

REALISTIC[®]
Service Manual

42-4004

CONCERTMATE-500

Catalog Number: 42-4004



CUSTOM MANUFACTURED FOR RADIO SHACK, A DIVISION OF TANDY CORPORATION

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SPECIFICATIONS

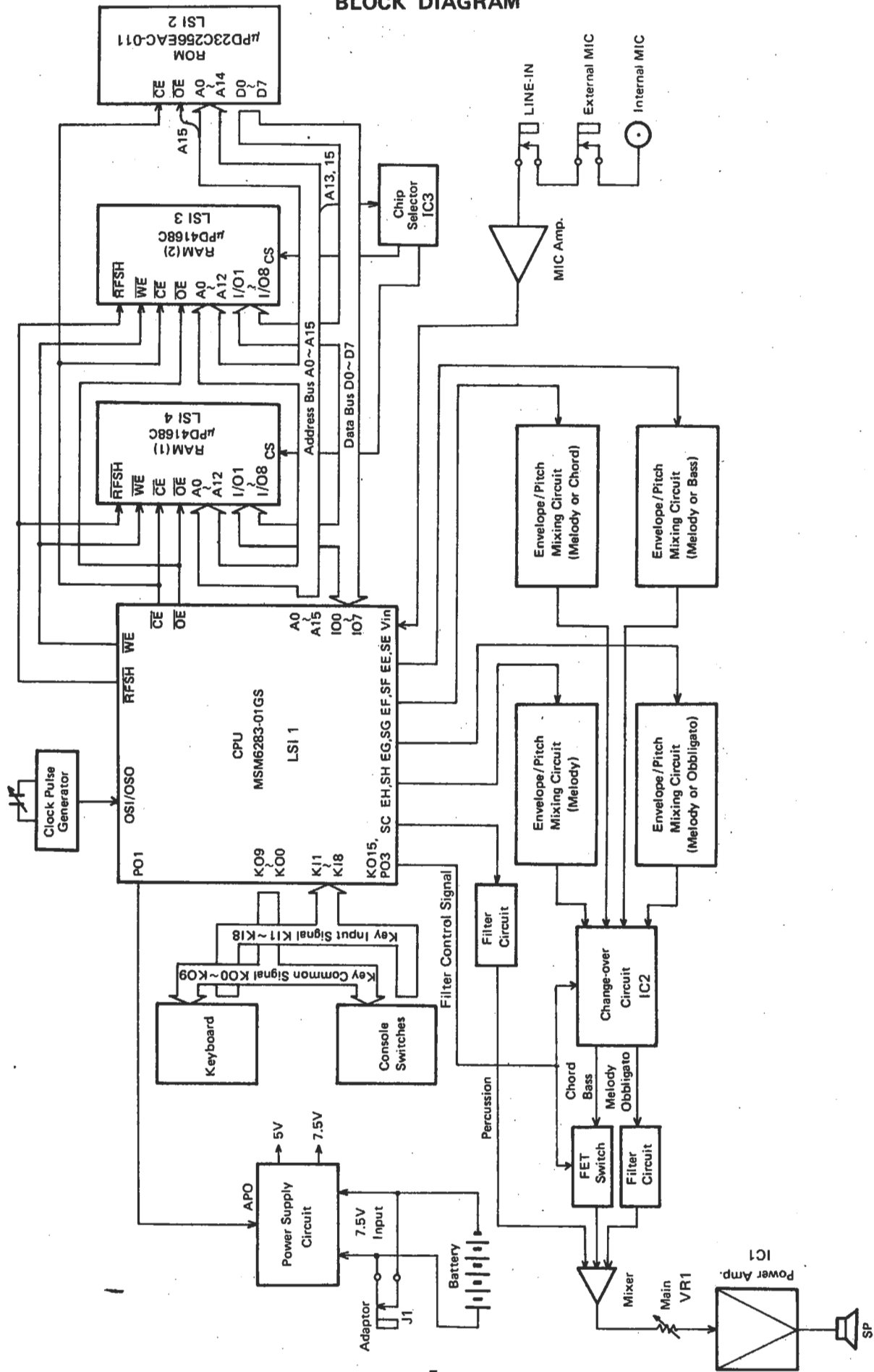
Keyboard:	32 Keys
Chords:	4-note polyphonic
Preset tones:	5 PCM: piano, brass ensemble, trumpet, synth drums, human voice 3 Harmonic synthesis: flute, pipe organ, jazz organ
Effects:	Vibrato, portamento
Envelope selection:	13
Synthesizer function:	Harmonic synthesis (16', 8', 5-1/3', 4', 2-2/3', 2', 1-3/5', 1-1/3', 1' up to 14 levels for each harmonic)
Auto-rhythms:	11 rhythms: disco, rock, pops, march, samba, bossa nova, rhumba, 4-beat, swing, slow rock, waltz Fill-in key Tempo keys
Auto accompaniment:	Concert chord: maj, min, 7th, min 7
Function:	Chord selector system: maj, min, 7th, min 7, maj 7, dim, sus 4, aug 6th, min 6, m 7-5, mM 7 Playback tones: 2
Memory play:	4-note polyphonic memory: 400 steps 3-channel multi-memory: Chords 99 steps, solo 1/solo 2 198 steps each Auto play One key play
Sampling function:	Method: 8-bit PCM Rate: 9.34 kHz Time: 1.4 sec. (auto trigger system) Input method: Internal microphone, external microphone, line Loop set Envelope select
Demonstration function:	Toy Symphony (one-touch endless)
Terminals:	MIC, LINE-IN, output (mini jacks)
Tuning control:	±30 cents
Speaker:	3-1/8" (8cm) x 1 (output 1W)
Power supply:	Five AA-size batteries External adapter
Auto power off:	7 min. after last operation
Power consumption:	1.8W
Dimensions:	18-1/8"(W) x 6-1/8"(D) x 1-3/4(H) or 461(W) x 155(D) x 44(H)mm
Weight:	2.4 lbs (1.1kg) including batteries

ELECTRICAL SPECIFICATIONS

	Nominal	Limit
1. Current Drain at DC 7.5V Input		
a) No sound output	54mA	54mA ± 30%
b) Maximum sound output with 4 keys A4 thru D5 being pressed simultaneously and with tone at Flute, mode at Normal, envelope at G#5	225mA	225mA ± 30%
2. Auto-power off Time when A4 is turned to 442 Hz	7 min. 30 sec.	7 min. 30 sec. ±1 min.
3. Output Level with C4 key pressed in Flute (47kohm load)	1.1V	1.1V ± 30%
4. Sound Pressure Level at 10cm away from speaker with G5 key pressed in Flute tone	106dB	106dB ± 10dB
5. Pitch Variable Range when A4 is turned to 442 Hz	442Hz ± 30¢	442Hz ± 30¢
Note: 1 ¢ = 1/100 half note		
6. Minimum Operating DC Supply Voltage for sound to not distort noticeably	5.5V	6.0V
7. Mic Input Sensibility at 1 kHz for sampling		4mV
8. Line Input Sensibility at 1 kHz for sampling		100mV
9. Line Output Level with A3 key by sampling external 1 kHz		
a) 4mV input at Mic	470mV	470mV ± 20%
b) 100mV input at Line	550mV	550mV ± 20%

Note: Nominal specs represent the design specs; all units should be able to approximate these – some will exceed and some may drop slightly below these specs. Limit specs represent the absolute worst condition that still might be considered acceptable; in no case should a unit perform to less than within any limit spec.

BLOCK DIAGRAM



CIRCUIT DESCRIPTION

CPU (MSM6283-01GS; LSI 1)

- Generates pitch and envelope signals for melody, chord, bass, and obbligato sounds.
- Provides percussion sounds.
- Controls keys, switches, RAMs, and ROM.

The following is a list of pin functions of the CPU.

Pin No.	Terminal Name	In/Out	Function
1	BGND		Ground (0V) source for ADC (Analog to Digital Converter).
2	VADC		-5V source for ADC.
3, 4			No function.
5~11	IO0 ~ IO6	In/Out	Data bus (IO0 ~ IO6).
12	A0	Out	Address bus (A0).
13	IO7	In/Out	Data bus (IO7).
14	A1	Out	Address bus (A1).
15	\overline{CE}	Out	Chip enable signal for the memory devices.
16~18	A2, A10, A3	Out	Address bus (A2, A3, A10).
19	\overline{OE}	Out	Output enable signal for the memory devices.
20~30	A4~9, A11~15	Out	Address bus (A4 ~ A9, A11 ~ A15).
31	\overline{WE}	Out	Write signal output. When "L", the CPU writes data into the memory devices.
32	\overline{RFSH}	Out	Refresh signal output. When "L", the CPU refresh the memory data of RAMs.
33~39			No function.
40	GND		Ground (0V) source.
41, 42			No function.
43	VDD1		-5V source.
44~56			No function.
57, 58	OSI, OSO	In/Out	7.24 MHz clock pulse inputs.
59			No function.
60	RESET	In	Reset signal input. "H" active. At power ON, the terminal receives an "H" level pulse so that the CPU's internal circuits are initialized.
61	KO15	Out	Control signal for external filter circuit.
62~66			No function.
67~76	KO9 ~ KO0	Out	Key and switch common signals output.
77~84	KI1 ~ KI8	In	Key and switch input signals input.
85			No function.
86	PO1	Out	APO (Auto Power Off) signal. When the instrument is left unoperated for approximately 7 minutes, the terminal drops to "L" level to shut the voltages off.
87			No function.
88	PO3	Out	Control signal for external filter circuit.

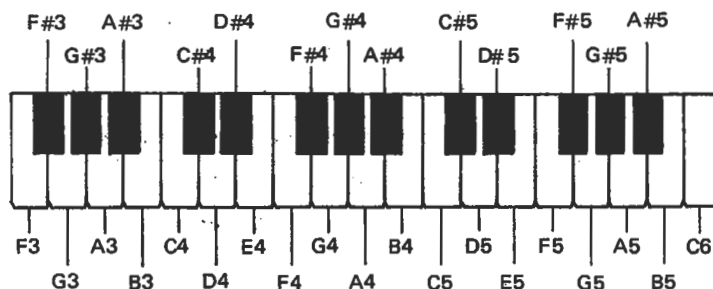
Pin No.	Terminal Name	In/Out	Function
89	EH	Out	Melody envelope signal output.
90	EG	Out	Melody or obbligato envelope signal output.
91	EF	Out	Melody or chord envelope signal output.
92	EE	Out	Melody or bass envelope signal output.
93	SH	Out	Melody pitch signal output.
94	SG	Out	Melody or obbligato pitch signal output.
95	SF	Out	Melody or chord pitch signal output.
96	SE	Out	Melody or bass pitch signal output.
97	SC	Out	Analog percussion signal output.
98	AGND		Ground (0V) source for DAC (Digital to Analog Converter).
99	VDAC		-5V source for DAC.
100	Vin		Sample sound signal input.

Note: Since this LSI functions as negative logic, 0V is provided to VDD1 terminal while +5V source is applied to GND terminal.

Keyboard Matrix

	KI1	KI2	KI3	KI4	KI5	KI6	KI7	KI8
KC0	SAMPLING	LOOP SET		DEMO	ONE KEY PLAY R	ONE KEY PLAY L		
KC1	PORTA- MENTO	HARMO. SYNTH.	ENVELOPE SELECT	VIBRATO	F3	F3#	G3	G3#
KC2	MEMORY PLAY	RESET	RHYTHM SELECT	FILL-IN	A3	A3#	B4	C4
KC3	TEMPO ▲	TEMPO ▼	DELETE	CLEAR	C4#	D4	D4#	E4
KC4	SAMPLING SOUND	HARMONIC SOUND			F4	F4#	G4	G4#
KC5					A4	A4#	B4	C5
KC6	JAZZ ORGAN	PIPE ORGAN	FLUTE	HUMAN VOICE	C#5	D5	D5#	E5
KC7	SYNTH DRUMS	TRUMPET	BRASS ENSEMBLE	PIANO	F5	F5#	G5	G5#
KC8	NORMAL	SOLO 1	SOLO 2	CHORD	A5	A5#	B5	C6
KC9	PLAY	RECORD						POWER OFF

Nomenclature of keys



Envelope/Pitch Mixing Circuit

The Concertmate-500 has four Envelope/Pitch mixing circuits. The circuits generate melody, obbligato, chord and bass sounds by means of a mixing envelope and pitch signals from the CPU. At "NORMAL" mode, all of the four circuits generate melody signal, while they create melody, obbligato, chord, and bass sounds individually at the other modes.

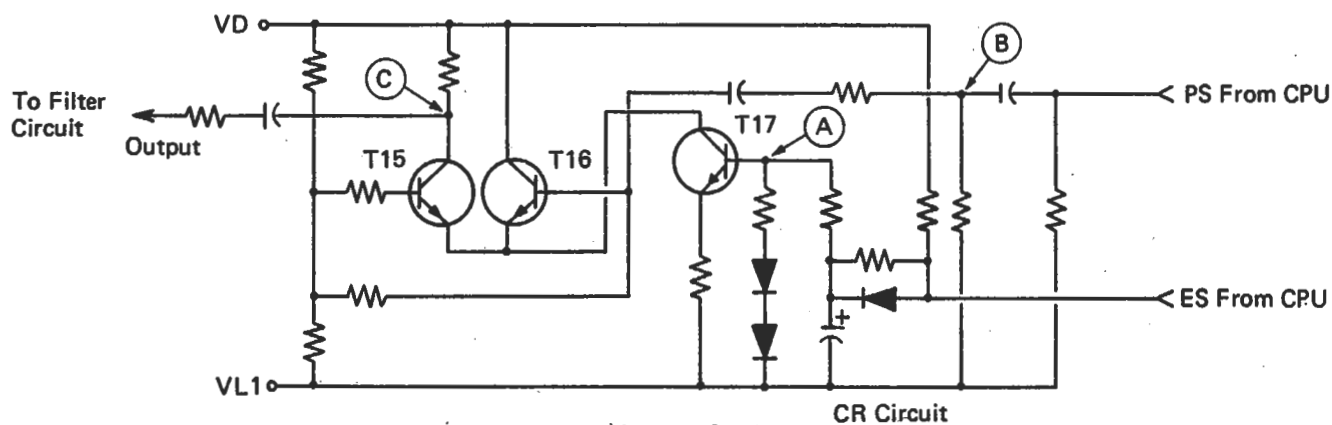


Figure 1

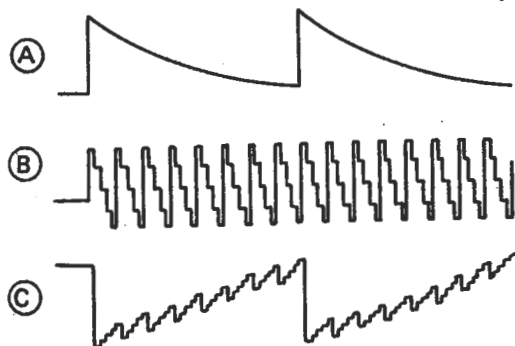


Figure 2

Note: The waveforms are only for understanding the principle of the above circuit. The actual waveforms differ from the figure.

$$\textcircled{A} : \textcircled{B} = 10 : 1$$

The pitch signal PS from the CPU is amplified by differential amplifiers (transistors T15 and T16). Since the envelope signal ES from the CPU is a stepped waveform, the CR circuit smooths it. These signals are mixed in transistor T17, and the mixed sound signal is provided to the filter circuit.

Filter Change-Over Circuit & Percussion Circuit

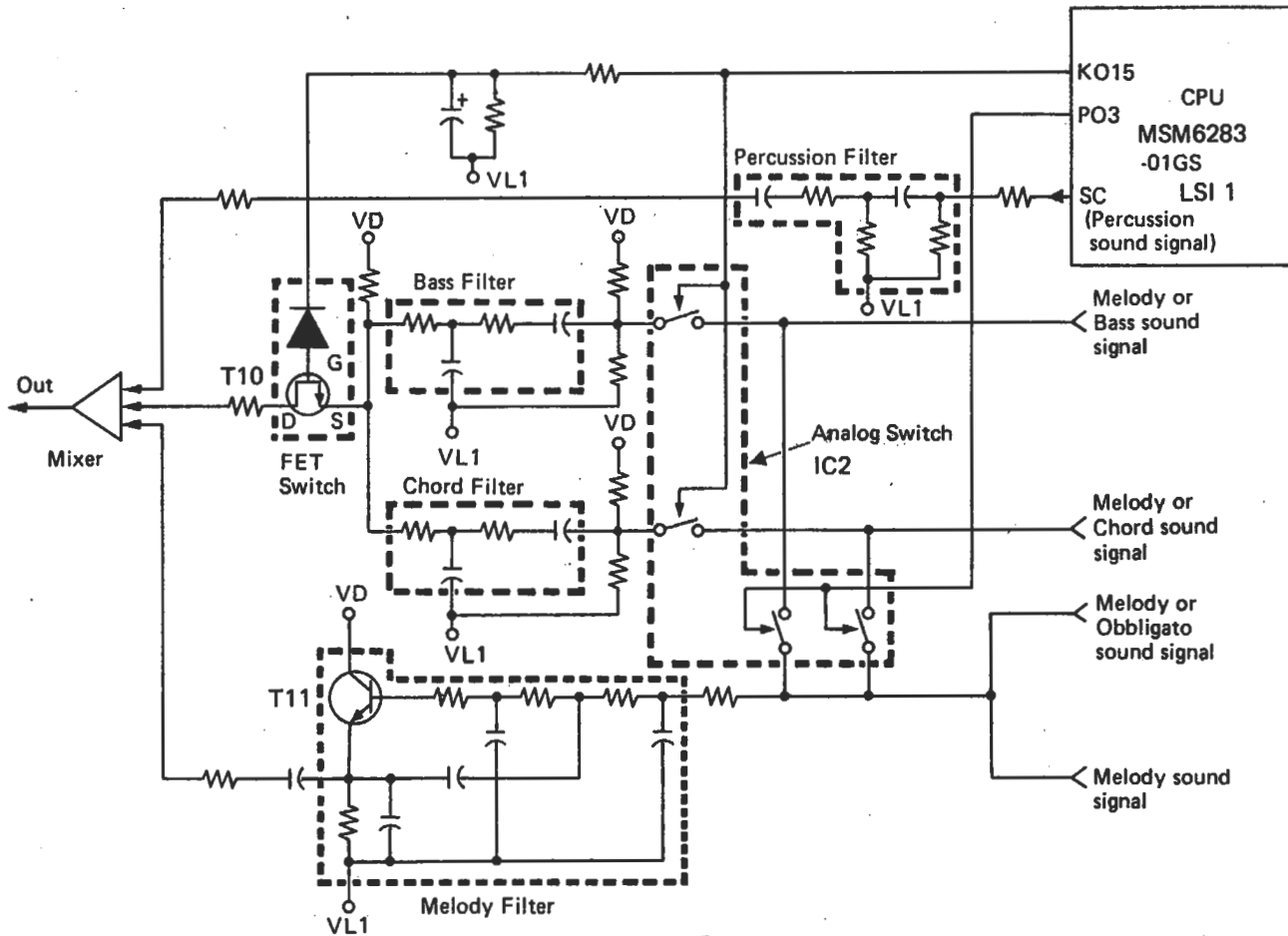


Figure 3

The Concertmate-500 has four Envelope/Pitch mixing circuits. In accordance with the mode switch position, signals PO3 and KO15 turn the analog switches on or off so that the sound signals pass through the appropriate filters.

Mode \ Signal	PO3	KO15
NORMAL	H	L
SOLO 1 SOLO 2 CHORD	L	H

On "NORMAL" mode, all Envelope/Pitch mixing circuits generate melody signals, and the signals pass through the melody filter. When the mode switch is at the other position, each Envelope/Pitch circuit creates different sound signals. These signals pass through corresponding filters.

The percussion signal comes out from the CPU directly, wherever the mode switch position is set. As the signal is a stepped waveform, the percussion filter shapes it.

Sample Sound Input Circuit

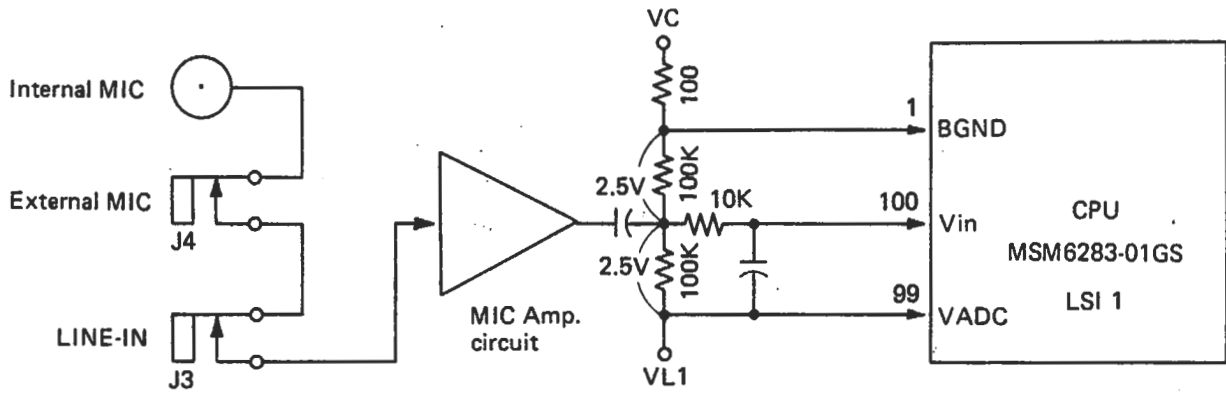


Figure 4. Sample Sound Input Circuit

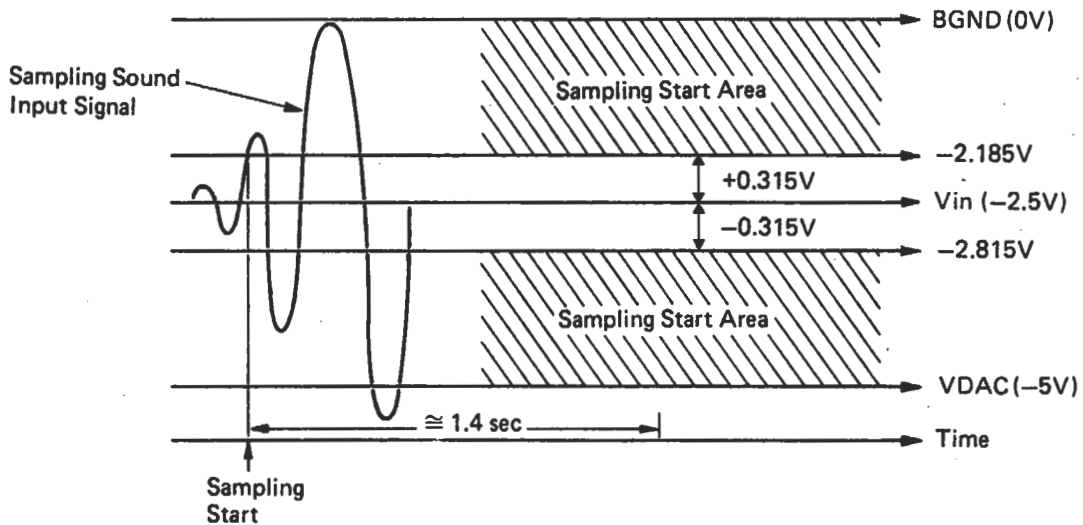


Figure 5. Vin Input Trigger Level

As shown in Fig. 4, the circuit provides sampling signals to pin 100 Vin terminal of the CPU. By divider circuit of 2 pcs of 100kohm resistors, the sampling signal is biased on 2.5V. When the sampling sound level exceeds $\pm 0.315V$ as shown Fig. 5, the CPU starts to transmit the sampling sound data to the RAMs during the following time.

$$\begin{aligned}
 \text{Sampling time} &= \frac{\text{RAM's Capacity (Kbit)}}{\text{Sampling Data Bit (bit)} \times \text{Sampling Frequency (kHz)}} \\
 &= \frac{108.544 \text{ (Kbit)}}{8 \text{ (bit)} \times 9.387 \text{ (kHz)}} \\
 &= 1.4454 \text{ Sec.} \\
 &\cong 1.4 \text{ Sec.}
 \end{aligned}$$

While sampling, the CPU doesn't output key common signals (K00 ~ K09), so that the keyboard cannot be operated.

ROM & RAM Accesses

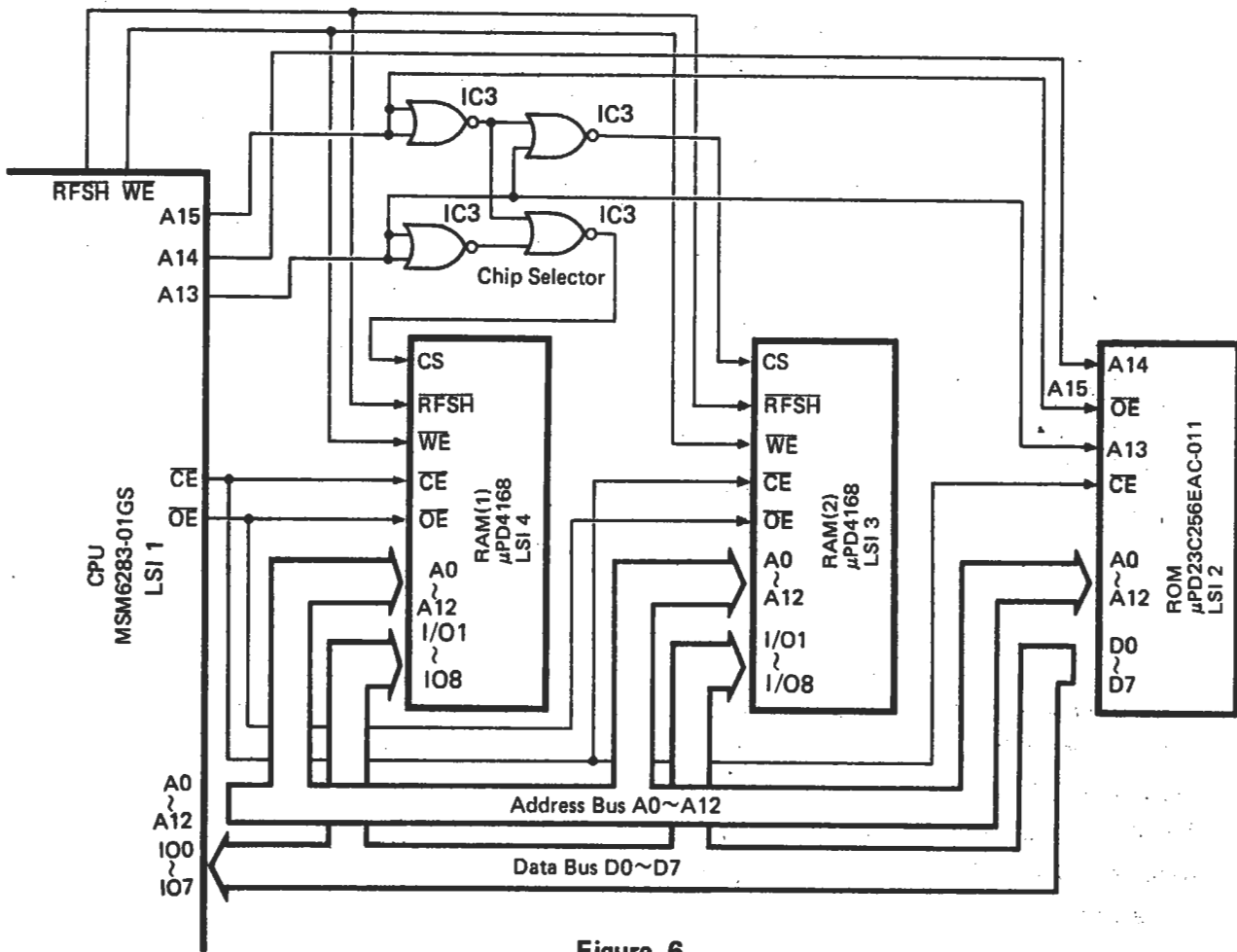


Figure 6

RAM (1) and RAM (2) are dynamic 64Kbit RAM. Since they are dynamic type, data should be refreshed every 2msec. at least. The memory is used as the demonstration, memory play, and sampling data area.

The chip select condition and memory assignments are as shown below.

Chip	Signal	A15	A13	CE	OE	Memory Assignment	
						(LSB)	(MSB)
RAM (1)		L	H	L	L	22,528 bit	43,008 bit
						Demonstration/Memory play	Sampling
RAM (2)		L	L	L	L	65,536 bit	
						Sampling	

RAM (1) cannot record demonstration data and memory play data at the same time.

The capacity of ROM is 256Kbit and contains the program for system execution.
 The chip select condition is as shown below.

Chip \ Signal	A15	CE
ROM	H	L

Power Supply Circuit

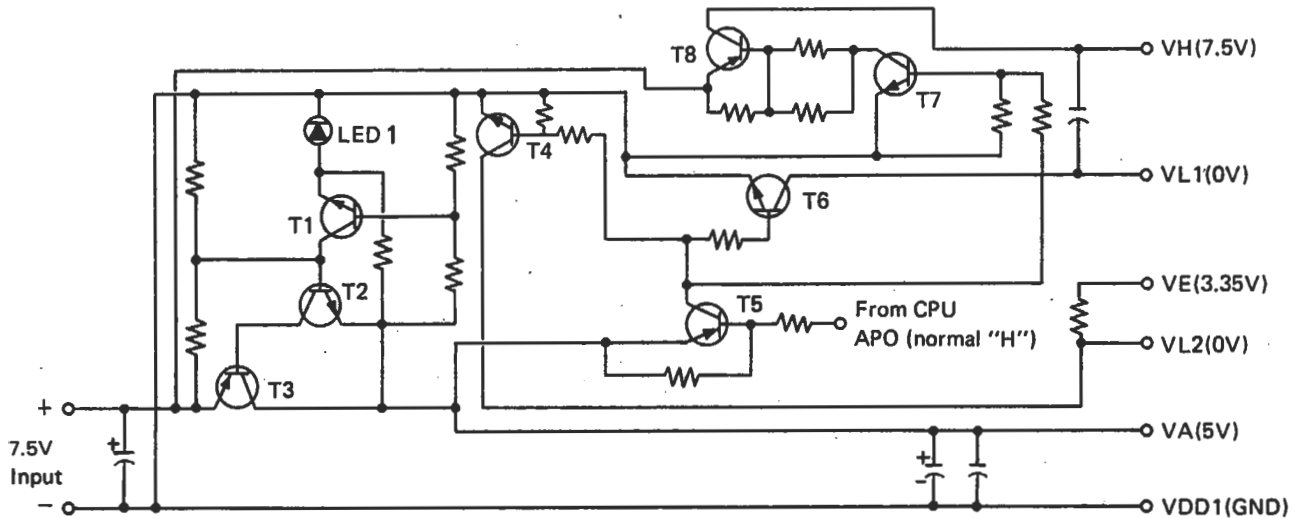


Figure 7

The power supply circuit has a voltage regulator and an APO (Auto Power Off) circuit. When power is ON and at the normal operation, the APO signal from the CPU keeps "H" level. Transistors T4 and T8 turn on, so that voltages VH, VL1, VL2 and VE are provided to the circuits.

When the keyboard is not operated for seven minutes, the APO signal becomes "L" level. Transistors T4 ~ T8 turn off causing the voltages to shut off.

Voltages VA (5V) and VDD1 (ground) are always provided to the CPU even at the APO. Transistors T1, T2 and T3 form a voltage regulator. Using the LEDs characteristic of current regulation, T1 stabilizes the battery voltage at 5V and the darlington-connected T2 and T3 amplifies the current.

Reset Circuit

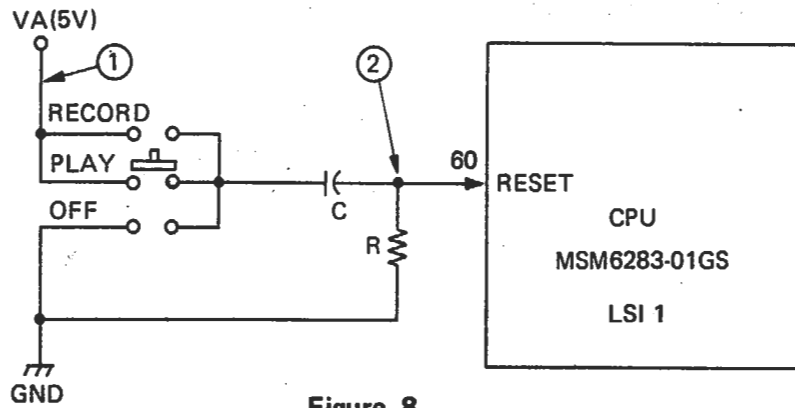


Figure 8

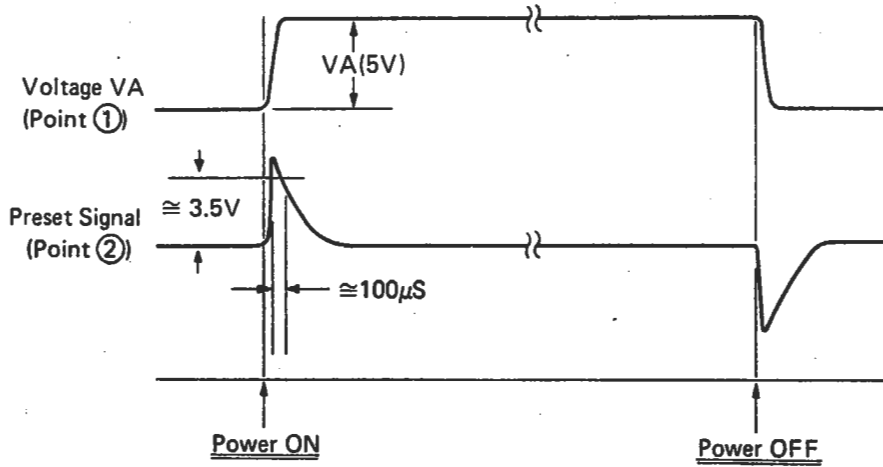


Figure 9

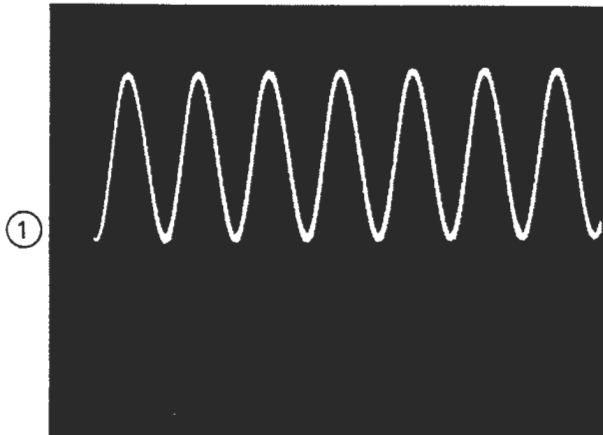
At power ON, the waveform of point 2 provides a pulse by the differential circuit of resistor R and capacitor C.

The pulse initializes the internal circuits of the CPU.

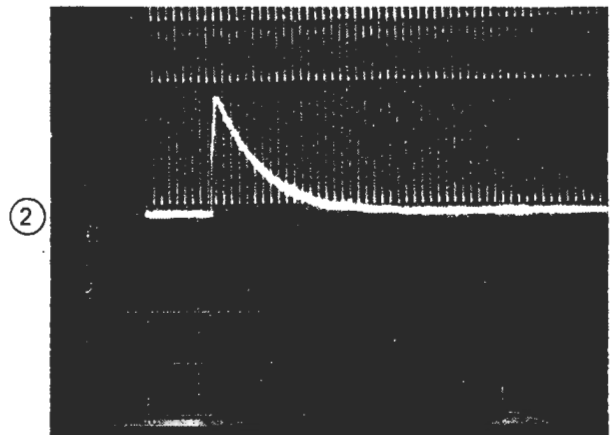
MAJOR WAVEFORMS

Attenuation of probe is 10:1

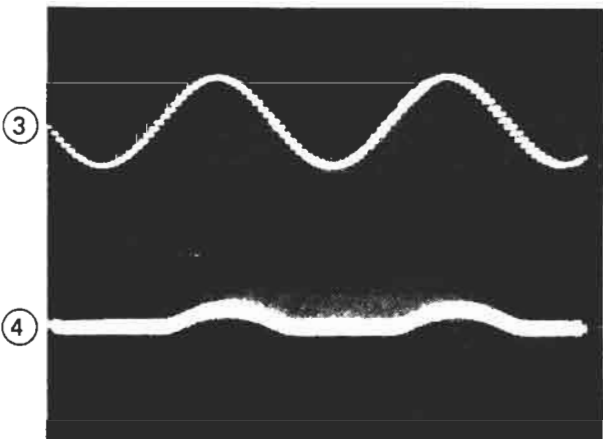
Checkpoints: Refer to the PCB View on page 17.



① Clock Pulse Signal
0.1V/div, 0.1 μ S/div

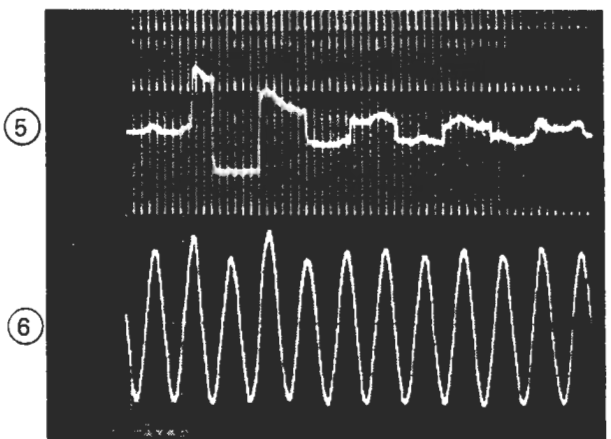


② Reset Signal
0.2V/div, 2mS/div



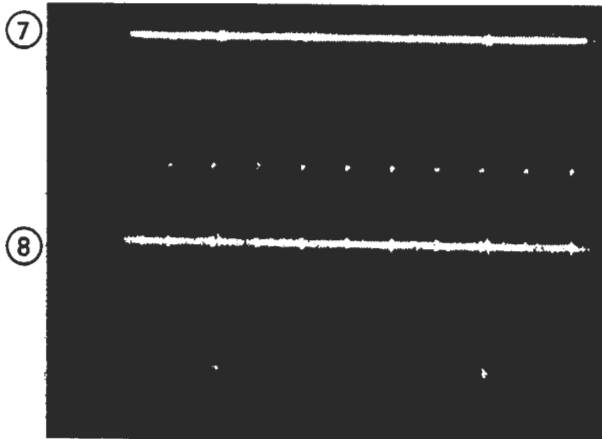
③ Pitch Signal for Flute
50mV/div, 0.5mS/div

④ Envelope Signal for Flute
2mV/div, 0.5mS/div
Tone: Flute, Key: C3



⑤ Percussion Signal
50mV/div, 5mS/div
Rhythm: Rock, Tempo: Maximum

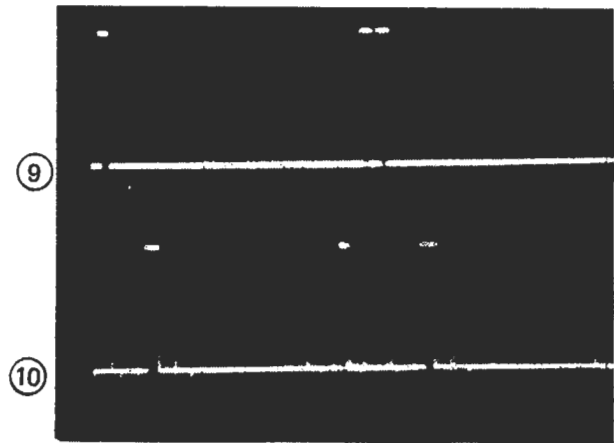
⑥ Envelope/Pitch Mixing Signal
20mV/div, 5mS/div
Tone: Flute, Key: C3



⑦ Refresh Signal
0.2V/div, 10 μ S/div

⑧ CE Signal
0.2V/div, 10 μ S/div

Tone: Sampling, Key: G3



⑨ Key Common Signal K00
0.2V/div, 0.5mS/div

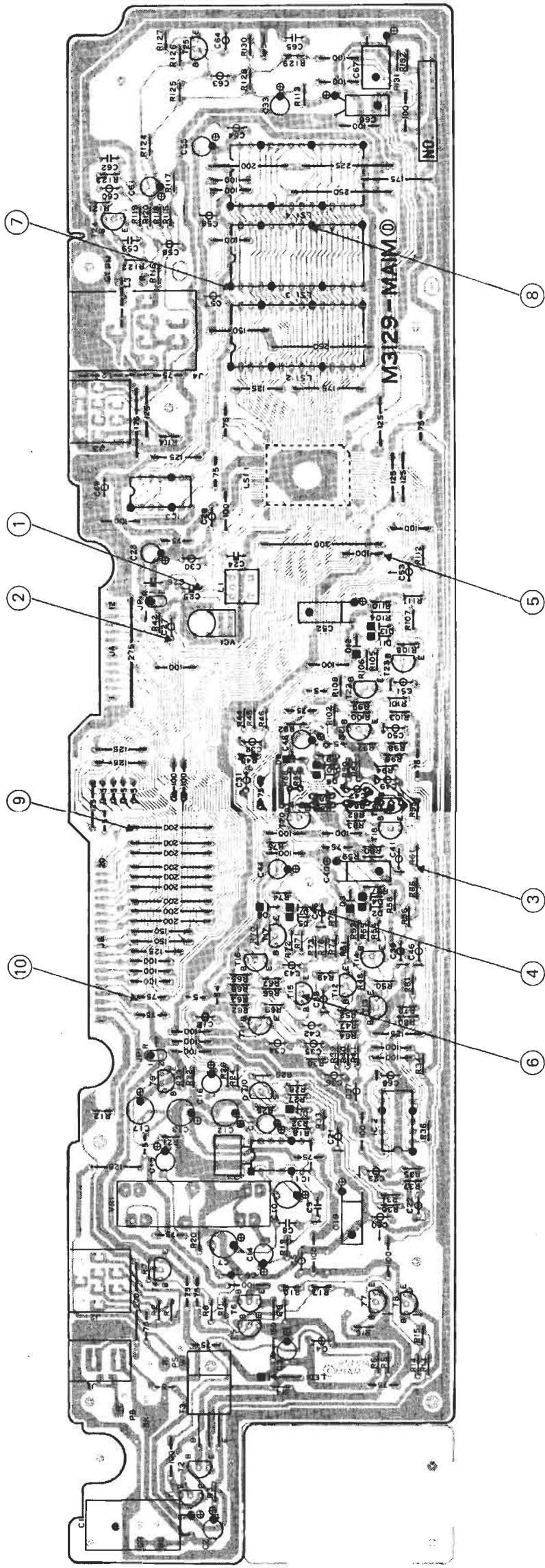
⑩ Key Input Signal K18
0.2V/div, 0.5mS/div

TROUBLESHOOTING

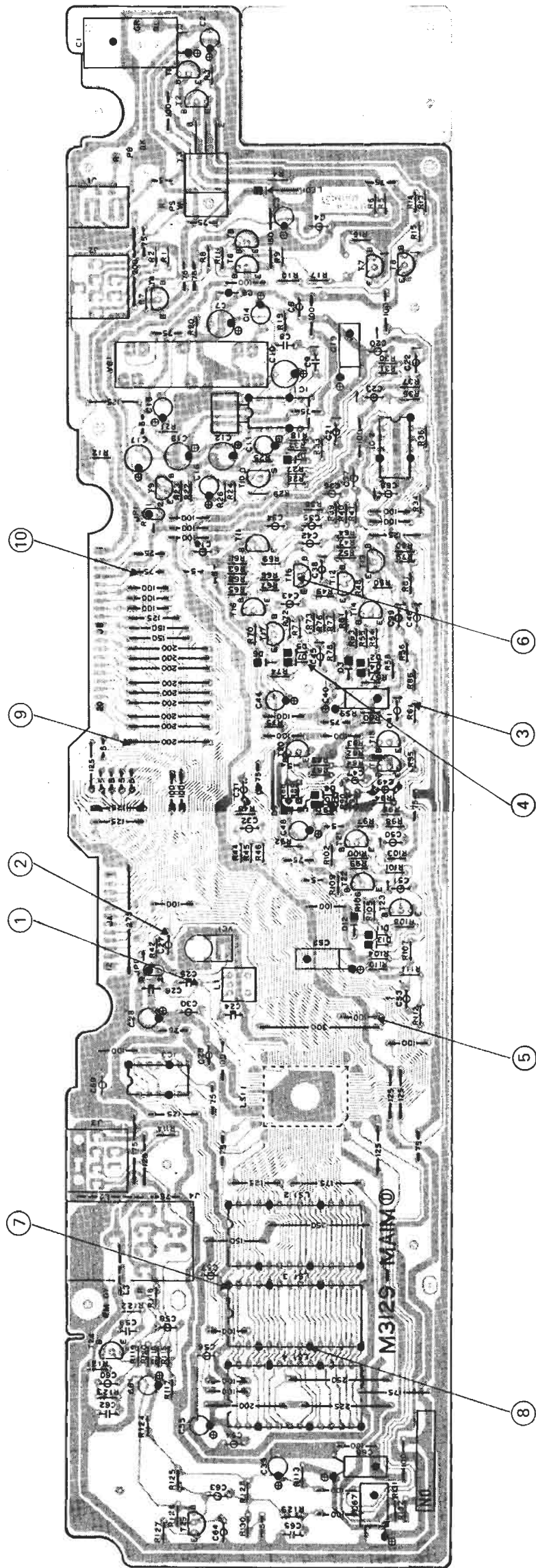
Trouble	Checkpoints and Possible Cause	Reference Waveform
Does not work at all (Pilot lamp does not light)	<ul style="list-style-type: none"> • Check the voltages VA (+5V), VE (+3.35V), VC (+5V) and VD (+5V). • Check the reset and APO signals. • Faulty parts: Transistors T1 ~ T4, Power switch, or CPU (LSI 1). 	Waveform ②
Does not work at all (Pilot lamp lights)	<ul style="list-style-type: none"> • Check the voltages VH (+7.5V), VC (+5V) and VD (+5V). • Check the clock pulse and key common signals. • Faulty parts: Transistors T5 ~ T8, Ceramic Trimmer VCT84K, or ROM (LSI 4). 	Waveforms ①, ⑨
Preset tone does not sound on PLAY mode	<ul style="list-style-type: none"> • Check the voltage VH (+7.5V). • Check the analog signal at base of transistor T11 or Power amp. (IC1). • Faulty parts: Transistors T7 ~ T9, T11, CPU (LSI 1) or Power Amp. (IC1). 	Waveform ⑤
Chord or Bass tone does not sound on CHORD mode	<ul style="list-style-type: none"> • Check the analog signal at collector of transistor T18 or T23. • Check the analog signal at source of FET T10. • Faulty parts: Transistors T18 ~ T23, T10, or Analog Switch (IC2). 	
Melody or Obligato tone does not sound on SOLO 1 or SOLO 2 mode	<ul style="list-style-type: none"> • Check the analog signal at collector of transistor T13 or T17, and at emitter of transistor T11. • Faulty parts: Transistors T12 ~ T17 or T11. 	
Memory/Demo play does not perform	<ul style="list-style-type: none"> • Faulty parts: RAM 1 (LSI 4), ROM (LSI 2), CPU (LSI 1) or Chip Selector (IC3). 	
Sampling impossible	<ul style="list-style-type: none"> • Check the analog signal at collector of transistor T25 at sampling time. • Check the voltage (2.5V) of pin 100 of the CPU (LSI 1). • Faulty parts: Transistors T24, T25, CPU (LSI 1), RAM 1 (LSI 4) or Chip Selector (IC3). 	
Distorted sound	<ul style="list-style-type: none"> • Faulty parts: Transistors T12 ~ T20, T9, or Power Amp. (IC1). 	
A certain key or switch does not respond	<ul style="list-style-type: none"> • Check the contacts of PC joiner or contact rubber. • Clean the contacts on the keys and the switches. 	
Percussions do not sound	<ul style="list-style-type: none"> • Check the analog signal at pin 97 of the CPU. • Check the poor soldering on pin 97 of the CPU. • Faulty parts: CPU (LSI 1). 	Waveform ⑥

PCB (Top and Bottom Views)

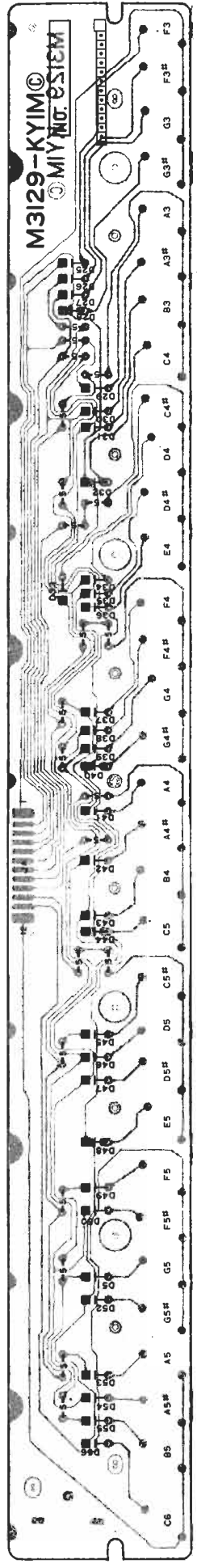
Main PCB M3129-MA1M (Top View and Major Test Points)



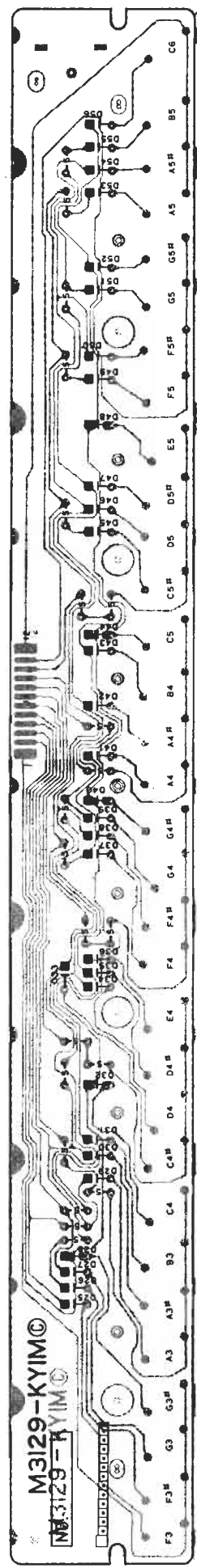
Main PCB M3129-MA1M (Bottom View and Major Test Points)



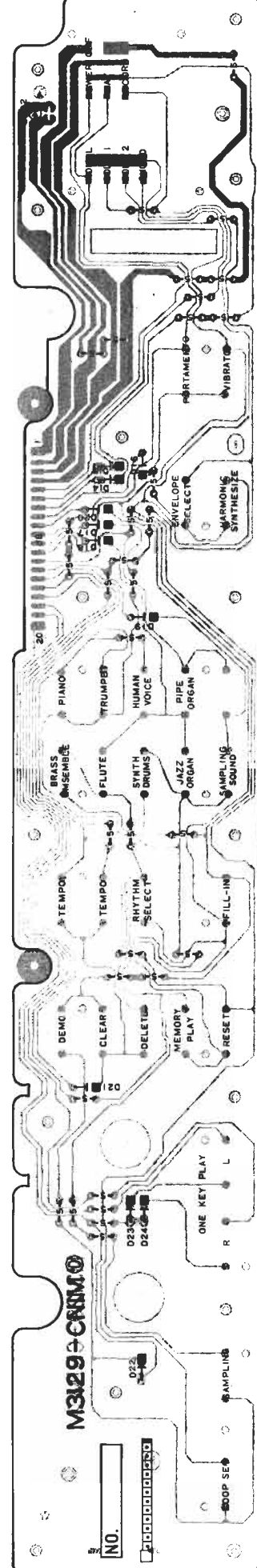
Keyboard PCB M3129-KY1M (Top View)



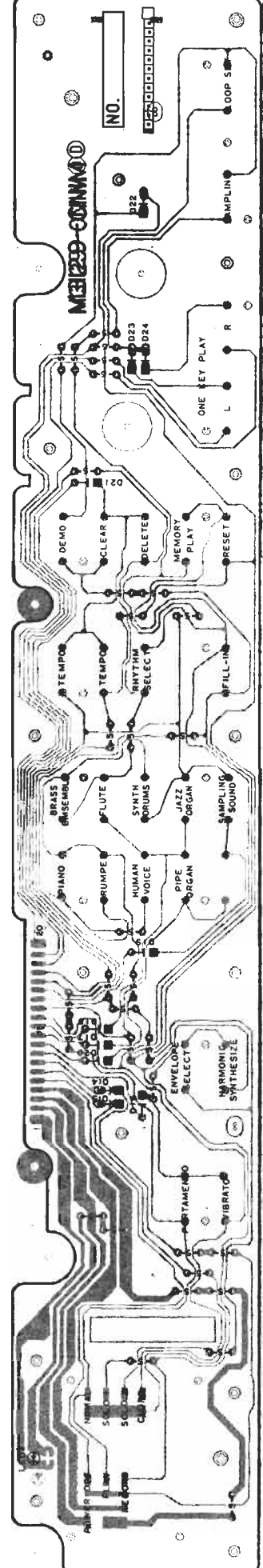
Keyboard PCB M3129-KY1M (Bottom View)



Console PCB M3129-CN1M (Top View)



Console PCB M3129-CN1M (Bottom View)



ELECTRICAL PARTS LIST

Ref. No.	Description	Radio Shack Part Number	Manufacturer's Part Number
Capacitors			
C1	Electrolytic 2200 μ F 16V \pm 20%	CC-228MBDA	2804 9731
C2	Electrolytic 2.2 μ F 50V \pm 20%	CC-225MJBA	2804 5336
C3	Electrolytic 47 μ F 10V \pm 20%	CC-476MCBA	2804 5069
C4, C5	Semiconductive 0.01 μ F 25V \pm 10%	CC-103KFBZ	0002 8903
C6	Mylar* 0.15 μ F 50V \pm 10%	CC-154KFBZ	2830 6067
C7	Electrolytic 220 μ F 10V \pm 20%	CC-227MCBA	2804 5140
C8	Ceramic 150pF 50V \pm 10%	CC-151KJBC	2818 0039
C9	Ceramic 220pF 50V \pm 10%	CC-221JJBC	2819 0107
C10	Electrolytic 100 μ F 10V \pm 20%	CC-107MCBA	2804 4879
C11	Electrolytic 47 μ F 10V \pm 20%	CC-476MCBA	2804 5069
C12, C13	Electrolytic 100 μ F 16V \pm 20%		2804 4933
C14~C16	Electrolytic 1 μ F 50V \pm 20%	CC-105MJBA	2804 4925
C17	Electrolytic 330 μ F 6.3V \pm 20%	CC-337MBDA	2804 5808
C18	Semiconductive 0.1 μ F 16V \pm 10%	CC-104MDCZ	0002 9177
C19	Electrolytic 2.2 μ F 50V \pm 20%	CC-225MJBA	2804 5336
C20, C21	Semiconductive 0.047 μ F 16V \pm 10%	CC-473KDCZ	0002 9178
C22, C23	Semiconductive 0.1 μ F 16V \pm 10%	CC-104MDCZ	0002 9177
C24	Ceramic 56pF 50V \pm 5%	CC-560JJBC	2819 0344
C25	Ceramic 150pF 50V \pm 5%	CC-151JJBC	2819 0654
C26	Ceramic 100pF 50V \pm 5%	CC-101JJBC	2818 3054
C27	Semiconductive 0.1 μ F 16V \pm 10%	CC-104MDCZ	0002 9177
C28	Electrolytic 10 μ F 16V \pm 20%	CC-106MDCA	2804 5051
C29, C30	Semiconductive 0.01 μ F 25V \pm 10%	CC-103KFBZ	0002 8903
C31, C32	Semiconductive 0.1 μ F 16V \pm 10%	CC-104MDCZ	0002 9177
C33	Electrolytic 100 μ F 6.3V \pm 20%	CC-107MBDA	2804 9374
C34	Semiconductive 0.1 μ F 16V \pm 10%	CC-104MDCZ	0002 9177
C35	Semiconductive 0.01 μ F 25V \pm 10%	CC-103KFBZ	0002 8903
C36	Semiconductive 1000pF 25V \pm 10%	CC-102KFBZ	0002 8898
C37	Semiconductive 6800pF 25V \pm 10%	CC-682KFBZ	0002 9179
C38	Semiconductive 0.047 μ F 16V \pm 10%	CC-473KDCZ	0002 9178
C39	Semiconductive 0.1 μ F 16V \pm 10%	CC-104MDCZ	0002 9177
C40	Electrolytic 1 μ F 50V \pm 20%	CC-105MJBA	2804 4925
C41	Semiconductive 0.1 μ F 16V \pm 10%	CC-104MDCZ	0002 9177
C42	Semiconductive 0.047 μ F 16V \pm 10%	CC-473KDCZ	0002 9178
C43	Semiconductive 0.1 μ F 16V \pm 10%	CC-104MDCZ	0002 9177
C44	Electrolytic 1 μ F 50V \pm 20%	CC-105MJBA	2804 4925
C45	Semiconductive 0.1 μ F 16V \pm 10%	CC-104MDCZ	0002 9177

* Mylar is a registered trademark of E.I. Du Pont de Nemours and Company.

Ref. No.	Description	Radio Shack Part Number	Manufacturer's Part Number
C46	Semiconductive 0.047 μ F 16V \pm 10%	CC-473KDCZ	0002 9178
C47	Semiconductive 0.1 μ F 16V \pm 10%	CC-104MDCZ	0002 9177
C48	Electrolytic 1 μ F 50V \pm 20%	CC-105MJBA	2804 4925
C49	Semiconductive 0.1 μ F 16V \pm 10%	CC-104MDCZ	0002 9177
C50	Semiconductive 0.047 μ F 16V \pm 10%	CC-473KDCZ	0002 9178
C51	Semiconductive 0.1 μ F 16V \pm 10%	CC-104MDCZ	0002 9177
C52	Electrolytic 1 μ F 50V \pm 20%	CC-105MJBA	2804 4925
C53, C54	Semiconductive 0.1 μ F 16V \pm 10%	CC-104MDCZ	0002 9177
C55	Electrolytic 10 μ F 16V \pm 20%	CC-106MDCA	2804 5051
C56, C57	Semiconductive 0.1 μ F 16V \pm 10%	CC-104MDCZ	0002 9177
C58	Semiconductive 0.022 μ F 25V \pm 10%	CC-223KFBZ	0002 8894
C59	Ceramic 1000pF 50V \pm 10%	CC-102KJBC	2818 0110
C60	Semiconductive 0.022 μ F 25V \pm 10%	CC-223KFBZ	0002 8894
C61	Electrolytic 100 μ F 6.3V \pm 20%	CC-107MBDA	2804 9374
C62	Ceramic 1000pF 50V \pm 10%	CC-102KJBC	2818 0110
C63, C64	Semiconductive 0.047 μ F 16V \pm 10%	CC-473KDCZ	0002 9178
C65	Ceramic 1000pF 50V \pm 10%	CC-102KJBC	2818 0110
C66	Electrolytic 100 μ F 6.3V \pm 20%	CC-107MBDA	2804 9374
C67	Electrolytic 220 μ F 6.3V \pm 20%	CC-227MBDA	2804 5638
C68, C69	Semiconductive 0.01 μ F 25V \pm 10%	CC-103KFBZ	0002 8903

Coils

L1	Oscillator, L10-495	CA-9951	3841 0695
L2, L3	Noise Filter, ELE-H821KA		3841 0154

Diodes

D1~D56	Silicon, 1S254	DX-0808	0002 8721
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ICs

IC1	Amp., Power, Linear LA4138	MX-6210	2120 8329
IC2	Switch, Analog, MOS, TC50H4066P	MX-7302	2100 5045
IC3	Gate, NOR, MOS, TC74HC02P	MX-7301	2100 4669

Jacks

J1	Power, HEC-0470-01-230	J-1793	3512 3288
J2, J3	Phone, YKB21-5101	J-1797	3612 0665
J4	Mic., YKB21-5006	J-1798	3612 0711

LEDs

LED1	Regulator, Voltage, LN2G		2320 9619
LED2	Lamp, Pilot, LN251RPP WE		2320 9764

Ref. No.	Description	Radio Shack Part Number	Manufacturer's Part Number
LSIs			
LSI1	CPU, MSM6283-01GS	MX-7287	2010 0035
LSI2	ROM, μ PD23C256EAC-011	MX-7299	2010 0896
LSI3, LSI4	RAM, μ PD4168C-15.20	MX-7300	2010 0056
Potentiometer			
VR1	Volume, 10kohm, EWA-MK0C25B14	P-7948	2770 9800
Resistors			
R1, R2	Carbon film 68ohm 1/2W \pm 5%	N-0111EFC	0002 9176
R3	Carbon film 56kohm 1/5W \pm 5%	N-0345EQC	0002 8957
R4	Carbon film 47kohm 1/5W \pm 5%	N-0340EQC	0002 8731
R5	Carbon film 68Kohm 1/5W \pm 5%	N-0354EQC	0002 8947
R6	Carbon film 56kohm 1/5W \pm 5%	N-0345EQC	0002 8957
R7	Carbon film 33kohm 1/5W \pm 5%	N-0324EQC	0002 8730
R8	Carbon film 1kohm 1/5W \pm 5%	N-0196EQC	0002 8726
R9	Carbon film 120kohm 1/5W \pm 5%	N-0375EQC	0002 8953
R10	Carbon film 15kohm 1/5W \pm 5%	N-0297EQC	0002 9002
R11	Carbon film 1kohm 1/5W \pm 5%	N-0196EQC	0002 8726
R12	Carbon film 2.2kohm 1/5W \pm 5%	N-0216EQC	0002 8727
R13	Carbon film 10kohm 1/5W \pm 5%	N-0281EQC	0002 8729
R14, R15	Carbon film 2.2kohm 1/5W \pm 5%	N-0216EQC	0002 8727
R16	Carbon film 120kohm 1/5W \pm 5%	N-0375EQC	0002 8953
R17	Carbon film 100kohm 1/5W \pm 5%	N-0371EQC	0002 8733
R18	Carbon film 330ohm 1/5W \pm 5%	N-0410EQC	0002 9104
R19~R21	Carbon film 1kohm 1/5W \pm 5%	N-0196EQC	0002 8726
R22	Carbon film 100kohm 1/5W \pm 5%	N-0371EQC	0002 8733
R23	Carbon film 68kohm 1/5W \pm 5%	N-0354EQC	0002 8947
R24, R25	Carbon film 10kohm 1/5W \pm 5%	N-0281EQC	0002 8729
R26	Carbon film 33kohm 1/5W \pm 5%	N-0324EQC	0002 8730
R27	Carbon film 6.8kohm 1/5W \pm 5%	N-0262EQC	0002 9021
R28	Carbon film 15kohm 1/5W \pm 5%	N-0297EQC	0002 9002
R29	Carbon film 560kohm 1/5W \pm 5%	N-0429EQC	0002 8958
R30, R31	Carbon film 22kohm 1/5W \pm 5%	N-0311EQC	0002 8956
R32	Carbon film 100kohm 1/5W \pm 5%	N-0371EQC	0002 8733
R33	Carbon film 1kohm 1/5W \pm 5%	N-0196EQC	0002 8726
R34~R37	Carbon film 100kohm 1/5W \pm 5%	N-0371EQC	0002 8733
R38	Carbon film 2.2kohm 1/5W \pm 5%	N-0216EQC	0002 8727
R39~R41	Carbon film 15kohm 1/5W \pm 5%	N-0297EQC	0002 9002
R42	Carbon film 10kohm 1/5W \pm 5%	N-0281EQC	0002 8729
R43, R44	Carbon film 100kohm 1/5W \pm 5%	N-0371EQC	0002 8733

Ref. No.	Description	Radio Shack Part Number	Manufacturer's Part Number
R45	Carbon film 47kohm 1/5W ±5%	N-0340EQC	0002 8731
R46	Carbon film 100kohm 1/5W ±5%	N-0371EQC	0002 8733
R47	Carbon film 47kohm 1/5W ±5%	N-0340EQC	0002 8731
R48	Carbon film 3.9kohm 1/5W ±5%	N-0237EQC	0002 9059
R49, R50	Carbon film 4.7kohm 1/5W ±5%	N-0247EQC	0002 8728
R51	Carbon film 2.2kohm 1/5W ±5%	N-0216EQC	0002 8727
R52	Carbon film 3.3kohm 1/5W ±5%	N-0230EQC	0002 8946
R53	Carbon film 330ohm 1/5W ±5%	N-0410EQC	0002 9104
R54	Carbon film 12kohm 1/5W ±5%	N-0288EQC	0002 8951
R55	Carbon film 100kohm 1/5W ±5%	N-0371EQC	0002 8733
R56	Carbon film 120kohm 1/5W ±5%	N-0375EQC	0002 8953
R57	Carbon film 100kohm 1/5W ±5%	N-0371EQC	0002 8733
R58	Carbon film 180kohm 1/5W ±5%	N-0387EQC	0002 9023
R59	Carbon film 680kohm 1/5W ±5%	N-0433EQC	0002 9020
R60	Carbon film 47kohm 1/5W ±5%	N-0340EQC	0002 8731
R61~R63	Carbon film 100kohm 1/5W ±5%	N-0371EQC	0002 8733
R64	Carbon film 47kohm 1/5W ±5%	N-0340EQC	0002 8731
R65	Carbon film 3.9kohm 1/5W ±5%	N-0237EQC	0002 9059
R66, R67	Carbon film 4.7kohm 1/5W ±5%	N-0247EQC	0002 8728
R68	Carbon film 2.2kohm 1/5W ±5%	N-0216EQC	0002 8727
R69	Carbon film 3.3kohm 1/5W ±5%	N-0230EQC	0002 8946
R70	Carbon film 330ohm 1/5W ±5%	N-0410EQC	0002 9104
R71	Carbon film 12kohm 1/5W ±5%	N-0288EQC	0002 8951
R72	Carbon film 100kohm 1/5W ±5%	N-0371EQC	0002 8733
R73	Carbon film 120kohm 1/5W ±5%	N-0375EQC	0002 8953
R74	Carbon film 100kohm 1/5W ±5%	N-0371EQC	0002 8733
R75	Carbon film 180kohm 1/5W ±5%	N-0387EQC	0002 9023
R76	Carbon film 680kohm 1/5W ±5%	N-0433EQC	0002 9020
R77	Carbon film 47kohm 1/5W ±5%	N-0340EQC	0002 8731
R78~R80	Carbon film 100kohm 1/5W ±5%	N-0371EQC	0002 8733
R81	Carbon film 47kohm 1/5W ±5%	N-0340EQC	0002 8731
R82	Carbon film 3.9kohm 1/5W ±5%	N-0237EQC	0002 9059
R83, R84	Carbon film 4.7kohm 1/5W ±5%	N-0247EQC	0002 8728
R85	Carbon film 2.2kohm 1/5W ±5%	N-0216EQC	0002 8727
R86	Carbon film 3.3kohm 1/5W ±5%	N-0230EQC	0002 8946
R87	Carbon film 330ohm 1/5W ±5%	N-0410EQC	0002 9104
R88	Carbon film 12kohm 1/5W ±5%	N-0288EQC	0002 8951
R89	Carbon film 100kohm 1/5W ±5%	N-0371EQC	0002 8733
R90	Carbon film 120kohm 1/5W ±5%	N-0375EQC	0002 8953
R91	Carbon film 100kohm 1/5W ±5%	N-0371EQC	0002 8733
R92	Carbon film 180kohm 1/5W ±5%	N-0387EQC	0002 9023
R93	Carbon film 680kohm 1/5W ±5%	N-0433EQC	0002 9020

Ref. No.	Description	Radio Shack Part Number	Manufacturer's Part Number
R94	Carbon film 47kohm 1/5W ±5%	N-0340EQC	0002 8731
R95~R97	Carbon film 100kohm 1/5W ±5%	N-0371EQC	0002 8733
R98	Carbon film 47kohm 1/5W ±5%	N-0340EQC	0002 8731
R99	Carbon film 3.9kohm 1/5W ±5%	N-0237EQC	0002 9059
R100, R101	Carbon film 4.7kohm 1/5W ±5%	N-0247EQC	0002 8728
R102	Carbon film 2.2kohm 1/5W ±5%	N-0216EQC	0002 8727
R103	Carbon film 3.3kohm 1/5W ±5%	N-0230EQC	0002 8946
R104	Carbon film 330ohm 1/5W ±5%	N-0410EQC	0002 9104
R105	Carbon film 12kohm 1/5W ±5%	N-0288EQC	0002 8951
R106	Carbon film 100kohm 1/5W ±5%	N-0371EQC	0002 8733
R107	Carbon film 120kohm 1/5W ±5%	N-0375EQC	0002 8953
R108	Carbon film 100kohm 1/5W ±5%	N-0371EQC	0002 8733
R109	Carbon film 180kohm 1/5W ±5%	N-0387EQC	0002 9023
R110	Carbon film 680kohm 1/5W ±5%	N-0433EQC	0002 9020
R111	Carbon film 47kohm 1/5W ±5%	N-0340EQC	0002 8731
R112	Carbon film 100kohm 1/5W ±5%	N-0371EQC	0002 8733
R113	Carbon film 100ohm 1/5W ±5%	N-0132EQC	0002 8723
R114	Carbon film 330kohm 1/5W ±5%		0002 9005
R115	Carbon film 10kohm 1/5W ±5%	N-0281EQC	0002 8729
R116	Carbon film 120kohm 1/5W ±5%	N-0375EQC	0002 8953
R117	Carbon film 15kohm 1/5W ±5%	N-0297EQC	0002 9002
R118	Carbon film 2.2kohm 1/5W ±5%	N-0216EQC	0002 8727
R119	Carbon film 390kohm 1/5W ±5%	N-0414EQC	0002 8961
R120	Carbon film 39kohm 1/5W ±5%	N-0330EQC	0002 8738
R121	Carbon film 680kohm 1/5W ±5%	N-0433EQC	0002 9020
R122	Carbon film 68ohm 1/5W ±5%	N-0111EQC	0002 9100
R123	Carbon film 22kohm 1/5W ±5%	N-0311EQC	0002 8956
R124	Carbon film 1kohm 1/5W ±5%	N-0196EQC	0002 8726
R125	Carbon film 3.9kohm 1/5W ±5%	N-0237EQC	0002 9059
R126	Carbon film 470kohm 1/5W ±5%	N-0423EQC	0002 8948
R127	Carbon film 68ohm 1/5W ±5%	N-0111EQC	0002 9100
R128	Carbon film 100kohm 1/5W ±2%		0002 9272
R129	Carbon film 10kohm 1/5W ±5%	N-0281EQC	0002 8729
R130	Carbon film 100kohm 1/5W ±2%		0002 9272
R131	Carbon film 100ohm 1/5W ±5%	N-0132EQC	0002 8723
R132	Carbon film 33ohm 1/5W ±5%	N-0087EQC	0002 9012

Transistors

T1, T2	2SC1740SQ, NPN	2SC-174DSQ	2220 1395
T3	2SB824S, PNP	2SB-824S	2210 6261
T4	2SC2060R, NPN	2SC-2060	2220 2632
T5	2SA933SQ, PNP	2SC-933SQ	2200 3721

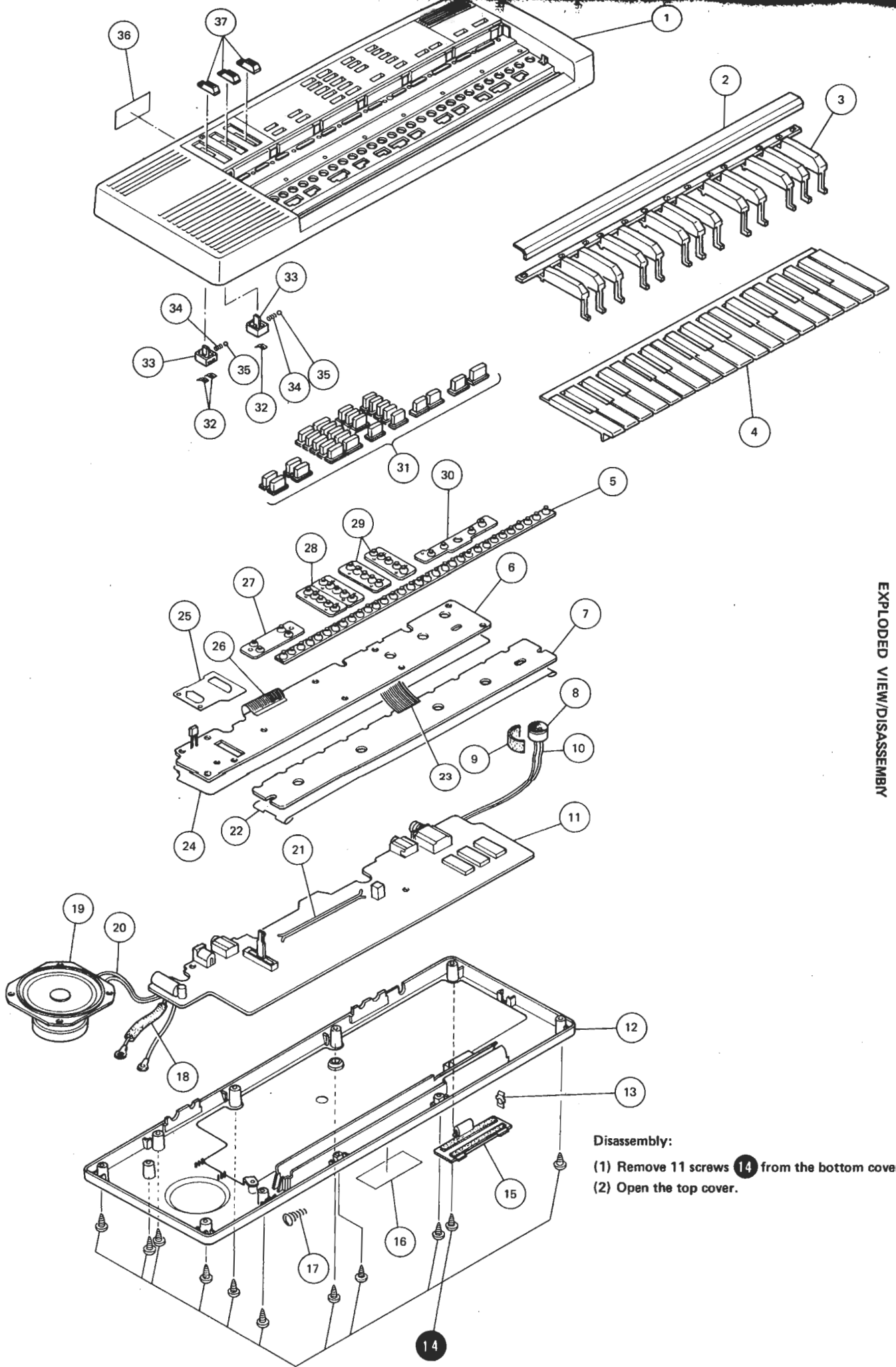
Ref. No.	Description	Radio Shack Part Number	Manufacturer's Part Number
T6	2SC2060R, NPN	2SC-2060	2220 2632
T7	2SC1740SQ, NPN	2SC-174DSQ	2220 1395
T8	2SA934R, PNP	2SA-934R	0002 9175
T9	2SC1740SQ, NPN	2SC-174DSQ	2220 1395
T10	2SK105E, FET	2SK-105E	0002 9076
T11~T23	2SC1740SQ, NPN	2SC-174DSQ	2220 1395
T24, T25	2SC1740LNSR, NPN	2SC-1740LNSR	0002 8740

Trimmer Capacitor

VC1	150pF, 50V, VCT84K	C-1866	2898 0007
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MECHANICAL PARTS LIST

Ref. No.	Description	Radio Shack Part Number	Manufacturer's Part Number
1	Case subass'y, Top, M2133*2	Z-1142	8424 0041
2	Panel, Keyboard, M21282-1	Z-1161	6907 0310
3	Set of keys, Black, M1844-1	K-0861	6907 0160
4	Set of keys, White, M1843-1	K-0860	6907 0150
5	Rubber, Contact, Keyboard, M31953-1	HC-4304	6907 0300
6	PCB ass'y, Console M3129-CN1M	XB-1388	9424 0042
7	PCB ass'y, Keyboard M3129-KY1M	XB-1389	9424 0043
8	Microphone, WM-034CY	M-1021	3830 9021
9	Sponge, for Microphone, M42612A-1		6907 0321
10	Wire, for Microphone, M42739-3		6907 4540
11	PCB ass'y, Main control, M3129-MA1M	XB-1387	9424 0041
12	Case subass'y, Bottom, M21334*1	Z-1163	8424 0046
13	Spring, Contact, Battery, (+), A42606A-1	B-0652	6345 2238
14	Hardware kit	HW-4204004	8424 0047
14-1	Screw, Tapping, (+), 2.6x10		5150 1089
15	Cover, Battery, M31417A*8	DB-0497	6905 8341
16	Plate, Rating, U.S.A.		8424 0047
	CANADA		8424 0048
	TANDY		8424 0049
17	Spring, Contact, Battery, (-), M42382-1	B-0932	6912 2630
18	Sponge, for Keyboard, M4918-1		6910 3840
19	Speaker, 4ohm, EAS-8P109H	SP-5346	3831 0014
20	Wire, for Speaker, M42739-2		6907 4530
21	Wire, for PCB ass'y, M3129-MA1M, M42739-1		6907 1080
22	Plate, Shield, for PCB ass'y, M21391-1		6907 4550
23	Joiner, 12 pins, for PCB-KY1M, SMVJU-12-105M	W-3478	3717 0014
24	Plate, Shield, for PCB ass'y, M21392A-1		6907 4561
25	Spacer, under Board-slide, M42610-1	HC-4306	6907 0070
26	Joiner, 20 pins, for PCB-CN1M, SMVJU-20-55M	W-3477	3717 0007
27	Rubber, Contact, 4 contacts aligned horizontally, M42606-1	HC-4307	6907 0100
28	Rubber, Contact, 10 contacts, M42607-1	HC-4308	6907 0110
29	Rubber, Contact, 5 contacts, M42607-2	HC-4309	6907 0120
30	Rubber, Contact, 4 contacts, M42608-1	HC-4310	6907 0130
31	Set of buttons, 14 pcs, M32105*1	K-0863	6907 0060
32	Spring, Contact, for Sliding knob, M42184-1	S-8044	6911 9160
33	Board, Slide, for Sliding knob, Power-switch, Mode-switch, M31673-1	HC-4305	6911 9150
34	Spring, for Sliding knob, M4491-1	RB-9296	6190 0480
35	Bearing, Ball, SUS 304 2 Pi	HC-0556	5580 1274
36	Seal, Polarity, +/-		8424 0042
37	Knobs, Sliding, M32084-1	K-0862	6907 0290

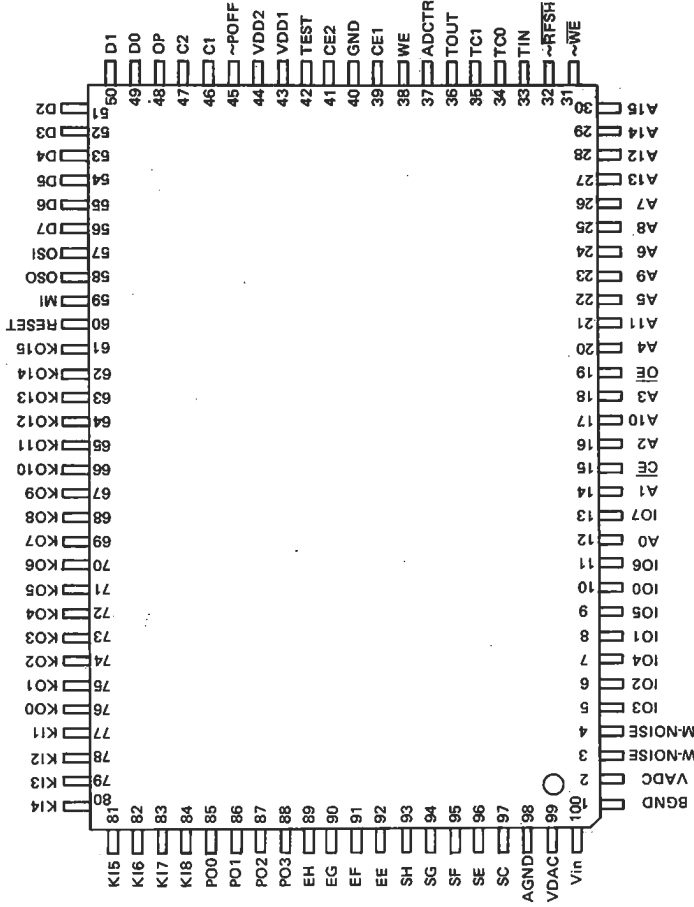


EXPLODED VIEW/DISASSEMBLY

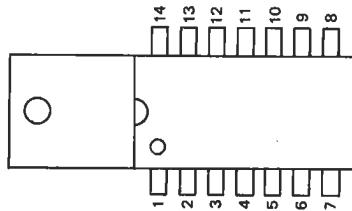
Disassembly:
 (1) Remove 11 screws 14 from the bottom cover.
 (2) Open the top cover.

IC AND TRANSISTOR LEAD IDENTIFICATION

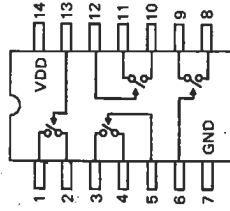
LSI 1: MSM6283-01GS



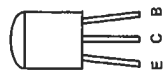
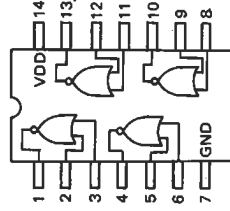
IC1: LA4138



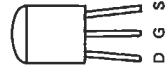
IC2: TC50H4066



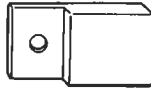
IC3: TC74HC02



25C1740
25C2060
25A933
25A934

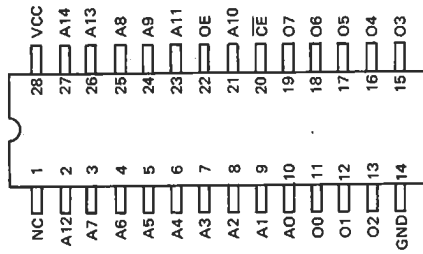


25K105F

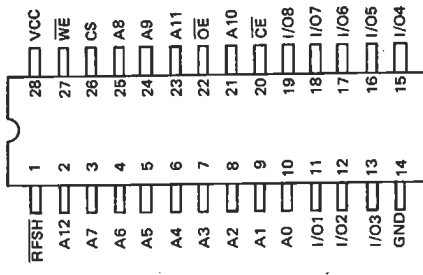


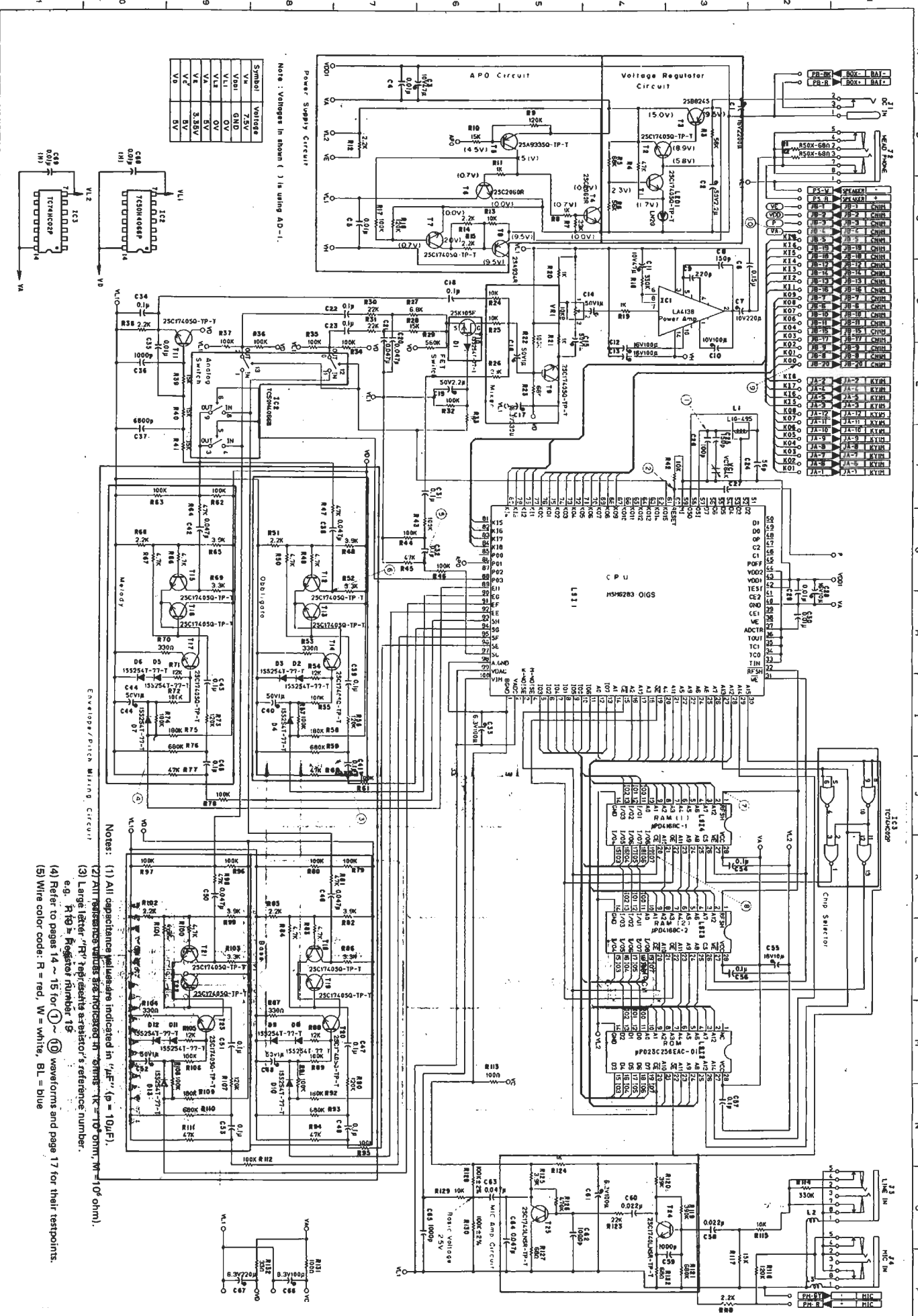
25B824

LSI 2: μ PD23C256EAC-011



LSI 3, 4: μ PD4168C

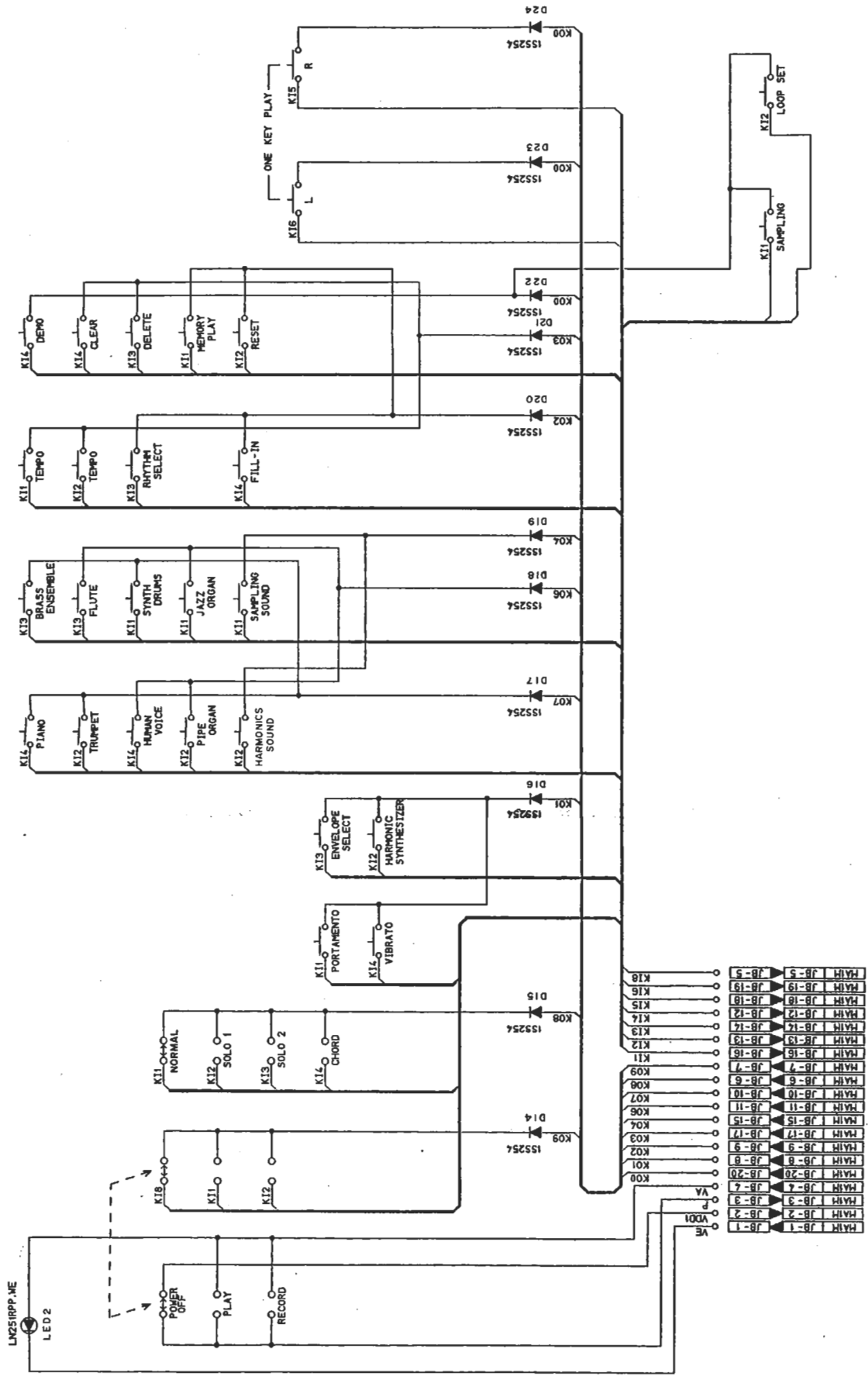


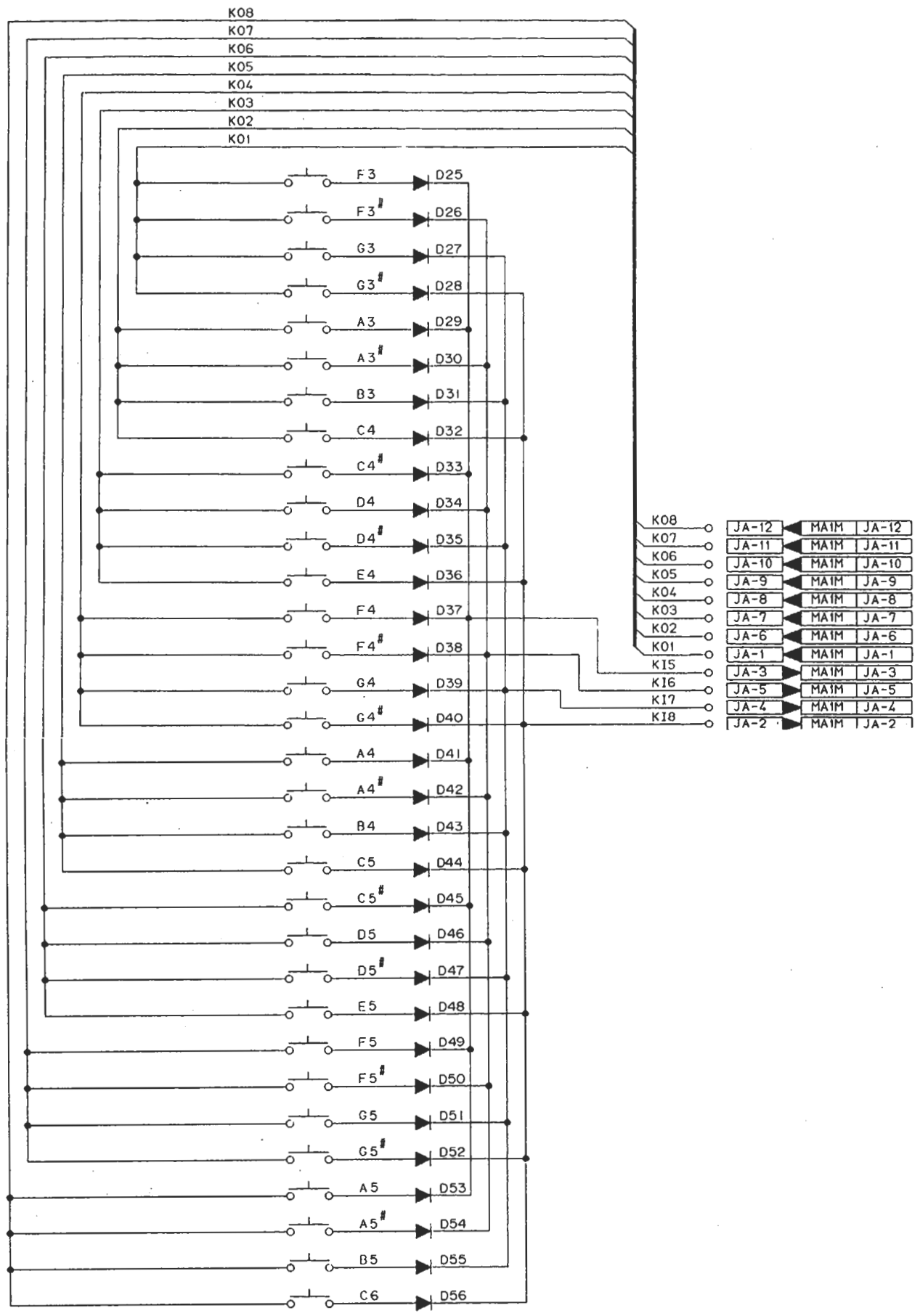


Symbol	Value
V1	73V
V2	73V
V3	73V
V4	73V
V5	73V
V6	73V
V7	73V
V8	73V
V9	73V
V10	73V
V11	73V
V12	73V
V13	73V
V14	73V
V15	73V
V16	73V
V17	73V
V18	73V
V19	73V
V20	73V

Note: Voltages in sheet (1) is using AD-1.

Notes: (1) All capacitance values are indicated in μF (e.g. = 10 μF).
 (2) All capacitance values are indicated in μF (e.g. = 10 μF).
 (3) Large letter "R" represents a resistor's reference number.
 e.g. R10 = Resistor number 10
 (4) Refer to pages 14 ~ 15 for (1) ~ (10) waveforms and page 17 for their responses.
 (5) Wire color code: R = red, W = white, BL = blue





0 5 4 3 2 1

0 5 4 3 2 1

RADIO SHACK, A DIVISION OF TANDY CORPORATION

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CANADA: BARRIE, ONTARIO L4M 4W5

TANDY CORPORATION

AUSTRALIA

**91 KURRAJONG AVENUE
MOUNT DRUITT, N.S.W.2770**

BELGIUM

**RUE DES PIEDS D'ALOUETTE, 39
5140 NANINNE(NAMUR)**

FRANCE

**BP 147-95022
CERGY PONTOISE CEDEX**

U.K.

**BILSTON ROAD WEDNESBURY
WEST MIDLANDS WS107 JN**