

KORG®



REMOTE KEYBOARD

SERVICE MANUAL RK-100

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KEIO ELECTRONIC LABORATORY CORPORATION
TOKYO/JAPAN

1. SPECIFICATIONS

Keyboard:	41 Keys (C–E)	Input Jack:	DC-IN
Octave:	H (60–100 at MIDI) M (48–88 at MIDI) L (36–76 at MIDI)	Output Jack:	MIDI out (DIN socket)
Matched Model:	MIDI equipped synthesizer	Strap Pins:	2
Program Select:	Program number 0–63 at MIDI	Power Supply:	UM-3 X 6/AC adaptor (9V, 100mA minimum)
Program Number Display:	LED Bank ➔ 8 (Green) Program ➔ 7 (Red)	Dimensions:	1,110(W) X 293(D) X 69(H) mm
Control:	Pitch bend wheel (Up, Down) Modulation wheel (0–10) Volume wheel (0–10) Program up switch Program down switch Octave switch (H/M/L) Modulation destination 1 (Modulation wheel/Joy stick + Y direction) 2 (Joystick – Y direction) Program select (1-1–8-8, 0–63 at MIDI)	Weight:	4.4kg (with battery)
		Accessories:	Batteries (UM-3 X 6) MIDI cable (5m)

2. MIDI IMPLEMENTATION

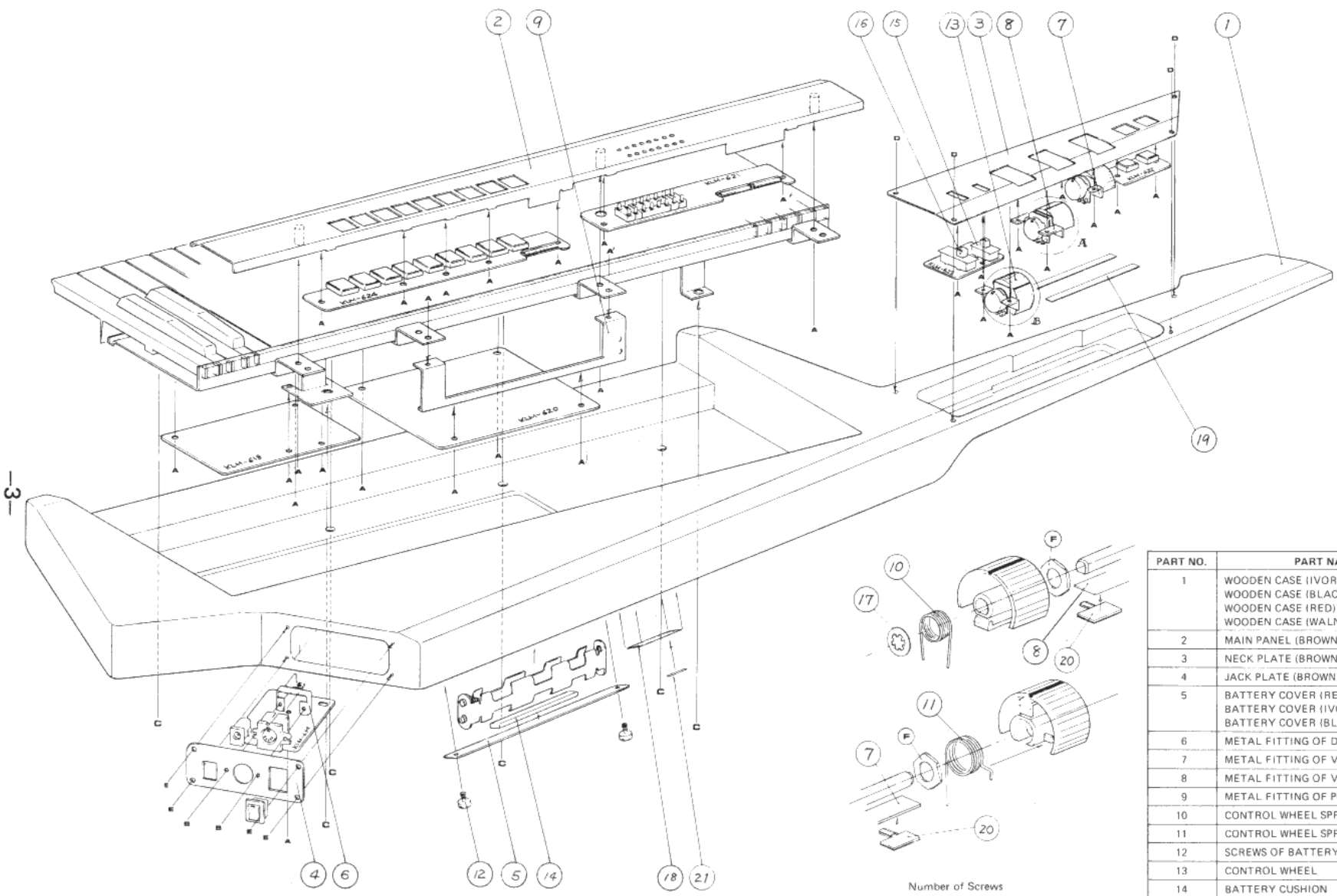
Transmitted data

Status byte	2nd byte	3rd byte	Description
1 0 0 1 0 0 0 0	0 k k k k k k k	0 0 0 0 0 0 0 0	Note Off event 90 – 00
1 0 0 1 0 0 0 0	0 k k k k k k k	0 1 0 0 0 0 0 0	Note On event 90 – 40
1 0 1 1 0 0 0 0	0 0 0 0 0 0 0 1	0 v v v v v v v	Modulation 1 B0 01 –
1 0 1 1 0 0 0 0	0 0 0 0 0 0 1 0	0 v v v v v v v	Modulation 2 B0 02 –
1 0 1 1 0 0 0 0	0 0 0 0 0 1 1 1	0 v v v v v v v	Output Volume B0 07 –
1 1 0 0 0 0 0 0	0 0 p p p p p p	_____	Program change C0 –
1 1 1 0 0 0 0 0	0 0 0 0 0 0 0 0	0 b b b b b b b	Pitch bend E0 00 –
1 1 1 1 1 1 1 0	_____	_____	Active Sensing FE

Note:

- When power is turned on, the RK-100 sends program change (0 on MIDI), modulation, volume, and pitch bend control change data according to positions of controls on RK-100.
- Note number (kkkkkkk) can be changed by the octave selector.
L = 36-76: M = 48-88: H = 60-100.
24-40H 30-58H 36-64H
- Destination switch position has the following effects.
At "1": MG wheel controls joystick +Y direction or modulation wheel on a 2-wheel equipped synth.
At "2": MG wheel controls joystick –Y direction only.
- Program number (pppppp) covers the range of 0-63 MIDI.
- Output volume (vvvvvvv) range is 0-127 MIDI.
- Active sensing is sent every 200msec.

3. STRUCTURAL DIAGRAM

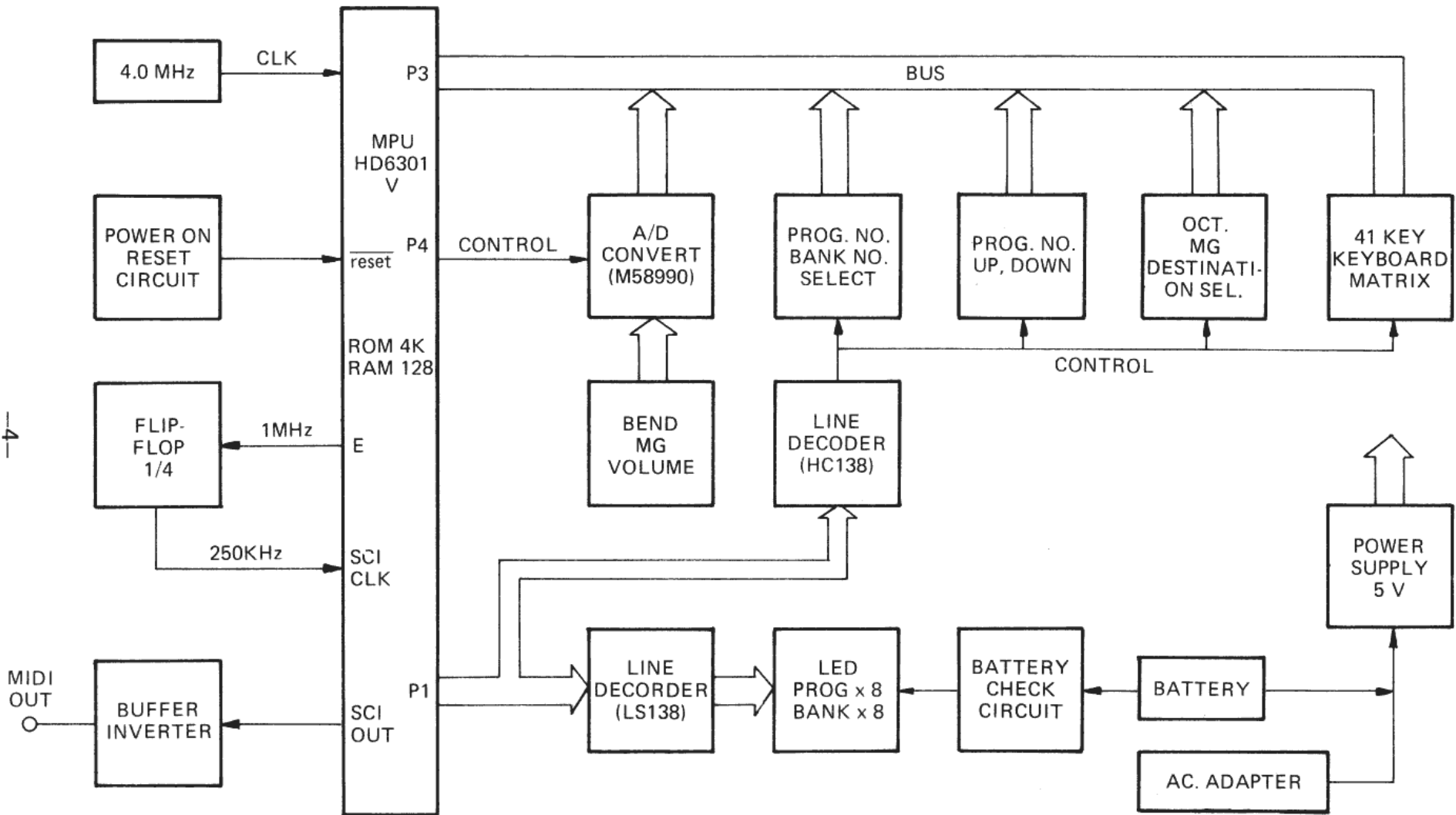


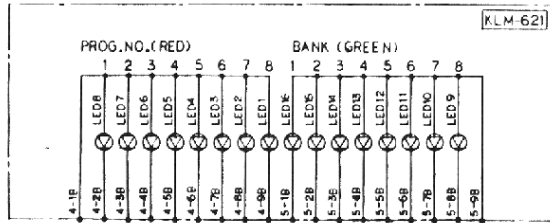
Number of Screws

A	FE	B	ZMC	3x6	31pcs
B	FE	B	BZMC	3x8	2pcs
C	FE	B	BZMC	5x16	6pcs
D	WS	O	BZMC	3.1x13	4pcs
E	WS	R	BZMC	3.1x13	4pcs
F	VN	ZMC	M7		3pcs

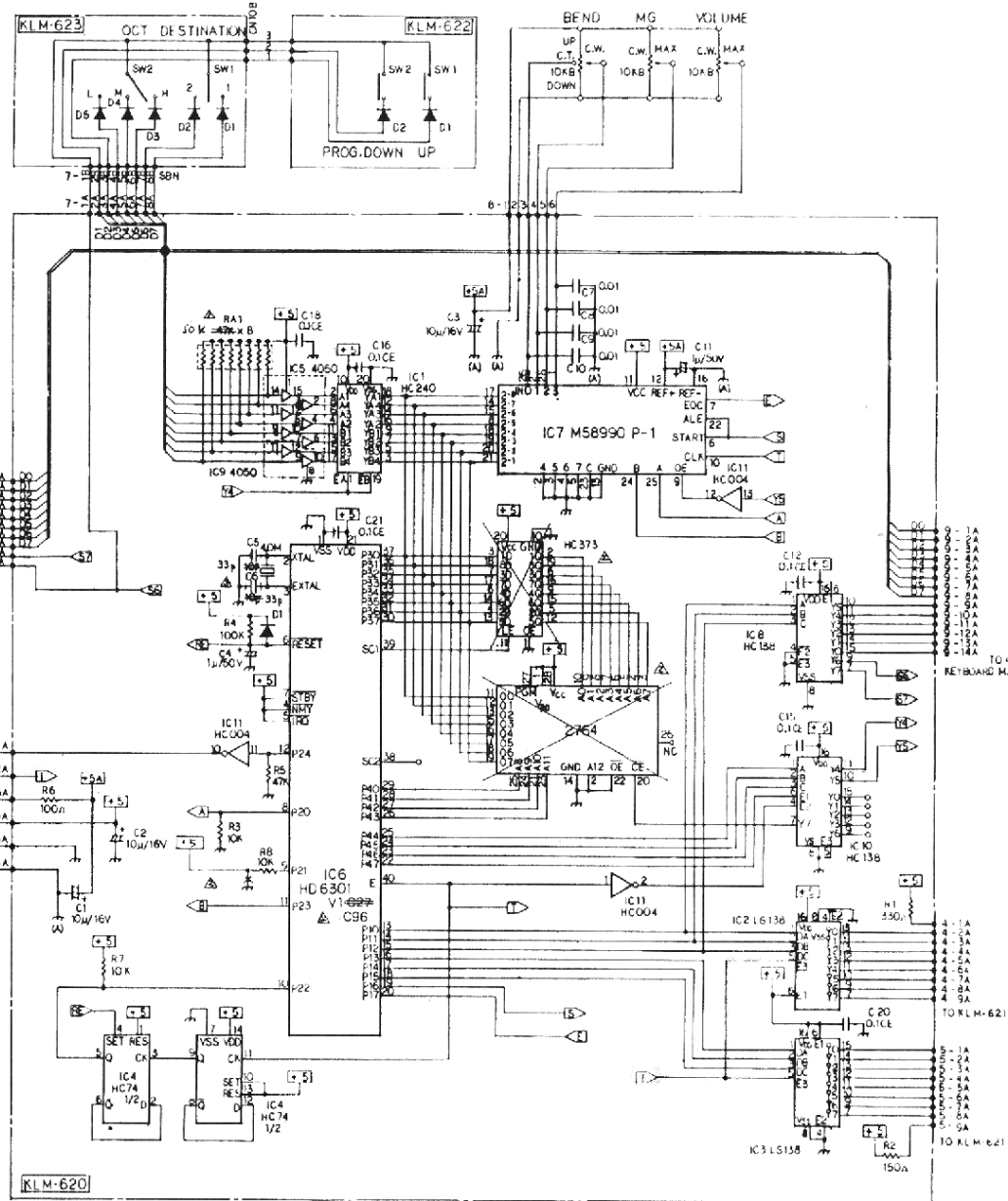
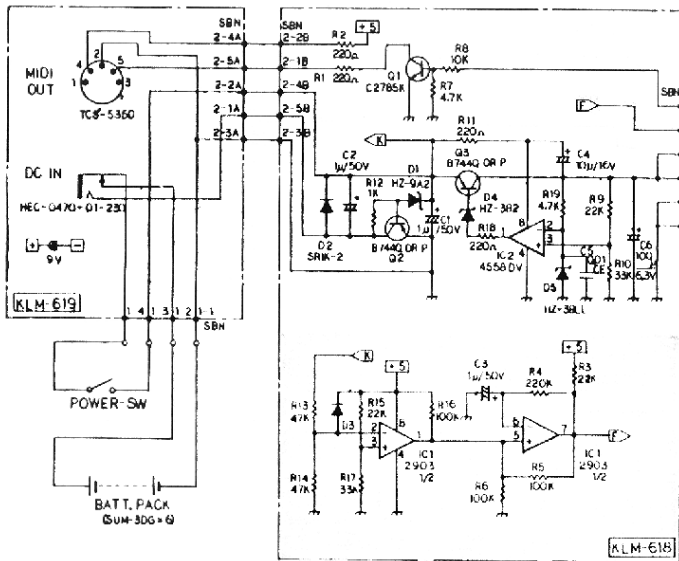
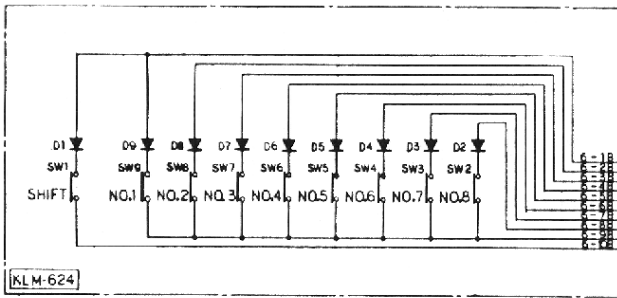
PART NO.	PART NAME	PART CODE
1	WOODEN CASE (IVORY) WOODEN CASE (BLACK) WOODEN CASE (RED) WOODEN CASE (WALNUT)	64508600 64508601 64508602 64508603
2	MAIN PANEL (BROWN)	64064701
3	NECK PLATE (BROWN)	64064801
4	JACK PLATE (BROWN)	64064901
5	BATTERY COVER (RED) BATTERY COVER (IVORY) BATTERY COVER (BLACK)	64065001 64065002 64065003
6	METAL FITTING OF DIN JACK	64065100
7	METAL FITTING OF VR (A)	64065300
8	METAL FITTING OF VR (B)	64065301
9	METAL FITTING OF PC BOARD	64065200
10	CONTROL WHEEL SPRING (A)	64905600
11	CONTROL WHEEL SPRING (B)	64905601
12	SCREWS OF BATTERY COVER	64402400
13	CONTROL WHEEL	64618900
14	BATTERY CUSHION	50009200
15	SLIDE SW MASK	55005400
16	SLIDE SW KNOB	62001600
17	STOPPER WASHER	54010300
18	MODEL NUMBER SEAL	58020800
19	ADHESIVE TAPE ON BOTH SIDES	
20	CORD KEEP PM-105	54010200
21	SERIAL NUMBER SEAL	40050

4. BLOCK DIAGRAM



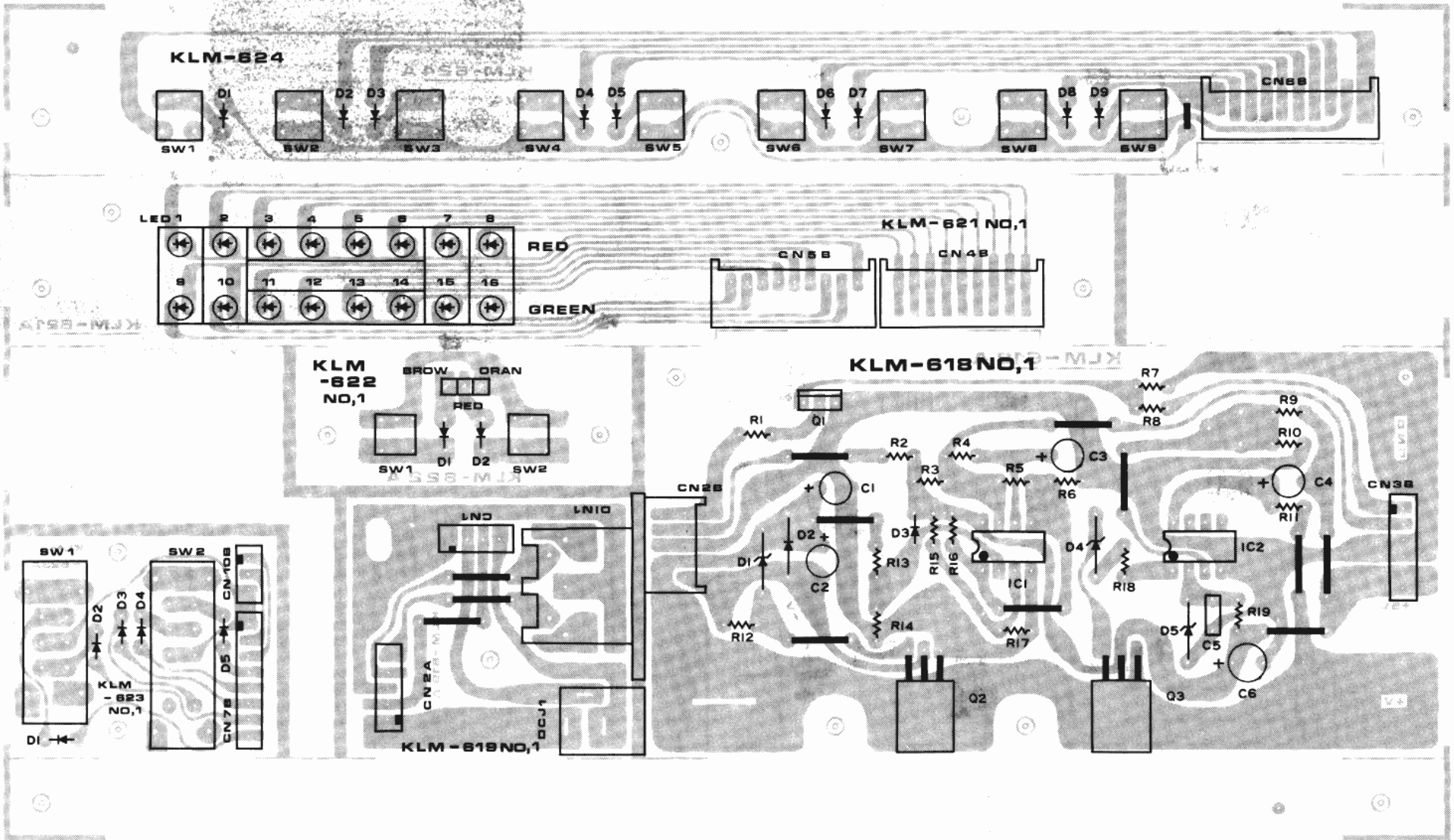


FILM CONDENSER'S RANK IS K.
USE 1SS-133 DIODES WITHOUT DESIGNATION.

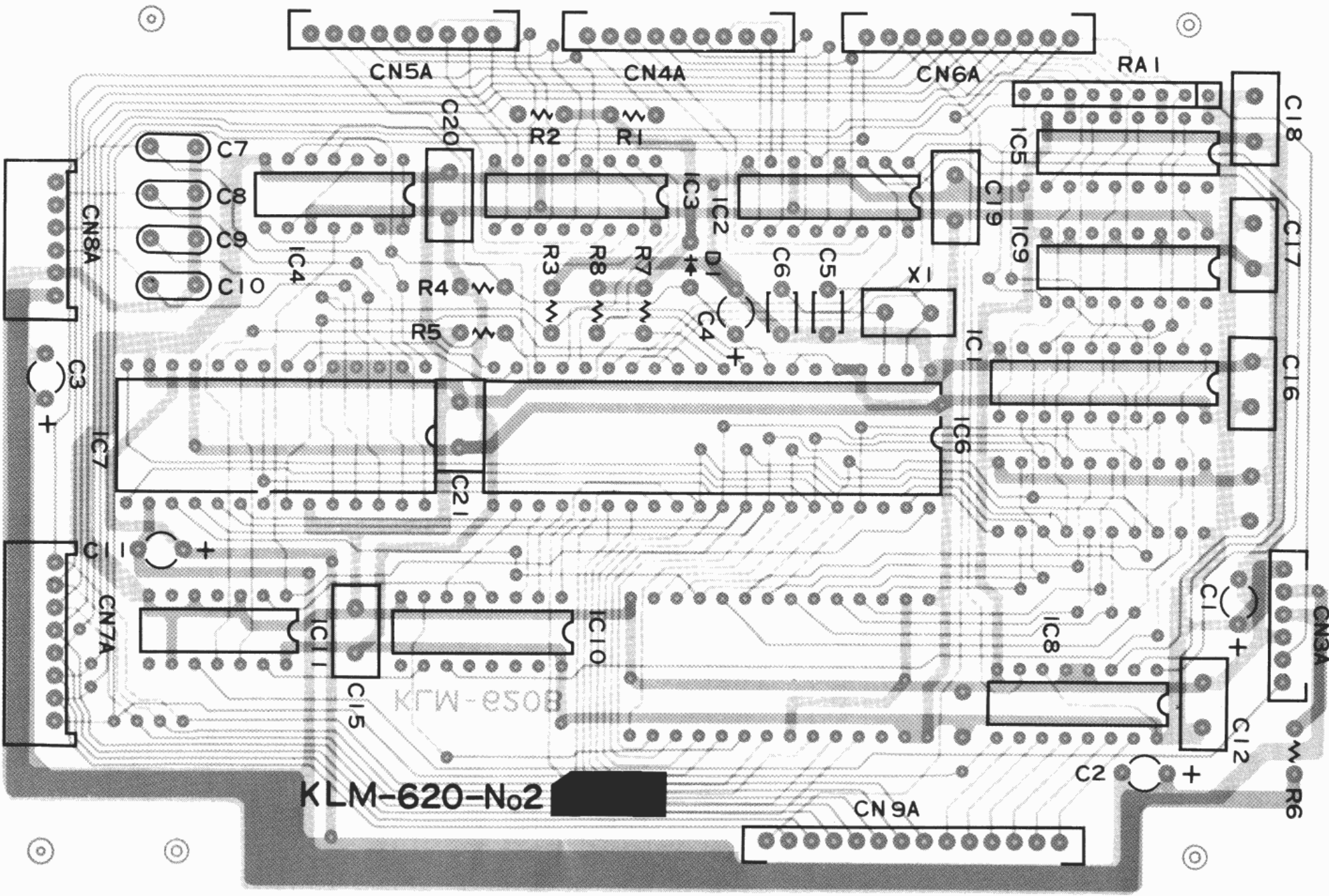


△; MODIFICATION

1. Modification of CPU mask eliminates necessity of external ROM about CPU; CPU 6303R can be used as a direct replacement of CPU 6301-C27. In this case external ROM must be used, and port (P21) of this CPU (6303) should be connected to GND through 10kΩ.



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7. CIRCUIT DESCRIPTIONS

The seven basic sections of the RK-100 are (1) the micro-computer CPU, (2) memory, (3) A-D converter, (4) input, (5) display, (6) MIDI data output, and (7) power supply. We are going to simply explain as follows.

(1) CPU

IC6 (HD6301) is an 8-bit microcomputer with internal 4K ROM and 128 RAM; it has the following four kinds of PORT.

Port	Term	Type	Function
Port 1 (P10–P17) 8-bit	P10–P15	Output	Scan address of program indicator, keyboard matrix and shift sw.
	P16	Output	A-D converter conversion start signal. Fig-1
	P17	Input	A-D converter conversion completion signal. Fig-2
Port 2 (P20–P24) 5-bit	P20	Output	A-D converter address signal. Fig-3
	P21	Input	Selection of internal or external memory.
	P22	Input	250kHz clock signal (8 times MIDI clock frequency 31.25kHz) Fig-4
	P23	Output	A-D converter address signal. Fig-5
	P24	Output	MIDI signal.
Port 3 (P30–P37) 8-bit	P30–P37	Input/output ports	A-D multiplex bus (Low order 8 bits of address and data bus).
Port 4 (P40–P47) 8-bit	P40–P43	Output	μ PD2764 address signal.
	P44–P47	Output	Selects IC using data bus (HC240, M58990, μ PD2746).

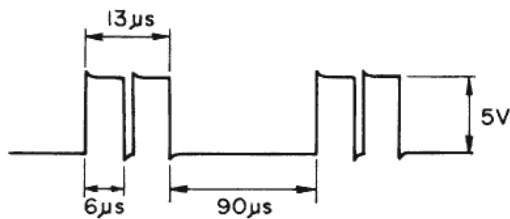


Fig-1 A/D Converter Conversion Start Signal

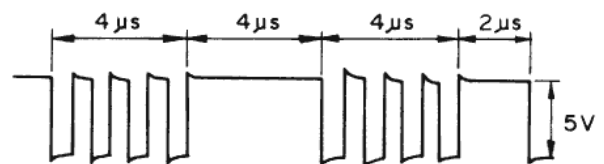


Fig-2 A/D Converter Conversion Completion Signal

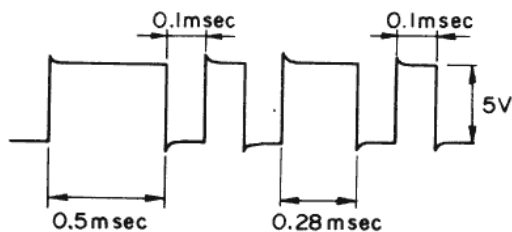


Fig-3 A/D Converter Address Signal



Fig-4 Clock Signal

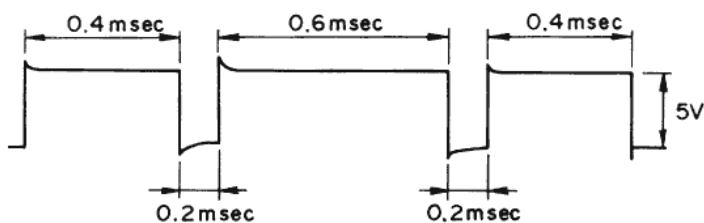
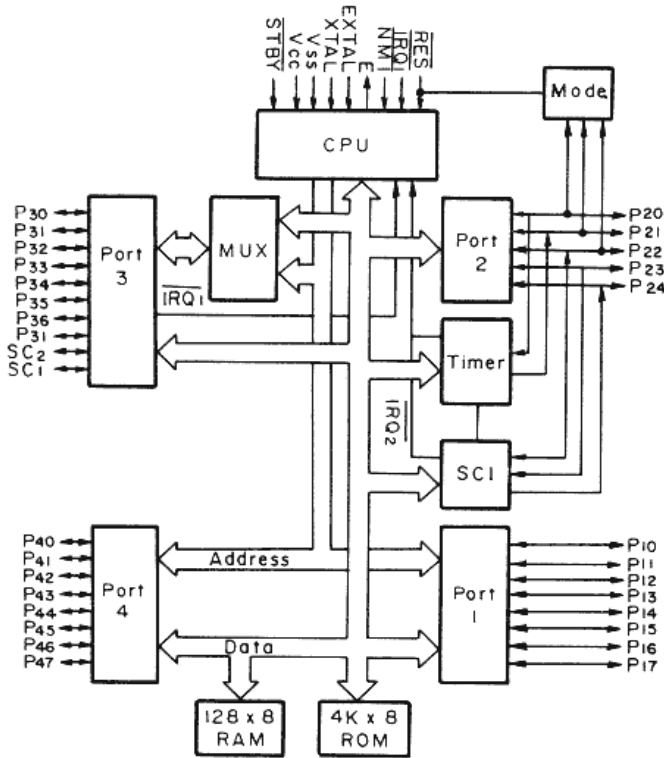


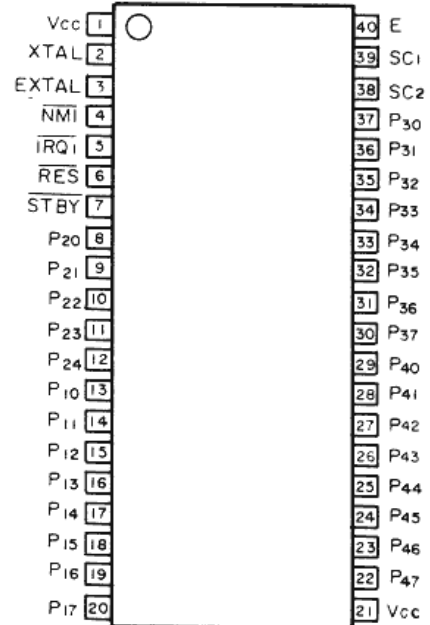
Fig-5 A/D Converter Address Signal

The CPU of the RK-100 runs at 1MHz. The CPU reads in VR A/D data at any time. For sending out the MIDI signal from the output port P24, intervals of at least 5ms are secured.

BLOCK DIAGRAM



PIN CONFIGURATION



Terminal Function

Term	Function
VCC, VSS	These two pins are connected to power supply and ground.
XTAL, EXTAL	These two pins are clock supply terminals for the internal oscillator circuit. A 1/4 divider produces the unit's 1MHz system clock.
E	Enable terminal for 1MHz system clock output.
RESET	For resetting the CPU. Requires a minimum of 20msec low signal level, thereby determining the time constant of the externally connected reset circuit.
IRQ	Interrupt request input terminal for detection of sync input start/stop control signal (high to low pulse).
SC1	Address strobe signal output terminal. This signal controls LS373 which is used to latch the least significant 8 bits of the address multiplexed with data output at port 3.
P10–P17 P20–P24 P30–P37 P40–P47	These terminals function as IO ports, address buses, or data buses depending on the operating mode and software.

(2) Memory section

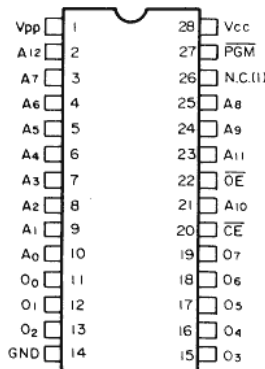
2764 is a programmable read only memory chip (erasable by ultraviolet radiation). The capacity of this EPROM is 65,536 bits (8192 words × 8).

A0–A11 are for address input; 00–07 are for data input/output. Read mode is selected when CE (chip enable) is 0 and OE is 0.

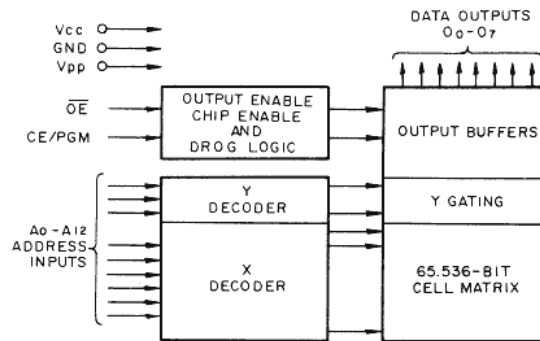
The standby mode is selected when CE = 1, regardless of the condition of OE. In this case, 00–07 go to high impedance. It is impossible to output data.

From the CPU, control signal goes to IC10 (HC138), the Y7 output of IC10 controls the CE of μ PD2764. When HC373, using a D-type latch, sets the LE control input to high level, data is output as is; data is retained when this is at low level. CPU port 3 is a TDM address and data bus so HC373 is used, distributing data among A0–A7 of μ PD2764.

**2764
PIN CONFIGURATION**



BLOCK DIAGRAM



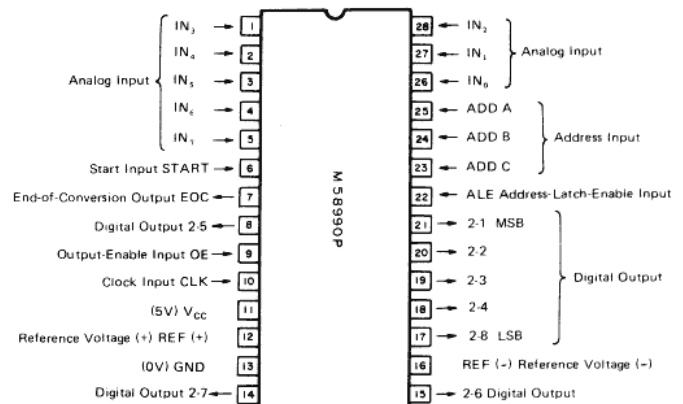
PIN NAMES

A ₀ - A ₁₂	ADDRESSES
CE	CHIP ENABLE
OE	OUTPUT ENABLE
O ₀ - O ₇	OUTPUTS
PGM	PROGRAM
N.C.[1]	NO CONNECT

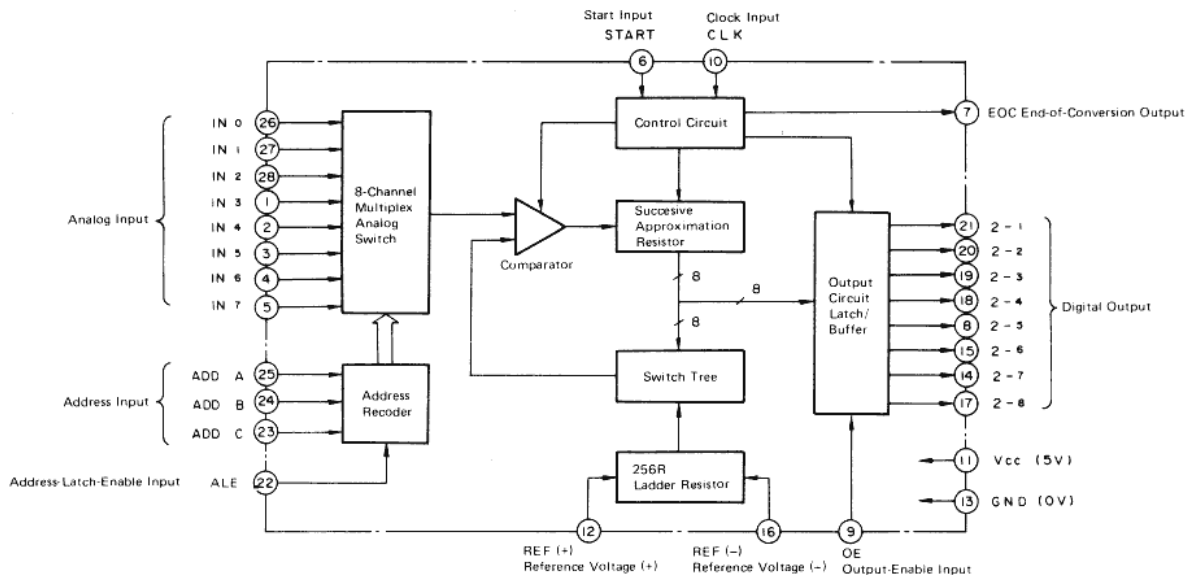
(3) A-D Converter

IC7 (M58990P) converts analog signals into 8-bit digital data; it has an internal multiplexer that selects 8-channel analog input. BEND, MG, and VOLUME analog values are received from IN0, IN1, IN2, IN3; when the M58990P OE terminal is high, the digital signal is output from 2-1 and through 2-8 and input to CPU port 3 (P30–P37). Conversion is initiated by the conversion start signal from CPU port 1, (P16) and a conversion end signal is output from the EOC terminal when conversion has finished; this goes to CPU port 1, (P17). The A-D converter uses the same 1MHz clock signal as of the CPU machine cycle.

PIN CONFIGURATION



BLOCK DIAGRAM



Functional Description of Terminals

Terminal Code	Name	I/O	Function
IN ₀ – IN ₇	Analog signals	I	These are the input terminals for analog signals. ADD A – ADD C determine which of the 8 inputs will be selected. The analog voltage applied to these terminals is converted to a digital value then output at terminals 2 ⁻¹ to 2 ⁻⁸ .
ADD A – ADD C	Address signals	I	These are the input terminals that select a terminal among IN ₀ to IN ₇ . The address input of ADD A to ADD B is read to the address latch at the rising edge of ALE.
ALE	Address Latch Enable signal	I	The strobe signal for reading the address signals input to ADD A through ADD C into the internal address latch.
REF (+)	Reference voltage (+)	I	The reference voltage input terminal. The voltages of the (REF (+) voltage > REF (-) voltage) REF (-) terminal and this terminal cause voltage to be applied to the internal 256R ladder circuit.
REF (-)	Reference voltage (-)	I	The reference voltage input terminal. The voltages of the (REF (+) voltage > REF (-) voltage) REF (+) terminal and this terminal cause voltage to be applied to the internal 256R ladder circuit.
OE	Output Enable signal	I	The control terminal for the digital data output terminal. When OE is "L", the terminals 2 ⁻¹ to 2 ⁻⁸ assume a floating status; when "H", digital data is output.
2 ⁻¹ – 2 ⁻⁸	Digital signal	O	The analog signals input to IN ₀ to IN ₇ are converted to digital data then output at these terminals. When OE is "L", these terminals assume a floating status; when "H", valid data is output. 2 ⁻¹ is the MSB and 2 ⁻⁸ is the LSB.
EOC	Convert End signal	O	This terminal indicates the end of A–D conversion. It is reset ("H" → "L") by the START signal, and is set ("L" → "H") by the end of conversion. EOC is normally used as the interrupt signal to the CPU.
START	Convert Start signal	I	This terminal signals the start of conversion. When rising from "L" to "H", the internal registers are reset by successive approximation. Conversion starts at the falling of "H" to "L".
CLK	Clock input	I	This is the clock input terminal that is the basis for internal timing.

(4) Input section

Key data goes through a 41 diode matrix circuit, and through IC5 (14050) and IC1 (HC240) before reaching the CPU. Likewise, PROGRAM NO., OCT DESTINATION, and PROGRAM DOWN UP data reach the CPU via HC240 (buffer amp).

(5) Display

Data from the CPU goes through IC2 (LS138) and IC3 (LS138) to operate display of PROGRAM NO. (red) and BANK (green).

IC2, 3, 8, 10, (TC-40H138) are a line decoder performing selection of one of 8 outputs Y0–Y7 using binary inputs DA, DB, DC.

Selection is inhibited when E3 pin-5 is at high level, and all outputs are up to high level.

(6) MIDI data output

The output signal from CPU port 1 (P24) goes through IC11 HC004 (inverter buffer) and Q1 2SC2785 for inversion, becoming the MIDI OUT signal.

(7) Power supply

While a 3-terminals regulator set in a normal stabilized voltage circuit is operated by 2–3 volts difference of input voltage, the regulator in RK-100 can be operated by only 0.1 volt difference of input voltage for effective use of batteries.

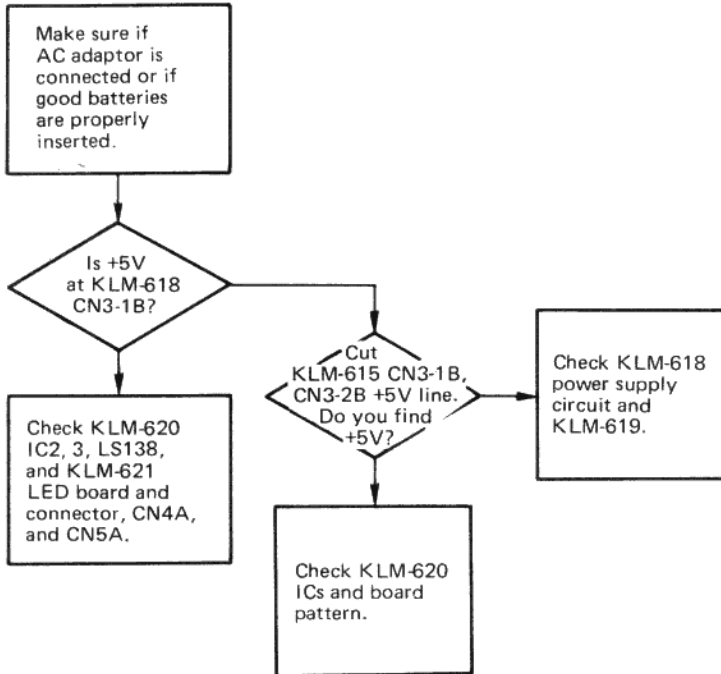
This produces a stable +5V power supply voltage whether using the external AC adaptor or internal vatteries (1.5V × 6).

If input voltage drops from 9V to 6V, this circuits produces a battery down indication via the IC1 (2903) comparator which detects the voltage drop and sends a signal to activate the IC1 (2903) multivibrator circuit into oscillation. This oscillator signal goes through IC2 LSI38 and IC3 LSI38 to illuminate the LED display.

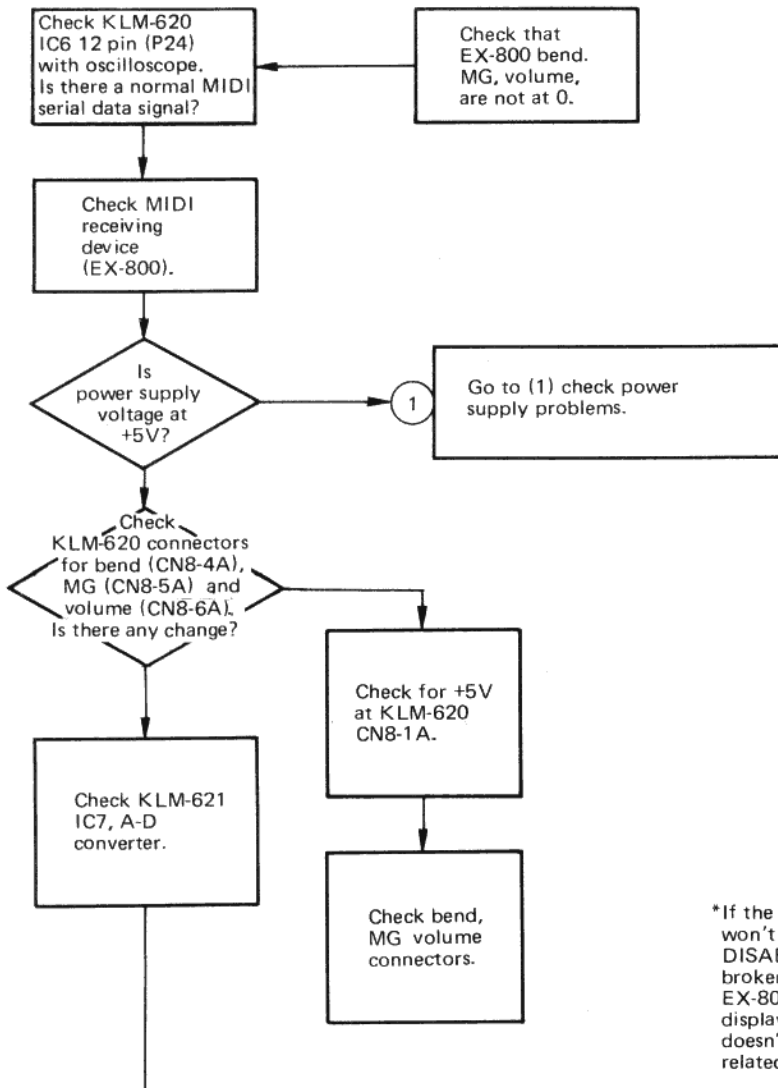
8. TROUBLESHOOTING CHART

RK-100 Troubleshooting Chart (for the RK-100 connected to the EX-800 with a MIDI cable)

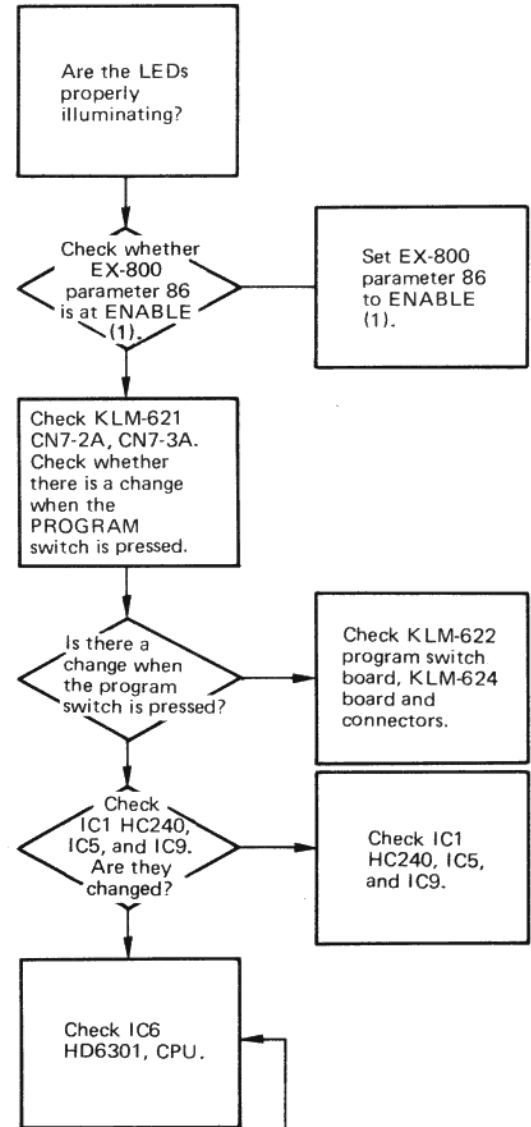
1 No power (LEDs not illuminated).



3 Bend, MG, volume, do not work.



2 No change in program no. & bank display.



*If the RK-100 is okay but the EX-800 won't work, it might be set to DISABLE or the MIDI cord may be broken. On the other hand, if the EX-800 works okay but the RK-100 display or other part of the RK-100 doesn't work, then check the circuitry related to that section.

9. PARTS LIST

PARTS CODE	PARTS NAME SPECIFICATIONS	P.C. BOARD	IDENTIFICATION NO. FUNCTION	Q'TY
CARBON RESISTORS				
10416310	1/6JTP 100Ω	KLM-620		1
10416315	1/6JTP 150Ω			1
10416322	1/6JTP 220Ω	KLM-618-4		4
10416333	1/6JTP 330Ω	KLM-620		1
10416410	1/6JTP 1.0K	KLM-618-4		1
10416447	1/6JTP 4.7K			2
10416510	1/6JTP 10K			1
		KLM-620		3
10416522	1/6JTP 22K	KLM-618-4		3
10416533	1/6JTP 33K			2
10416547	1/6JTP 47K			2
		KLM-620		1
10416610	1/6JTP 100K	KLM-618-4		3
		KLM-620		1
10416622	1/6JTP 220K	KLM-618-4		1
BLOCK RESISTOR				
13508510	RKC1/8B8J 10K	KLM-620		1
MYLAR CAPACITOR				
20402510	50V 0.01μF K	KLM-620		4
CERAMIC CAPACITOR				
21452330	50V 33pF TP	KLM-620		2
21455100	50V 0.01μF TP	KLM-618-4		1
21456100	25V 0.1μF TP	KLM-620		8
ELECTROLYTIC CAPACITORS				
25441310	6.3V 100μF	KLM-618-4		1
25443210	16V 10μF			1
		KLM-620		3
25446110	50V 1μF	KLM-618-4		3
		KLM-620		2
TRANSISTOR				
30100328	TR 2SB744 A P/Q	KLM-618-4		2
30420020	TR 2SC2785 K TN			1

PARTS CODE	PARTS NAME SPECIFICATIONS	P.C. BOARD	IDENTIFICATION NO. FUNCTION	Q'TY
DIODES				
31001500	SR1K-2	KLM-618-4		1
31401300	1SS-133 T-77			17
		KLM-620		1
LED				
31204300	LED SLP-181B Red	KLM-618-4		8
31204400	LED SLP-281B Green			8
ZENER DIODES				
31422600	HZ-9A2-TD	KLM-618-4		1
31422900	HZ-3BLL-TD			1
31423000	HZ-3B2-TD			1
IC				
32003068	TC74HC74	KLM-620	Dual D-type flip flop	1
32003104	TC74HC04 P		Hex inverter	1
32003137	TC74HC138 P		3 line to 8 line decoder	2
32003167	TC74HC240 P		Octal buffer (inverted)	1
32004016	HD-14050 BP		Hex buffer (Non inverted)	2
32004080	HD-6301V1C96 P		CPU	1
32009001	NJM-4558D-V	KLM-618-4	OP AMP	1
32009015	NJM-2903 D		OP AMP	1
32011036	M58990 P-1	KLM-620	A/D converter	1
32021033	SN-74LS138		3 line to 8 line decoder	2
CERAMIC OSCILLATOR				
33501400	KBR-4.0MHZ	KLM-620		1
ROTARY VR				
36018200	VR K161100VR-10KB		Bend	1
36018400	VR K161100VIA-10KB		Volume, MG	2
SLIDE SW				
37301600	SSB-123014	KLM-618-4	Octave	1
37301700	SSB-122020		Destination	1
POWER SW				
37506600	WK-2A44	KI		1

PARTS CODE	PARTS NAME SPECIFICATIONS	P.C. BOARD	IDENTIFICATION NO. FUNCTION	Q'TY
PUSH SW				
37507000	TM1-01	KLM-618-4		11
KEY BOARD				
42002700	ESK-729			1
42203500	C			4
42203600	D			4
42203700	E			4
42203800	F			3
42203900	G			3
42204000	A			3
42204100	B			3
42204300	Black key			17
42205706	Key contact x 6			1
42205707	Key contact x 7			5
DC INPUT JACK				
45400300	HEC-0470-01-230	KLM-618-4		1
DIN JACK				
45403600	TCS5350-01-5011	KLM-618-4		1
HARNESSES				
47040301	HNS-303-01	KLM-618-4		1
47040302	HNS-303-02			1
47040303	HNS-303-03			1
47040304	HNS-303-04			1
47040305	HNS-303-05			1
47040306	HNS-303-06			1
47040307	HNS-303-07			1
47040308	HNS-303-08			1
47040309	HNS-303-09			1
47040310	HNS-303-10			1
CONNECTOR				
47160600	B6B-EH	KLM-620		1
47160900	B9B-EH			2
47161000	B10B-EH			1
47161400	B14B-EH			1
47260500	S5B-EH	KLM-618-4		1
47260600	S6B-EH	KLM-620		1

PARTS CODE	PARTS NAME SPECIFICATIONS	P.C. BOARD	IDENTIFICATION NO. FUNCTION	Q'TY
47260800	S8B-EH	KLM-620		1
47260900	S9B-EH	KLM-618-4		2
47261000	S10B-EH			1
BATTERY CUSHION				
50009200	8x15x100 KOC-F40306			1
BATTERY				
52000300	SUM-3DG 1.5V			6
CORD KEEP				
54005200	K-105G			2
54010200	PM-105			3
HARNES BAND				
54007200	PLT-1M			3
SPIRAL CLIP				
54008600	CS-8			1
BATTERY HOLDER				
54010000	AH-520			1
STOPPER WASHER				
54010300	CSTW-6			1
SLIDE SW MASK				
55005400	KOC-F40222			2
MODEL NUMBER SEAL				
58020800	RK-100 KOC-F40308			1
MIDI CORD				
60202000	5M			1

PARTS CODE	PARTS NAME SPECIFICATIONS	P.C. BOARD	IDENTIFICATION NO. FUNCTION	Q'TY
SLIDE SW KNOB				
62001600	SSB L=6 Black			2
PUSH SW KNOB				
62013900	22100304 Gray	KLM-618-4	Program No. 1 ~ 8 Shift Up, down	8
62013903	22100311 Light gray			1
62014000	21100204 Gray			2
MAIN PANEL				
64064701	Brown KOC-C30218			1
NECK PLATE				
64064801	Brown C20133			1
JACK PLATE				
64064901	Brown C40526			1
BATTERY COVER				
64065001	Red C40527		RD 100	1
64065002	Ivory C40527		WT 100	1
64065003	Black C40527		BK 100 NT 100	1
METAL FITTING OF DIN JACK				
64065100	C40528			1
METAL FITTING OF PC BOARD				
64065200	C30217			1
METAL FITTING OF VR				
64065300	(A) C30216			2
64065301	(B) C30223			1

PARTS CODE	PARTS NAME SPECIFICATIONS	P.C. BOARD	IDENTIFICATION NO. FUNCTION	Q'TY
KORG SEAL FOR NT				
64066400	RK-100 Walnut		NT 100 NT	.1 1
SCREWS OF BATTERY COVER				
64402400	KOC-C40535			2
WOODEN CASE				
64508600	Ivory KOC-D10018		WT 100 ST	1 1
64508601	Black KOC-D10018		BK 100 BK	1 1
64508602	Red KOC-D10018		RD 100	1
64508602	Red KOC-D10018		RD	1
64508603	X-303 Walnut KOC-D10018		NT 100 NT	1 1
LED SPACER				
64617700	(A) KOC-E40161	KLM-618-4		2
64617701	(B) KOC-E40162			4
CONTROL WHEEL				
64618900	KOC-E30065			3
PUSH SW FRAME				
64619500	TM1-01 BLACK	KLM-618-4		9
64619600	TM1-01 BLACK			2
CONTROL WHEEL SPRING				
64905600	(A) KOC-C40529			1
64905601	(B) KOC-C40533			1
SCREWS				
70530306	FE B ZMC 3x6			31
70560308	FE B BZMC 3x8			2
70560516	FE B BZMC 5x16			6

PARTS CODE	PARTS NAME SPECIFICATIONS	P.C. BOARD	IDENTIFICATION NO. FUNCTION	Q'TY
76263113	WS O BZMC 3.1x13			4
76363113	WS R BZMC 3.1x13			4
INNER CARTON BOX WITH PACKING				
80018000	RK-100			1