th>OCS</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>-</td> <td>-</td> <td>-</td> <td>-</td> <td>Hi-imp</td> <td>1</td> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> <td>0</td> <td>1</td> <td>Hi-imp</td> <td>0</td> </tr> <tr> <td>0</td> <td>0</td> <td>0</td> <td>1</td> <td>0</td> <td>Data Register Write (MB89251A, MB87013)</td> <td>0</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td>0</td> <td>1</td> <td>Hi-imp</td> <td>0</td> </tr> <tr> <td>0</td> <td>0</td> <td>1</td> <td>1</td> <td>0</td> <td>Hi-imp</td> <td>0</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>0</td> <td>1</td> <td>CRC Register(MSB)Read</td> <td>1</td> </tr> <tr> <td>0</td> <td>1</td> <td>0</td> <td>1</td> <td>0</td> <td>Data Register Write</td> <td>1</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> <td>0</td> <td>1</td> <td>Control Register Read CRC Register(LSB)Read</td> <td>1</td> </tr> <tr> <td>0</td> <td>1</td> <td>1</td> <td>1</td> <td>0</td> <td>Control Register Write</td> <td>1</td> </tr> </tbody> </table>	CS	A1	A0	RD	WR	DATA BUS	OCS	1	-	-	-	-	Hi-imp	1	0	0	0	0	1	Hi-imp	0	0	0	0	1	0	Data Register Write (MB89251A, MB87013)	0	0	0	1	0	1	Hi-imp	0	0	0	1	1	0	Hi-imp	0	0	1	0	0	1	CRC Register(MSB)Read	1	0	1	0	1	0	Data Register Write	1	0	1	1	0	1	Control Register Read CRC Register(LSB)Read	1	0	1	1	1	0	Control Register Write	1
CS	A1	A0	RD	WR	DATA BUS	OCS																																																																			
1	-	-	-	-	Hi-imp	1																																																																			
0	0	0	0	1	Hi-imp	0																																																																			
0	0	0	1	0	Data Register Write (MB89251A, MB87013)	0																																																																			
0	0	1	0	1	Hi-imp	0																																																																			
0	0	1	1	0	Hi-imp	0																																																																			
0	1	0	0	1	CRC Register(MSB)Read	1																																																																			
0	1	0	1	0	Data Register Write	1																																																																			
0	1	1	0	1	Control Register Read CRC Register(LSB)Read	1																																																																			
0	1	1	1	0	Control Register Write	1																																																																			
8, 9	A0, A1	I	Address: Used to select internal register. 内部レジスタを選択するの用いられる。																																																																						
28	INIT	O	Reset output: Inverted RST. Active high. RSTを反転したアクティブHIGHのリセット信号端子。																																																																						
32	INIB	O	Low active reset output: Buffered RST. RSTをバッファリングしたアクティブLOWのリセット信号 出力。																																																																						
29	OCS	O	Chip Select: Used to select serial interface(MB89251A). シリアル・インターフェースMB89251AのCS信号。(OCS=CS+A1)																																																																						

33	TxD	I	Transmitter Data: To be re-transmitted to QD after modified frequency modulated. 送信データ入力端子。
34	TxC	O	Transmitter Clock: Controls the rate at which data is transmitted to QD drive. 送信同期クロック出力端子。
37	RxD	O	Receiver Data: Demodulated data read from QD. To be re-transmitted to IC30. 受信データ出力端子。
36	RxC	O	Receiver Clock: Controls the rate at which IC30 receives the data from QD via IC31. 受信同期クロック出力端子。
16	RTS	I	Gate: A low on this input enables transfer of data read from QD to IC30, through RxC and RxD. 受信データを、RxCとRxDに出力する時のゲート。LOWで受信データをMB89251Aなどに転送できる。
15	DTR	I	A low on this input causes MFM modulator to be initialized. MFMモジュレータのイニシャライズ信号入力端子。
26	WRDT	O	Data out: Signal from this output is to be recorded on QD. クイックディスクへのデータ出力端子。
24	RDT	I	Data In: Data read from QD is received through this port. クイックディスクからのリードデータ入力端子。
25	WRGA	O	A high from this output enables recording on QD. クイックディスクはWRGAがHIGHの時、ディスクにデータ書き込み 出来る。この端子にはDTRの反転値が出力される。
27	IPO	I	Indicates the status of the WRITE PROTECT switch: With a disk inserted a high IPO represents "WRITE PROTECTED". ライトプロテクトSWをセンスするためのポート。QDが入った状態で、HIGHならプロテクトされたQD。
23, 22	IP1, IP2	I	Used to sense QD: Low=QD inserted, High=QD not inserted. QDの挿入、検出用ポート。L=挿入、H=未挿入
18	OP3	O	Used to turn on/off disk unit motor: Low=ON. モータのON・OFFビット。LOWでON
17	OP4	O	This output is connected to RTS. Low OP4 enables MB89251A to receive data from QD. RTSをコントロール。LOWで受信可能。
20	XTAL		6.5MHz crystal input for internal oscillator. 水晶振動子の接続端子。6.5MHzの水晶接続。
21	EXAL		Not used 未使用
30	VDD		Main power supply: +5V +5V
10	VSS		Circuit GND potential GND
31	TST		Used for test purpose only: must be pulled up to VDD. テスト用端子です。通常VDDにプルアップ。

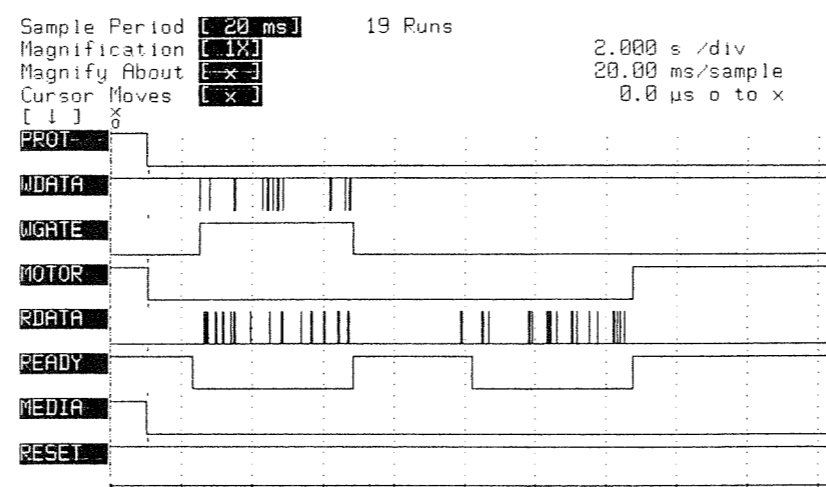
QD DRIVE INTERFACE I/O  
MB87013  
Block Diagram



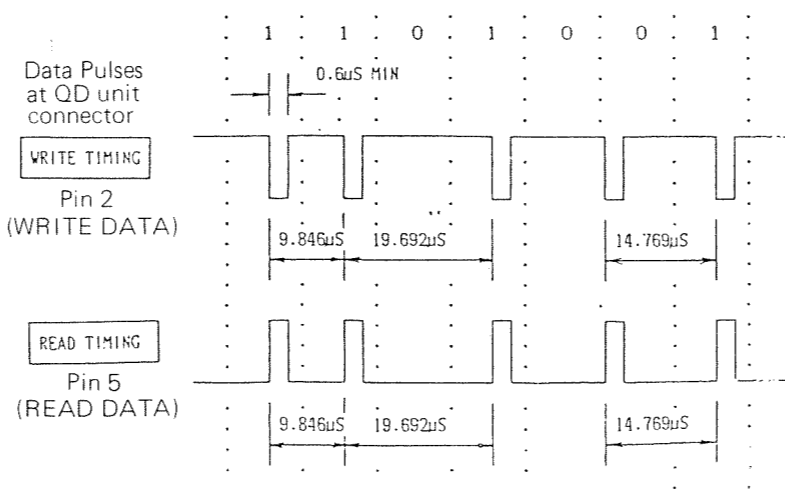
READ TIMING DIAGRAM IN LOAD MODE



WRITE TIMING DIAGRAM IN SAVE MODE



DATA PULSE TIMING



These three diagrams represent waveforms on the drive unit connector (or Main Board CN12).

Note that the data pulses shown in the figure right are of ideal ones and cannot be observed as they drawn.

これら3枚のタイミングチャートは、ドライブユニットのコネクタ (又はメインボードCN12) 上の波形です。

注  
右図のデータパルスは理想波形であって、実際にはこの様なきれいなパルス波形とならない。

QD DRIVE UNIT PIN DESCRIPTION TABLE

PIN NUMBER	SIGNAL NAME	I/O	DESCRIPTION
1	WRITE PROTECT	OUT	Indicates whether the recording on the inserted disk is inhibited or not. HIGH : inhibited LOW : not inhibited With a write protected disk inserted, the internal recording circuits are disabled. この信号は、挿入されたディスクが記録許可か禁止かを示します。 "HIGH" : 記録禁止 "LOW" : 記録許可 ライトプロテクトされたディスクが挿入された時ドライブ内部ではライト動作を禁止します。(記録禁止はA、B両面に可能)
2	WRITE DATA	IN	External data input to be recorded. Recorded with high WRITE GATE, a high to low transition of a data reverses the current direction in the read/write head, which records a 1 bit data. この信号は、外部回路より供給される信号で、ディスク上に記録するデータです。 "HIGH" から"LOW"レベルに変わることによりリードライトヘッドに流れる電流を反転させデータビットを記録します。 この記録は、WRITE GATE 信号が "HIGH" レベルの時行えます。
3	WRITE GATE	IN	High WRITE GATE enables recording. この信号が、"HIGH" レベルの時ディスク上にデータを記録出来ます。"LOW" レベルの時は記録できない。
4	MOTOR ON	IN	Low MOTOR ON starts the motor. With High MOTOR ON, an internal MOTOR STOP can stop the motor. ドライブモーターの ON/OFF 制御信号です。この信号を "LOW" にするとモーターが回転します。この信号を "HIGH" にした後、ドライブ内の MOTOR STOP 信号が入るとモーターは停止します。
5	READ DATA	OUT	Pulse-shaped analog signal read from the disk. Contains the unseparated clock and data pulses. このデータは、ディスクから読み出されたアナログ信号をパルスに波形整形したもので、クロックとデータを含んでいます。
6	READY	OUT	Indicates that recording or reading may take place. この信号は、ディスクから読み出し許可、または記録許可を示します。
7	MEDIA SW	OUT	Low state indicates that disk slot lid is closed with a disk inserted. High state represents open lid or closed lid without a disk. ディスクがセットされた状態で蓋をしめていれば "LOW" レベル、蓋が開いているか又はディスクを装着しないで蓋をしめた場合 "HIGH" レベルとなります。
8	RESET	IN	Low for the predetermined period after POWER ON RESET, causing internal READY pulled low and resetting the internal flip-flop for the motor to defeat MOTOR ON. POWER ON RESET 時、一定時間 "LOW" レベルとなる信号で、この信号により (ドライブ内部の) READY 信号を "LOW" にすると共に MOTOR が起動しないように (ドライブ内部の) MOTOR ON用 F/F をリセットする。
9	VB		+ 5 V
10	GND		

IC DATA

I/O GATE ARRAY

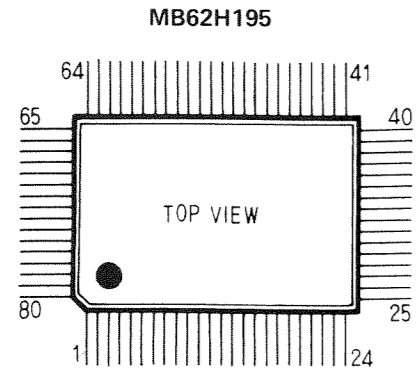
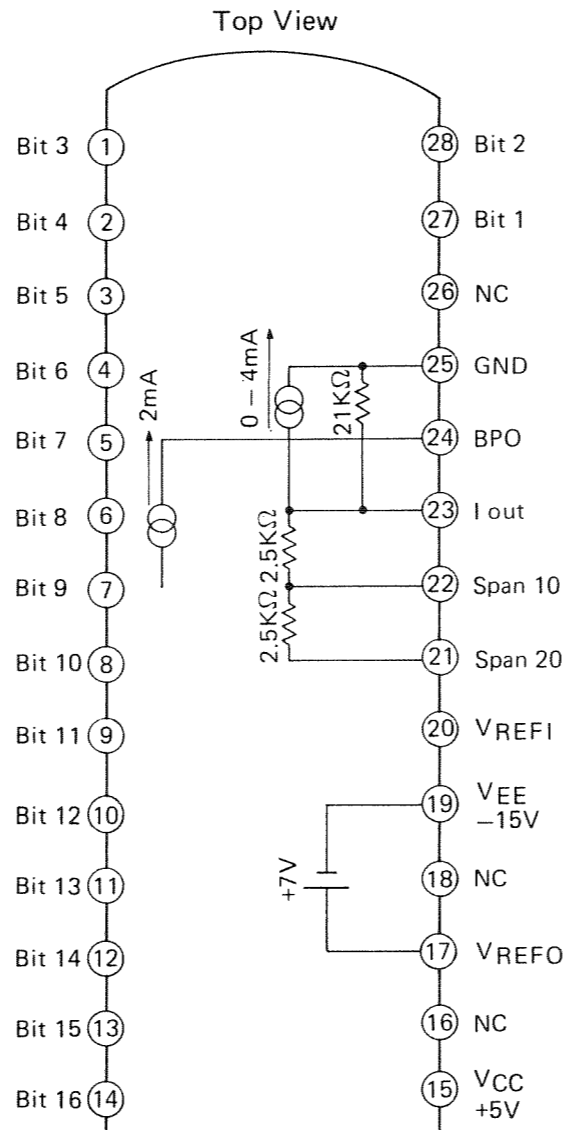
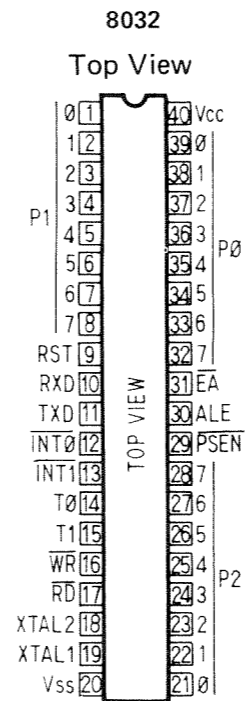


Table with 5 columns: No, I/O, NAME, No, I/O, NAME, No, I/O, NAME, No, I/O, NAME. Lists various pins and their functions for the MB62H195.

D/A CONVERTER



CPU



SAMPLER CUSTOM IC

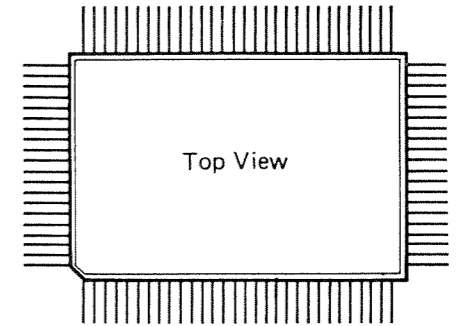


Table with 6 columns: PIN No, PIN NAME, I/O, PIN No, PIN NAME, I/O. Lists pin connections and functions for the RF5C36 sampler.

DYNAMICS GATE ARRAY

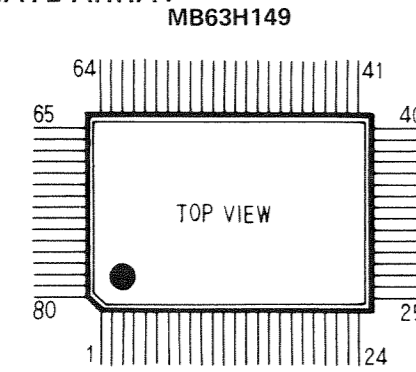
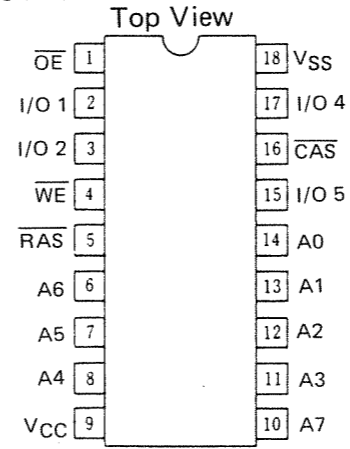


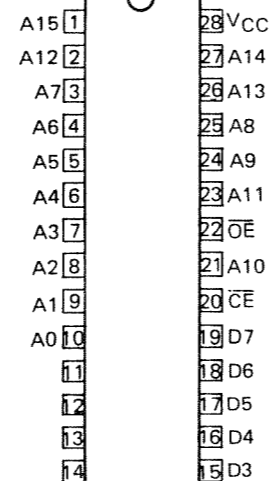
Table with 5 columns: No, I/O, NAME, No, I/O, NAME, No, I/O, NAME, No, I/O, NAME. Lists various pins and their functions for the MB63H149.

HM50464P-12 64K DRAM



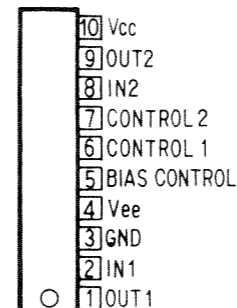
MBM27C512-25

TOP VIEW



VCA

5241L



TEST MODE

テスト・モード

1. Press and hold PERFORMANCE and MIDI and switch the power on.

Display will show ROM Version number.

2. Press any panel button.

See NOTE 1.

3. Turn off S-10. Wait 10 sec and then re-apply the power as in step 1.

4. Press any panel button.

5A. With No Error, press any button.

5B. If SRAM Error is displayed again. This time, the error message is a real error message: SRAM is not working properly. To ignore this message to go on the next step, press PERFORMANCE and MIDI simultaneously.

To ignore DRAM Error message and go to the next step, press PERFORMANCE and MIDI simultaneously.

6. Press the panel buttons one by one in any order, checking mate LED (if any) for lighting. An LED stays on until the next button is pressed. The last-lit LED stays on.

The program would stop at faulty button.

To force the program to proceed to the next step, press PERFORMANCE and MIDI.

1. PERFORMANCE と MIDI を押えながら電源を入れる。

ディスプレイに ROM バージョンが表示される。

2. パネル上の任意のボタンを押す。

注1 参照

3. 電源をオフにし、10秒経ってからステップ1の方法で電源を再投入する。

4. パネル上の任意のボタンを押す。

5 A. No Error の場合。

任意のボタンを押す。

5 B. 再度エラーが出た場合。

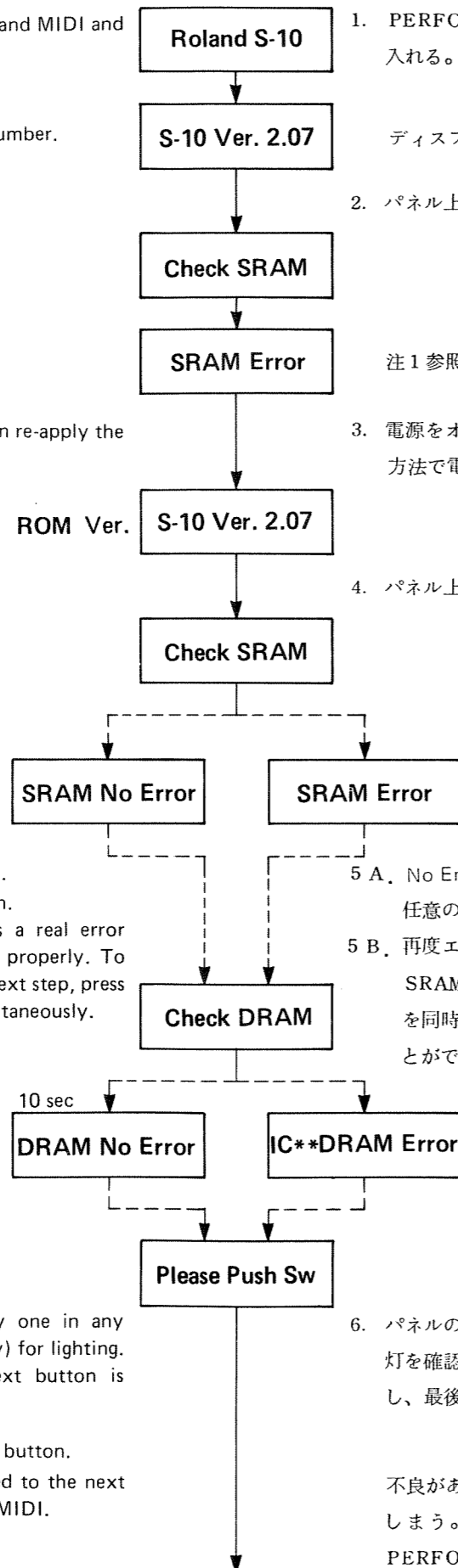
SRAM周辺の不良。PERFORMANCEとMIDIを同時に押すと次のステップへ強制的に進むことができる。

エラーメッセージを無視して次のステップへ進む場合は、PERFORMANCEとMIDIを同時に押す。

6. パネルのボタンを任意の順に押す。LED付は点灯を確認、(次のボタンが押されると消灯、ただし、最後に点灯したLEDはそのまま点灯を継続)

不良があった場合、プログラムはそこで停止してしまう。強制的に次のステップへ進むには PERFORMANCE と MIDI を同時に押す。

DISPLAY



7. Rotate α-dial clockwise to display letters A to Z.

8. Rotate α-dial counterclockwise to return to A.

9. Press any button.

10. Set Bender panel controls as shown and check the reading. Small discrepancy can be ignored.

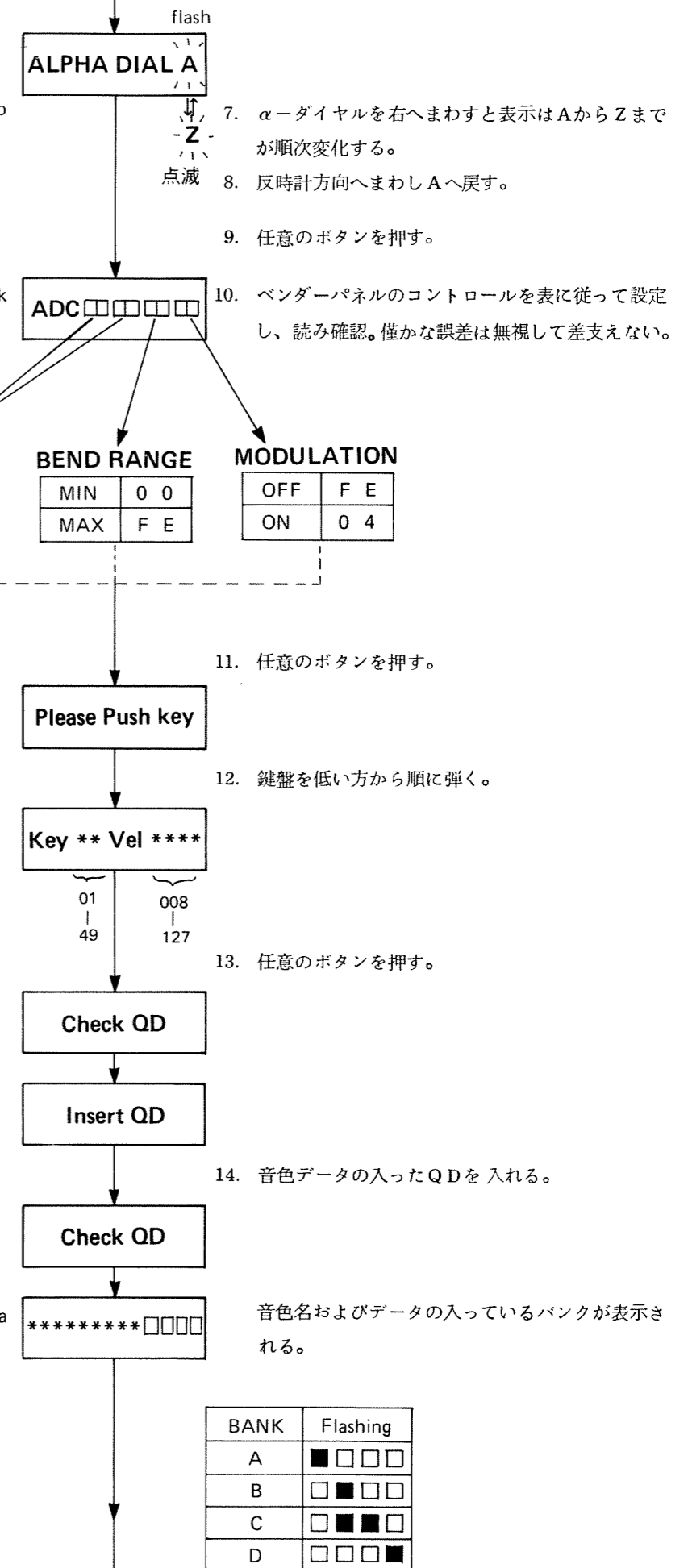
11. Press any button.

12. Hit a key from the lowest to the highest.

13. Press any button.

14. Insert Tone data QD.

Tone name and the bank containing the data will be indicated.



15. Press LOAD

15. LOAD を押す。

Load \*\*\*\*\* ← Tone Name

Load complete

Please Push SAVE

16. Change disk with a disk having no data or erasable.  
17. Press SAVE

16. データが入っていないか。または書換えられてもよいデータを含むディスクに替える。  
17. SAVE を押す。

Tone name loaded at step 15.

Name\*\*\*\*\* ステップ15でロードされた音色。

18. Press SAVE

18. SAVE を押す。

Tone name loaded at step 15.

Save \*\*\*\*\* ステップ15でロードされた音色。

Save complete

Copying to other bank.  
Repeats two more times.

Copy -----> 他のバンクへコピーしている。計3回

Check BANK 1

19. Using headphone or amp, check by ear that loaded tone is repeatedly sounding.  
20. Press any button.

19. アンプまたはヘッドホンを接続し、ロードされた音が繰り返していることを確認。  
20. 任意のボタンを押す。

21. Repeat for BANKs 2 to 4.

Check BANK 2 21. 同様に BANK 2 - 4 を確認。

Check BANK 3

Check BANK 4

22. Press any button.

22. 任意のボタンを押す。

Check MIDI

Connect IN-OUT!

23. Run the MIDI cable between MIDI IN and OUT.

23. MIDI INとOUTをMIDIケーブルで接続する。

24. Press any button.

24. 任意のボタンを押す。

Check MIDI

MIDI No. Error

MIDI Hard Error

When the test program displays MIDI Hard (ware) Error, it will not step forward. MIDI circuits need checking. See NOTE 2.

End of Check Prg

MIDI Hard Errorが出た場合、テストプログラムは先へ進まない。MIDI入出力関連の修理が必要 注2参照

See NOTE 3 for "Please Power Off".

Please Push Entr

Please Power Off 注3参照

25. Press ENTER IMPORTANT This is to replace the test data in SRAM with the factory performance data.

25. ENTERを押す。これはSRAMに入っているテストデータをファクトリパフォーマンスデータに置き換えるためのもの。

Roland S-10

Memory Init

Ready

The unit is now ready for playing.

通常のプレイモードに入った事を示す。

NOTE 1 The CPU first reads and compares the data backed up in IC27 SRAM with the test data. They should differ from each other in content. While displaying "SRAM Error", the CPU writes the test data into the SRAMs for the second SRAM checking.

注1 CPUはSRAM IC27にバックアップされているデータとSRAMテストデータを比較するが、当然内容は一致しない。CPUはエラーメッセージを出す一方、テストデータをSRAMに書き込み、2回目のSRAM Checkに備える。

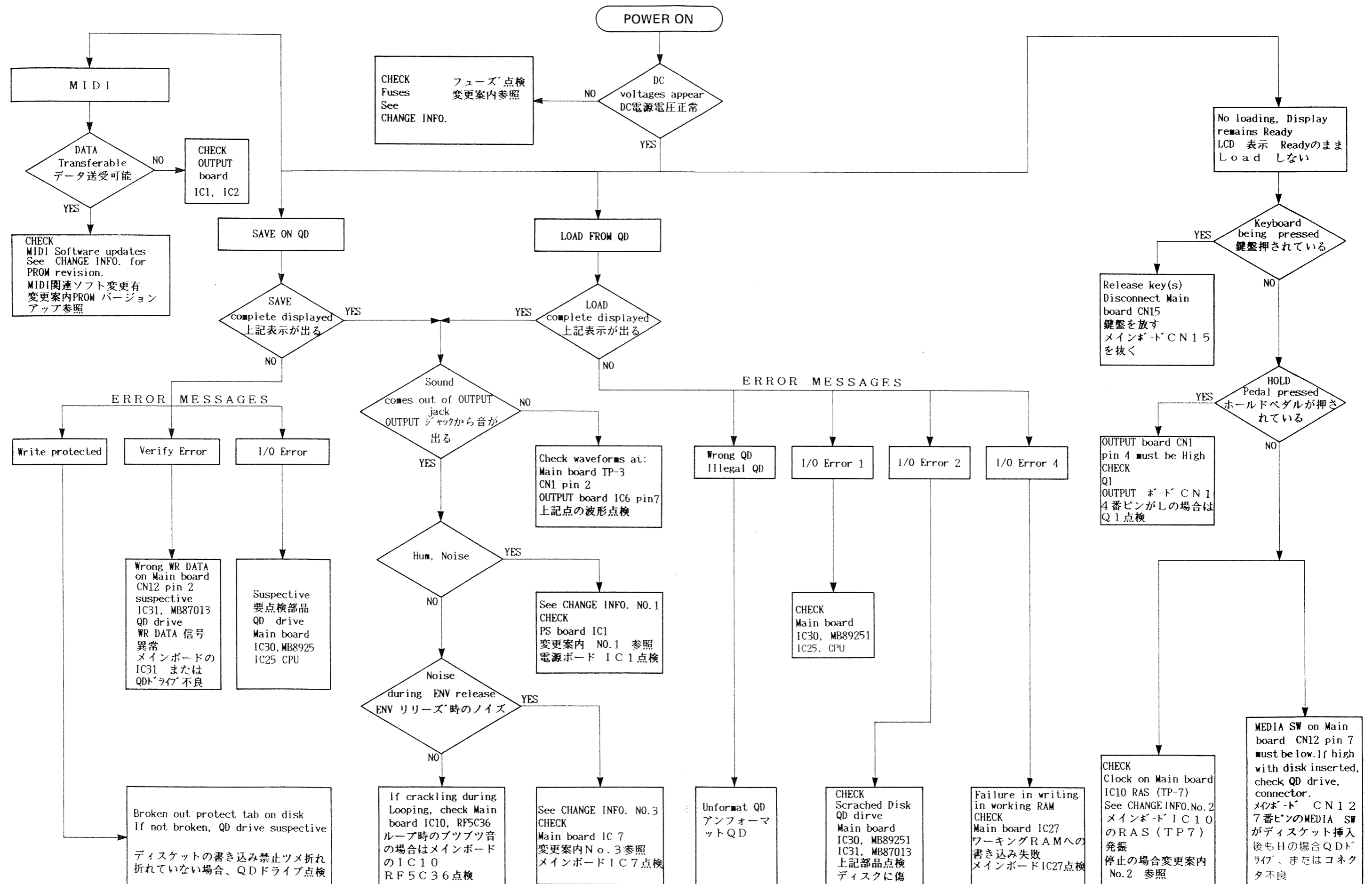
NOTE 2 The test program stops testing without removing the test data from the SRAM. Holding ENTER, turn the switch on and the initialization routine transfers "Factory Performance Data" into the SRAM.

注2 この段階でテストを終了すると、SRAM IC27にはテスト用データが残ったままとなる。一旦電源を切り、ENTERを押しながら再投入すると演奏用データ(ファクトリ・パフォーマンスデータ)がSRAMへ転送されます。(SRAMイニシャライゼーション)

NOTE 3 This message is telling there is an error(s) which has been ignored by PERFORMANCE and MIDI buttons. Also see NOTE 2 above for SRAM initialization.

注3 エラーメッセージを無視し、PERFORMANCEとMIDIボタンでテストを進めて来た場合、テストはここで終了する。RAMのイニシャライゼーションについては上の注2参照。

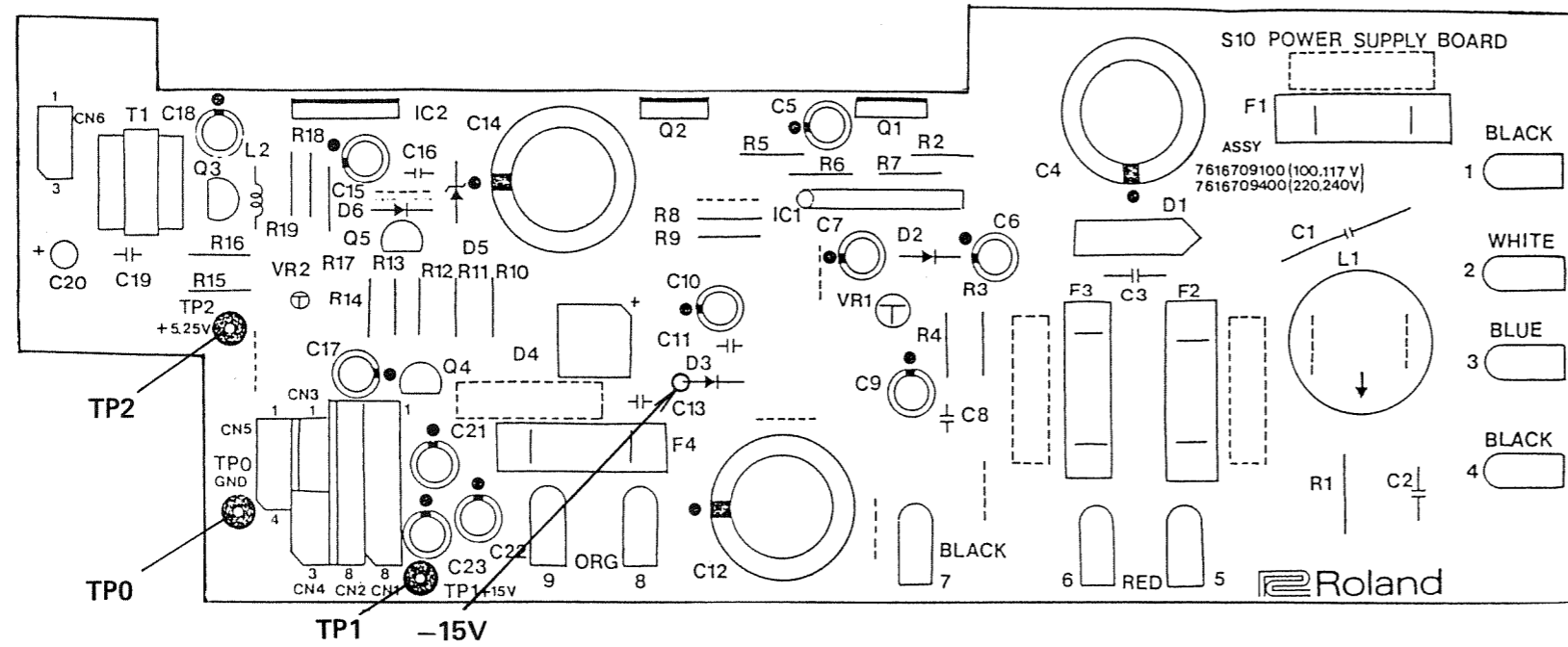
TROUBLESHOOTING    トラブルシューティング



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22

ADJUSTMENT

調整仕様



POWER SUPPLY BOARD

1. Connect the digital voltmeter to TP1 (+15V) and TP0 (GND).
2. Adjust VR1 for  $+15.0V \pm 0.1V$ .
3. Connect the digital voltmeter to TP2 (+5.25V) and TP0 (GND).
4. Adjust VR2 for  $+5.25V \pm 10mV$ .
5. Confirm the remaining terminal voltages.  
 $-15V \pm 400mV$

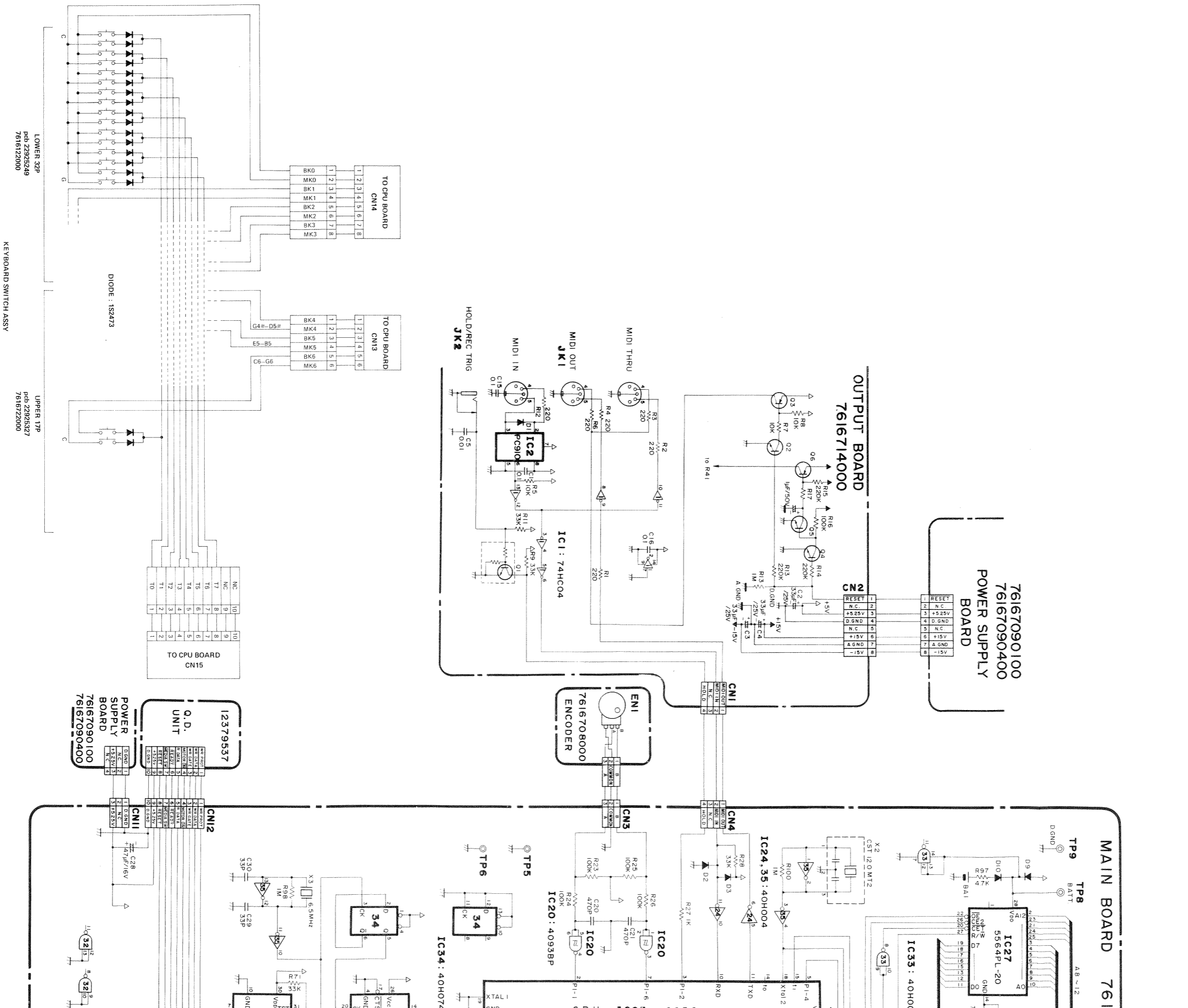
電源基板

1. TP1 (+15V)とTP0 (GND) 間の電圧が  $15.0 \pm 0.1V$  になるようVR1を調整する。
2. TP2 (+5.25V)とTP0 (GND) 間電圧が  $5.25 \pm 10mV$  になるようVR2を調整する。
3. D3アノードの電圧が  $-15 \pm 400mV$  であることを確認する。

A  
B  
C  
D  
E  
F  
G  
H  
I  
J  
K  
L  
M

CIRCUIT DIAGRAM

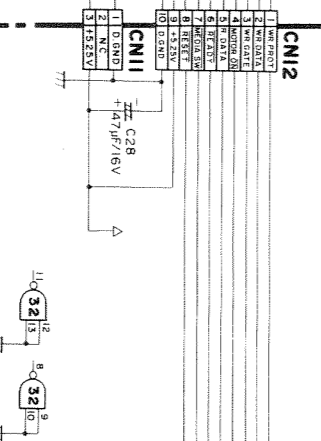
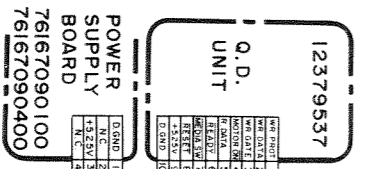
A B C D E F G H I J K L M N O P Q R S T U V W X Y Z



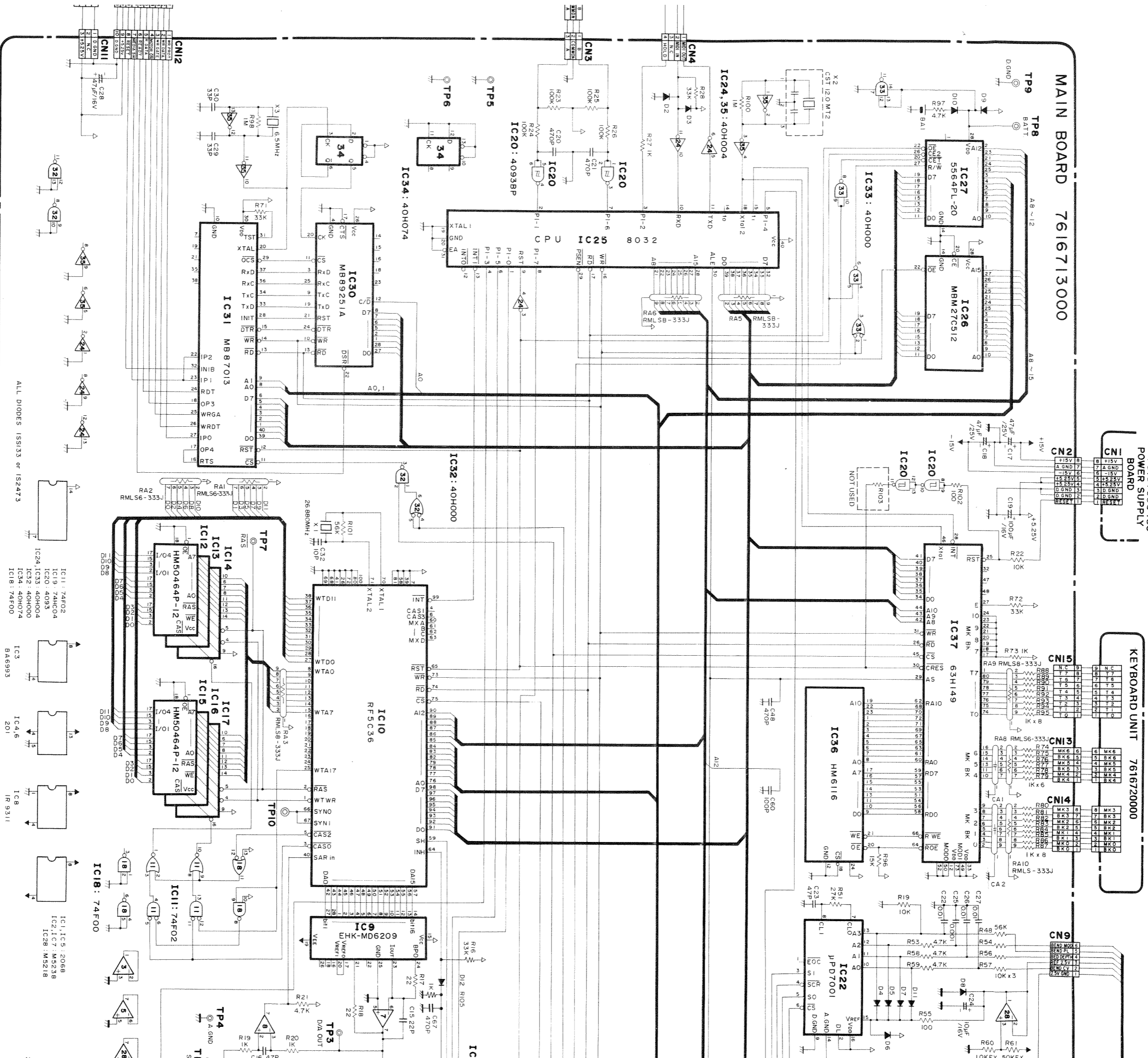
LOWER 32P  
p/b 22925249  
761672000

KEYBOARD SWITCH ASSY

UPPER 17P  
p/b 22925327  
761672000





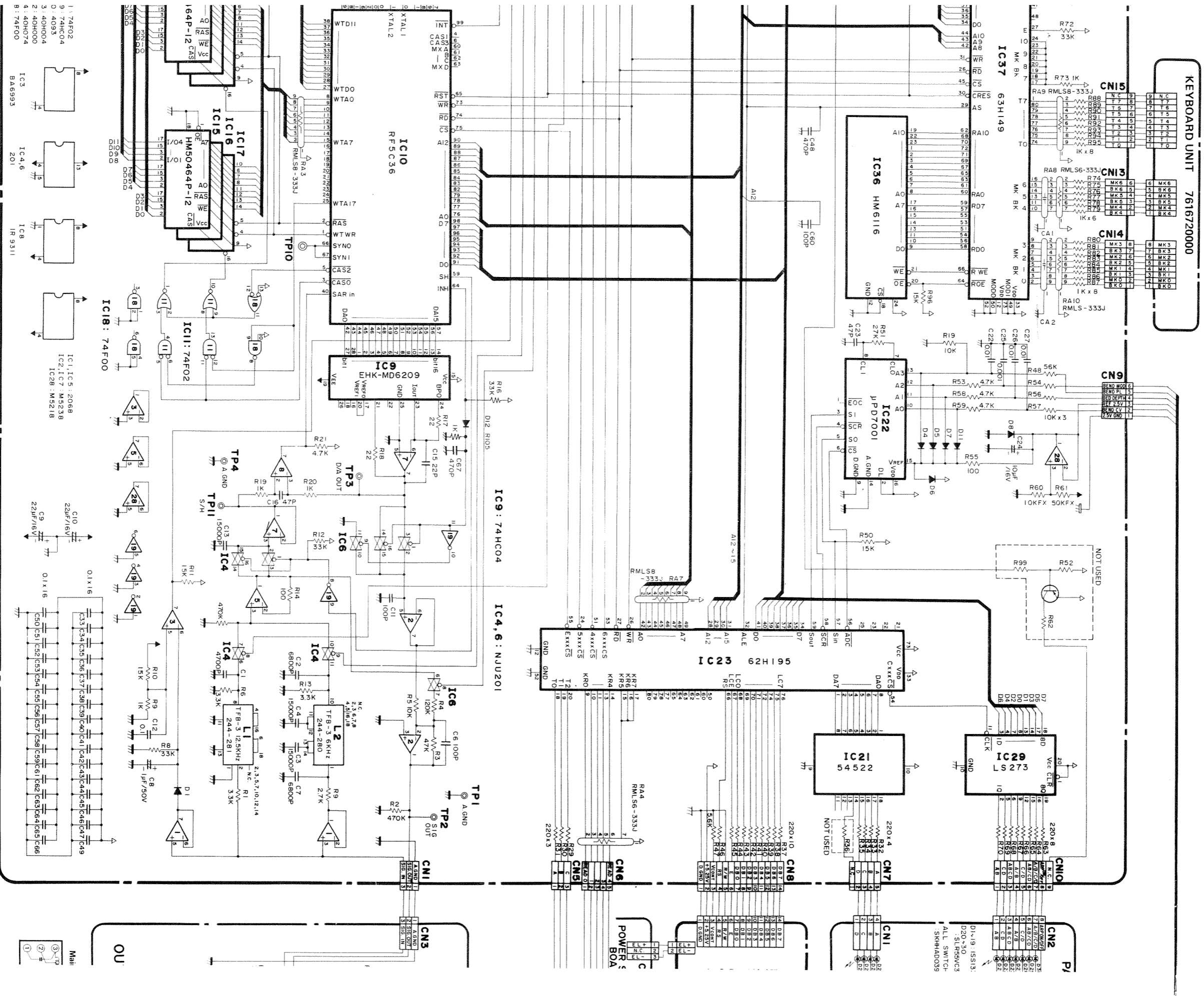


76167090100  
76167090400  
POWER SUPPLY  
BOARD

KEYBOARD UNIT  
7616720000

ALL DIODES 158133 or 152473

- IC1: 555
- IC2: 7410
- IC3: B48993
- IC4: 201
- IC5: IR 9311
- IC6: 74F00
- IC7: 2068
- IC8: M5238
- IC9: M5218
- IC10: 74F02
- IC11: 74HC04
- IC12: 4093
- IC13: 40H004
- IC14: 40H000
- IC15: 40H074
- IC16: 74F00
- IC17: 2068
- IC18: M5238
- IC19: M5218



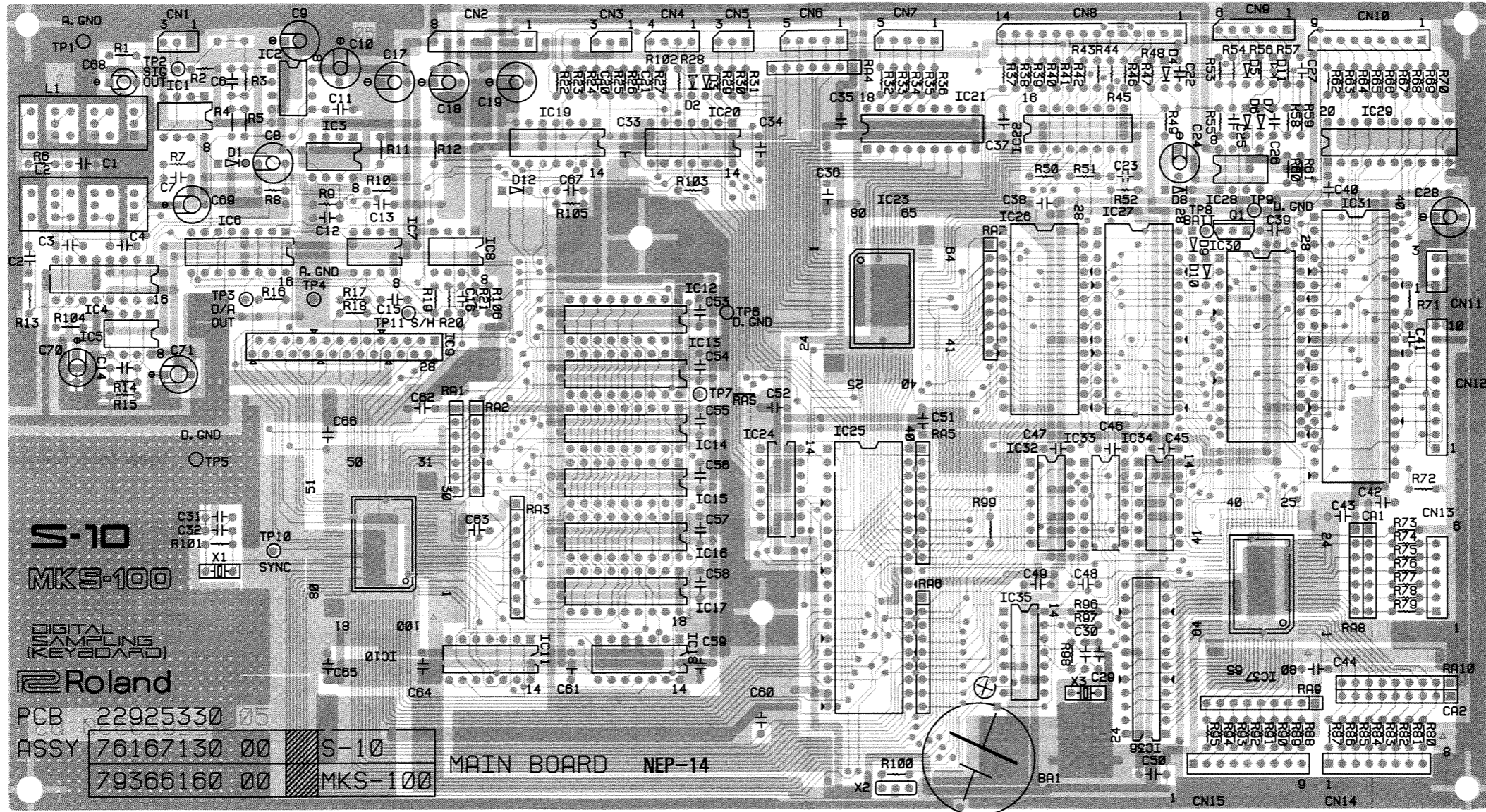
Mali

OU

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40

A  
B  
C  
D  
E  
F  
G  
H  
I  
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K  
L  
M  
N  
O  
P  
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R  
S  
T  
U

**MAIN BOARD**  
**76167130**  
(pcb 22925330)



View from foil side

**ADVARSEL!**

Lithiumbatteri. Eksplosionsfare.  
Udskiftning må kun foretages af en sagkyndig,  
og som beskrevet i servicemanual.

Lithium batteri må kun udskiftes med samme type  
og fabrikat.

**ADVARSEL!**

Lithiumbatteri. Fare for eksplosion.  
Må bare skiftes af kvalificeret tekniker som  
beskrevet i servicemanualen.

Lithium batteri må kun udskiftes med samme type  
og fabrikat.

**WARNING!**

Lithiumbatteri. Explosionsrisk.  
Får endast byttas av behörig servicetekniker.  
Se instruktioner i servicemanualen.

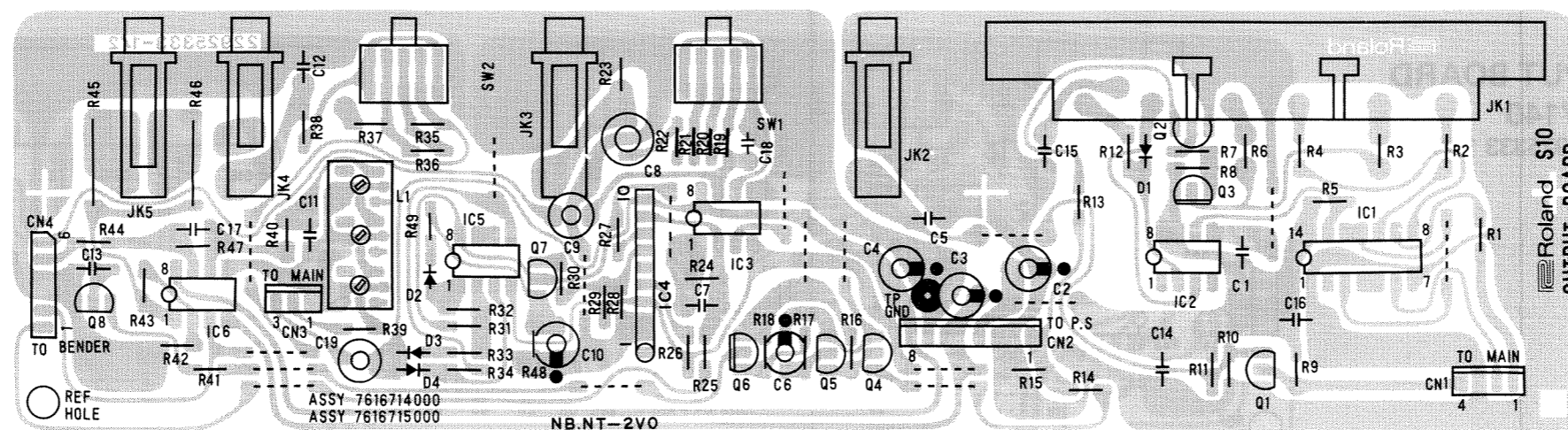
Lithium batten for endast ersattes med samme typ  
och fabrikat.

**VAROITUS!**

Lithiumparisto. Rajahdysvaara.  
Pariston saa vaihtaa ainoastaan  
alan ammottimies.

Kun vaihat lithium pariston KÄYTA saman valmista-  
jan samaa tyyppiä.

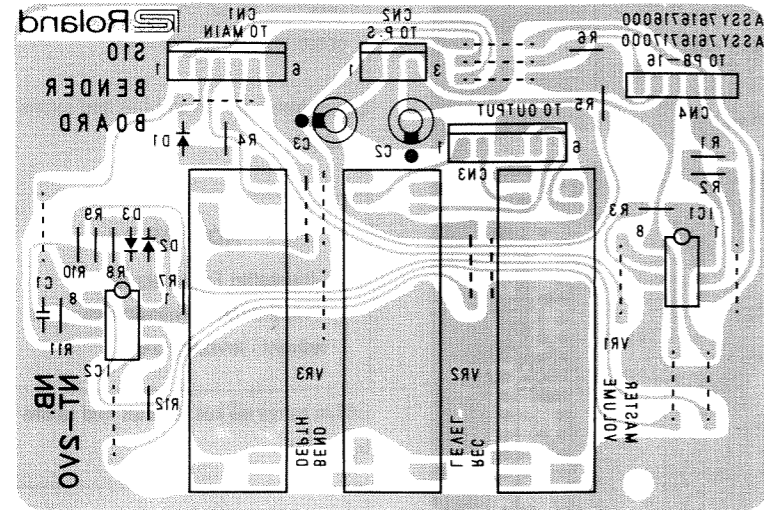
**OUTPUT BOARD**  
**76167140**  
(pcb 22925333 1/2)



View from foil side

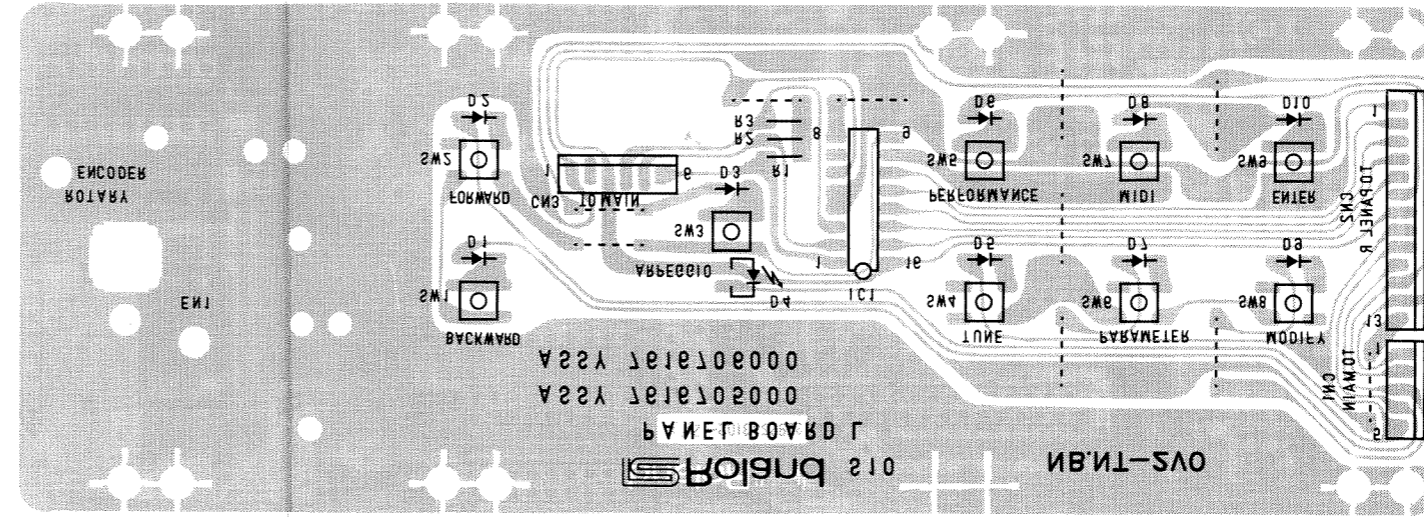
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41

**BENDER BOARD 76167160** (pcb 22925331 3/3)



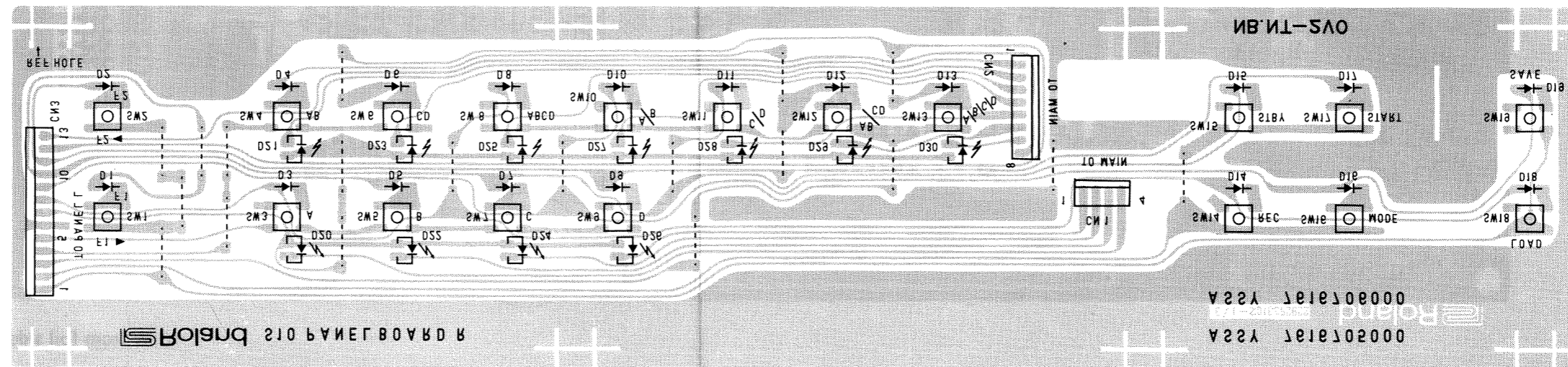
View from foil side

**PANEL BOARD L 76167050** (pcb 22925331 2/3)



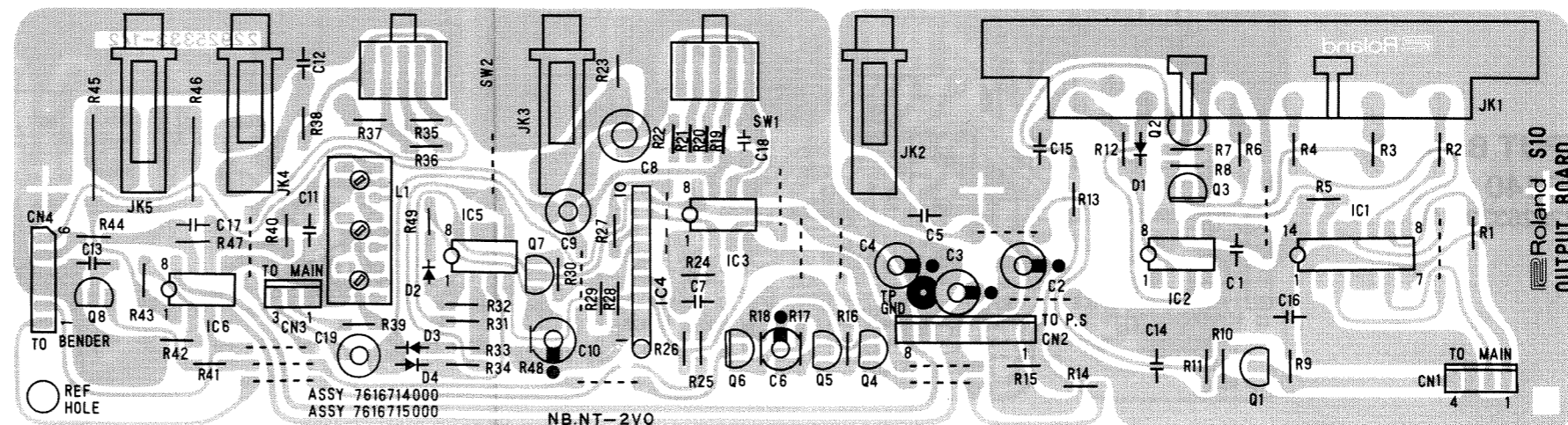
View from foil side.

**PANEL BOARD R 76167050**  
(pcb 22925331 1/3)



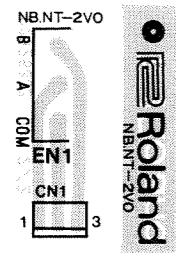
View from foil side

**OUTPUT BOARD 76167140**  
(pcb 22925333 1/2)

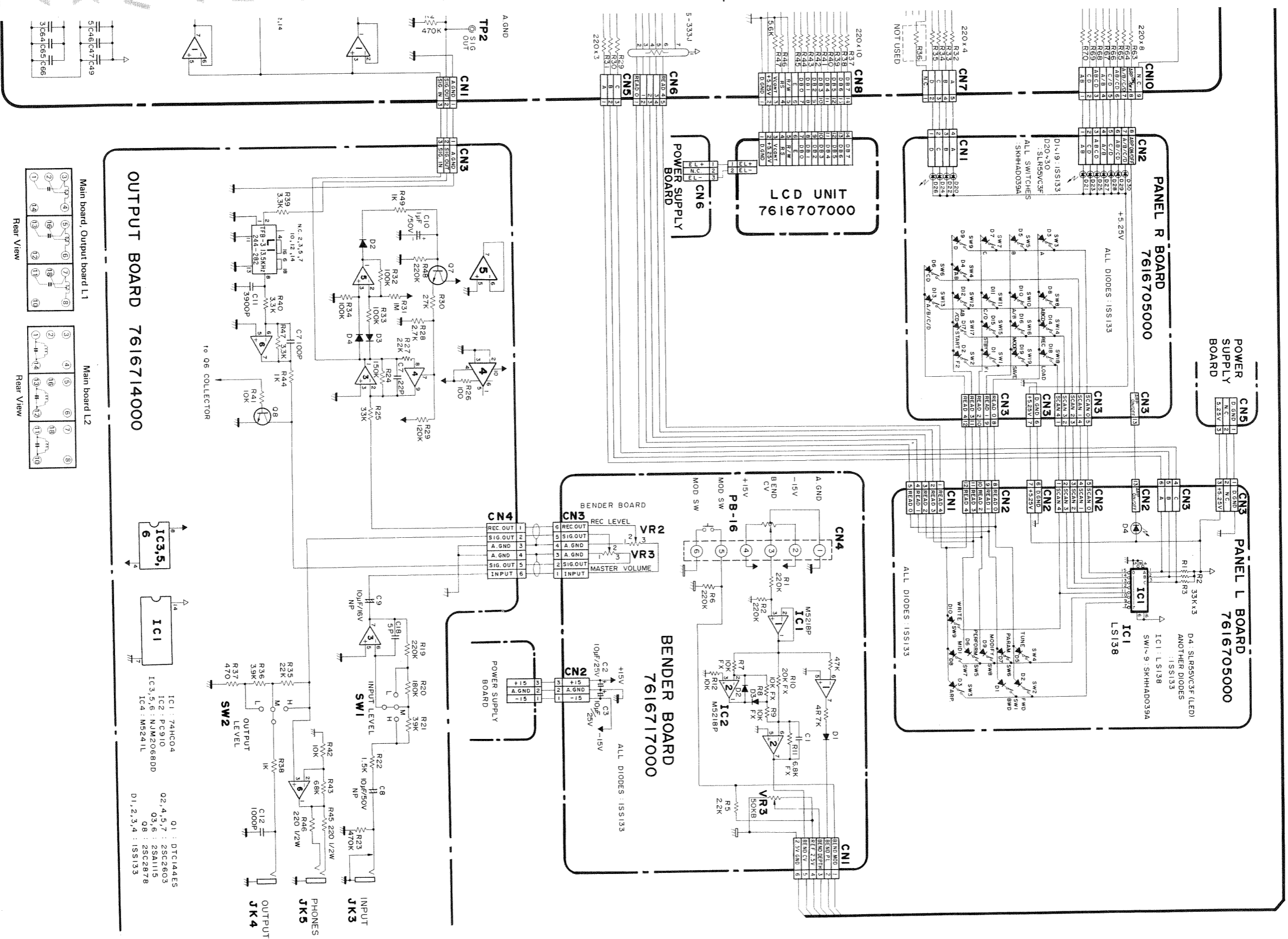


View from foil side

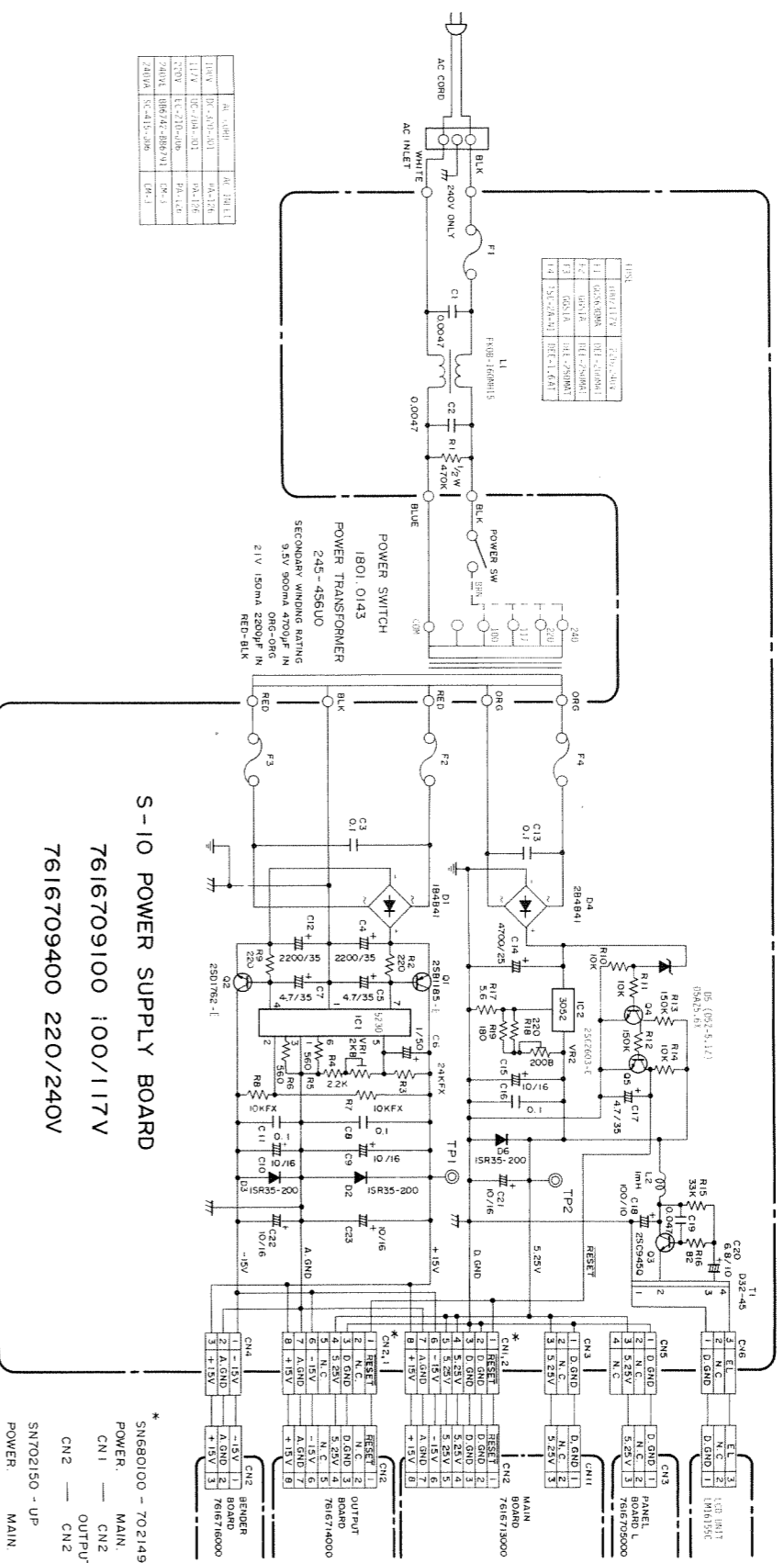
**ENCODER BOARD 76167080**  
(pcb 22925332 2/2)



# CIRCUIT DIAGRAM



A B C D E F G H I J K L M N O P Q R S T U V W X Y Z



S-10 POWER SUPPLY BOARD

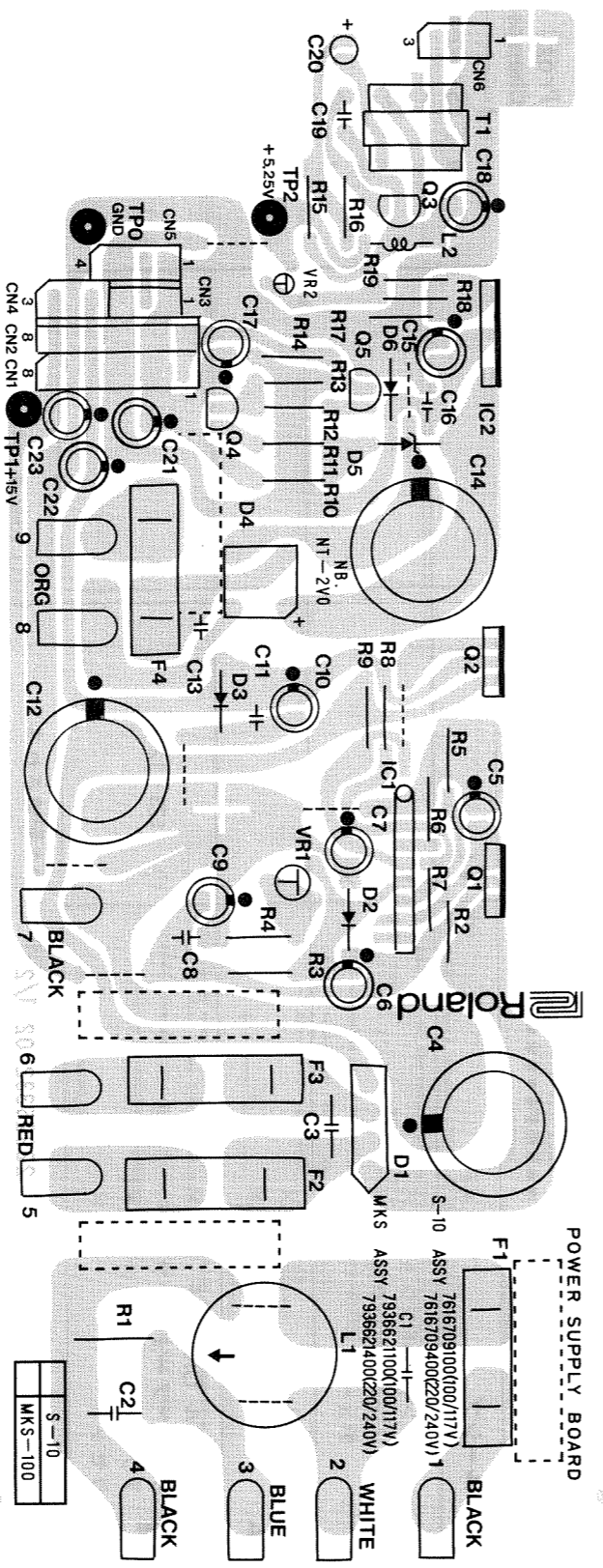
7616709100 100/117V

7616709400 220/240V

- \* SNEB0100 - 702149 POWER MAIN CN1 OUTPUT CN2
- SNT02150 - UP POWER MAIN CN2 OUTPUT CN1

**POWER SUPPLY BOARD**  
76167091  
(pcb 22925332 1/2) 100/117V

**76167094**  
(pcb 22925332 1/2) 220/240V



View from foil side

# MIDI IMPLEMENTATION

8-voice digital sampling keyboard

## MODEL S-10 MIDIインテリジェントキーボード

バージョン: 2.00

フアンクション...	送	信	受	信	備	考
ペーシツク チャンネル	電源 ON 時 設定可能	1-16 1-16	1-16 1-16		電源オフ後も記憶される	
モード	電源 ON 時 メツセージ 代用	モード 3 X *****	モード 3 X			
ノート ナンバー	音 域	36-84 *****	24-103 24-103			
ペロシタイ	ノート・オン ノート・オフ	○ 9n v= 8-127 X 9n v= 0	○ v= 1-127 X			
アフター タッチ	キー別 チャンネル別	X X	X X			
ピツチ・ベンダー		*1	*1 0-12 半音		分解能: 9ビット	
		1 64	*1 *1		レジューション ホールド 1	
コントロール チェンジ	100, 101 6, 38	*1, *2 (0, 1) *1, *2	*1, *2 (0, 1) *1, *2		RPC LSB, MSB データ・エントリ MSB, LSB	
プログラム チェンジ	設定可能範囲	*1 0-122 *****	*1 0-127 0-127			
エクスクルージブ		*1	*1			
コモソ	ソング・ポジショ ン ソング・セレクト チューン	X X X	X X X			
リアル タイム	クロック コマンド	X X	X X			
その他	ローカル ON/OFF オール・ノート・オフ リセット	X ○ (123) *1 X	X ○ (123-127) ○ X			
備 考		*1 ○X切替可能で電源オフ後も記憶される。 *2 レジスター・パラメーター・コントロール・ナンバー RPC #0: ピツチ・ソング・セクテイビテイ RPC #1: マスター・フレイソ・チューニソグ パラメーターの値はデータ・エントリにより与えられる。				

モード 1 : オムニ・オン, ポリ  
モード 3 : オムニ・オフ, ポリ

モード 2 : オムニ・オン, モノ  
モード 4 : オムニ・オフ, モノ

○ : あり  
X : なし

Function ...	Transmitted
Basic Default	1 - 16
Channel Changed	1 - 16
Mode	Default Messages Altered Mode 3 X *****
Note Number	36 - 84 *****
Velocity Note ON	○ 9n v= 8 - 127
Velocity Note OFF	X 9n v= 0
After Touch	Key's Ch's X X
Pitch Bender	*1
	1 *1 64 *1
Control Change	100, 101 *1, *2 (0, 1) 6, 38 *1, *2
Prog Change	*1 0 - 122 *****
System Exclusive	*1
System Common	Song Pos X Song Sel X Tune X
System Real Time	Clock X Commands X
Aux Mes-sages	Local ON/OFF X All Notes OFF ○ (123) Active Sense *1 Reset X
Notes	*1 Can be set to *2 RPC = Register RPC #0 : RPC #1 : Parameter va

Mode 1 : OMNI ON, POLY Mode 2 : O  
Mode 3 : OMNI OFF, POLY Mode 4 : O

[ 8-voice digital sampling keyboard ] Date : Aug.28 1986  
 Model S-10 MIDI Implementation Chart Version : 2.00

Function ...	Transmitted	Recognized	Remarks
Basic Default	1 - 16	1 - 16	Memorized
Channel Changed	1 - 16	1 - 16	
Mode Default	Mode 3	Mode 3	
Mode Messages Altered	X	X	
Note Number	36 - 84	24 - 103	24 - 103 *****
Velocity Note ON	0 9n v = 8 - 127	0 v = 1 - 127	
Note OFF	X 9n v = 0	X	
After Touch	X	X	
Pitch Bender	*1	*1 0 - 12 semi	9 bit resolution
Control Change	100,101 6, 38	*1,*2 *1,*2	(0,1) (0,1) RPC LSB,MSB Data Entry MSB,LSB
Prog Change	*1 0 - 122	*1 0 - 127	*****
System Exclusive	*1	*1	
System Song Pos	X	X	
System Song Sel	X	X	
System Common Tune	X	X	
System Real Time Commands	X	X	
Aux Local ON/OFF	X	X	
Mes- Active Sense	*1	0	
Mes- Reset	X	X	
Notes	*1 Can be set to o or x manually, and memorized. *2 RPC = Registered parameter control number. RPC #0 : Pitch bend sensitivity RPC #1 : Master fine tuning Parameter values are given by Data Entry.		

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

1. TRANSMITTED DATA

Status	Second	Third	Description
1001 mmm	0kk kkk	0000 0000	Note OFF kkkkkk = 36 - 84
1001 mmm	0kk kkk	0vv vvv	Note ON kkkkkk = 36 - 84 vvvvvv = 8 - 127
1011 mmm	0000 0001	0vv vvv	Modulation depth vvvvvv = 0 (OFF) vvvvvv = 127 (ON)
1011 mmm	0010 0110	0vv vvv	Data Entry MSB
1011 mmm	0100 0000	0000 0000	Data Entry LSB
1011 mmm	0100 0000	0111 1111	Hold1 OFF
1011 mmm	0100 0000	0111 1111	Hold1 ON
1011 mmm	0110 0100	0vv vvv	RPC LSB
1011 mmm	0110 0101	0vv vvv	RPC MSB
1100 mmm	0ppp pppp		Program Change pppppp = 0 - 122
1110 mmm	0vv vvv	0vv vvv	Pitch Bend Change
1011 mmm	0111 1011	0000 0000	All Notes OFF
1111 0000	...	1111 0111	System exclusive

Notes :  
 \*1-1 Transmitted if the corresponding function switch is ON.  
 \*1-2 When BEND RANGE or MASTER TUNE is changed, RPC (Registered parameter control number) and its value are sent as follows.  
 Bnh, 64h, pp, 65h, qq, 06h, sm, 28h, 11  
 pp,qq = RPC number LSH,MSB  
 sm,11 = parameter value RSH,LSB  
 \*1-3 Program change number indicates the condition of the 'Sampling Structure'. (See Owner's manual)  
 \*1-4 See section 3 (EXCLUSIVE COMMUNICATION).

2. RECOGNIZED RECEIVE DATA

Status	Second	Third	Description
1000 mmm	0kk kkk	0vv vvv	Note OFF, Velocity ignored kkkkkk = 24 - 103
1001 mmm	0kk kkk	0000 0000	kkkkkk = 24 - 103 vvvvvv = 1 - 127
1001 mmm	0kk kkk	0vv vvv	Note ON kkkkkk = 24 - 103 vvvvvv = 1 - 127
1011 mmm	0000 0001	0vv vvv	Modulation depth
1011 mmm	0000 0110	0vv vvv	Data Entry MSB
1011 mmm	0010 0110	0vv vvv	Data Entry LSB
1011 mmm	0100 0000	0vv vvv	Hold1 OFF
1011 mmm	0100 0000	0vv vvv	Hold1 ON
1011 mmm	0100 0000	0vv vvv	vvvvvv = 0 - 63
1011 mmm	0110 0100	0vv vvv	RPC LSB
1011 mmm	0110 0101	0vv vvv	RPC MSB
1100 mmm	0ppp pppp		Program Change pppppp = 0 - 127
1110 mmm	0vv vvv	0vv vvv	Pitch Bend Change
1011 mmm	0111 1011	0000 0000	All NOTES OFF
1011 mmm	0111 1100	0000 0000	OMNI OFF
1011 mmm	0111 1101	0000 0000	OMNI ON
1011 mmm	0111 1110	0000 0000	OMNI ON
1011 mmm	0111 1111	0000 0000	POLY ON
1111 0000	...	1111 0111	System exclusive

Notes :  
 \*2-1 Note numbers outside the range 24 - 103 are ignored.  
 \*2-2 Received if the corresponding function switch is ON.  
 \*2-3 vvvvvv = 1 - 127 : modulation ON (Depth ignored.)  
 \*2-4 RPC and value (Data Entry) are recognized as follows.  
 RPC # value MSB value LSB  
 0 0vv vvv 0xx xxx  
 \*2-5 Program number corresponds to the condition of the 'Sampling Structure'. (See Owner's manual)  
 \*2-6 Mode Messages (123-127) are recognized as only an ALL NOTES OFF.  
 \*2-7 See section 3 (EXCLUSIVE COMMUNICATION).

3. EXCLUSIVE COMMUNICATION

It is possible to communicate with exclusive messages, in NORMAL MODE and SAMPLE DATA DUMP MODE.

NORMAL MODE: In which it is possible to play and generate sound, is explained in section 4, 5.

SAMPLE DATA DUMP MODE has following 4 functions explained in section 6-9.

When 'FIR' and 'MIDI' buttons are pressed, it becomes SAMPLE DATA DUMP SAMPLE DATA TRANSMIT'. Sample data has: It seems Then 'FORWARD' button is pressed, LCD shows 'Sample Data Xate'. It seems 'HANDSHAKE SAMPLE DATA TRANSMIT'. 'Sample Data Rev.' button is pressed, LCD shows 'DATA RECEIVE'. Sample data Rev.' means 'Send'. LCD shows 'DATA RECEIVE'. Then 'FORWARD' button is pressed, LCD shows 'Sample Data Rev.'. It seems 'HANDSHAKE SAMPLE DATA RECEIVE'. When 'BACKWARD' button is pressed, it changes reversely.

All exclusive communications are based on following structure ( Roland Exclusive format type 1 ).

Byte	Description
a 1111 0000	Exclusive status
b 0000 0001	Device-ID # = MIDI basic channel
c 0000 mmm	where mmm + 1 = channel #
d 0001 0000	Model-ID # ( 5-10 )
e 0aaa aaaa	Command-ID # ( ) depend on Command-ID
f 0bbb bbbb	Address HSB
g 0ccc cccc	Address LSB
h 0ddd dddd	Address LSB
i 0eee eeee	Data
j 0fff ffff	Checksum
k 1111 0111	End of System Exclusive

Summed value of the all bytes between Command-ID and EOF must be 00h (7 bits). It is not include Command-ID and EOF.



4. EXCLUSIVE COMMUNICATIONS IN NORMAL MODE

4.1 Communication format

4.1.1 Request (One way) RQ1 11H (Recognized only)

Table with 2 columns: Byte, Description. Rows include Exclusive status, Roland ID #, Device-ID #, Model-ID #, Command-ID #, Address MSB, Address LSB, Size MSB, Size LSB, Checksum, End of System Exclusive.

4.1.2 Data set (One way) DT1 12H (Transmitted and recognized)

Table with 2 columns: Byte, Description. Rows include Exclusive status, Roland ID #, Device-ID #, Model-ID #, Command-ID #, Address MSB, Address LSB, Data, Checksum, End of System Exclusive.

- Notes: #4-1 If aaaaaa - ccccccc doesn't indicate the top address of the parameter, the message will be ignored. #4-2 The data size is always ignored and regarded as the size of a parameter which is addressed by aaaaaa - ccccccc. #4-3 Data of one parameter is sent at one time. Data of only one parameter is recognized at one time.

5. Address mapping of parameters

Table mapping parameter addresses to values. Includes TONE NAME, REC KEY, BANK TUNE, LOOP TUNE, SCAN MODE, LOOP TYPE, ST (start address), END (end address), LP (loop length), AEN (auto end address), ALP (auto loop length), KEY FOLLOW, PITCH BEND, VIBRATO, ENV V-SENS, ENV RATE1, ENV LEVEL1, ENV RATE2, ENV LEVEL2, ENV RATE3, ENV LEVEL3, ENV RATE4, ENV LEVEL4, DYN RANGE, ABEND RATE, ABEND DPTH, SPT KEY#1, SPT KEY#2, SPT KEY#3.

Table mapping temporary wave parameter block addresses to sampling structures. Includes block-2, block-3, block-4.

000800 : Performance parameters #5-6

Table mapping performance parameters to values. Includes VIB RATE, M-VIB DPTH, D-VIB DPTH, D-VIB DLAY, BEND MODE, ARP SYNC, ARP RATE, ARP MODE, ARP RANGE, ARP REPEAT, ARP DECAY, V-MX THRS, V-SW THRS, DTUN MOD, DTUN RANGE, ABEND DES, BEND DEST, DELAY TIME, DELAY LEVL, KEY OFFSET, TRG G-TIME, TRIGGER KEY #1-4.

Table mapping structure # of temporary wave parameter blocks to values. Includes structure # of block-1, block-2, block-3, block-4. Also includes Write command switch, ARPEGGIO on/off, Sample dump mode switch.

Notes :

- #5-1 Temporary wave parameters Transmitted when the parameter (except TONE NAME) is edited or 'Request data' is received. #5-2 Transmitted only when 'Request data' is received. #5-3 Three value (NNNNN, MMMMM) depends on the sampling structure, as following chart. #5-4 Auto loop addresses are transmitted when it is displayed in edit mode. #5-5 If 2 or 4 blocks are used, the SPT KEY # of top block should be used for the communication. #5-6 Performance parameters Transmitted when the parameter (except TONE NAME) is edited or 'Request data' is received. #5-7 Structure # of temporary wave parameter These can't be changed by Data set command ( DT1 ).

Table mapping structure # of temporary wave parameter to sampling structure. Includes structure #, sampling structure, and values for A, B, C, D, AB, CD, ABCD, OFH.

#5-8 Write command switch Transmitted when 'ENTER' button is pressed. If any data would be written to this address, write the parameters in temporary area to wave parameter area of the banks on the condition of the sampling structure. Request data command ( RQ1 ) for this address is ignored.

#5-9 Arpeggio on/off switch Transmitted when 'ARPEGGIO' button is pressed. When Data set command ( DT1 ) is recognized, arpeggio will turn to ON or OFF. Request data command ( RQ1 ) for this address is ignored.

#5-10 Sample dump mode switch Transmitted when 'F1' and 'MIDI' button are pressed. If any data is written to this address, the mode will change from NORMAL MODE to SAMPLE DATA DUMP MODE. The transmitter should be wait more then 10msec for changing the mode. Request data command ( RQ1 ) for this address is ignored.

6. TRANSMITTED EXCLUSIVE MESSAGES IN SAMPLE DATA DUMP MODE

Sample data is determined by sampling structure. It is transmitted in following order. WAVE DATA - WAVE PARAMETER - PERFORMANCE PARAMETER

6.1 One way transfer

6.1.1 Data set DT1 12H

Transmitted when 'ENTER' button is pressed in 'Sample Data Xst' mode.

Table with 2 columns: Byte, Description. Rows include Exclusive status, Roland ID #, Device-ID #, Model-ID #, Command-ID #, Address MSB, Address LSB, Data, Checksum, End of System Exclusive.

6.2 Handshaking communication

6.2.1 Want to send data WSD 40H

Transmitted when 'ENTER' button is pressed in 'Sample Data Xst' mode.

Table with 2 columns: Byte, Description. Rows include Exclusive status, Roland ID #, Device-ID #, Model-ID #, Command-ID #, Address MSB, Address LSB, Size MSB, Size LSB, Checksum, End of System Exclusive.

6.2.2 Request data RQD 41H

Transmitted when 'ENTER' button is pressed in 'Sample Data Revt' mode.

Table with 2 columns: Byte, Description. Rows include Exclusive status, Roland ID #, Device-ID #, Model-ID #, Command-ID #, Address MSB, Address LSB, Size MSB, Size LSB, Checksum, End of System Exclusive.

6.2.3 Data set DAT 42H

Table with 2 columns: Byte, Description. Rows include Exclusive status, Roland ID #, Device-ID #, Model-ID #, Command-ID #, Address MSB, Address LSB, Data, Checksum, End of System Exclusive.

6.2.4 Acknowledge ACK 43H

Table with 2 columns: Byte, Description. Rows include Exclusive status, Roland ID #, Device-ID #, Model-ID #, Command-ID #, Address MSB, Address LSB, Data, Checksum, End of System Exclusive.

6.2.5 End of Data EOD 45H

Table with 2 columns: Byte, Description. Rows include Exclusive status, Roland ID #, Device-ID #, Model-ID #, Command-ID #, End of System Exclusive.

6.2.6 Communication error ERR 4EH

Table with 2 columns: Byte, Description. Rows include Exclusive status, Roland ID #, Device-ID #, Model-ID #, Command-ID #, End of System Exclusive.

6.2.7 Rejection RJC 4FH

Table with 2 columns: Byte, Description. Rows include Exclusive status, Roland ID #, Device-ID #, Model-ID #, Command-ID #, End of System Exclusive.

Notes :

#6-1 Address is determined by sampling structure. Address of first Data set command ( DT1, DAT ), Want to send data ( WSD ) or Request data ( RQD ) is as follows.

Table mapping structure, wave data, wave parameter, performance parameter to values. Includes structure, wave data, wave parameter, performance parameter.

#6-2 Number of data in one Data set command ( DT1 ) is as follows.

Table mapping structure, wave data, wave parameter, performance parameter to values. Includes structure, wave data, wave parameter, performance parameter.

#6-3 Size ( MSB - LSB ) is as follows.

Table mapping structure, wave data, wave parameter, performance parameter to values. Includes structure, wave data, wave parameter, performance parameter.

7. RECOGNIZED EXCLUSIVE MESSAGES IN SAMPLE DATA DUMP MODE

Transmitted Sample data is determined by sampling structure. It must be transmitted in following order. WAVE DATA - WAVE PARAMETER - PERFORMANCE PARAMETER

Following exclusive message is recognized only in SAMPLE DATA DUMP MODE. When all sample data is received completely, sampling structure changes accordingly.

7.1 One way receive

7.1.1 Data set DT1 12H

Table with 2 columns: Byte, Description. Rows include Exclusive status, Roland ID #, Device-ID #, Model-ID #, Command-ID #, Address MSB, Address LSB, Data, Checksum, End of System Exclusive.

7.2 Handshaking communication

7.2.1 Want to send data WSD 40H

Table with 2 columns: Byte, Description. Rows include Exclusive status, Roland ID #, Device-ID #, Model-ID #, Command-ID #, Address MSB, Address LSB, Data, Checksum, End of System Exclusive.

7.2.2 Request data RQD 41H

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0000 nnnn	Device-ID # = MIDI basic channel where nnnn + 1 = channel #
d 0001 0000	Model-ID # ( S-10 )
e 0100 0001	Command-ID # ( RQD )
f 0aaa aaaa	Address MSB
g 0bbb bbbb	Address
h 0ccc cccc	Address LSB
i 0ddd dddd	Size MSB
j 0eee eeee	Size
k 0fff ffff	Size LSB
l 0gxx gxxx	Checksum
m 1111 0111	End of System Exclusive

7.2.3 Data set DAT 42H

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0000 nnnn	Device-ID # = MIDI basic channel where nnnn + 1 = channel #
d 0001 0000	Model-ID # ( S-10 )
e 0100 0010	Command-ID # ( DAT )
f 0aaa aaaa	Address MSB
g 0bbb bbbb	Address
h 0ccc cccc	Address LSB
i 0ddd dddd	Data
j 0eee eeee	Checksum
k 1111 0111	End of System Exclusive

7.2.4 Acknowledge ACK 43H

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0000 nnnn	Device-ID # = MIDI basic channel where nnnn + 1 = channel #
d 0001 0000	Model-ID # ( S-10 )
e 0100 0011	Command-ID # ( ACK )
f 1111 0111	End of System Exclusive

7.2.5 End of data EOD 45H

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0000 nnnn	Device-ID # = MIDI basic channel where nnnn + 1 = channel #
d 0001 0000	Model-ID # ( S-10 )
e 0100 0101	Command-ID # ( EOD )
f 1111 0111	End of System Exclusive

7.2.6 Communication error ERR 4EH

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0000 nnnn	Device-ID # = MIDI basic channel where nnnn + 1 = channel #
d 0001 0000	Model-ID # ( S-10 )
e 0100 1110	Command-ID # ( ERR )
f 1111 0111	End of System Exclusive

7.2.7 Rejection RJC 4FH

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0000 nnnn	Device-ID # = MIDI basic channel where nnnn + 1 = channel #
d 0001 0000	Model-ID # ( S-10 )
e 0100 1111	Command-ID # ( RJC )
f 1111 0111	End of System Exclusive

Notes :  
\*7-1 Address of first data set command ( DTI, DAT ), want to send data ( WSD ) or Request data ( RQD ) is as follows.

structure	WAVE DATA	WAVE PARAMETER	PERFORMANCE PARAMETER
A	020000	010000	010800
B	060000	:	:
C	0A0000	:	:
D	0E0000	:	:
AB	020000	:	:
CD	0A0000	:	:
ABCD	020000	:	:
A/B	020000	:	:
C/D	0A0000	:	:
AB/CD	020000	:	:
A/B/C/D	020000	010000	010800

\*7-2 Number of data in data set is as follows.

structure	WAVE DATA	WAVE PARAMETER	PERFORMANCE PARAMETER
A	2 - 244	73	28
B	:	:	:
C	:	:	:
D	:	:	:
AB	:	:	:
CD	:	:	:
ABCD	73	:	:
A/B	146	:	:
C/D	:	:	:
AB/CD	:	:	:
A/B/C/D	2 - 244	146	28

Number of data of WAVE DATA must be even.

\*7-3 Size ( MSB - LSB ) is as follows.

structure	WAVE DATA	WAVE PARAMETER	PERFORMANCE PARAMETER
A	040000	000049	00001C
B	:	:	:
C	:	:	:
D	040000	:	:
AB	080000	:	:
CD	080000	:	:
ABCD	100000	000049	:
A/B	080000	000112	:
C/D	080000	:	:
AB/CD	100000	000112	:
A/B/C/D	100000	000224	00001C

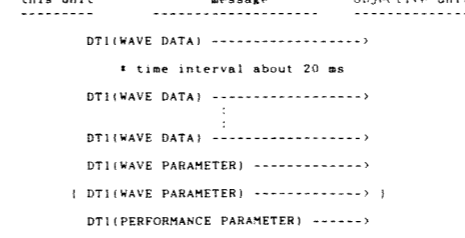
8. Address mapping of SAMPLE DATA

Address	Description
010100	Wave parameter of block-1
010100	0aaa aaaa : TONE NAME
9 : 0000 aaaa	SAMPLING STRUCTURE
A : 0000 aaaa	DESTINATION BANK
B : 0000 abcd	a BENDER 0 : OFF 1 : ON
	b KEY FOLLOW 0 : OFF 1 : ON
	c VIBRATO 0 : OFF 1 : ON
	d SAMPLING RATE 0 : 30 kHz 1 : 15 kHz
C : 0000 aabb	aa LOOP MODE 00 : 1SHOT 01 : MAN 10 : AUTO
	bb SCAN MODE 00 : FORWARD 01 : ALTERNATE 10 : BACKWARD
D : 0000 aaaa	
E : 0000 bbbb	
bbbbaaaa	REC KEY NUMBER
F : 0000 0000	dummy
G : 0000 0000	dummy
H : 0000 aaaa	
I : 0000 bbbb	
J : 0000 cccc	
K : 0000 dddd	
L : 0000 eeee	
M : 0000 ffff	
N : 0000 gxxx	
O : 0000 hhhh	
P : 0000 iiii	
Q : 0000 jjjj	
R : 0000 kkkk	
S : 0000 llll	
T : 0000 mmmm	
U : 0000 nnnn	
V : 0000 oooo	
W : 0000 pppp	
X : 0000 qqqq	
Y : 0000 rrrr	
Z : 0000 ssss	
010100	0000 tttt
25 : 0000 uvvv	
26 : 0000 wwww	
27 : 0000 xxxx	dummy
28 : 0000 yyyy	
uu brrbaaaa ddddeccc	START ADDRESS
vv ffffeeee bbbggggg	MANUAL LOOP LENGTH
xx jrrrrrrrr lllllkkkk	MANUAL END ADDRESS
yy nnnnnnnnn pppppoooo	AUTO LOOP LENGTH
zz rrrrrqqq tttttssss	AUTO END ADDRESS
29 : 0000 aaaa	
2A : 0000 bbbb	bbbbaaaa BANK TUNE
2B : 0000 aaaa	
2C : 0000 bbbb	bbbbaaaa LOOP TUNE
2D : 0000 aaaa	
2E : 0000 bbbb	bbbbaaaa VELOCITY SENSE
2F : 0000 aaaa	
30 : 0000 bbbb	bbbbaaaa ENVELOPE RATE-1
31 : 0000 aaaa	
32 : 0000 bbbb	bbbbaaaa ENVELOPE RATE-2
33 : 0000 aaaa	
34 : 0000 bbbb	bbbbaaaa ENVELOPE RATE-3
35 : 0000 aaaa	
36 : 0000 bbbb	bbbbaaaa ENVELOPE RATE-4
37 : 0000 aaaa	
38 : 0000 bbbb	bbbbaaaa ENVELOPE LEVEL-1
39 : 0000 aaaa	
3A : 0000 bbbb	bbbbaaaa ENVELOPE LEVEL-2
3B : 0000 aaaa	
3C : 0000 bbbb	bbbbaaaa ENVELOPE LEVEL-3
3D : 0000 aaaa	
3E : 0000 bbbb	bbbbaaaa KEY SPLIT POINT-1
3F : 0000 aaaa	
40 : 0000 bbbb	bbbbaaaa KEY SPLIT POINT-2
41 : 0000 aaaa	
42 : 0000 bbbb	bbbbaaaa KEY SPLIT POINT-3
43 : 0000 aaaa	
44 : 0000 bbbb	bbbbaaaa DYNAMIC SENS
45 : 0000 aaaa	
46 : 0000 bbbb	bbbbaaaa AUTO BEND RATE
47 : 0000 aaaa	
48 : 0000 bbbb	bbbbaaaa AUTO BEND DEPTH
010049	Wave parameter of block-2
010111	
010112	Wave parameter of block-3
01015A	
01015B	Wave parameter of block-4
010224	
010800	Performance parameter
0 : 0000 aaaa	
1 : 0000 bbbb	bbbbaaaa EXTERNAL TRIGGER KEY NUMBER-1
2 : 0000 aaaa	
3 : 0000 bbbb	bbbbaaaa EXTERNAL TRIGGER KEY NUMBER-2
4 : 0000 aaaa	
5 : 0000 bbbb	bbbbaaaa EXTERNAL TRIGGER KEY NUMBER-3

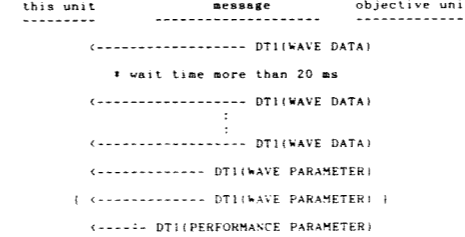
6 : 0000 aaaa	
7 : 0000 bbbb	bbbbaaaa EXTERNAL TRIGGER KEY NUMBER-4
8 : 0000 aaaa	
9 : 0000 bbbb	bbbbaaaa EXTERNAL TRIGGER TRIGGER TIME
A : 0000 aaaa	
B : 0000 bbbb	bbbbaaaa ARPEGGIO RATE
C : 0000 aa00	ARPEGGIO SYNC 00 : INTERNAL CLOCK 01 : EXTERNAL CLOCK
D : 0000 aabb	aa ARPEGGIO MODE 00 : UP 01 : DOWN 10 : UP/DOWN 11 : RANDOM
	bb ARPEGGIO RANGE 00 : 1 OCTAVE 01 : 2 OCTAVE 10 : 3 OCTAVE
E : 0000 aaaa	
F : 0000 bbbb	bbbbaaaa ARPEGGIO REPEAT TIME
10 : 0000 aaaa	
11 : 0000 bbbb	bbbbaaaa ARPEGGIO DECAY RATIO
12 : 0000 aaaa	
13 : 0000 bbbb	bbbbaaaa VIBRATO RATE
14 : 0000 aaaa	
15 : 0000 bbbb	bbbbaaaa MANUAL VIBRATO DEPTH
16 : 0000 aaaa	
17 : 0000 bbbb	bbbbaaaa DELAY VIBRATO DEPTH
18 : 0000 aaaa	
19 : 0000 bbbb	bbbbaaaa DELAY VIBRATO TIME
1A : 0000 aaaa	
1B : 0000 bbbb	bbbbaaaa DELAY TIME OF DELAY MODE
1C : 0000 aaaa	
1D : 0000 bbbb	bbbbaaaa DELAY LEVEL OF DELAY MODE
1E : 0000 aaaa	
1F : 0000 bbbb	bbbbaaaa DELAY KEY OFFSET OF DELAY MODE
20 : 0000 aaaa	
21 : 0000 bbbb	bbbbaaaa DETUNE RANGE OF DETUNE MODE
22 : 0000 aaaa	
23 : 0000 bbbb	bbbbaaaa THRESHOLD LEVEL OF VELOCITY MIX MODE
24 : 0000 aaaa	
25 : 0000 bbbb	bbbbaaaa THRESHOLD LEVEL OF VELOCITY SWITCH MODE
26 : 0000 abcd	a AUTO BEND DESTINATION OF DETUNE MODE 0 : BOTH 1 : HALF
	b BEND DESTINATION OF DETUNE MODE 0 : BOTH 1 : HALF
	c BENDER MODE 0 : CONTINUOUS 1 : CHROMATIC
	d DETUNE MODE 0 : FIX 1 : VELOCITY
27 : 0000 0000	dummy
020000	Wave data of bank-1
0 : 0aaa aaaa	
1 : 0bbb bb00	aaaa aaabbbb Wave data (12 bit 2's complement)
057F7F	
060000	Wave data of bank-2
097F7F	
0A0000	Wave data of bank-3
0D7F7F	
0E0000	Wave data of bank-4
127F7F	

9. Sequence of communication

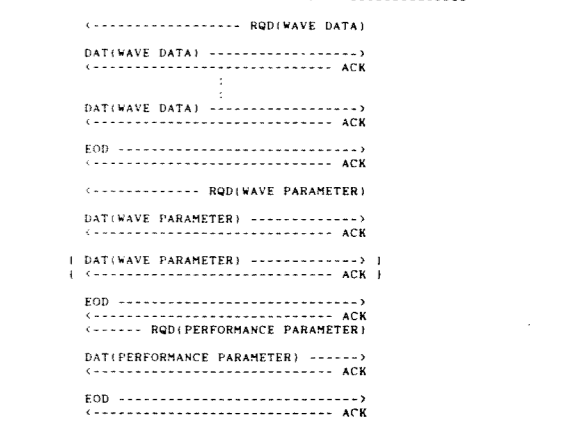
9.1 When one way data set of WAVE DATA is transmitted



9.2 When one way data set of WAVE DATA is received

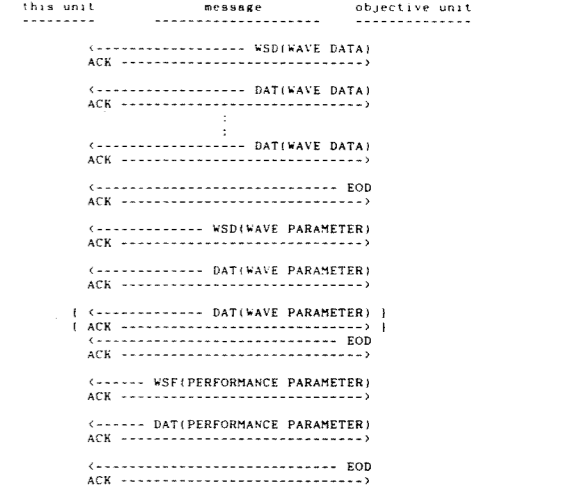


9.4 When request data is received



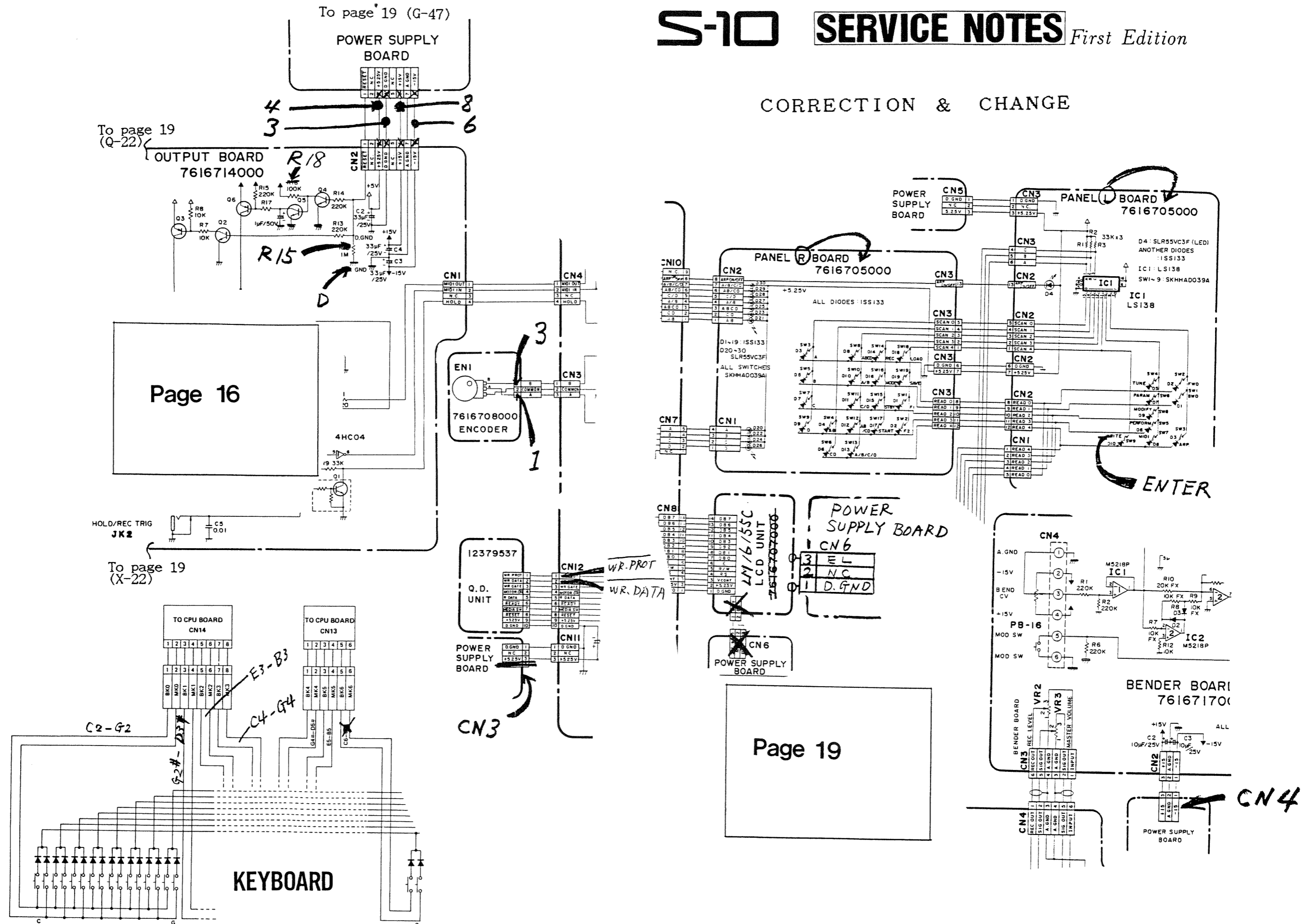
Notes :  
\*When it receives ERR, it sends same data set again.  
\*When a transmitting S-10 receives any illegal command (ie. a note on etc.), it ignores and waits for legal command.  
\*When a receiving S-10 receives any illegal command (ie. a note on etc.), it ignores and waits for legal command.  
\*It sends RJC and stops sample dump sequence immediately, when sampling structure button is pressed.  
\*It stops the sequence immediately when it receives RJC.

9.3 When want to send data is received



# S-10 SERVICE NOTES *First Edition*

## CORRECTION & CHANGE



To page 19 (Q-22)

To page 19 (G-47)

Page 16

To page 19 (X-22)

KEYBOARD

Page 19

BENDER BOARD 7616717000

PANEL BOARD 7616705000

POWER SUPPLY BOARD

OUTPUT BOARD 7616714000

POWER SUPPLY BOARD

ENI 7616708000 ENCODER

POWER SUPPLY BOARD

POWER SUPPLY BOARD

HOLD/REC TRIG JK2

TO CPU BOARD CN14

TO CPU BOARD CN13

PANEL BOARD 7616705000

PANEL BOARD 7616705000

Q.D. UNIT 12379537

LM16155C LCD UNIT 7616708000

POWER SUPPLY BOARD

POWER SUPPLY BOARD

POWER SUPPLY BOARD

BENDER BOARD

OUTPUT BOARD 7616714000

POWER SUPPLY BOARD

POWER SUPPLY BOARD

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### MIDI IMPLEMENTATION

#### PARTS CHANGED

##### AC CORD

13439846 BH-301-J01  
change to  
23495110 5722 660 4606

##### AC INLET

13429709 PA-125  
change to  
13429708 CM-3

##### IC

15189191 NJM2068D-D  
change to  
15189186  $\mu$ PC4570C  
Use of  $\mu$ PC4570C is recommended  
for low noise.

##### BATTERY

12569149H0 CR2032T16  
change to  
12569149S0 CR2032T12

##### PCB LAYOUT

Change "View from foil side"  
to  
"View from component side"

MAIN BOARD  
OUTPUT BOARD  
POWER SUPPLY BOARD

Notes :

#6-1 Address is determined by sampling structure.

Address of first Data set command ( DTI, DAT ), want to send data ( WSD ) or Request data ( RQD ) is as follows.

structure	WAVE DATA	WAVE PARAMETER	PERFORMANCE PARAMETER
A	020000	010000	010800
B	060000	:	:
C	0A0000	:	:
D	0E0000	:	:
AB	020000	:	:
CD	0A0000	:	:
ABCD	020000	:	:
A/B	020000	:	:
C/D	0A0000	:	:
AB/CD	020000	:	:
A/B/C/D	020000	010000	010800

#6-2 Number of data in one Data set command ( DTI ) is as follows.

structure	WAVE DATA	WAVE PARAMETER	PERFORMANCE PARAMETER
A	128	73	20 → 40
B	:	:	:
C	:	:	:
D	:	:	:
AB	:	:	:
CD	:	:	:
ABCD	:	73	:
A/B	:	146	:
C/D	:	:	:
AB/CD	:	:	:
A/B/C/D	128	146	20 → 40

#6-3 Size ( MSB - LSB ) is as follows.

structure	WAVE DATA	WAVE PARAMETER	PERFORMANCE PARAMETER
A	040000	000049	00001C → 000028
B	:	:	:
C	:	:	:
D	040000	:	:
AB	080000	:	:
CD	080000	:	:
ABCD	100000	000049	:
A/B	080000	000112	:
C/D	080000	:	:
AB/CD	100000	000112	:
A/B/C/D	100000	000224	00001C → 000028

Notes :

#7-1 Address of first Data set command ( DTI, DAT ), want to send data ( WSD ) or Request data ( RQD ) is as follows.

structure	WAVE DATA	WAVE PARAMETER	PERFORMANCE PARAMETER
A	020000	010000	010800
B	060000	:	:
C	0A0000	:	:
D	0E0000	:	:
AB	020000	:	:
CD	0A0000	:	:
ABCD	020000	:	:
A/B	020000	:	:
C/D	0A0000	:	:
AB/CD	020000	:	:
A/B/C/D	020000	010000	010800

#7-2 Number of data in data set is as follows.

structure	WAVE DATA	WAVE PARAMETER	PERFORMANCE PARAMETER
A	2 - 244	73	20 → 40
B	:	:	:
C	:	:	:
D	:	:	:
AB	:	:	:
CD	:	:	:
ABCD	:	73	:
A/B	:	146	:
C/D	:	:	:
AB/CD	:	:	:
A/B/C/D	2 - 244	146	20 → 40

Number of data of WAVE DATA must be even.

#7-3 Size ( MSB - LSB ) is as follows.

structure	WAVE DATA	WAVE PARAMETER	PERFORMANCE PARAMETER
A	040000	000049	00001C → 000028
B	:	:	:
C	:	:	:
D	040000	:	:
AB	080000	:	:
CD	080000	:	:
ABCD	100000	000049	:
A/B	080000	000112	:
C/D	080000	:	:
AB/CD	100000	000112	:
A/B/C/D	100000	000224	00001C → 000028



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