

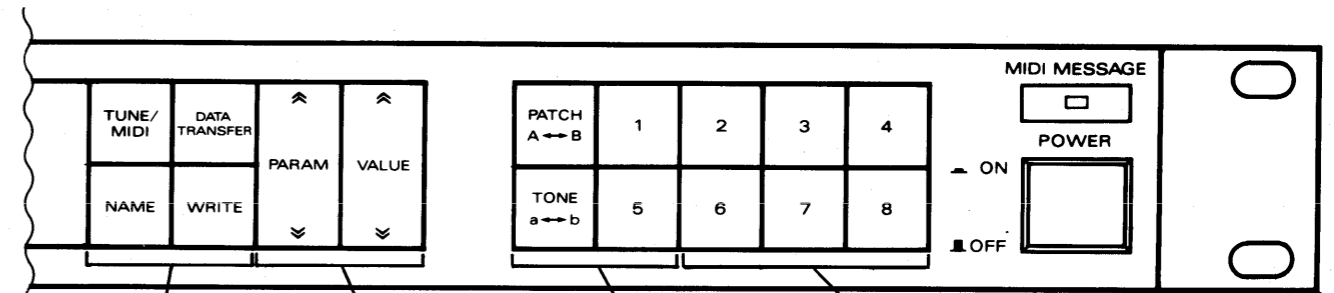
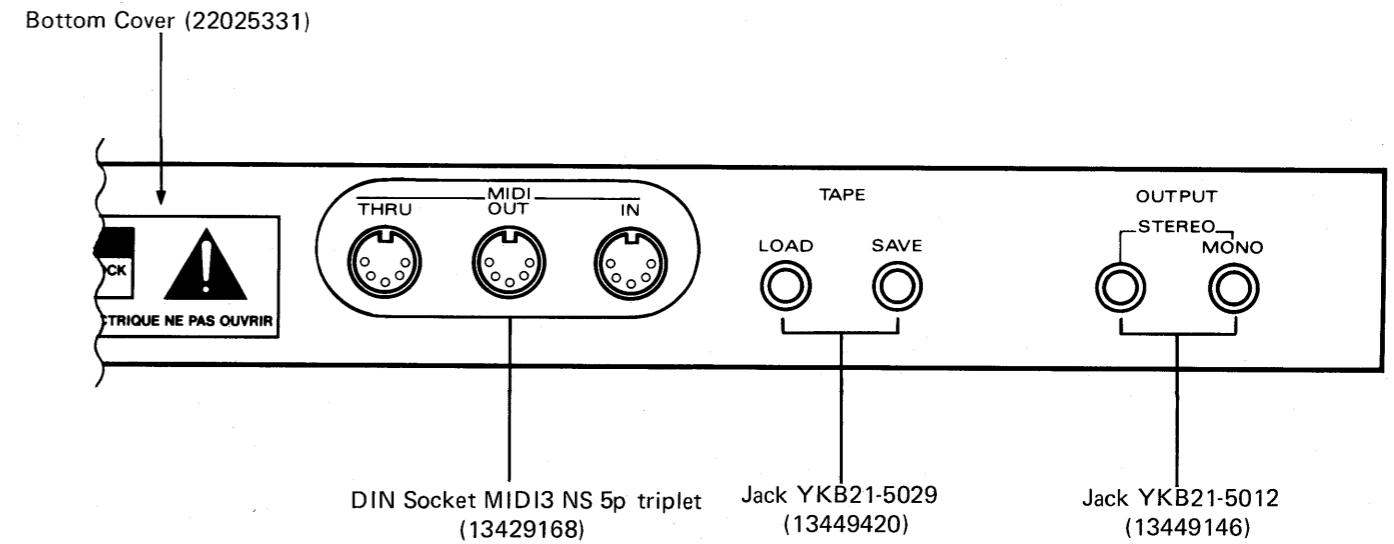
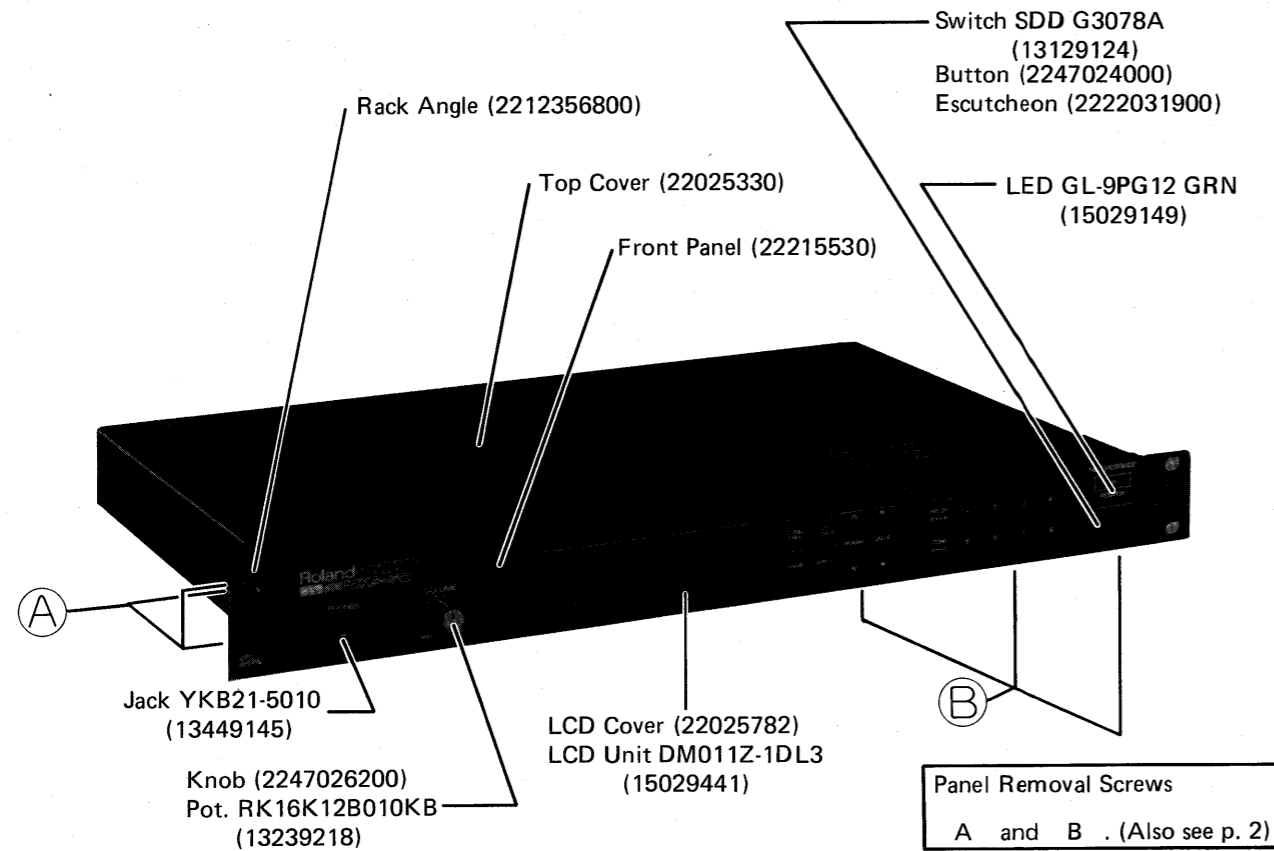
MKS-50

SERVICE NOTES

First Edition

SPECIFICATIONS

DCO	TUNE	±50 cents
	LFO MOD	±400 cents
	ENV MOD	±3200 cents
	AFTERTOUCH BENDER	±400 cents
VCF	CUTOFF FREQ.	8Hz to 33kHz, -24dB/oct
	ENV MOD	±12 oct
	LFO MOD	±6 oct
	AFTERTOUCH	+6 oct
ENV	KEY FOLLOW	0 - 100%
	T1	4ms - 30s
	T2	4ms - 30s
	T3	8ms - 30s
LFO	T4	8ms - 30s
	RATE	0.03Hz - 60Hz
	DELAY TIME	0 - 30s
	AUDIO	-3dBm
OUTPUT	PHONES	8 - 150Ω Stereo
	EXP	16W, 12W (Japan)
POWER CONSUMPTION		
DIMENSIONS		480(W) x 290(D) x 44(H) mm
		18-7/8(W) x 11-7/16(D) x 1-3/4(H) in
WEIGHT		3.5kg, 7 lb, 120 oz



Button Assy A (22475966)

Button Assy B (22475967)

Button Assy C (22475968)

Button Assy D (22475969)

Set of the followings.
 Button Frame 2P (13129124)
 Buttons
 MIDI/TUNE (22495501)
 NAME (22475699)
 DATA TRANSFER (22495502)
 WRITE (22495503)

Set of the followings.
 Button Frame 2P (13129124)
 Buttons
 PARAM (22495504)
 VALUE (22495505)

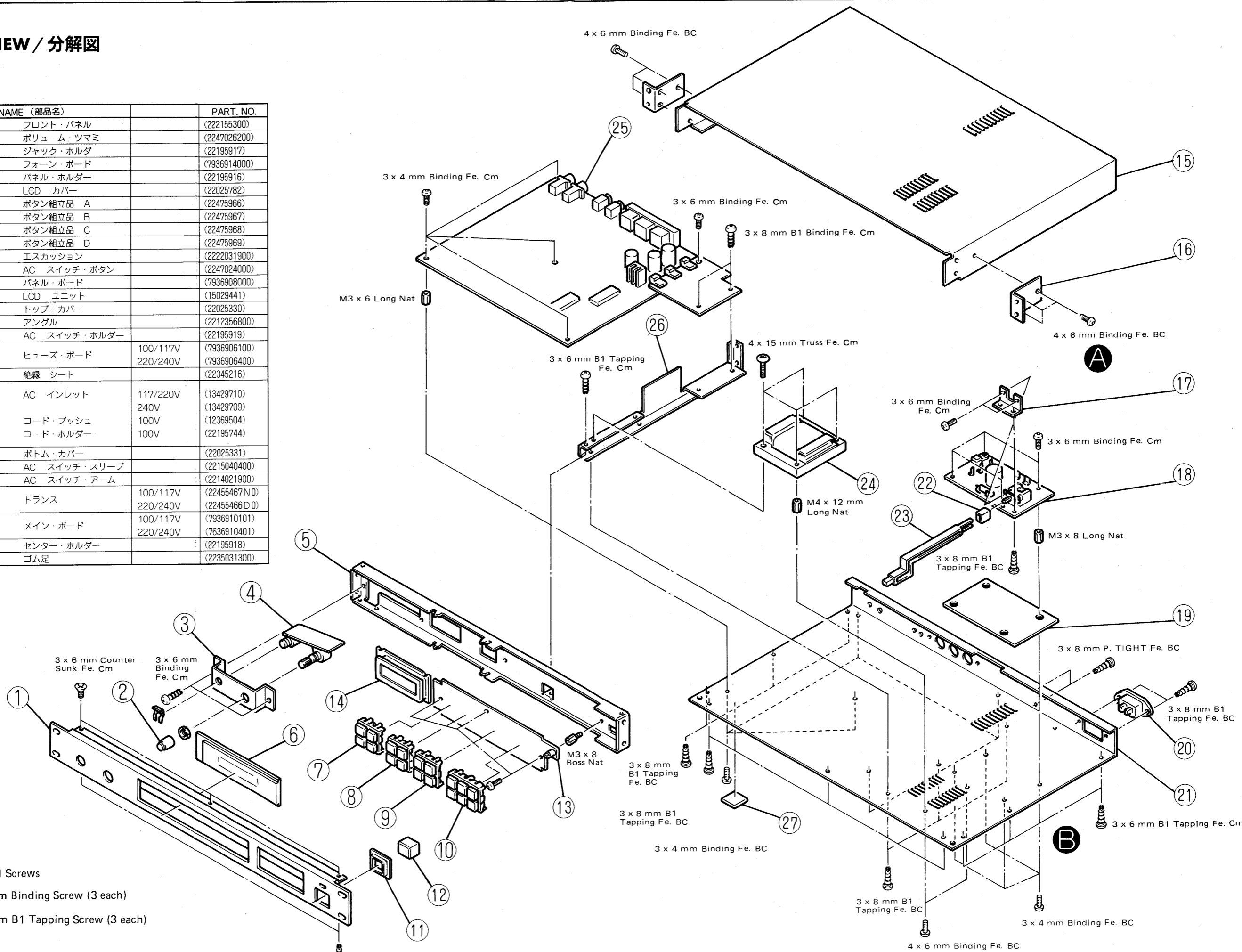
Set of the followings.
 Button Frame 2P (13129124)
 Buttons
 PATCH A-B (22495506)
 TONE A-B (22495507)
 BUTTON 1 (22495508)
 BUTTON 5 (22495515)

Set of the followings.
 Button Frame 3P (2247024000)
 Buttons
 BUTTON 2 (22495509)
 BUTTON 3 (22495511)
 BUTTON 4 (22495513)
 BUTTON 6 (22495510)
 BUTTON 7 (22495512)
 BUTTON 8 (22495514)

All switches : SKHHBS (13129733)

EXPLODED VIEW / 分解図

No	PART NAME (部品名)		PART. NO.
1	Front Panel	フロント・パネル	(222155300)
2	Knob	ボリューム・ツマミ	(2247026200)
3	Jack Holder	ジャック・ホルダ	(22195917)
4	Phone Board	フォン・ボード	(7936914000)
5	Panel Bracket	パネル・ホルダー	(22195916)
6	LCD Cover	LCD カバー	(22025782)
7	Button Assy A	ボタン組立品 A	(22475966)
8	Button Assy B	ボタン組立品 B	(22475967)
9	Button Assy C	ボタン組立品 C	(22475968)
10	Button Assy D	ボタン組立品 D	(22475969)
11	Escutcheon	エスカッション	(2222031900)
12	Button	AC スイッチ・ボタン	(2247024000)
13	Panel Board	パネル・ボード	(7936908000)
14	LCD Unit	LCD ユニット	(15029441)
15	Top Cover	トップ・カバー	(22025330)
16	Rack Angle	アングル	(2212356800)
17	Bracket	AC スイッチ・ホルダー	(22195919)
18	Fuse Board	ヒューズ・ボード	100/117V (7936906100) 220/240V (7936906400)
19	Insulating Shield	絶縁 シート	(22345216)
20	AC Inlet	AC インレット	117/220V (13429710) 240V (13429709)
	Cord Bushing	コード・ブッシュ	100V (12369504)
	Cord Holder	コード・ホルダー	100V (22195744)
21	Bottom Cover	ボトム・カバー	(22025331)
22	Sleeve	AC スイッチ・スリーブ	(2215040400)
23	Extension Shaft	AC スイッチ・アーム	(2214021900)
24	Power Transformer	トランス	100/117V (22455467N0) 220/240V (22455466D0)
25	Main Board	メイン・ボード	100/117V (7936910101) 220/240V (7636910401)
26	Center Bracket	センター・ホルダー	(22195918)
27	Rubber Foot	ゴム足	(2235031300)



Panel Removal Screws

- A 4 x 6 mm Binding Screw (3 each)
- B 3 x 6 mm B1 Tapping Screw (3 each)

3 x 8 mm B1 Tapping Fe. BC

PARTS LIST

PANEL/COVER

22215530	Front Panel
22025330	Top Cover
22025331	Bottom Cover
22025782	LCD Cover

KNOB, BUTTON

2247024000	Button	Power SW
2247026200	Knob	VOLUME
22475966	Button Assy A	NAME
2219076000	Button Frame 2p Buttons NAME, MIDI/TUNE, DATA TRANSFER, WRITE	
22475967	Button Assy B	
2219076000	Button Frame 2p Buttons PARAM, VALUE	
22475968	Button Assy C	
2219076000	Button Frame 2p Buttons PATCH A-B, TONE a-b, 1, 5	
22475969	Button Assy D	
2219076100	Button Frame 3p Buttons 2, 3, 4, 6, 7, 8	

SWITCH

13129124	SDD G3078A	Power SW
13129733	SKHHBS	light touch Panel Board

PCB ASSY

7936908000	(PCB 2292540701) 2/4	Panel Board
7936914000	(PCB 2292540701) 4/4	Phone Board
7936910101	(PCB 2292540701) 1/4	Main Board 100/117V
7936910401	(PCB 2292540701) 1/4	Main Board 220/240V
7936906100	(PCB 2292540701) 3/4	Fuse Board 100/117V
7936906400	(PCB 2292540701) 3/4	Fuse Board 220/240V

NOTE: Main and Fuse Boards.
Difference between voltage versions: Only in fuse system.
Any version can be supplied as a replacement for particular voltage order, with correct fuses. Specify the line voltage when ordering.

[メイン・ボードおよびヒューズボード]

電圧区分による違いはヒューズ値のみですので、補修用には異なった電圧のものが供給されることがあります。その際、ヒューズ値が適当か確認して下さい。

JACK

13449145	YKB21-5010	PHONES (stereo type)
13449146	YKB21-5012	OUTPUT (each)
13449420	YKB21-5029	TAPE (SAVE, LOAD, each)

SOCKET

13429168	MID13-NS	5P Triplet DIN
13429532	TDH4100-28B	28P ROM

CONNECTOR

13439333	IL-S-2P-S2T2-EF	2P	
13439330	IL-S-3P-S2T2-EF	3P	
13439331	IL-S-11P-S2T2-EF	11P	
13439343	PS-14PE-D-41T1-PN1	14P	
13439341	5277-05A	5P	Main to Power Transformer

FUSE

12559412	SD-6	200mA	100/117V prim.
12559335	T-GGS 1A	1A	100/117V F1, Main Brd
12559538	CEE-100mAT	100mA	220/240V prim.
12559546	CEE-630mAT	630mA	220/240V F1, Main Brd

CAPACITOR

13519695	DD107-959CH680J	68pF	Temperature Compensating
13639156S0		3300μF/16V	
13639194S0		1000μF/35V	
13529104	DE7150F472MAI	0.0047μF	Line Bypass

CAPACITOR ARRAY

13529127	B8ZC0111-32N	8200pF x 7	
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RESISTOR ARRAY

13919146	RKM14L503F	R-2R	Ladder Network
13919312	RMLS8-153J	15k x 10	
13919334	RMLS10-153J	15k x 8	
13919166	EXB-G810860S	VCF/VCA	

POSISTOR

15229919	ERS-A33J 561T	560 Ohm	
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POTENTIOMETER

13239118	RK16K12B010KB	10kB	slide VOLUME
13299197	EVN-D4A00B15	100kB	trimpot VCF FREQUENCY

POWER TRANSFORMER

22455467N0		100/117V
22455466D0		220/240V

AC CORD, AC CORD SET

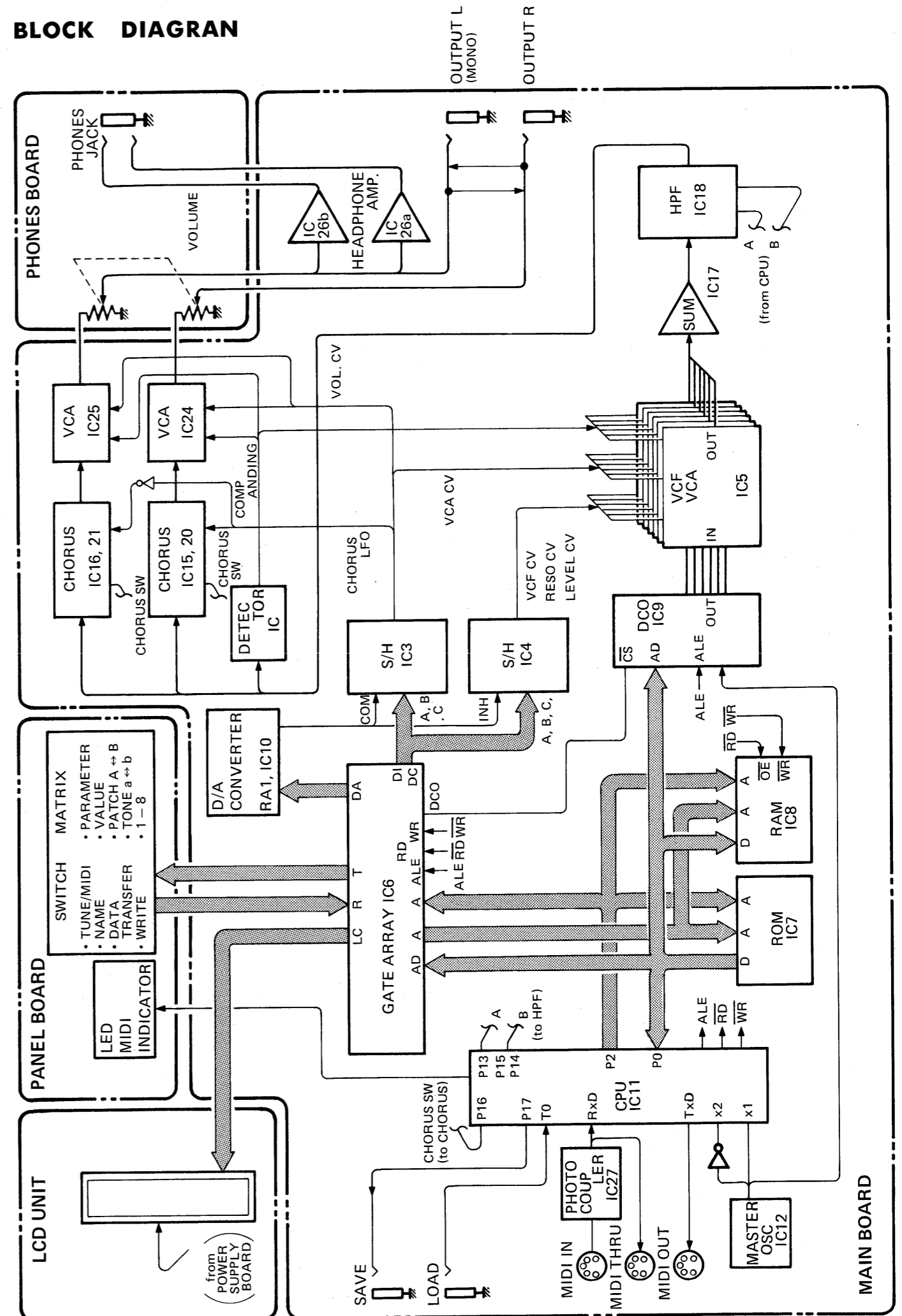
13439801W0	VFF2.5m	100V
13439812F0	UC-704-J01	117V
13439813F0	DNS EC210-J06	220V
13439846	BH-301-J01	240V England
13439814F0	SC-415-J06	240V Australian

MISCELLANEOUS

12389765	Xtal	12MHz
15029441	DM011Z-1DL3	LCD Unit
12569329	CR2032-FT6	Lithium Battery
(12569149S0)	CR2032-T12)	
12449229	FK0B-160MH15	Line Filter Coil
13529105	DSS310-55D223S	EMI Filter
2222031900	Escutcheon	Power SW
2214021900	Extension Shaft	Power SW
2215040400	Sleeve	Power SW
2235031300	Rubber Foot	
22345216	Insulating Shield	
12469137	16PC16	Heat Sink (Tr)
22465154	Heat Sink	Regulator
12169333	PS-307	LED Guide
2212356800	Rack Angle	Front Panel
12199556	MET41-0105	Snap Pin (Phone Jack)

IC		
15179253	MSM80C31F	CPU
15179823	M5L27128K-2	EP-ROM
15179334	TC5564PL-20	RAM
15229835	MB87123P-G	DCO
15229834	MB62H195PF-G-BND	Gate Array
15229826	IR3R05	VCF, VCA
15229836	NJU7302	S/H
15219150	μPD7001C	A/D Converter
15219157	M5241L	VCA
15159128T0	TC4050BP	Hex Buffer/ Converter Non-inverting
15159113H0	HD14051BP	8-channel Multiplexer/ Demultiplexer
15159114T0	TC4052BP	4-channel Multiplexer/ Demultiplexer
15159505	TC40H004P	Hex Inverter
15219213	MN3009	BBD
15169504	MN3101	BBD Driver
15189136	M5218L	Low-noise OP Amp
15189147N0	μPC4072C	BI-FET OP Amp
15159159	μPC4570HA	Low-noise OP Amp single in line
15199133	AN7815F	+ 15V Voltage Regulator
15199134	AN7915F	- 15V Voltage Regulator
15199135	LM78MR05	+ 5V Voltage Regulator and Reset
TRANSISTOR		
15129152	2SC2878A	
15129153	2SC1740	
15119134	2SA933	
15019272	2SD1406-0	
15139118B0	2SK381CP	FET
DIODE		
15019125	1SS133	
15019208	1SR35-200	100V/1A
(LED)		
15029149	GL-9PG12 green	MIDI MESSAGE
(RECTIFIER)		
15019245SN	S1VB10	100/1A
(15019243)	1B4B41)	
150129272	2B4B41	100/1A
OPTOISOLATOR		
15229706S0	PC910	
HOLDER		
22195916	Bracket	Panel
22195917		Jack, MIDI
22195918	Center Bracket	Center
22195919	Bracket	Power SW
2219076000	Frame 2p	Button
2219076100	Frame 3p	Button

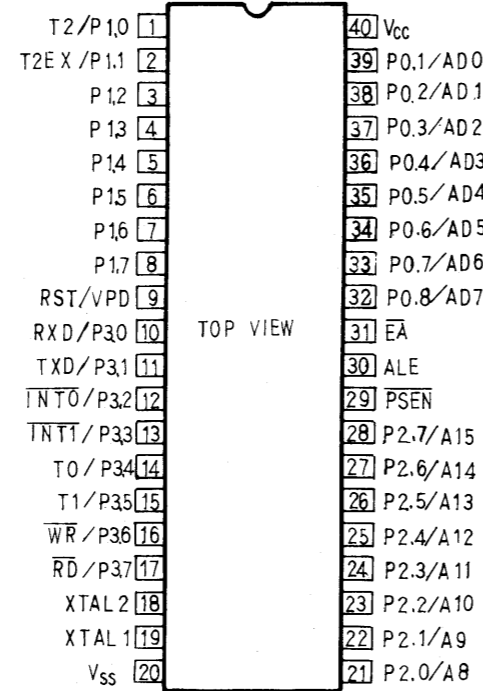
BLOCK DIAGRAM



CIRCUIT DESCRIPTION/回路解説

DESIGNATION	PIN NO.	FUNCTION	I/O		
P0 (Data Bus)	7 32	ROM RAM GATE ARRAY DCO	ROM RAM GATE ARRAY DCO		
	6 33				
	5 34				
	4 35				
	3 36				
	2 37				
	1 38				
0 39	Address	Data	I/O		
P1	7 8	SAVE (Serial Data OUTPUT for CMT)	O		
	6 7	CHORUS SW	I		
	5 6	HPF A	I		
	4 5	HPF B	I		
	3 4	MIDI INDICATOR	I		
	2 3	NC	I		
	1 2	NC	I		
	0 1	NC	I		
P2	7 28	GATE ARRAY Address	O		
	6 27				
	5 26				
	4 25				
	3 24			ROM	
	2 23			Address	RAM Address
	0 21				
P3	7 17	RD: RAM, GATE ARRAY READ PULSE	O		
	6 16	WR: RAM, GATE ARRAY WRITE PULSE	O		
	5 15	T1: NOT USED	I		
	4 14	T0: LOAD (Serial Data INPUT from CMT)	I		
	3 13	INT1: NOT USED	I		
	2 12	INT0: NOT USED	I		
	0 10	RXD: MIDI SERIAL INPUT	I		
RST	9	RESET PULSE INPUT	I		
X2	18	CLOCK INPUT	I		
X1	19				
Vss	20	GND	I		
PSEN	29	READ PULSE FOR ROM ONLY	O		
ALE	30	ADDRESS LATCH PULSE	O		
EA	31	EXT ROM MODE (LOW)	I		
Vcc	40	+5V	I		

**CPU IC11(Main Board)
MSM80C31F**



各種コントロールの読み込み

各ファンクション・コントロール (スイッチ, 外部ジャック等) は CPU11 に読み込まれます。それらは、直接読み込まれるものもあれば、ゲート・アレイ IC6 や専用デバイス (フィルター) を通して読み込まれるものもあります。

・パネルボード

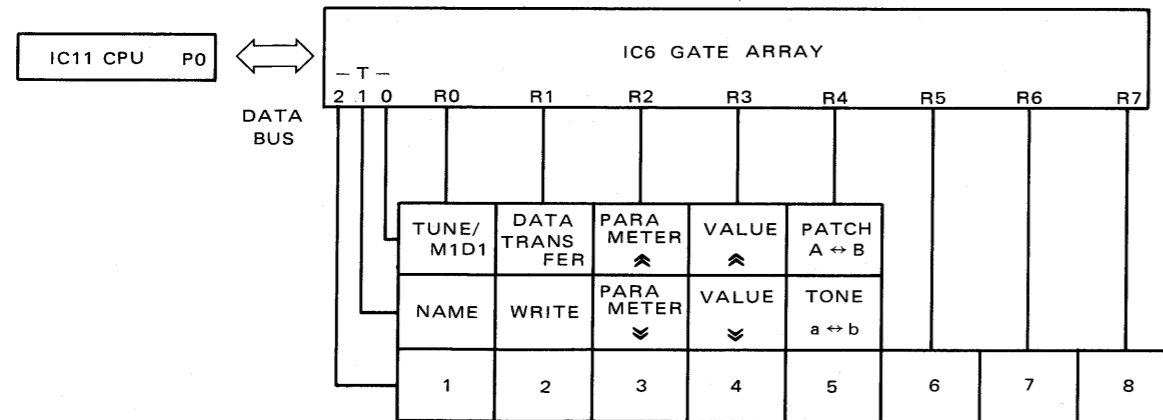
パネルボードには、合計18個のスイッチが下図のように3×8のマトリクス上に並べられていて、ゲート・アレイ IC6 に接続されています。

CONTROLS READING

Various function controls (switches, external control jacks, etc.) on the MKS-50 are read into the CPU IC11 directly or through gate array IC6 or some appropriate devices (filter). Most of them are read group by group.

・Panel Board

The 18 switches on the panel board are connected to gate array IC6 through 3 by 8 matrix.



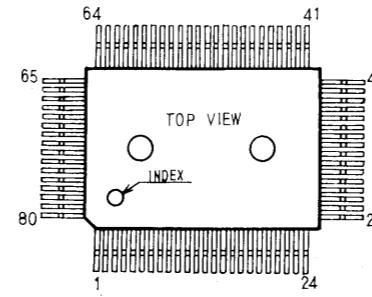
Upon receiving switch scanning address on the CPU data bus P0, IC6 places latched data on T0-T2.

The 8 rows are pulled to low one by one while the switches on the low row are read through R0-R7. IC6 sends the switch status to the CPU IC11 through P0.

CPU IC11 がデータバス P0 よりスキャン・アドレスをゲート・アレイ IC6 の AD に出力すると、ゲート・アレイ IC6 は 3 本の並びを順次ロー・レベルにしていきます。

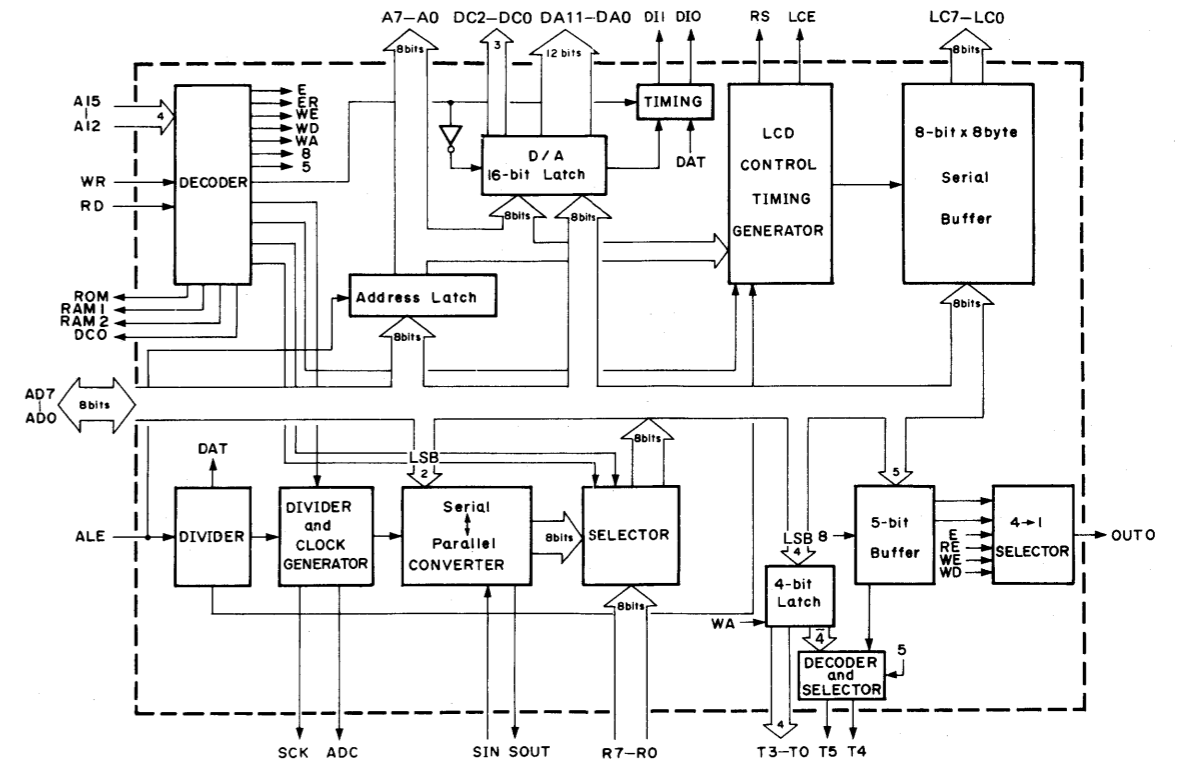
各スイッチの状態はゲート・アレイ IC6 の R0-7 より取り込まれ、データ・バスを通じて CPU11 に転送されます。

**GATE ARRAY IC6(Main Board)
MB62H195**

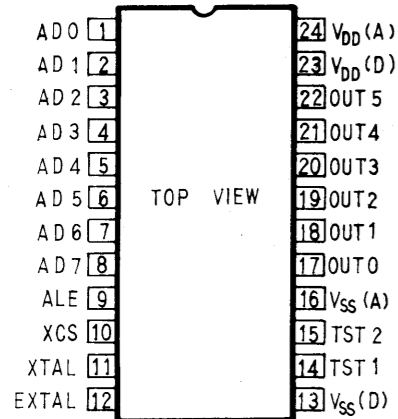


DESIGNATION	PIN NO.	FUNCTION	I/O
DA	0 8	D/A CONVERTER (12 bits)	O
	1 7		O
	2 6		O
	3 5		O
	4 4		O
	5 3		O
	6 2		O
	7 1		O
	8 80		O
	9 79		O
	10 78		O
	11 77		O
R	0 9	Switch Read	I
	1 10		I
	2 11		I
	3 13		I
	4 14		I
	5 15		I
	6 16		I
	7 17		I
T	0 18	Switch Scan	O
	1 19		O
	2 20		O
	3 21		O
	4 22		O
5 24	O		

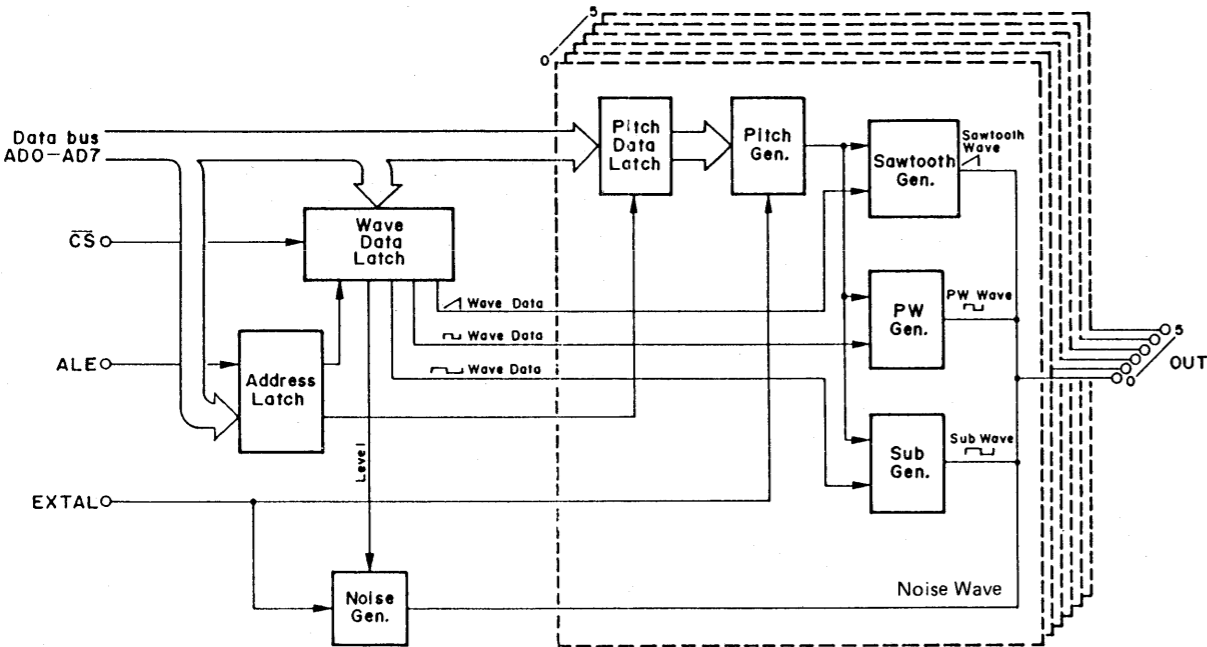
DESIGNATION	PIN NO.	FUNCTION	I/O	
AD	0 41	Data Bus	I/O	
	1 40		I/O	
	2 39		I/O	
	3 38		I/O	
	4 37		I/O	
	5 36		I/O	
	6 35		I/O	
7 34	I/O			
A	0 42	ROM and RAM Address (lower 8 bits)	O	
	1 43		O	
	2 44		O	
	3 45		O	
	4 46		O	
	5 47		O	
	6 48		O	
	7 49		O	
LC	12 28	Address (for chip select)	I	
	13 29		I	
	14 30		I	
	15 31		I	
	0 68		LCD Data	O
	1 69			O
2 70	O			
3 71	O			
4 72	O			
5 74	O			
DC	0 65	S/H Channel Select	O	
	1 64		O	
	2 62		O	
DI	0 61	IC18 Inhibit pulse	O	
	1 60		O	
SOUT	59	NC	O	
SCK	58	NC	O	
SIN	57	+5V	O	
ADC	56	NC	O	
LCE	67	LCD Write Pulse	O	
RS	66	LCD Resistor Select L: Instruction H: Data	O	
ROM	50	NC	O	
ALE	32	ALE Pulse	I	
RD	27	Read Pulse	I	
WR	26	Write Pulse	I	
RAM 2	53	NC	O	
LED	25	NC	O	
DCO	54	DCO Chip Select	O	
RAM 1	51	NC	O	
OUT0	55	NC	O	
NC	23	NC	-	
NC	63	NC	-	
VDD	33	+5V	I	
VDD	73	+5V	I	
VSS	12	GND	I	
VSS	52	GND	I	



DCO IC9(Main Board)
MB87123



DESIGNATION	PIN NO.	FUNCTION	I/O		
AD	0	1	DCO DATA INPUT (8 bits)	I	
	1	2			
	2	3			
	3	4			
	4	5			
	5	6			
	6	7			
	7	8			
OUT	0	17	Ach	WAVE OUTPUT	O
	1	18	Bch		
	2	19	Cch		
	3	20	Dch		
	4	21	Ech		
	5	22	Fch		
ALE	9	ADDRESS LATCH PULSE INPUT	I		
CS	10	CHIP SELECT INPUT	I		
EXTAL	11	MASTER CLOCK INPUT	I		
XTAL	12	NC	O		
TST 1	14	GND	I		
TST 2	15				
VS	13	Digital GND	I		
VS	16	Analog GND	I		
VD	23	Analog +5V	I		
VD	24	Digital +5V	I		

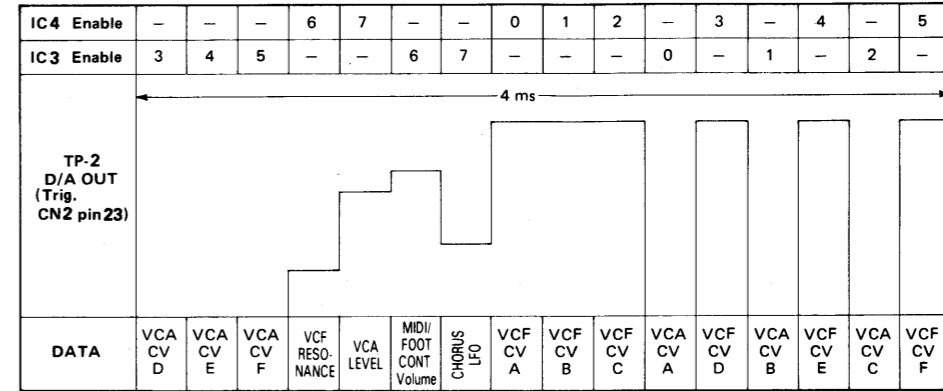


DMUX AND S/H

Data for controlling VCF, VCA and subsequent stages are fed from DAC RA1 and IC10 to IC3 and IC4 in multiplexed analog form as shown below. IC3 and IC4 demultiplex the data and sample each of the signals into the correct destination. Note that IC4 7302 has hold capacitors built internally.

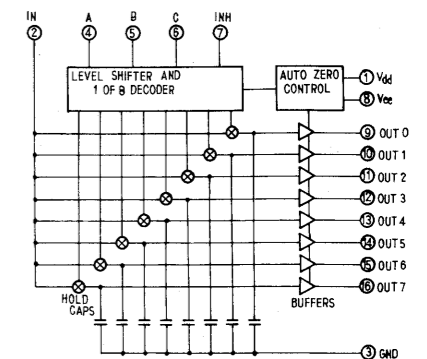
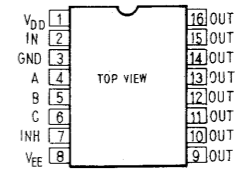
デマルチプレクサー サンプル・アンド・ホールド

VCF,VCA等を制御するデータは、DAC RA1,IC10から出力され、IC3,IC4に入ります。この間のデータは右図のように時分割多重のアナログ・データです。IC3,IC4は、このデータを振り分けて次のデータが入ってくるまでホールドします。
注) IC4 7302は内部にホールド・コンデンサとバッファを持っています。



A	B	C	IC4 OUT	IC3 OUT
0	0	0	0 VCF A CV	0 VCA A CV
0	0	1	1 VCF B CV	1 VCA B CV
0	1	0	2 VCF C CV	2 VCA C CV
0	1	1	3 VCF D CV	3 VCA D CV
1	0	0	4 VCF E CV	4 VCA E CV
1	0	1	5 VCF F CV	5 VCA F CV
1	1	0	6 RESONANCE CV	6 VOLUME CV
1	1	1	7 VCA LEVEL CV	7 CHORUS RATE CV

7302

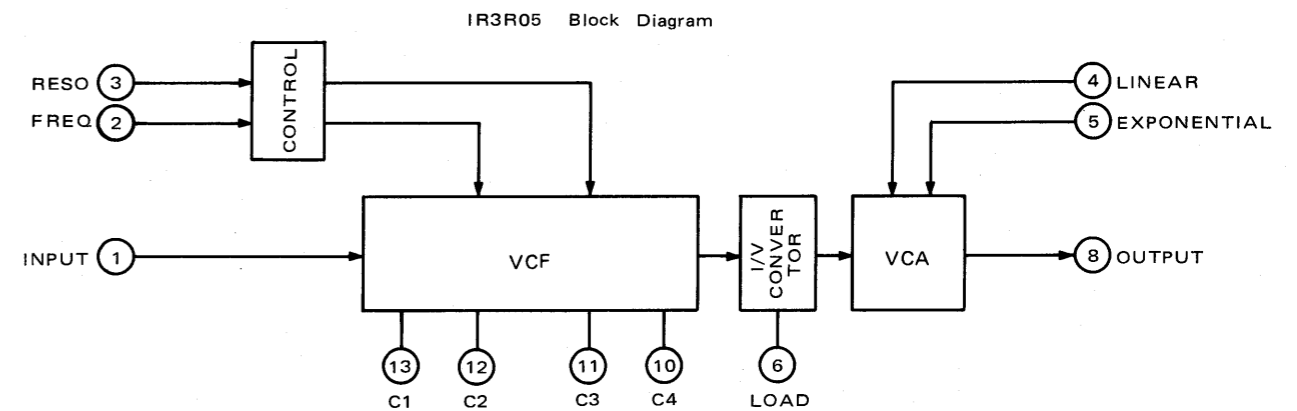


VCF, VCA

IC5 IR3R05 consists of VCF and VCA. The VCF has two 2-pole LPFs (-12dB/oct) in series to have a total -24dB/oct capability. The VCA has two control inputs, LINEAR and EXPONENTIAL. Applied to EXPONENTIAL is a CV for compression to provide companding function in combination with expanding being performed at IC24 in CHORUS stage.

VCF, VCA

IC5 IR3R05はワンチップのVCF/VCAです。VCFはステートバリエブルな2ポールLPF 2段構成で、4ポール-24dB/oct(-12dB/oct×2)の特性を持っています。VCAのLINEAR入力にはVCA CVが、EXPONENTIAL入力にはVCA LEVEL CLとCOMPRESSIONが加えられます。VCAはCHORUS回路のIC24でのExpandingとの組合せでCompanding回路を形成します。



ADJUSTMENT AND CHECKING

The test routine should be preceded by DC voltage confirmation.

1. POWER SUPPLIES

NOTE:

Paragraphs 1 and 2 correlate: some steps may have to be repeated after corrective procedure is taken at another step.

1A. Battery

Test points: IC8 (RAM) pin 24 (Vdd), pin 12 (GND)
With power off measure the voltage across the test points. It should be within 2.800 to 3.500V.

1B. DC Supplies

Test points: Main Board DC rails +5V, +15V, -15V.
Turn the power on. (See NOTE for LCD reading.)
The voltages should be as follows:
+5V +5.0 ± 0.2V
+15V +15.0 ± 0.5V
-15V -15.0 ± 0.5V

NOTE:

The display will show an error message "CHECK BATTERY!!!" if the unit has problems around RAM IC8: Memory destroyed. . . . RAM defective or erased due to poor backup battery.
RAM Initialization. . . . Not attempted or failed (See RAM INITIALIZATION)

2. RAM AND LCD

2A. RAM, IC8

No fear of memory erasure or overwrite in this step.

2-1. With power OFF. Press and hold PATCH A-B and DATA TRANSFER and switch the power ON.
The LCD will read either:
"RAM CHECK OK!!"
"RAM wr/rd ERR!!"

2B. LCD

2-2. Press PATCH A-B. All LCD segments and the back-light LED will be lit.
2-3. Press PATCH A-B. All LCD segments will go off while the LED will remain lit.
2-4. Repetition of PATCH A-B should alternately turn on and off the LCD.

RAM INITIALIZATION

CAUTION:

User program will be erased. Should be performed only when in the following cases.
RAM, IC8 replaced
Backup battery replaced
RAM contents erased
MIDI mode to be changed (POLY or MONO)

During initialization the following data are transferred from ROM IC7 to RAM IC8.

- TUNE/MIDI function
- 16 chord memories
- 64 tones for the a group
- 128 patches for A/B groups

In addition, TONE-names in A group are copied to the A group PATCH NAMES.

The initialization also sets the MIDI receiving mode. So there are two ways through which the MKS-50 enters initialization.

INITIALIZATION WITH POLY MODE

Press and hold NUMBER Buttons 4 and 8, and switch the power on. The display will transiently show "FACTORY PRESET".

INITIALIZATION WITH MONO MODE

Press and hold NUMBER buttons 3 and 7, and switch the power on. The display will transiently show "FACTORY PRESET".

3. TEST MODE

3A. Entering Test Mode

Press and hold TUNE/MIDI and PATCH A-B, and turn the power on. The display will read "\$ADJ/INS MODE!!!", prompting a command input. In the test mode, some switches and functions change their effects.

3B. Key Assignment

Rotary mode. One module is assigned to a key. Assignment is cyclic in the order from A to F.

Tone parameter. Two test tone parameters are available. Only one set can be selected at a time, using one of the buttons shown in the table below.

SWITCH	LCD DISPLAY/FUNCTION
NAME	"\$adj VCF sine" Sets VCF cutoff adj parameter values
WRITE	"&adj BASIC wave" Sets basic tone parameter values

NOTE:

Default setting is NAME on, while LCD reading remains "\$ADJ/INS MODE!!!".
Pressing WRITE, TONE a-b (display shows T-all BASIC wave) and PARAMETER allows to glance over the basic parameter values one by one at a time.
The parameters not listed in the table below have values 00.

調整・検査仕様

電気的な検査、点検や調整を行なう前には、まず電源関係を点検・確認する。項目の1と2は相互に関連があるので、順序通りに実行できるとは限らない。エラー表示が出た場合、適切な処置を行った後に再チェックする必要がある。

1. 電源チェック

〔バッテリー〕

電源をOFFにし、RAM(IC8:5564)のVDD(PIN No.24)と、GND端子(PIN No.12)間の電圧が+2.800~3.500Vの範囲に入っていることを確認する。

〔DC電圧〕

電源スイッチをONにする。
メイン・ボード上において、
+5V +5.0 ± 0.2V
+15V +15.0 ± 0.5V
-15V -15.0 ± 0.5V
の範囲に入っていることを確認する。

★注★ 「CHECK BATTERY!!!」とLCDに表示された場合

- ① RAMの内容が、RAM自体の不良や電池ぎれ等のため壊れてしまっている。
- ② RAMが一度もインシャライズされていないか、インシャライズができない。
- ②の場合〔インシャライズ〕の項を実施した後、再点検する。

2. LCD, RAM チェック

〔LCD/RAM(IC8)チェック〕

1. 電源を一旦OFFにし、(PATCH A-B)と(DATA TRANSFER)を押しながら電源をONにする。
この時LCDの表示が
「RAM CHECK OK!!」ならば正常。
「RAM wr/rd ERR!!」ならば異常。

この項の表示は、RAM(IC8:5564)の書き込み/読み出し検査の結果である。この検査の実行でRAM内のデータが消されたり、書き換えられることはない。異常の場合は、RAMとその周辺を調べる。

2. ① (PATCH A-B)を押す。
LCDの全セグメントが点灯することを確認する。
- ② もう一度押す。
全セグメントが消灯することを確認する。
以後、(PATCH A-B)を押すごとに点灯、消灯を繰り返す。同時にLED(バック照明)が常時点灯していることを確認する。

〔インシャライズ〕

インシャライズは、RAM(IC8:5564)を交換したりRAMの内容が破壊されたとき(バッテリーを交換した場合など)以外には必要ない。

インシャライズを行なうと、ROM(IC7:27128)からRAMに下記のデータが転送される。

- チューン/MIDIファンクション
- コード・メモリー 16種類
- トーンのアグループ 64種類
- パッチのA/Bグループ 128種類
- トーン・ネーム (aグループ)をパッチ・ネーム (Aグループ)にコピー

また、インシャライズによってMKS-50の受信モードが決定します。接続されるMIDI機器に応じて次のいずれかの方法で行ってください。

- ポリ・モードで設定する場合
 - ①電源スイッチをOFFにする。
 - ②ナンバー・ボタンの4と8を押しながら電源をONにする。
「FACTORY PRESET」が一瞬表示される。
- モノ・モードで設定する場合
 - ①電源スイッチをOFFにする。
 - ②ナンバー・ボタンの3と7を押しながら電源をONにする。
「FACTORY PRESET」が一瞬表示される。

3. テストモード

テストモードとは、調整・検査及びサービス用に設けられたモードです。

〔テストモードの設定の仕方〕

1. 電源スイッチをOFFにする。
2. (TUNE/MIDI)と(PATCH A-B)を押しながら電源を入れる。
「\$ADJ/INS MODE!!!」と表示されテスト・モードに入る。

〔テストモードの機能〕

テスト・モードの状態では、キーアサインがロータリー・モードとなる。また、(NAME)か(WRITE)を押すと以下の設定を呼び出す機能になる。
①と②を同時にONにはできない(後に押したほうがONとなる。)
なおテスト・モードにはいった直後は、(NAME)を押した時の状態、すなわちVCFカットオフ・フリケンシー調整用音色にセットされる。

スイッチ名	〔LCDの表示〕機能の内容
① (NAME)	〔\$adj VCF sine〕 VCF調整用音色データセット
② (WRITE)	〔&adj BASIC wave〕 基本セッティングに入る。

基本セッティングの状態では、(TONE a-b)を一度押してから(PARAMETER)を押すと、基本セッティングの音色パラメーターの設定が順次表示されます。(右表参照)
なお、表に示されていないパラメーターのバリューは00です。

PARAMETER	VALUE	PARAMETER	VALUE
DCO RNG	8'	DCO ENV	ノ
DCO BEND	12	PULSE	01
PW/PWM	80	PWM RATE	80
HPF FREQ	01	VCF FREQ	127
VCF ENV	ノ	VCF KYBD	14
VCA LEVEL	127	VCA ENV	ノ
CHORUS	OFF	CRS RATE	64
LFO RATE	80	ENV L1	127
ENV L2	127	ENV L3	127
ENV T4	10		

— Test Keyboard —

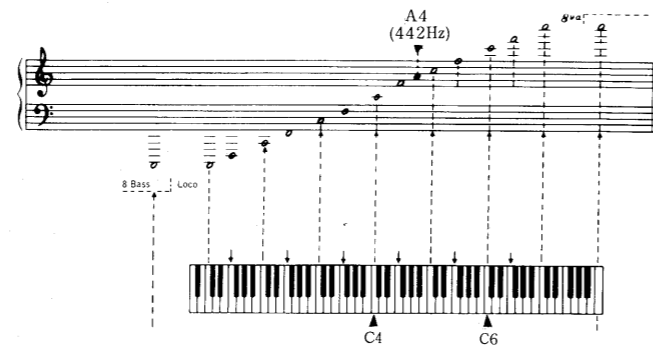
For the following tests, use of an external MIDI keyboard is recommended for simpler key operation, although VALUE button can be used to duplicate a one octave keyboard.

Assigned module number will appear at the right end of the LCD.

— VALUE Button as a Keyboard —

When the LCD is showing other than parameter, press the upper portion of the button, which will sound A4 (A above middle C).

When a parameter is shown, press TONE a-b (display will show T-all BASIC wave, but have no effects on key function) and then press upper portion of VALUE. To select the next parameter press PARAMETER.



4. VCF CUTOFF FREQUENCY

NOTE:

Start after 10-minute warmup period has passed.

4A. Test instrument . . . scope (0.5V/DIV, 1ms/DIV) sound monitor system

PARAMETER	VALUE	PARAMETER	VALUE
DCO RNG	8'	DCO ENV	ノ
DCO BEND	12	PULSE	01
PW/PWM	80	PWM RATE	80
HPF FREQ	01	VCF FREQ	127
VCF ENV	ノ	VCF KYBD	14
VCA LEVEL	127	VCA ENV	ノ
CHORUS	OFF	CRS RATE	64
LFO RATE	80	ENV L1	127
ENV L2	127	ENV L3	127
ENV T4	10		

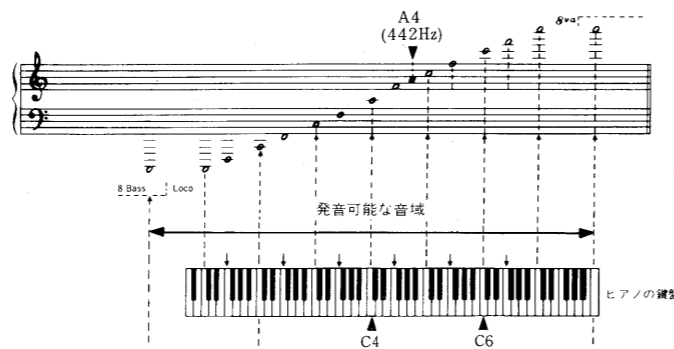
音を出すには外部に MIDI キーボードを接続して行なう方法と、本体で行なう方法とがありますが、外部キーボードを使用した方が便利です。

本体で行なう場合、テスト・モード表示の時とパラメーター表示の時とは操作が異なります。

・テスト・モード表示の時は (VALUE) の上側を押すと A4 が発音します。

・パラメーター表示の時は、一度 (TONE a-b) を押してから (VALUE) の上側を押すと A4 が発音します。表示は変わりますが問題ありません。次にパラメーターを選択する場合は (PARAMETER) を押して下さい。

テスト・モードの場合、音を出すとディスプレイの右端にアサインされたモジュール・ナンバーを表示します。



4. VCF カットオフ・フリケンシー調整

★注★ この調整は、通電後最低10分間たってから行なうこと。

〔使用機器〕

オシロスコープ (0.5V/DIV, 1ms/DIV)

4B. Test points. TP-3 (SUM OUT), TP-2 (GND)

4-1. Press NAME. The display will show "\$adj VCF sine".
4-2. Press A4 key (Module No. 1 should be assigned to the key). Adjust VR1A for a maximum amplitude. (typ. 0.8-1.5Vp-p.)

4-3. Press A4 key (module No. 2). Adjust VR1B.

4-4. Repeat for the remainder.
If C6 key is available, check for no level reduction on this key at all modules.

5. DCO

5A. Test instrument . . . scope (0.5V/DIV, 1ms/DIV)

LCD reading	Press SW	Check for
DCO RNG = 8' → 8' PULSE = 01 PULSE = 01 → 00 SAWTOOTH = 00	PARAMETER VALUE PARAMETER VALUE	Become inaudible No sound heard
SAWTOOTH = 00 → 01 SAWTOOTH = 00 → 02 SAWTOOTH = 00 → 03 SAWTOOTH = 00 → 04 SAWTOOTH = 00 → 05	A4 6 times A4 6 times A4 6 times A4 6 times A4 6 times	Waveform and its level remain unchanged
SAWTOOTH = 00 → 00	PARAMETER SELECT	No sounds

5B. Test point one of OUTPUT jacks (no connection for the other)

5-1. Press WRITE.

5-2. Press TONE a-b. The display will show T-all BASIC wave.

5-3. While watching the scope, generate A4 6 times; verify similarity of output from 6 modules in level and waveshape.

5-4. Press PARAMETER: the display will change reading to DCO RNG = 8'.

5-5. Press VALUE and the display changes 8' to 32' followed by pitch change in sound. Press VALUE for 16', 8' and 4'.

5-6. In a similar way perform PULSE and the subsequent items to the list in the table below.

〔テスト・ポイント〕

メインボード TP3(SUM OUT), TP-2(GND)

〔調整方法〕

1. テストモードに設定し、(NAME) を押し VCF カットオフ・フリケンシー調整用音色データにセットをする。以後モニタースピーカーも接続して、音を聞きながら調整する。

2. A4 を発音するごとにモジュールが 1 ~ 6 に変わるので、各モジュールごとにサイン波が最大になるように VR1 (A ~ F) で調整する。

0.8 ~ 1.5Vp-p の範囲に入っていれば良い。できれば C6 を 6 回発音して、全てのモジュールの電圧が下がっていないことを確認する。

5. DCO チェック

〔使用機器〕

オシロスコープ (0.5V/DIV, 1ms/DIV)

〔テスト・ポイント〕

OUTPUT ジャック

〔検査方法〕

1. (WRITE) を押し、基本セッティングにする。

2. (TONE a-b) を一度押し、「T-all BASIC wave」にする。

3. A4 を 6 回発音して全てのモジュールの出力波形、レベルが同じであること。

4. (PARAMETER) を押しと「DCO RNG = 8'」と表示される。(VALUE) を押しごとに DCO RNG が 32' / 16' / 8' / 4' と変化する。同時に音程も変化するを確認する。

5. 以下同様にして確認する。

LCD 表示	押さえる SW	確認事項
DCO RNG = 8' → 8' PULSE = 01 PULSE = 01 → 00 SAWTOOTH = 00	PARAMETER VALUE PARAMETER VALUE	音は出なくなる。 音は出ない。
SAWTOOTH = 00 → 01 SAWTOOTH = 00 → 02 SAWTOOTH = 00 → 03 SAWTOOTH = 00 → 04 SAWTOOTH = 00 → 04	A4 6回 A4 6回 A4 6回 A4 6回 A4 6回	全てのモジュールの波形とレベルが同じであること。
SAWTOOTH = 00 → 00	PARAMETER	音は出ない。
オシロスコープのセッティングを 0.5V/DIV, 2m/DIV にする。		
SUB LEVL = 00	VALUE	音は出ない。
SUB LEVL = 00 → 01 SUB LEVL = 00 → 02 SUB LEVL = 00 → 03	A4 6回 A4 6回 A4 6回 PARAMETER	全てのモジュールの波形とレベルが同じであること。 表示されたレベルと共に、レベルが変わる。
SUB = 00 SUB = 00 → 01 SUB = 00 → 02 SUB = 00 → 03 SUB = 00 → 04 SUB = 00 → 05	VALUE A4 6回 A4 6回 A4 6回 A4 6回 A4 6回 PARAMETER	全てのモジュールの波形とレベルが同じであること。 表示された波形と共に波形が変わる。

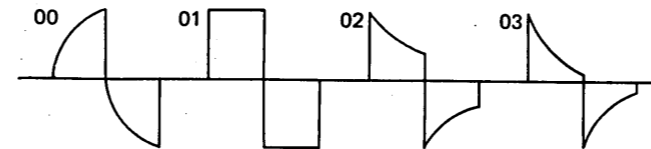
Reset scope inputs to 0.5V/DIV, 2ms/DIV		
SUB LEVEL = 00	VALUE	No sounds
SUB LEVEL = 00 → 01 SUB LEVEL = 00 → 02 SUB LEVEL = 00 → 03	A4 6 times A4 6 times A4 6 times PARAMETER SELECT	Waveform and its level unchanged Sound level keeps with value display
SUB = 00 SUB = 00 → 01 SUB = 00 → 02 SUB = 00 → 03 SUB = 00 → 04 SUB = 00 → 05	VALUE A4 6 times A4 6 times A4 6 times A4 6 times A4 6 times PARAMETER	Waveform and level will not change Waveform changes as value changes
Reset scope to 0.5V/DIV, 1ms/DIV		
SUB LEVEL = 03 SUB LEVEL = 03 → 00	VALUE PARAMETER	No sounds
NOIS LVL = 00 → 03	A4 6 times VALUE	All modules have the same noise level
NOIS LVL = 03 → 00 PULSE = 00	PARAMETER VALUE	No sounds heard
PULSE = 00 → 03	A4 6 times	PWM effect on all modules

6. HPF

6A. Test instrumentscope (0.5V/DIV, 1ms/DIV)

6B. Test pointone of OUTPUT jacks
(no connection for the other)

- 6-1. Press WRITE.
- 6-2. Press TONE a-b: The display will show T-all BASIC wave.
- 6-3. Press PARAMETER to call HPF FREQ parameter.
- 6-4. While watching the scope screen, press VALUE repeatedly to change the values from 00 to 01, 02 and 03. The waveform should change just as like below.



7. OUTPUT LEVEL

7A. Test instrumentscope (0.5V/DIV, 1ms/DIV)

7B. Test points.OUTPUT jacks

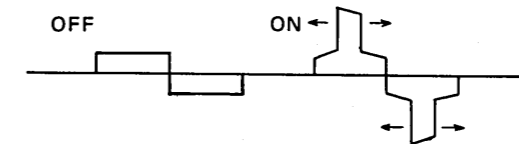
- 7-1. Press WRITE.
- 7-2. Turn up VOLUME to maximum.
- 7-3. Generate A4 sound. Read OUTPUTs. The levels should be 0.8-1.5Vp-p.
The difference between two readings must be less than 0.1Vp-p.

8. CHORUS

8A. Test instrumentscope (0.5V/DIV, 1ms/DIV)

8B. Test pointone OUTPUT jack with the other plugged with an open-circuit plug

- 8-1. Press WRITE.
- 8-2. Press TONE a-b.
- 8-3. Press PARAMETER to call CHORUS parameter.
- 8-4. Press VALUE and verify waveshape changes.



オシロスコープのセッティングを 0.5V/DIV, 1m/DIV にする。		
SUB LEVEL = 03 SUB LEVEL = 03 → 00	VALUE PARAMETER	音は出ない。
NOIS LVL = 00 → 03	A4 6回 VALUE	全てのモジュールのレベルが同じであること
NOIS LVL = 03 → 00 PULSE = 00	PARAMETER VALUE	音は出ない。
PULSE = 00 → 03	A4 6回	全モジュールに PWM がかかっている。

6. HPF チェック

〔使用機器〕

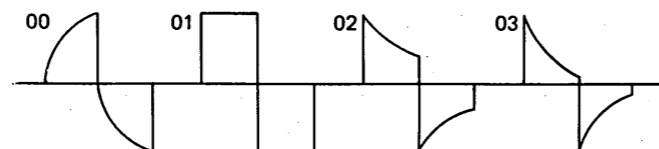
オシロスコープ (0.5V/DIV, 1ms/DIV)

〔テスト・ポイント〕

OUTPUT ジャック

〔検査方法〕

- 1. (WRITE) を押し、基本セッティングにする。
- 2. (TONE a-b) を一度押し、「T-all BASIC wave」にする。
- 3. (PARAMETER) を押し、「HPF FREQ」のパラメーターを選択する。
- 4. (VALUE) で「00→01→02→03」と変えて波形が変わること。



7. OUTPUT レベルチェック

〔使用機器〕

オシロスコープ (0.5V/DIV, 1ms/DIV)

〔テスト・ポイント〕

左右両方の OUTPUT ジャック

〔検査方法〕

- 1. (WRITE) を押し、基本セッティングにする。
- 2. 本体の VOLUME を最大にして、A4 を発音させたとき左右両方のレベルが 0.8~1.5V の範囲内であり、かつ左右のレベル差が 0.1V 以内であること。

8. CHORUS チェック

〔使用機器〕

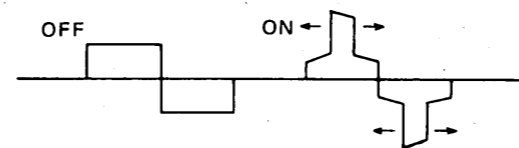
オシロスコープ (0.5V/DIV, 1ms/DIV)

〔テスト・ポイント〕

OUTPUT ジャック (片方の OUTPUT ジャックに空プラグを差す。)

〔検査方法〕

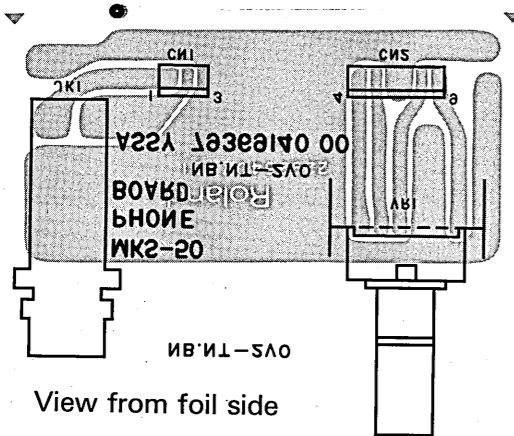
- 1. (WRITE) を押し、基本セッティングにする。
- 2. (TONE a-b) を一度押し、「T-all BASIC wave」にする。
- 3. (PARAMETER) を押し、「CHORUS」のパラメーターを選択する。
- 4. (VALUE) で ON にすると波形の山が動くことを確認する。



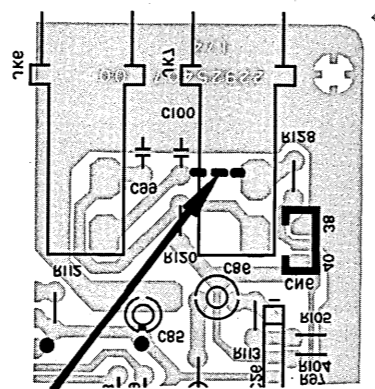
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37

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

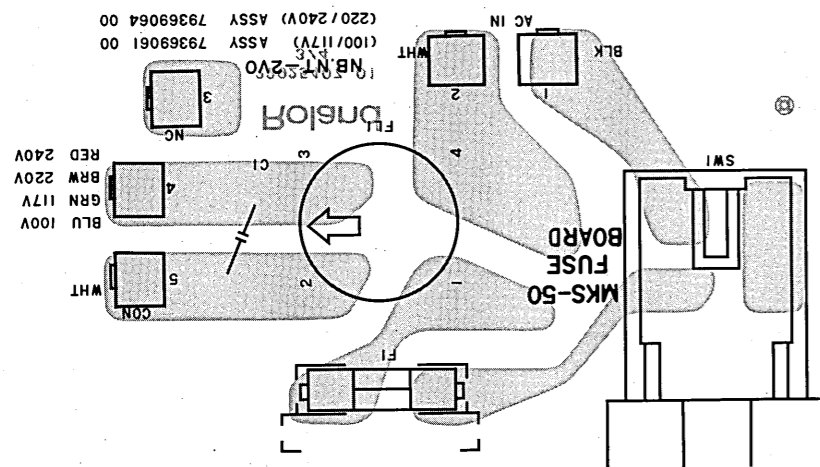
Phone Board
7936914000
(pcb 2292540701 4/4)



Main Board
7936910101 100/117V
7936910401 220/240V
(pcb 2292540701 1/4)



Fuse Board
7936906100 100/117V
7936906400 220/240V
(pcb 2292540701 3/4)



F1			
12559412	SD6	200mA	100/117V
12559538	CEE-100mA	T	220/240V

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 servicemanual.

Lithium batteri må kun udskiftes med samme type
og fabrikat.

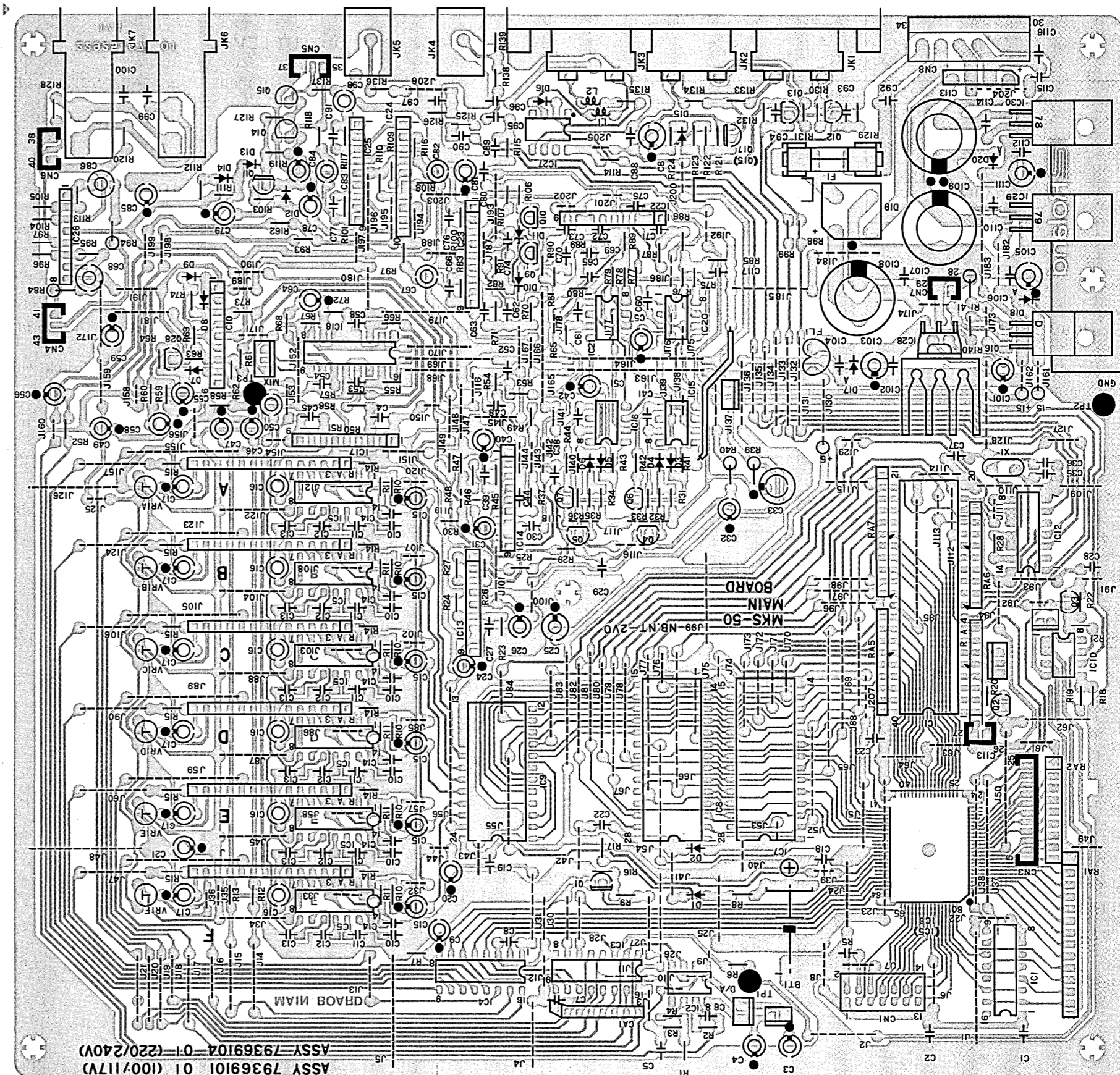
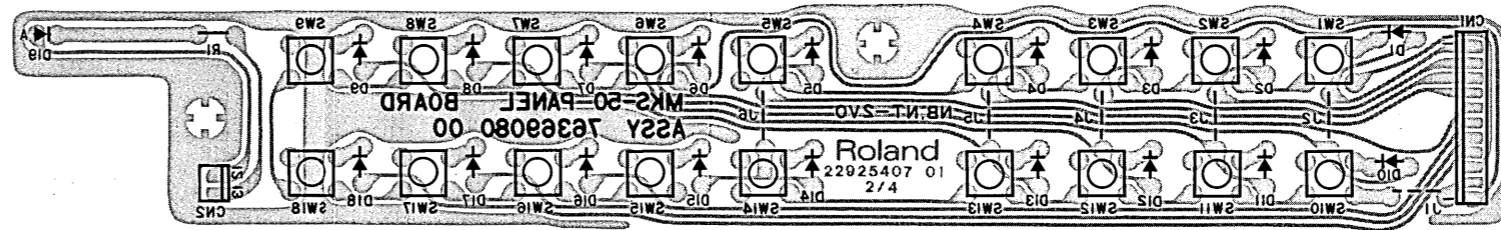
VARNING!
Lithiumbatteri. Explosionsrisk.
Får endast bytas av behörig servicetekniker.
Se instruktioner i servicemanualen.

Lithium batteri för endast ersättes med samma typ
och fabrikat.

VAROITUS!
Lithiumparisto. Rajahdysvaara.
Pariston saa vaihtaa ainoastaan
alan ammottimies.

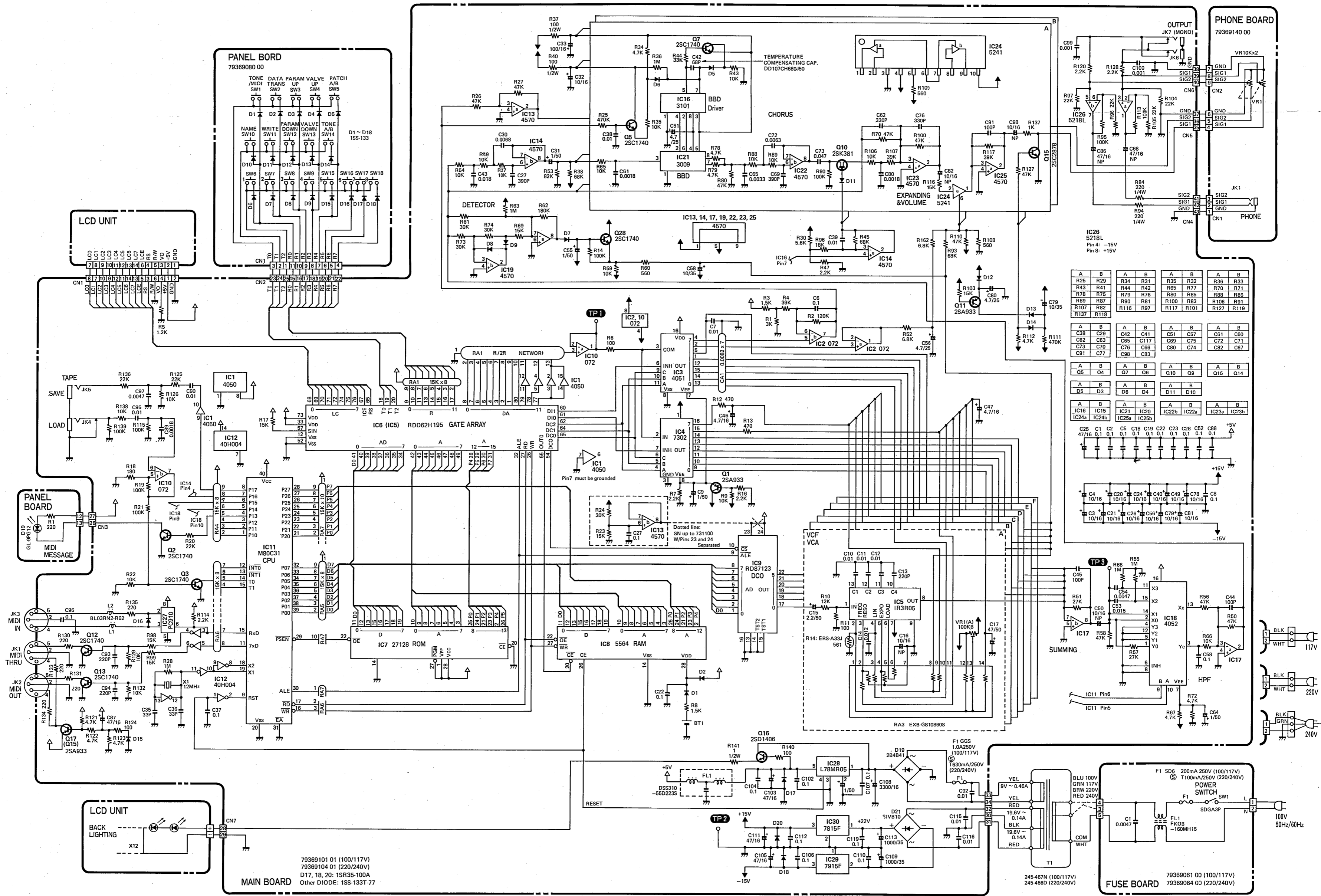
Kun vaihat lithium pariston KÄYTÄ saman valmistaja
samaan tyyppiä.

Panel Board
7636908000
(pcb 2292540701 2/4)



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

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



79369101 01 (100/117V)
 79369104 01 (220/240V)
 D17, 18, 20: 1SR35-100A
 Other DIODE: 1SS-133T-77

79369061 00 (100/117V)
 79369064 00 (220/240V)

MODEL MKS-50 MIDI Implementation Chart

Date: Sep, 05 1986
Version: 1.0

Function	Transmitted	Recognized	Remarks	
Basic Channel	Default Changed	1-16 1-16	1-16 1-16	memorized
Mode	Default Messages Altered	Mode 3 POLY, OMNI OFF *****	Mode 1, 2, 3, 4 MONO, POLY, OMNI, ON/OFF	
Note Number	True voice	X *****	0-127 12-108	
Velocity	Note ON Note OFF	X X	○ v=1-127 X	
After Touch	Key's Ch's	X X	X *	
Pitch Bender		X	* 0-24 semi-tone	9 bit resolution
Control Change	1 5 6 7 64 65 100 101	X X X X X X X X	* Mod. depth * ○ ** Volume * Hold * ○ ○	Modulation Portamento Time Data Entry(MSB) Hold-1 Portamento Switch RPC (LSB) RPC (MSB)
Prog Change	True #	X *****	* 0-127 0-127	
System Exclusive		*	*	
System Common	Song Pos Song Sel Tune	X X X	X X X	
System Real Time	Clock Commands	X X	X X	
Aux Messages	Local ON/OFF All Notes OFF Active Sense Reset	X X X X	X ○ (123-127) ○ X	
Notes			* Can be set to ○ or X and memorized. ** Can adjust the volume of the sound within the level set with the panel volume knob. RPC-PITCH BEND SENSITIVITY only	

Mode 1 : OMNI ON POLY Mode 2 : OMNI ON MONO
Mode 3 : OMNI OFF POLY Mode 4 : OMNI OFF MONO

○ : Yes
X : No

MODEL MKS-50 MIDI Implementation

Date: Sep, 05 1986
Version: 1.0

1. TRANSMITTED DATA	2. RECOGNIZED RECEIVE DATA	3. TRANSMITTED EXCLUSIVE MESSAGES																																																																																	
<p>Status Second Third Description</p> <p>1111 0000 1111 0111 SYSTEM EXCLUSIVE</p> <p>Note : See Section 3. TRANSMITTED EXCLUSIVE MESSAGES.</p>	<p>Status Second Third Description</p> <p>1000 nnnn Okkk kkkk 0vzv vvzv Note OFF, velocity ignored</p> <p>1001 nnnn Okkk kkkk 0000 0000 Note OFF</p> <p>1001 nnnn Okkk kkkk 0vzv vvzv Note ON</p> <p>1011 nnnn 0000 0001 0vzv vvzv Modulation</p> <p>1011 nnnn 0000 0101 0vzv vvzv Portamento Time</p> <p>1011 nnnn 0000 0110 0vzv vvzv Portamento Time</p> <p>1011 nnnn 0000 0111 0vzv vvzv Data Entry (MSB)</p> <p>1011 nnnn 0000 0111 0vzv vvzv Main volume</p> <p>1011 nnnn 0100 0000 01xx xxxx Hold1 ON</p> <p>1011 nnnn 0100 0000 00xx xxxx Hold1 OFF</p> <p>1011 nnnn 0100 0001 01xx xxxx Portamento ON</p> <p>1011 nnnn 0100 0001 00xx xxxx Portamento OFF</p> <p>1011 nnnn 0110 0100 0000 0000 RPC (LSB)</p> <p>1011 nnnn 0110 0101 0000 0000 RPC (MSB)</p> <p>1100 nnnn 0ppp pppp Program Change</p> <p>1101 nnnn 0vzv vvzv Channel After Touch</p> <p>1110 nnnn 0bbx xxxx 0bbb bbbb Pitch Bend Change</p> <p>1011 nnnn 0111 1011 0000 0000 ALL NOTES OFF</p> <p>1011 nnnn 0111 1100 0000 0000 OMNI OFF</p> <p>1011 nnnn 0111 1101 0000 0000 OMNI ON</p> <p>1011 nnnn 0111 1110 0000 0000 MONO ON</p> <p>1011 nnnn 0111 1111 0000 0000 POLY ON</p> <p>1111 0000 1111 0111 SYSTEM EXCLUSIVE</p> <p>1111 1110 Active Sensing</p> <p>Notes : #1 Note numbers outside the range 12 - 108 are transposed to the nearest octave inside this range. While key assign mode is 'CHORD MEMORY', modified notes with CHORD MEMORY are sounded. #2 Recognized if the corresponding PATCH MIDI function switch is ON. #3 RPC and value (Data Entry) are recognized as follows.</p> <p>RPC # value MSB value LSB Description</p> <p>0 0vzv vvzv 0xxx xxxx BEND RANGE (0-24 semitone, 1 semitone step) xxxxxxxx is ignored.</p> <p>#4 The volume of the sound can be controlled by main volume message within level which adjusted by the panel volume knob. #5 Recognized if MIDI PROG.CG in the TUNE/MIDI function is on. 0 - 63 : PATCH-A GROUP 64 - 127 : PATCH-B GROUP #6 Mode Messages (123 - 127) are also recognized as ALL NOTES OFF. Mode Messages are recognized as follows:</p> <p>POLY ON (127) : MONO ON (126) : MONO ON (126) mmmm = 1 mmmm <> 1</p> <p>OMNI OFF (124) : OMNI = OFF : OMNI = OFF : OMNI = OFF POLY MONO ** MONO ***</p> <p>OMNI ON (125) : OMNI = ON : OMNI = ON : OMNI = ON POLY MONO ** MONO ***</p> <p>** set 'CHORD MEMORY' key assign *** mmmm : MONO CHANNEL RANGE</p> <p>0 : 1 - 6 : 1 - 6 7 - 16 : 6 17 - 127 : ignore</p> <p>Note event, Pitch bend change and Velocity change on each channels are recognized by each tone module. Other voice messages on only basic channel are recognized by all tone modules.</p> <p>#7 Ignored in MONO mode. #8 See Section 4. RECOGNIZED EXCLUSIVE MESSAGES.</p>	<p>3.1 All Parameters (APR)</p> <p>3.1.1 All Tone Parameters with Tone names (APR)</p> <p>Transmitted if EXCL in the PATCH MIDI function is on and TX TONE APR in the TUNE/MIDI function is on.</p> <p>When the PATCH or TONE Group, Bank or Number is changed.</p> <p>Byte Description</p> <p>a 1111 0000 Exclusive status</p> <p>b 0100 0001 Roland ID #</p> <p>c 0011 0101 Operation code = APR (all parameters)</p> <p>d 0000 nnnn Unit # = MIDI basic channel, nnnn = 0 - 15 where nnnn + 1 = channel #</p> <p>e 0010 0011 Format type (JU-1, JU-2, HS-10, HS-80, MKS-50)</p> <p>f 0010 0000 Level # = 1</p> <p>g 0000 0001 Group #</p> <p>h 0vzv vvzv Value (0 - 127)</p> <p>i In sequence (36 bytes total)</p> <p>i 00tt tttt Tone name (0 - 63)</p> <p>j In sequence (10 bytes total)</p> <p>j 1111 0111 End of System Exclusive</p> <p>3.1.2 All Patch Parameters with Patch names (APR)</p> <p>Transmitted if EXCL in the PATCH MIDI function is on and TX PATCH APR in the TUNE/MIDI function is on.</p> <p>When the PATCH Group, Bank or Number is changed.</p> <p>Byte Description</p> <p>a 1111 0000 Exclusive status</p> <p>b 0100 0001 Roland ID #</p> <p>c 0011 0101 Operation code = APR (all parameters)</p> <p>d 0000 nnnn Unit # = MIDI basic channel, nnnn = 0 - 15 where nnnn + 1 = channel #</p> <p>e 0010 0011 Format type (JU-1, JU-2, HS-10, HS-80, MKS-50)</p> <p>f 0011 0000 Level # = 2 (used MKS-50 only)</p> <p>g 0000 0001 Group #</p> <p>h 0vzv vvzv Value (0 - 127)</p> <p>i In sequence (13 bytes total)</p> <p>i 00tt tttt Tone name (0 - 63)</p> <p>j In sequence (10 bytes total)</p> <p>j 1111 0111 End of System Exclusive</p> <p>3.1.3 All Chord Memory Parameters (APR)</p> <p>Transmitted if EXCL in the PATCH MIDI function is on and TX CM APR in the TUNE/MIDI function is on.</p> <p>When the PATCH Group, Bank or Number is changed.</p> <p>Byte Description</p> <p>a 1111 0000 Exclusive status</p> <p>b 0100 0001 Roland ID #</p> <p>c 0011 0101 Operation code = APR (all parameters)</p> <p>d 0000 nnnn Unit # = MIDI basic channel, nnnn = 0 - 15 where nnnn + 1 = channel #</p> <p>e 0010 0011 Format type (JU-1, JU-2, HS-10, HS-80, MKS-50)</p> <p>f 0100 0000 Level # = 3 (used MKS-50 only)</p> <p>g 0000 0001 Group #</p> <p>h 0vzv vvzv Value (0 - 127)</p> <p>i In sequence (6 bytes total)</p> <p>j 1111 0111 End of System Exclusive</p> <p>Notes : #1 Tone Parameter</p> <table border="1"> <thead> <tr> <th>#</th> <th>Function</th> <th>Value</th> </tr> </thead> <tbody> <tr><td>0</td><td>DCO ENV MODE</td><td>0 = ENV normal 1 = ENV inverted</td></tr> <tr><td>1</td><td>VCF ENV MODE</td><td>2 = ENV normal with dynamics 3 = ENV inverted with dynamics 0 = ENV normal 1 = ENV inverted</td></tr> <tr><td>2</td><td>VCA ENV MODE</td><td>2 = ENV normal with dynamics 3 = dynamics 0 = ENV 1 = GATE</td></tr> <tr><td>3</td><td>DCO WAVEFORM PULSE</td><td>2 = ENV with dynamics 3 = GATE with dynamics</td></tr> <tr><td>4</td><td>DCO WAVEFORM SAWTOOTH</td><td>0 - 5</td></tr> <tr><td>5</td><td>DCO WAVEFORM SUB</td><td>0 - 5</td></tr> <tr><td>6</td><td>DCO RANGE</td><td>0 = 4' 1 = 8' 2 = 16' 3 = 32'</td></tr> <tr><td>7</td><td>DCO SUB LEVEL</td><td>0 - 3</td></tr> <tr><td>8</td><td>DCO NOISE LEVEL</td><td>0 - 3</td></tr> <tr><td>9</td><td>HPF CUTOFF FREQ</td><td>0 - 3</td></tr> <tr><td>10</td><td>CHORUS</td><td>0 = OFF 1 = ON</td></tr> <tr><td>11</td><td>DCO LFO MOD DEPTH</td><td>0 - 127</td></tr> <tr><td>12</td><td>DCO ENV MOD DEPTH</td><td>0 - 127</td></tr> <tr><td>13</td><td>DCO AFTER DEPTH</td><td>0 - 127</td></tr> <tr><td>14</td><td>DCO PW/PWM DEPTH</td><td>0 - 127</td></tr> <tr><td>15</td><td>DCO PWM RATE</td><td>1 - 127 = PW manual 0 - 127 = PWM LFO RATE</td></tr> <tr><td>16</td><td>VCF CUTOFF FREQ</td><td>0 - 127</td></tr> <tr><td>17</td><td>VCF RESONANCE</td><td>0 - 127</td></tr> <tr><td>18</td><td>VCF LFO MOD DEPTH</td><td>0 - 127</td></tr> <tr><td>19</td><td>VCF ENV MOD DEPTH</td><td>0 - 127</td></tr> <tr><td>20</td><td>VCF KEY FOLLOW</td><td>0 - 127</td></tr> <tr><td>21</td><td>VCF AFTER DEPTH</td><td>0 - 127</td></tr> <tr><td>22</td><td>VCA LEVEL</td><td>0 - 127</td></tr> <tr><td>23</td><td>VCA AFTER DEPTH</td><td>0 - 127</td></tr> <tr><td>24</td><td>LFO RATE</td><td>0 - 127</td></tr> <tr><td>25</td><td>LFO DELAY TIME</td><td>0 - 127</td></tr> </tbody> </table>	#	Function	Value	0	DCO ENV MODE	0 = ENV normal 1 = ENV inverted	1	VCF ENV MODE	2 = ENV normal with dynamics 3 = ENV inverted with dynamics 0 = ENV normal 1 = ENV inverted	2	VCA ENV MODE	2 = ENV normal with dynamics 3 = dynamics 0 = ENV 1 = GATE	3	DCO WAVEFORM PULSE	2 = ENV with dynamics 3 = GATE with dynamics	4	DCO WAVEFORM SAWTOOTH	0 - 5	5	DCO WAVEFORM SUB	0 - 5	6	DCO RANGE	0 = 4' 1 = 8' 2 = 16' 3 = 32'	7	DCO SUB LEVEL	0 - 3	8	DCO NOISE LEVEL	0 - 3	9	HPF CUTOFF FREQ	0 - 3	10	CHORUS	0 = OFF 1 = ON	11	DCO LFO MOD DEPTH	0 - 127	12	DCO ENV MOD DEPTH	0 - 127	13	DCO AFTER DEPTH	0 - 127	14	DCO PW/PWM DEPTH	0 - 127	15	DCO PWM RATE	1 - 127 = PW manual 0 - 127 = PWM LFO RATE	16	VCF CUTOFF FREQ	0 - 127	17	VCF RESONANCE	0 - 127	18	VCF LFO MOD DEPTH	0 - 127	19	VCF ENV MOD DEPTH	0 - 127	20	VCF KEY FOLLOW	0 - 127	21	VCF AFTER DEPTH	0 - 127	22	VCA LEVEL	0 - 127	23	VCA AFTER DEPTH	0 - 127	24	LFO RATE	0 - 127	25	LFO DELAY TIME	0 - 127
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25	LFO DELAY TIME	0 - 127																																																																																	

26	ENV T1	0 - 127	(ATTACK TIME)
27	ENV L1	0 - 127	(ATTACK LEVEL)
28	ENV T2	0 - 127	(BREAK TIME)
29	ENV L2	0 - 127	(BREAK LEVEL)
30	ENV T3	0 - 127	(DECAY TIME)
31	ENV L3	0 - 127	(SUSTAIN LEVEL)
32	ENV T4	0 - 127	(RELEASE TIME)
33	ENV KEY FOLLOW	0 - 127	
34	CHORUS RATE	0 - 127	
35	BENDER RANGE	0 - 12	
36 - 45	TONE NAME	0 - 63	(TONE NAME table)

0=A	16=Q	32=g	48=w
1=B	17=R	33=h	49=x
2=C	18=S	34=i	50=y
3=D	19=T	35=j	51=z
4=E	20=U	36=k	52=0
5=F	21=V	37=l	53=1
6=G	22=W	38=m	54=2
7=H	23=X	39=n	55=3
8=I	24=Y	40=o	56=4
9=J	25=Z	41=p	57=5
10=K	26=a	42=q	58=6
11=L	27=b	43=r	59=7
12=M	28=c	44=s	60=8
13=N	29=d	45=t	61=9
14=O	30=e	46=u	62=space
15=P	31=f	47=v	63=-

#2 Patch Parameter

#	Function	Value
0	TONE NUMBER	0 - 63 TONE-a Group 64 - 127 TONE-b Group
1	KEY RANGE (LOW)	12 - 108 (note no.)
2	KEY RANGE (HIGH)	13 - 109 (note no.)
3	PORTAMENTO TIME	0 - 127
4	PORTAMENTO	0 = OFF 1 = ON
5	MODULATION SENSITIVITY	0 - 127
6	KEY SHIFT	0 - 12 (+ 12 semitone) 127 - 116 (- 12 semitone)
7	VOLUME	0 - 127
8	DETUNE	0 - 63 (+ 25 cent) 127 - 65 (- 25 cent)
9	MIDI FUNCTION	bit (0= on, 1= off) 6 AFTER TOUCH 5 PITCH BENDER CHANGE 4 EXCLUSIVE 3 HOLD 2 MODULATION 1 VOLUME 0 PORTAMENTO
10	MONO BENDER RANGE	0 - 12 (12 semitone)
11	CHORD MEMORY	0 - 15
12	KEY ASSIGN MODE	bit 6 5 0 0 POLY MODE 1 0 CHORD MEMORY 1 1 MONO MODE bit 4 - 0 ignored
13 - 22	PATCH NAME	0 - 63 (see TONE NAME table)

#3 Chord parameter

#	Function	Value
0 - 5	CHORD NOTE NO.	36 - 84 (sounded note) 127 (dummy)

3.2 Bulk Dump (BLD)

*Bulk Dump has no relation with the EXCL in the PATCH MIDI function.

3.2.1 When 'WRITE Button' is pressed in the TONE Bulk*Dump Mode.

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0011 0111	Operation code = BLD (bulk dump)
d 0000 nnnn	Unit # = MIDI basic channel, nnnn = 0 - 15 where nnnn + 1 = channel #
e 0010 0011	Format type (JU-1, JU-2, HS-10, HS-80, MKS-50)
f 0010 0000	Level # = 1
g 0000 0001	Group #
h 0000 0000	Extension of program #
i 00pp pppp	Program # (pppppp= n*4 : n= 0 - 15)
j 0000 vvvv	4 sets of TONE data (256 bytes) *1, *2
k 1111 0111	End of System Exclusive

3.2.2 When 'WRITE Button' is pressed in the PATCH Bulk*Dump Mode.

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0011 0111	Operation code = BLD (bulk dump)
d 0000 nnnn	Unit # = MIDI basic channel, nnnn = 0 - 15 where nnnn + 1 = channel #
e 0010 0011	Format type (JU-1, JU-2, HS-10, HS-80, MKS-50)
f 0011 0000	Level # = 2 (MKS-50 only)
g 0000 0001	Group #
h 0000 0000	Extension of program #
i 00pp pppp	Program # (pppppp= n*4 : n= 0 - 15)
j 0000 vvvv	4 sets of PATCH data (256 bytes) *1, *3
k 1111 0111	End of System Exclusive

3.2.3 When 'WRITE Button' is pressed in the CM Bulk*Dump Mode.

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0011 0111	Operation code = BLD (bulk dump)
d 0000 nnnn	Unit # = MIDI basic channel, nnnn = 0 - 15 where nnnn + 1 = channel #
e 0010 0011	Format type (JU-1, JU-2, HS-10, HS-80, MKS-50)
f 0100 0000	Level # = 3 (MKS-50 only)
g 0000 0001	Group #
h 0000 0000	Extension of program #
i 0000 0000	Program #
j 0000 vvvv	16 sets of CHORD MEMORY data (192 bytes) *4
k 1111 0111	End of System Exclusive

Notes :

*1 The Program # (i) represents the first TONE or PATCH number of the TONE or PATCH data sets (j).
The 4 sets of TONE or PATCH data are sequentially transmitted.
TONE or PATCH data is sent in four-bit nibbles, right justified, least significant nibble sent first.
Each TONE or PATCH data consists of 32 bytes.
The Bulk Dump message repeats 16 times.

#2 TONE data format

byte	msb	lsb						
	7	6	5	4	3	2	1	0
0	DCO AFTER DEPTH	VCF KEY FOLLOW						
1	VCF AFTER DEPTH	VCA AFTER DEPTH						
2	ENV KEY FOLLOW	DCO BENDER RANGE						
3	***	DCO LFO MOD DEPTH						
4	b00	DCO ENV MOD DEPTH						
5	b01	DCO PULSE PW/PWM DEPTH						
6	b02	DCO PWM RATE						
7	b03	VCF CUTOFF FREQ						
8	b04	VCF RESONANCE						
9	b05	VCF ENV MOD DEPTH						
10	b06	VCF LFO MOD DEPTH						
11	b07	VCA LEVEL						
12	b08	LFO RATE						
13	b09	LFO DELAY						
14	b10	ENV T1						
15	b11	ENV L1						
16	b12	ENV T2						
17	b13	ENV L2						
18	b14	ENV T3						
19	b15	ENV L3						
20	b16	ENV T4						
21	b17	***	TONE NAME - 1					
22	b18	***	TONE NAME - 2					
23	b19	***	TONE NAME - 3					
24	b20	***	TONE NAME - 4					
25	b21	***	TONE NAME - 5					
26	b22	***	TONE NAME - 6					
27	c 1	c 0	TONE NAME - 7					
28	c 3	c 2	TONE NAME - 8					
29	c 5	c 4	TONE NAME - 9					
30	c 7	c 6	TONE NAME - 10					
31			0 (TONE DATA code)					

*** : 0, ignored if received

Switch bit

b00	CHORUS	0 = OFF 1 = ON
b01 b02		
0 0	DCO ENV MODE	ENV normal
0 1		ENV inverted
1 0		ENV normal with dynamics
1 1		ENV inverted with dynamics
b03 b04	VCF ENV MODE	ENV normal
0 0		ENV inverted
1 0		ENV normal with dynamics
1 1		dynamics
b05 b06	VCA ENV MODE	ENV
0 0		GATE
1 0		ENV with dynamics
1 1		GATE with dynamics
b07 b08 b09	DCO WAVEFORM	0
0 0 0		SUB 1
0 0 1		2
0 1 0		3
0 1 1		4
1 0 0		5
1 0 1		
b10 b11 b12	DCO WAVEFORM	0
0 0 0		SAWTOOTH 1
0 0 1		2
0 1 0		3
0 1 1		4
1 0 0		5
1 0 1		
b13 b14	DCO WAVEFORM	0
0 0		PULSE 1
0 1		2
1 0		3
1 1		
b15 b16	HPF CUTOFF	0
0 0		FREQ 1
0 1		2
1 0		3
1 1		

b17 b18			
0 0	DCO RANGE	4'	
0 1		8'	
1 0		16'	
1 1		32'	
b19 b20			
0 0	DCO SUB	0	
0 1	LEVEL	1	
1 0		2	
1 1		3	
b21 b22			
0 0	DCO NOISE	0	
0 1	LEVEL	1	
1 0		2	
1 1		3	
c7 c6 c5 c4 c3 c2 c1 c0			
0 v v v v v v v v	CHORUS RATE		
	vvvvvvv = 0 - 127		

*3 PATCH data format

byte	msb	7	6	5	4	3	2	1	0	lsb
0										
1										
2										
3										
4										
5										
6										
7										
8										
9										
10	b00	b01	b02	b03	0	0	0	0		
11	***	***								
12	***	***								
13	***	***								
14	***	***								
15	***	***								
16	***	***								
17	***	***								
18	***	***								
19	***	***								
20	***	***								
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										
31										

*** : 0, ignored if received

Switch bit

b00	EXP.MODE	0 = NORMAL 1 = EXP.
b01 b02	KEY ASSIGN MODE	POLY
0 0		CHORD MEMORY
1 0		MONO (6 voice range)
1 1	PORTAMENTO	0 = OFF 1 = ON

*4 CHORD MEMORY data is sent in four-bit nibbles, right justified, least significant nibble sent first. (6 bytes/(one CHORD MEMORY data) * 16 = 96 bytes)

4. RECOGNIZED EXCLUSIVE MESSAGES

4.1 All Parameters (APR)

*Received if EXCL in the PATCH MIDI function is on.

4.1.1 All Tone Parameters with Tone names (APR)

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0011 0101	Operation code = APR (all parameters)
d 0000 nnnn	Unit # = MIDI basic channel, nnnn = 0 - 15 where nnnn + 1 = channel #
e 0010 0011	Format type (JU-1, JU-2, HS-10, HS-80, MKS-50)
f 0010 0000	Level # = 1
g 0000 0001	Group #
h 0vvv vvvv	Value (0 - 127) *1
i 00tt tttt	Tone name (0 - 63)
j 1111 0111	In sequence (10 bytes total)
	End of System Exclusive

4.1.2 All Tone Parameters without Tone names (APR)

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0011 0101	Operation code = APR (all parameters)
d 0000 nnnn	Unit # = MIDI basic channel, nnnn = 0 - 15 where nnnn + 1 = channel #
e 0010 0011	Format type (JU-1, JU-2, HS-10, HS-80, MKS-50)
f 0010 0000	Level # = 1
g 0000 0001	Group #
h 0vvv vvvv	Value (0 - 127) *1
i 1111 0111	In sequence (36 bytes total)
	End of System Exclusive

4.1.3 Individual Tone Parameter (IPR)

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0011 0110	Operation code = IPR (individual parameter)
d 0000 nnnn	Unit # = MIDI basic channel, nnnn = 0 - 15 where nnnn + 1 = channel #
e 0010 0011	Format type (JU-1, JU-2, HS-10, HS-80, MKS-50)
f 0010 0000	Level # = 1
g 0000 0001	Group #
h 00pp pppp	Parameter # (0 - 35) *1
i 0vvv vvvv	Value (0 - 127)
j 1111 0111	h and i (repetitively) End of System Exclusive

4.1.4 All Patch Parameters with Patch names (APR)

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0011 0101	Operation code = APR (all parameters)
d 0000 nnnn	Unit # = MIDI basic channel, nnnn = 0 - 15 where nnnn + 1 = channel #
e 0010 0011	Format type (JU-1, JU-2, HS-10, HS-80, MKS-50)
f 0011 0000	Level # = 2 (used MKS-50 only)
g 0000 0001	Group #
h 0vvv vvvv	Value (0 - 127) *2
i 00tt tttt	In sequence (13 bytes total) Tone name (0 - 63)
j 1111 0111	In sequence (10 bytes total) End of System Exclusive.

4.1.5 Individual Patch Parameter (IPR)

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0011 0110	Operation code = IPR (individual parameter)
d 0000 nnnn	Unit # = MIDI basic channel, nnnn = 0 - 15 where nnnn + 1 = channel #
e 0010 0011	Format type (JU-1, JU-2, HS-10, HS-80, MKS-50)
f 0011 0000	Level # = 2 (MKS-50 only)
g 0000 0001	Group #
h 0000 pppp	Parameter # (0 - 12) *2
i 0vvv vvvv	Value (0 - 127)
j 1111 0111	h and i (repetitively) End of System Exclusive

4.1.6 All Chord Memory Parameters (APR)

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0011 0101	Operation code = APR (all parameters)
d 0000 nnnn	Unit # = MIDI basic channel, nnnn = 0 - 15 where nnnn + 1 = channel #
e 0010 0011	Format type (JU-1, JU-2, HS-10, HS-80, MKS-50)
f 0100 0000	Level # = 3 (used MKS-50 only)
g 0000 0001	Group #
h 0vvv vvvv	Value (0 - 127) *3
i 00tt tttt	In sequence (6 bytes total)
j 1111 0111	End of System Exclusive

Notes :

- *1 See Tone Parameter in 3.1 All Parameter (APR)
- *2 See Patch Parameter in 3.1 All Parameter (APR)
- *3 See Chord Parameter in 3.1 All Parameter (APR)

4.2 Bulk Dump (BLD)

*Bulk Dump has no relation with the EXCL in the PATCH MIDI function.

4.2.1 When 'WRITE Button' is pressed in the TONE Bulk*Load Mode.

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0011 0111	Operation code = BLD (bulk dump)
d 0000 nnnn	Unit # = MIDI basic channel, nnnn = 0 - 15 where nnnn + 1 = channel #
e 0010 0011	Format type (JU-1, JU-2, HS-10, HS-80, MKS-50)
f 0010 0000	Level # = 1
g 0000 0001	Group #
h 0000 0000	Extension of program #
i 00pp pppp	Program #
j 0000 tttt	Some sets of TONE data *1, *2
k 1111 0111	End of System Exclusive

4.2.2 When 'WRITE Button' is pressed in the PATCH Bulk*Load Mode.

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0011 0111	Operation code = BLD (bulk dump)
d 0000 nnnn	Unit # = MIDI basic channel, nnnn = 0 - 15 where nnnn + 1 = channel #
e 0010 0011	Format type (JU-1, JU-2, HS-10, HS-80, MKS-50)
f 0011 0000	Level # = 2 (MKS-50 only)
g 0000 0001	Group #
h 0000 0000	Extension of program #
i 00pp pppp	Program #
j 0000 vvvv	same set of PATCH data *1, *3
k 1111 0111	End of System Exclusive

4.2.3 When 'WRITE Button' is pressed in the CM Bulk*Load Mode.

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0011 0111	Operation code = BLD (bulk dump)
d 0000 nnnn	Unit # = MIDI basic channel, nnnn = 0 - 15 where nnnn + 1 = channel #
e 0010 0011	Format type (JU-1, JU-2, HS-10, HS-80, MKS-50)
f 0100 0000	Level # = 3 (MKS-50 only)
g 0000 0001	Group #
h 0000 0000	Extension of program #
i 0000 0000	Program #
j 0000 vvvv	16 sets of CHORD MEMORY data (192 bytes) *4
k 1111 0111	End of System Exclusive

Notes :

- *1 The Program # is recognized as the first TONE or PATCH number of the TONE or PATCH data sets. 32 bytes are recognized as a set of TONE or PATCH data. TONE or PATCH data is received in four-bit nibbles, right justified, least significant nibble received first.
- *2 See 3.2 Bulk Dump, to understand the TONE data format.
- *3 See 3.2 Bulk Dump, to understand the PATCH data format.
- *4 See 3.2 Bulk Dump, to understand the CHORD MEMORY data format.

5. HANDSHAKING COMMUNICATION

5.1 Message type

5.1.1 Want to send a file (WSF)

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0100 0000	Operation code = WSF
d 0000 nnnn	Unit # = MIDI basic channel, nnnn = 0 - 15 where nnnn + 1 = channel #
e 0010 0011	Format type (JU-1, JU-2, HS-10, HS-80, MKS-50)
f 1111 0111	End of System Exclusive

5.1.2 Request a file (RQF)

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0100 0001	Operation code = RQF
d 0000 nnnn	Unit # = MIDI basic channel, nnnn = 0 - 15 where nnnn + 1 = channel #
e 0010 0011	Format type (JU-1, JU-2, HS-10, HS-80, MKS-50)
f 1111 0111	End of System Exclusive

5.1.3 Data (DAT)

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0100 0010	Operation code = DAT
d 0000 nnnn	Unit # = MIDI basic channel, nnnn = 0 - 15 where nnnn + 1 = channel #
e 0010 0011	Format type (JU-1, JU-2, HS-10, HS-80, MKS-50)
f 0000 tttt	4 sets of TONE or PATCH data (256 bytes), CHORD MEMORY data (192 bytes)
g 0sss ssss	Check sum
h 1111 0111	End of System Exclusive

Notes :

- Each data are sent in four-bit nibbles, right justified, least significant nibble sent first.
- PATCH or CHORD MEMORY data is valid only for MKS-50.
- See 3.2 Bulk Dump, to understand each data format.
- Summed value of the all bytes in data and the check sum must be 0 (7bits).

5.1.4 Acknowledge (ACK)

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0100 0011	Operation code = ACK
d 0000 nnnn	Unit # = MIDI basic channel, nnnn = 0 - 15 where nnnn + 1 = channel #
e 0010 0011	Format type (JU-1, JU-2, HS-10, HS-80, MKS-50)
f 1111 0111	End of System Exclusive

5.1.5 End of file (EOF)

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0100 0101	Operation code = EOF
d 0000 nnnn	Unit # = MIDI basic channel, nnnn = 0 - 15 where nnnn + 1 = channel #
e 0010 0011	Format type (JU-1, JU-2, HS-10, HS-80, MKS-50)
f 1111 0111	End of System Exclusive

5.1.6 Communication error (ERR)

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0100 1110	Operation code = ERR
d 0000 nnnn	Unit # = MIDI basic channel, nnnn = 0 - 15 where nnnn + 1 = channel #
e 0010 0011	Format type (JU-1, JU-2, HS-10, HS-80, MKS-50)
f 1111 0111	End of System Exclusive

5.1.7 Rejection (RJC)

Byte	Description
a 1111 0000	Exclusive status
b 0100 0001	Roland ID #
c 0100 1111	Operation code = RJC
d 0000 nnnn	Unit # = MIDI basic channel, nnnn = 0 - 15 where nnnn + 1 = channel #
e 0010 0011	Format type (JU-1, JU-2, HS-10, HS-80, MKS-50)
f 1111 0111	End of System Exclusive

5.2 Sequence of communication

5.2.1 In the 'Dump' mode.

this unit	message	objective unit
-----	-----	-----
	WSF ----->	
	<----- ACK or (RQF)	
	DAT ----->	
	<----- ACK	
	:	
	:	
	DAT ----->	
	<----- ACK	
	EOF ----->	
	<----- ACK	

5.2.2 In the 'Load' mode.

this unit	message	objective unit
-----	-----	-----
	RQF----->	
	(<----- WSF	
	ACK ----->)	
	<----- DAT	
	ACK ----->	
	:	
	:	
	<----- DAT	
	ACK ----->	
	<----- EOF	
	ACK ----->	

Notes :

- * This unit sends RJC and the sequence is discontinued when it receives ERR or detects some error.
- * This unit sends RJC when the sequence is discontinued manually.
- * This unit stops the sequence if the unit receives RJC.