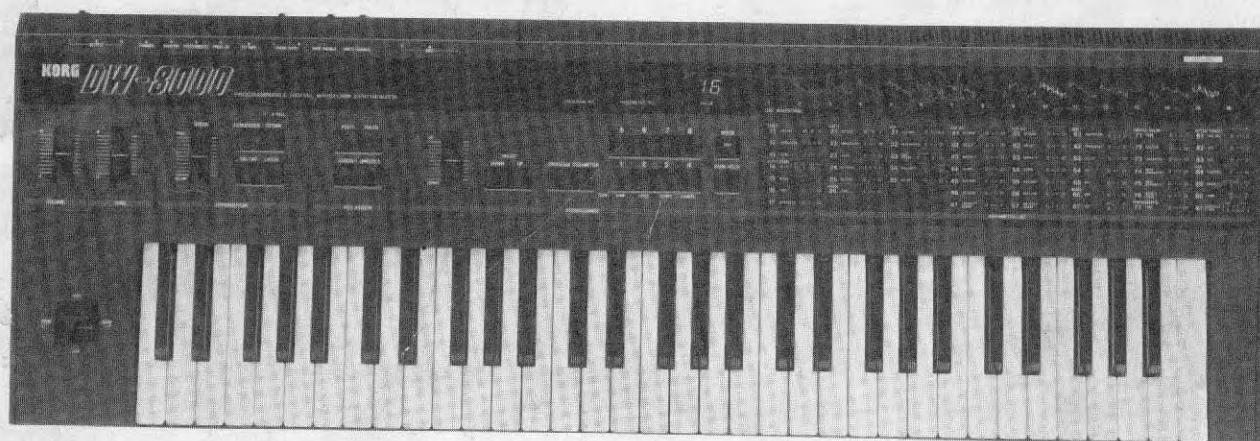


KORG[®]

PROGRAMMABLE DIGITAL WAVEFORM SYNTHESIZER **DW-8000**



SERVICE MANUAL

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KORG INC.
TOKYO/JAPAN

1. SPECIFICATIONS

● Keyboard	61 keys (C ~ C), Initial Touch/After Touch	● Volume	(0 ~ max.)
● Voice	8 voice	● Tune	±50 cents
● OSC1	Octave (16', 8', 4'), Waveform (1 ~ 16), Level adjustment	● Joystick	X axis (OSC bend, VCF bend), + Y axis (OSC modulation), -Y axis (VCF modulation)
● OSC2	Octave (16', 8', 4'), Waveform (1 ~ 16), Interval (Unison, Minor 3rd, Major 3rd, Perfect 4th, Perfect 5th), Detune (25 cents MAX), Level adjustment	● Arpeggiator	ON/OFF, Assign (UP/DOWN Mode or ASSIGNABLE mode), Octave (1, 2, full), Latch (ON/OFF), Speed control slider (Arpeggio tempo: = approx. 20 ~ 250)
● Auto bend	Select (OFF, OSC1, OSC2, Both), Mode (UP/DOWN), Time, Intensity	● Programmer	Value (edit slider, UP/DOWN switches), PROGRAM/PARAMETER switches, Number select buttons (1 ~ 8), WRITE switch, BANK HOLD switch
● Noise	Level adjustment (White noise)	● Display	Program number, Parameter number, Parameter value
● VCF	Cutoff frequency, Resonance, Keyboard track (0, 1/4, 1/2, 1), EG polarity ( , ), EG intensity	● Tape interface	Save, Load, Verify, Cancel
● VCF EG	Attack time, Decay time, Breakpoint level, Slope time, Sustain level, Release time, Velocity sens	● Input jacks	FROM TAPE (HIGH/LOW), DAMPER ( , GND), PORTAMENTO ( , GND), Program UP ( , GND)
● VCA EG	Attack time, Decay time, Breakpoint level, Slope time, Sustain level, Release time, Velocity sens	● Output jacks	Output (R, L/MONO, HIGH/LOW), PHONES, TO TAPE
● MG	Waveform ( ,  ,  , ), Frequency, Delay time, OSC intensity, VCF intensity	● Tape switch	ENABLE/DISABLE
● Bend	Max. OSC bend (±1 octave), VCF bend ON/OFF	● Write switch	ENABLE/DISABLE
● Portamento	Portamento time	● MIDI jacks	IN, OUT, THRU
● Digital delay	Time (approx. 4 ~ 512ms), Factor (x0.5 ~ 1.0), Feedback level, Modulation frequency (max. 10Hz), Modulation intensity, Effect level	● Power consumption	31W
● After touch	OSC MG, VCF, VCA	● Power supply	Local voltage
● Key assign mode	POLY 1, POLY 2, UNISON 1, UNISON 2	● Weight	10.9kg
● MIDI	Send/receive channel (ch 1 ~ 16), ENABLE (NOTE DATA/ALL), OMNI (ON/OFF), Arpeggio clock	● Dimensions	998(W) x 338(D) x 101(H)mm
		● Accessories	AC power cord, Connection cord, Data cassette, Program card

2. MIDI IMPLEMENTATION

1. TRANSMITTED DATA

1. Channel messages

STATUS	SECOND	THIRO	DESCRIPTION
1 0 0 0 n n n n	0 k k k k k k k	0 1 0 0 0 0 0 0	NOTE OFF kkkkkkk = 36 – 96
1 0 0 1 n n n n	0 k k k k k k k	0 v v v v v v v	NOTE ON kkkkkkk = 36 – 96 vvvvvv = 15 – 127 (40 STEPS)
1 0 1 1 n n n n	0 0 0 0 0 0 0 1	0 v v v v v v v	OSC MODULATION vvvvvv = 0 – 127 (31 STEPS)
1 0 1 1 n n n n	0 0 0 0 0 0 1 0	0 v v v v v v v	VCF MODULATION vvvvvv = 0 – 127 (31 STEPS)
1 0 1 1 n n n n	0 1 0 0 0 0 0 0	0 0 0 0 0 0 0 0	DAMPER PEDAL OFF
1 0 1 1 n n n n	0 1 0 0 0 0 0 0	0 1 1 1 1 1 1 1	DAMPER PEDAL ON
1 0 1 1 n n n n	0 1 0 0 0 0 0 1	0 0 0 0 0 0 0 0	PORTAMENTO OFF
1 0 1 1 n n n n	0 1 0 0 0 0 0 1	0 1 1 1 1 1 1 1	PORTAMENTO ON
1 1 0 0 n n n n	0 p p p p p p p	—	PROGRAM CHANGE (NOTE 1) ppppppp = 0 – 63
1 1 0 1 n n n n	0 v v v v v v v	—	CHANNEL PRESSURE (AFTER-TOUCH) vvvvvv = 0 – 127 (63 STEPS)
1 1 1 0 n n n n	0 0 0 0 0 0 0 0	0 b b b b b b b	PITCH BENDER CHANGE bbbbbbb = 0 – 127 (bbbbbbb = 64 : CENTER)

★ nnnn = 0 ~ 15: channel number specified by parameter 84.

NOTE: 1. PROGRAM NUMBER (0ppppppp) correspond to DISPLAY NUMBER on the PANEL which will be the following:

DISPLAY NUMBER	PROGRAM NUMBER
#11	0
#12	1
:	:
#87	62
#88	63

2. System real time messages

STATUS	DESCRIPTION
1 1 1 1 1 0 0 0	TIMING CLOCK (NOTE 2)
1 1 1 1 1 0 1 0	START (NOTE 2)
1 1 1 1 1 1 0 0	STOP (NOTE 2)
1 1 1 1 1 1 1 0	ACTIVE SENSING (NOTE 3)

- NOTES:**
- Can be sent when "internal clock" has been specified by parameter 87 (Arpeggio clock).
 - Sent at intervals of 300ms or less.

3. System exclusive messages

(a) DEVICE ID

BYTE	DESCRIPTION
1 1 1 1 0 0 0 0	EXCLUSIVE STATUS
0 1 0 0 0 0 1 0	KORG ID 42H
0 0 1 1 n n n n	FORMAT ID 3*H (* = ch)
0 0 0 0 0 0 1 1	DW-8000 ID 03H
1 1 1 1 0 1 1 1	EOX

★ nnnn = 0 ~ 15: channel number (channel to transmit exclusive messages) specified by parameter 84.

NOTE: 4. If receive DEVICE ID REQUEST, DEVICE ID message will be sent.

(b) WRITE COMPLETED

BYTE	DESCRIPTION
1 1 1 1 0 0 0 0	EXCLUSIVE STATUS
0 1 0 0 0 0 1 0	KORG ID 42H
0 0 1 1 n n n n	FORMAT ID 3*H (* = ch)
0 0 0 0 0 0 1 1	DW-8000 ID 03H
0 0 1 0 0 0 0 1	WRITE COMPLETED 21H
1 1 1 1 0 1 1 1	EOX

★ nnnn = 0 ~ 15: channel number (channel to transmit exclusive messages) specified by parameter 84.

NOTE: 5. If WRITE REQUEST is received and program write is completed, a WRITE COMPLETED message will be sent.

(c) WRITE ERROR

BYTE	DESCRIPTION
1 1 1 1 0 0 0 0	EXCLUSIVE STATUS
0 1 0 0 0 0 1 0	KORG ID 42H
0 0 1 1 n n n n	FORMAT ID 3*H (* = ch)
0 0 1 0 0 0 1 1	DW-8000 ID 03H
0 0 1 0 0 0 1 0	WRITE ERROR 22H
1 1 1 1 0 1 1 1	EOX

★ nnnn = 0 ~ 15: channel number (channel to transmit exclusive messages) specified by parameter 84.

NOTE: 6. If WRITE REQUEST is received and program write is not completed (if WRITE DISABLE is chosen on the rear panel), a WRITE ERROR message will be sent.

(d) DATA SAVE (DATA DUMP)

BYTE	DESCRIPTION
1 1 1 1 0 0 0 0	EXCLUSIVE STATUS
0 1 0 0 0 0 1 0	KORG ID 42H
0 0 1 1 n n n n	FORMAT ID 3*H (* = ch)
0 0 0 0 0 0 1 1	DW-8000 ID 03H
0 1 0 0 0 0 0 0	DATA DUMP 40H
0 v v v v v v v v	DATA 51 BYTES (See DW-8000 BIT MAP)
⋮	
0 v v v v v v v v	
1 1 1 1 0 1 1 1	EOX

★ nnnn = 0 ~ 15: channel number (channel to transmit exclusive messages) specified by parameter 84.

NOTE: 7. If DATA SAVE REQUEST is received, DATA SAVE (DATA DUMP) will be sent.

2. RECOGNIZED RECEIVE DATA

1. Channel messages

STATUS		SECOND		THIRD		DESCRIPTION
1 0 0 0	n n n n	0 k k k	k k k k	0 x x x	x x x x	NOTE OFF (NOTE 1) velocity will be ignored.
1 0 0 1	n n n n	0 k k k	k k k k	0 v v v	v v v v	NOTE ON (NOTE 1) vvvvv = 1 - 127 (15 STEPS)
1 0 0 1	n n n n	0 k k k	k k k k	0 0 0 0	0 0 0 0	NOTE OFF (NOTE 1)
1 0 1 1	n n n n	0 0 0 0	0 0 0 1	0 v v v	v v x x	OSC MODULATION (5 BITS RESOLUTION)
1 0 1 1	n n n n	0 0 0 0	0 0 1 0	0 v v v	v v x x	VCF MODULATION (5 BITS RESOLUTION)
1 0 1 1	n n n n	0 0 0 0	0 1 1 1	0 v v v	v v v v	VOLUME (7 BITS RESOLUTION)
1 0 1 1	n n n n	0 1 0 0	0 0 0 0	0 0 0 0	0 0 0 0	DAMPER PEDAL OFF
1 0 1 1	n n n n	0 1 0 0	0 0 0 0	0 1 1 1	1 1 1 1	DAMPER PEDAL ON
1 0 1 1	n n n n	0 1 0 0	0 0 0 1	0 0 0 0	0 0 0 0	PORTAMENTO OFF
1 0 1 1	n n n n	0 1 0 0	0 0 0 1	0 1 1 1	1 1 1 1	PORTAMENTO ON
1 0 1 1	n n n n	0 1 1 1	1 0 1 1	0 0 0 0	0 0 0 0	ALL NOTES OFF
1 0 1 1	n n n n	0 1 1 1	1 1 0 0	0 0 0 0	0 0 0 0	OMNI MODE OFF (ALL NOTES OFF)
1 0 1 1	n n n n	0 1 1 1	1 1 0 1	0 0 0 0	0 0 0 0	OMNI MODE ON (ALL NOTES OFF)
1 0 1 1	n n n n	0 1 1 1	1 1 1 0	0 x x x	x x x x	(ALL NOTES OFF)
1 0 1 1	n n n n	0 1 1 1	1 1 1 1	0 0 0 0	0 0 0 0	(ALL NOTES OFF)
1 1 0 0	n n n n	0 p p p	p p p p	—		PROGRAM CHANGE (NOTE 2)
1 1 0 1	n n n n	0 v v v	v v v x	—		AFTER TOUCH (6 BITS RESOLUTION)
1 1 1 0	n n n n	0 x x x	x x x x	0 b b b	b b b b	PITCH BENDER CHANGE LSB will be ignored. MSB will be recognized. (bbbbbb = 64 : CENTER)

★ nnnn = 0 ~ 15:

Channel number specified by parameter 84. When the mode is OMNI ON, all the data will be received. When the mode is OMNI OFF, only data of the channel designated by the parameter will be received. As to MODE MESSAGE, however, designated channel data only will be received even if the mode is OMNI ON.

- NOTES:** 1. NOTE NUMBER (0kkkkkkk) = 24 ~ 108. If data outside this range is received, the data will be transposed to the same note on the nearest octave.
2. PROGRAM NUMBER (0ppppppp) = 0 ~ 63. If the data is larger than 63, it will be recognized as a number that has 64 subtracted from it.

2. System real time messages

STATUS		DESCRIPTION
1 1 1 1	1 0 0 0	TIMING CLOCK (NOTE 3)
1 1 1 1	1 0 1 0	START (NOTE 3)
1 1 1 1	1 1 0 0	STOP (NOTE 3)
1 1 1 1	1 1 1 0	ACTIVE SENSING (NOTE 4)

- NOTES:** 3. Can be received if external clock has been selected by parameter 87 (Arpeggio clock).
4. Should be received at intervals of 300ms or less.

3. System exclusive messages

(a) DEVICE ID REQUEST

BYTE	DESCRIPTION
1 1 1 1 0 0 0 0	EXCLUSIVE STATUS
0 1 0 0 0 0 1 0	KORG ID 42H
0 1 0 0 n n n n	FORMAT ID 4*H (* = ch) (NOTE 5)
1 1 1 1 0 1 1 1	EOX

★ nnnn = 0 ~ 15: channel number (channel to receive exclusive messages) specified by parameter 84.

(b) WRITE REQUEST

BYTE	DESCRIPTION
1 1 1 1 0 0 0 0	EXCLUSIVE STATUS
0 1 0 0 0 0 1 0	KORG ID 42H
0 0 1 1 n n n n	FORMAT ID 3*H (* = ch) (NOTE 5)
0 0 0 0 0 0 1 1	DW-8000 ID 03H
0 0 0 1 0 0 0 1	WRITE REQUEST 11H
0 p p p p p p p	PROGRAM NUMBER (p p p p p p p = 0 - 63)
1 1 1 1 0 1 1 1	EOX

★ nnnn = 0 ~ 15: channel number (channel to receive exclusive messages) specified by parameter 84.

(c) DATA SAVE REQUEST

BYTE	DESCRIPTION
1 1 1 1 0 0 0 0	EXCLUSIVE STATUS
0 1 0 0 0 0 1 0	KORG ID 42H
0 0 1 1 n n n n	FORMAT ID 3*H (* = ch) (NOTE 5)
0 0 0 0 0 0 1 1	DW-8000 ID 03H
0 0 0 1 0 0 0 0	DATA SAVE REQUEST 10H
1 1 1 1 0 1 1 1	EOX

★ nnnn = 0 ~ 15: channel number (channel to receive exclusive messages) specified by parameter 84.

(d) DATA LOAD (DATA DUMP)

BYTE	DESCRIPTION
1 1 1 1 0 0 0 0	EXCLUSIVE STATUS
0 1 0 0 0 0 1 0	KORG ID 42H
0 0 1 1 n n n n	FORMAT ID 3*H (* = ch) (NOTE 5)
0 0 0 0 0 0 1 1	DW-8000 ID 03H
0 1 0 0 0 0 0 0	DATA DUMP 40H
0 v v v v v v v	DATA 51 BYTES (See DW-8000 BIT MAP)
...	
0 v v v v v v v	
1 1 1 1 0 1 1 1	EOX

★ nnnn = 0 ~ 15: channel number (channel to receive exclusive messages) specified by parameter 84.

(e) PARAMETER CHANGE

BYTE	DESCRIPTION
1 1 1 1 0 0 0 0	EXCLUSIVE STATUS
0 1 0 0 0 0 1 0	KORG ID 42H
0 0 1 1 n n n n	FORMAT ID 3*H (* = ch) (NOTE 5)
0 0 0 0 0 0 1 1	DW-8000 ID 03H
0 1 0 0 0 0 0 1	PARAMETER CHANGE 41H
0 v v v v v v v	PARAMETER OFFSET (See DW-8000 BIT MAP)
0 v v v v v v v	PARAMETER VALUE (See DW-8000 BIT MAP)
1 1 1 1 0 1 1 1	EOX

★ nnnn = 0 ~ 15: channel number (channel receive exclusive messages) specified by parameter 84.

NOTE: 5. Messages with channel numbers different from those specified by parameter 84 are ignored.
(This has no relation to OMNI mode setting.)

3. SYSTEM EXCLUSIVE MESSAGE REFERENCE

1. DW-8000 Bit map

PARAMETER OFFSET	PARAMETER VALUE							
	b7	b6	b5	b4	b3	b2	b1	b0
0	0	0	0	0	0	0	OSC 1 OCTAVE	
1	0	0	0	0	OSC 1 WAVE FORM			
2	0	0	0	OSC 1 LEVEL				
3	0	0	0	0	0	0	AUTO BEND SELECT	
4	0	0	0	0	0	0	0	A. BEND MODE
5	0	0	0	A. BEND TIME				
6	0	0	0	A. BEND INTENSITY				
7	0	0	0	0	0	0	OSC 2 OCTAVE	
8	0	0	0	0	OSC 2 WAVE FORM			
9	0	0	0	OSC 2 LEVEL				
10	0	0	0	0	0	INTERVAL		
11	0	0	0	0	0	DETUNE		
12	0	0	0	NOISE LEVEL				
13	0	0	0	0	0	0	ASSIGN MODE	
14	0	0	PARAMETER NO. MEMORY					
15	0	0	CUTOFF					
16	0	0	0	RESONANCE				
17	0	0	0	0	0	0	KBD. TRACK	
18	0	0	0	0	0	0	0	POLARITY
19	0	0	0	EG. INTENSITY				
20	0	0	0	VCF ATTACK				
21	0	0	0	VCF DECAY				
22	0	0	0	VCF BREAK. P				
23	0	0	0	VCF SLOPE				
24	0	0	0	VCF SUSTAIN				
25	0	0	0	VCF RELEASE				
26	0	0	0	0	0	VCF VELOCITY SENS		
27	0	0	0	VCA ATTACK				
28	0	0	0	VCA DECAY				
29	0	0	0	VCA BREAK. P				
30	0	0	0	VCA SLOPE				
31	0	0	0	VCA SUSTAIN				
32	0	0	0	VCA RELEASE				
33	0	0	0	0	0	VCA VELOCITY SENS		
34	0	0	0	0	0	0	MG WAVE FORM	
35	0	0	0	MG FREQUENCY				
36	0	0	0	MG DELAY				
37	0	0	0	MG OSC				

PARAMETER OFFSET	PARAMETER VALUE							
	b7	b6	b5	b4	b3	b2	b1	b0
38	0	0	0	MG VCF				
38	0	0	0	0	BEND OSC			
40	0	0	0	0	0	0	0	BEND VCF
41	0	0	0	0	0	DELAY TIME		
42	0	0	0	0	DELAY FACTOR			
43	0	0	0	0	DELAY FEEDBACK			
44	0	0	0	DELAY FREQUENCY				
45	0	0	0	DELAY INTENSITY				
46	0	0	0	0	DELAY EFFECT LEVEL			
47	0	0	0	PORTAMENTO				
48	0	0	0	0	0	0	AFTER T. OSC MG	
49	0	0	0	0	0	0	AFTER T. VCF	
50	0	0	0	0	0	0	AFTER T. VCA	

2. DW-8000 Bit map and corresponding parameter values

PARAMETER NAME	PARAMETER OFFSET	BIT	CORRESPONDING PANEL VALUE	PARAMETER NUMBER
OSC 1 OCTAVE	0	b1 – b0	00 = 16 01 = 8 10 = 4 11 = INHIBIT	11
OSC 1 WF	1	b3 – b0	0000 – 1111 = 1 – 16	12
OSC 1 LEVEL	2	b4 – b0	00000 – 11111 = 0 – 31	13
A. B. SELECT	3	b1 – b0	00 = OFF 01 = OSC1 10 = OSC2 11 = BOTH	14
A. B. MODE	4	b0	0 = UP 1 = DOWN	15
A. B. TIME	5	b4 – b0	00000 – 11111 = 0 – 31	16
A. B. INT.	6	b4 – b0	00000 – 11111 = 0 – 31	17
OSC 2 OCTAVE	7	b1 – b0	00 = 16 01 = 8 10 = 4 11 = INHIBIT	21
OSC 2 WF	8	b3 – b0	0000 – 1111 = 1 – 16	22
OSC 2 LEVEL	9	b4 – b0	00000 – 11111 = 0 – 31	23
OSC2 INTERVAL	10	b2 – b0	000 = 1 001 = -3 010 = 3 011 = 4 100 = 5 101 – 111 = INHIBIT	24
OSC 2 DETUNE	11	b2 – b0	000 – 110 = 0 – 6 111 = INHIBIT	25
NOISE LEVEL	12	b4 – b0	00000 – 11111 = 0 – 31	26
CUTOFF	15	b5 – b0	000000 – 111111 = 0 – 63	31
RESONANCE	16	b4 – b0	00000 – 11111 = 0 – 31	32
KBD TRACK	17	b1 – b0	00 = (0) 01 = 1(1/4) 10 = 2(1/2) 11 = 3(1)	33
POLARITY	18	b0	0 = 1() 1 = 2()	34
VCF EG INT.	19	b4 – b0	00000 – 11111 = 0 – 31	35
VCF ATTACK	20	b4 – b0	00000 – 11111 = 0 – 31	41
VCF DECAY	21	b4 – b0	00000 – 11111 = 0 – 31	42
VCF BREAK P.	22	b4 – b0	00000 – 11111 = 0 – 31	43

PARAMETER NAME	PARAMETER OFFSET	BIT	CORRESPONDING PANEL VALUE	PARAMETER NUMBER
VCF SLOPE	23	b4 – b0	00000 – 11111 = 0 – 31	44
VCF SUSTAIN	24	b4 – b0	00000 – 11111 = 0 – 31	45
VCF RELEASE	25	b4 – b0	00000 – 11111 = 0 – 31	46
VCF V. SENS	26	b2 – b0	000 – 111 = 0 – 7	47
VCA ATTACK	27	b4 – b0	00000 – 11111 = 0 – 31	51
VCA DECAY	28	b4 – b0	00000 – 11111 = 0 – 31	52
VCA BREAK P.	29	b4 – b0	00000 – 11111 = 0 – 31	53
VCA SLOPE	30	b4 – b0	00000 – 11111 = 0 – 31	54
VCA SUSTAIN	31	b4 – b0	00000 – 11111 = 0 – 31	55
VCA RELEASE	32	b4 – b0	00000 – 11111 = 0 – 31	56
VCA V. SENS	33	b2 – b0	000 – 111 = 0 – 7	57
MG WAVE FORM	34	b1 – b0	0 = 1($\wedge$) 1 = 2($\searrow$) 2 = 3($\swarrow$) 3 = 4($\sqcup$)	61
MG FREQUENCY	35	b4 – b0	00000 – 11111 = 0 – 31	62
MG DELAY	36	b4 – b0	00000 – 11111 = 0 – 31	63
MG OSC	37	b4 – b0	00000 – 11111 = 0 – 31	64
MG VCF	38	b4 – b0	00000 – 11111 = 0 – 31	65
BEND OSC	39	b3 – b0	0000 – 1100 = 0 – 12 1101 – 1111 = INHIBIT	66
BEND VCF	40	b0	0 = 0(OFF) 1 = 1(ON)	67
DELAY TIME	41	b2 – b0	000 – 111 = 0 – 7	71
DELAY FACTOR	42	b3 – b0	0000 – 1111 = 0 – 15	72
D. FEEDBACK	43	b3 – b0	0000 – 1111 = 0 – 15	73
D. FREQUENCY	44	b4 – b0	00000 – 11111 = 0 – 31	74
D. INTENSITY	45	b4 – b0	00000 – 11111 = 0 – 31	75
D. EFF. LEVEL	46	b3 – b0	0000 – 1111 = 0 – 15	76
PORTAMENTO	47	b4 – b0	00000 – 11111 = 0 – 31	77
A.T. OSC MG	48	b1 – b0	00 – 11 = 0 – 3	81
AFTER T. VCF	49	b1 – b0	00 – 11 = 0 – 3	82
AFTER T. VCA	50	b1 – b0	00 – 11 = 0 – 3	83

PARAMETER NAME	PARAMETER OFFSET	BIT	CORRESPONDING PANEL DISPLAY/MEMORY
ASSIGN MODE	13	b1 – b0	00 = POLY 1 01 = POLY 2 10 = UNISON 1 11 = UNISON 2
PAR. NO. MEMO.	14	b5 – b0	000000-111110 = 0-62 (7, 14, 15, 21, 22, 23, 31, 39, 47, 55, = INHIBIT)

3. DW-8000 can send/receive the following data.

Sending

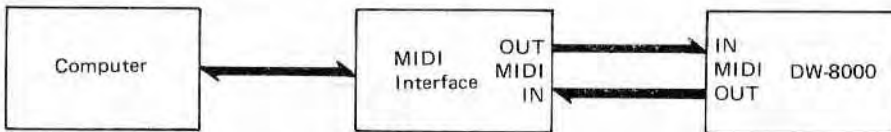
DEVICE ID	: Identifies the equipment. Sent upon receiving a DEVICE REQUEST.
WRITE COMPLETED	: Sent in response to a WRITE REQUEST. This indicates that the PROGRAM WRITE task has been successfully completed.
WRITE ERROR	: Sent in response to a WRITE REQUEST. This indicates that the synth is set to the WRITE DISABLE mode so PROGRAM WRITE task cannot be completed.
DATA SAVE (DATA DUMP)	: In response to a DATA SAVE REQUEST, this sends the data for the sound presently being produced.

Receiving

RECEIVE ID REQUEST	: A request for the equipment's MIDI identification number.
WRITE REQUEST	: A request for the DW-8000 to write data for the present sound to program memory.
DATA SAVE REQUEST	: A request for the DW-8000 to send data for the present sound.
DATA LOAD (DATA DUMP)	: Sound data information. Sound data is entered via the Data Load.
PARAMETER CHANGE	: Used to change parameters of the current sound.

- The DW-8000 can use these system exclusive messages to communicate with a computer equipped with a MIDI interface. (A program to process the exclusive messages is required.)

■ Connecting a computer

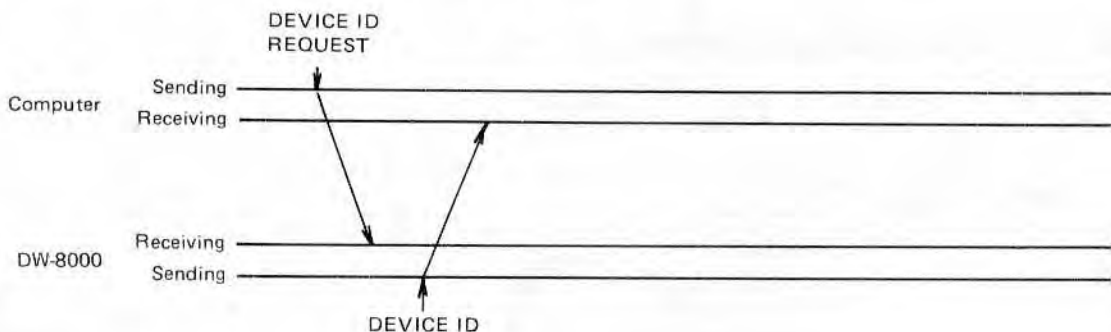


Because each exclusive message for the DW-8000 is specified with a channel designated by parameter 84, the corresponding channel must be used for message transmission from a computer to the DW-8000. A message sent using the incorrect channel will be ignored, regardless of OMNI mode being ON or OFF.

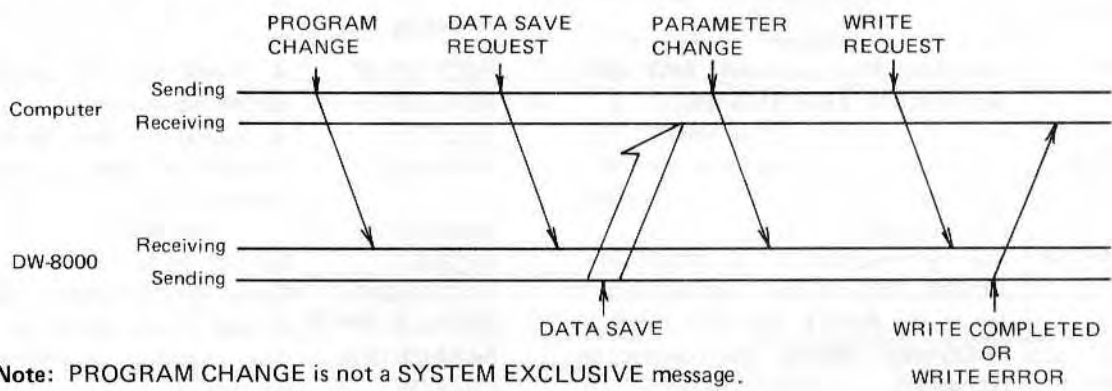
These channels are used to effectively that timbre control could be done independently for each DW-8000 in a system using two or more DW-8000s.

■ Examples of communication with a computer

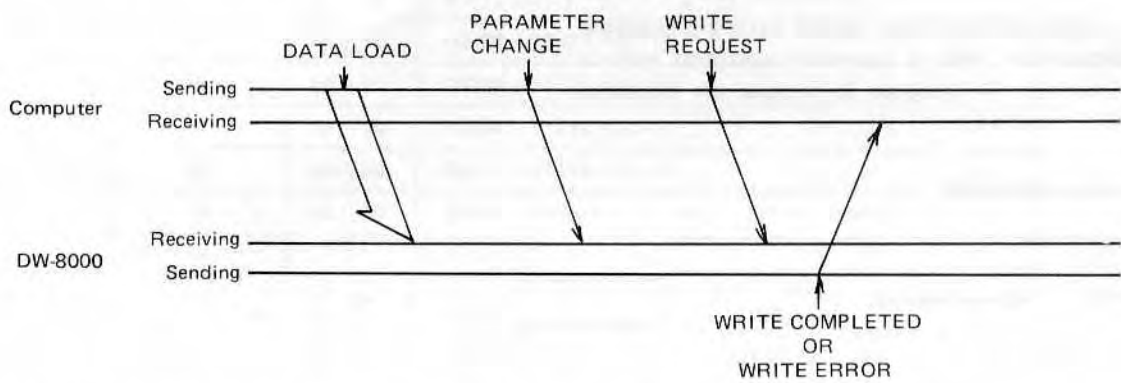
- (1) To find the ID number for equipment connected to the computer.



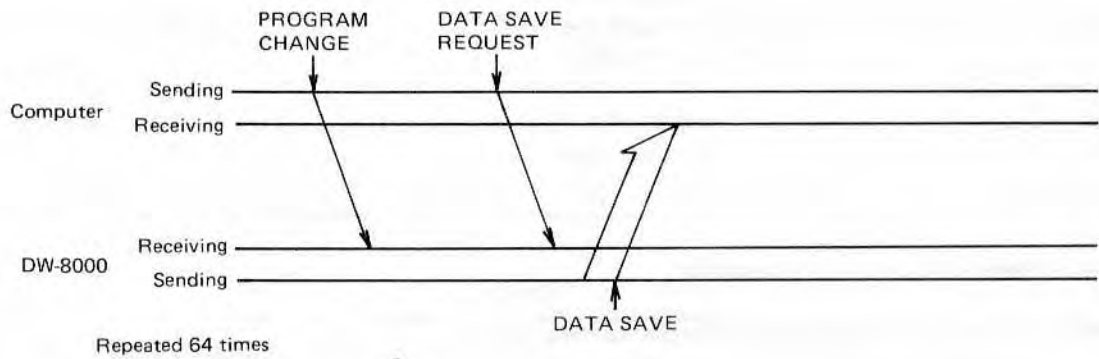
(2) To edit sound data within the DW-8000.



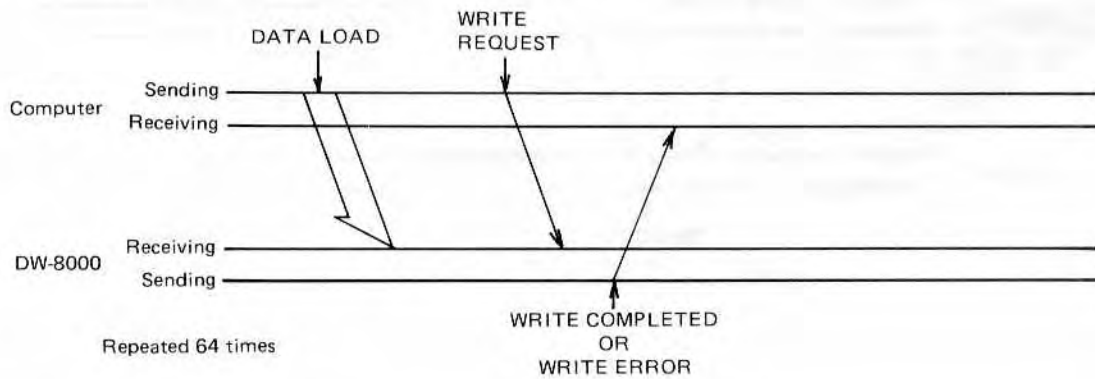
(3) To edit data already available in the computer.



(4) To load all 64 sound programs from the computer to the DW-8000.

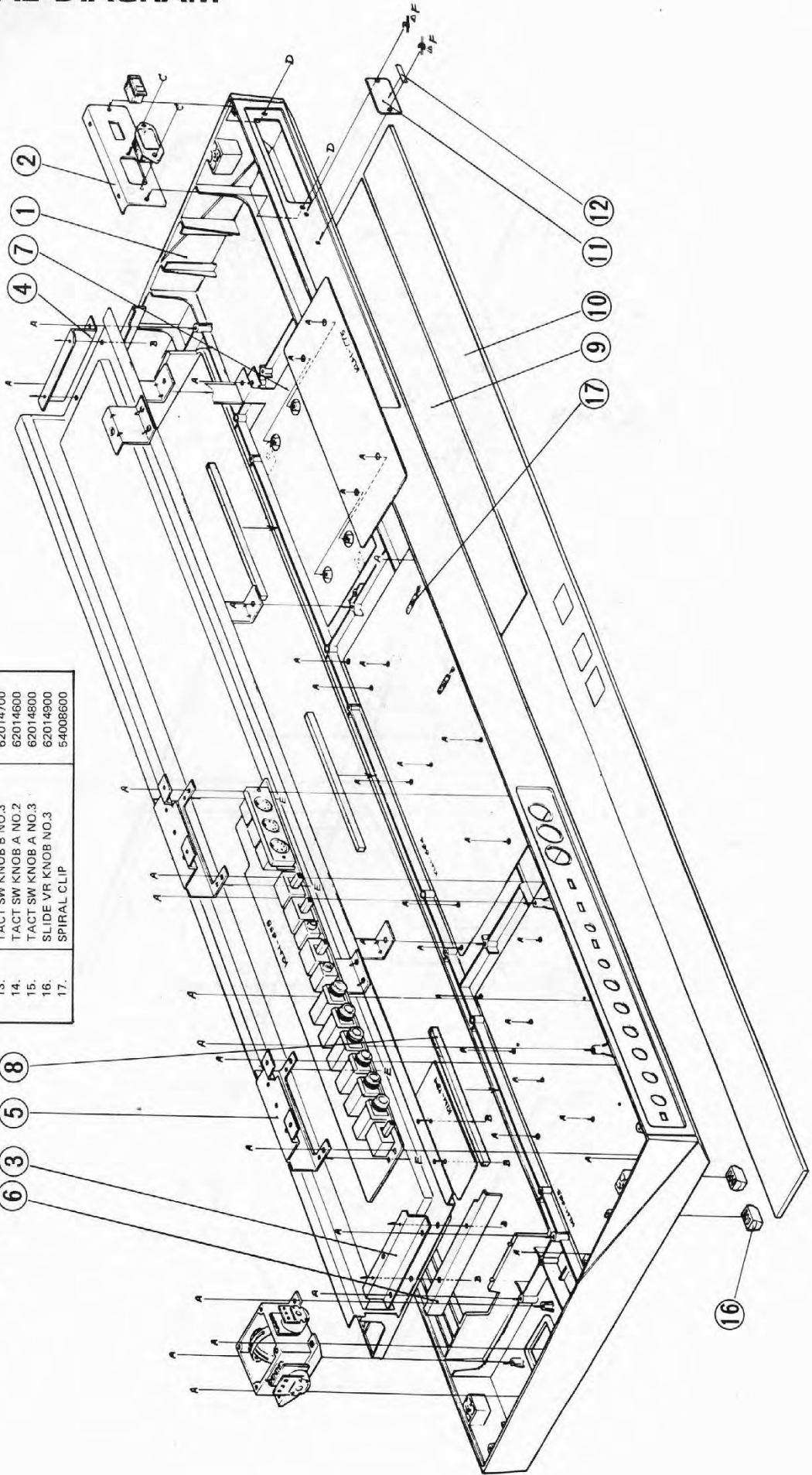
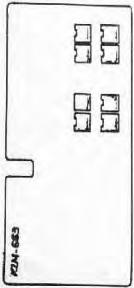
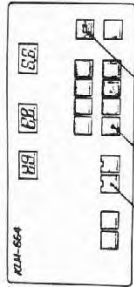


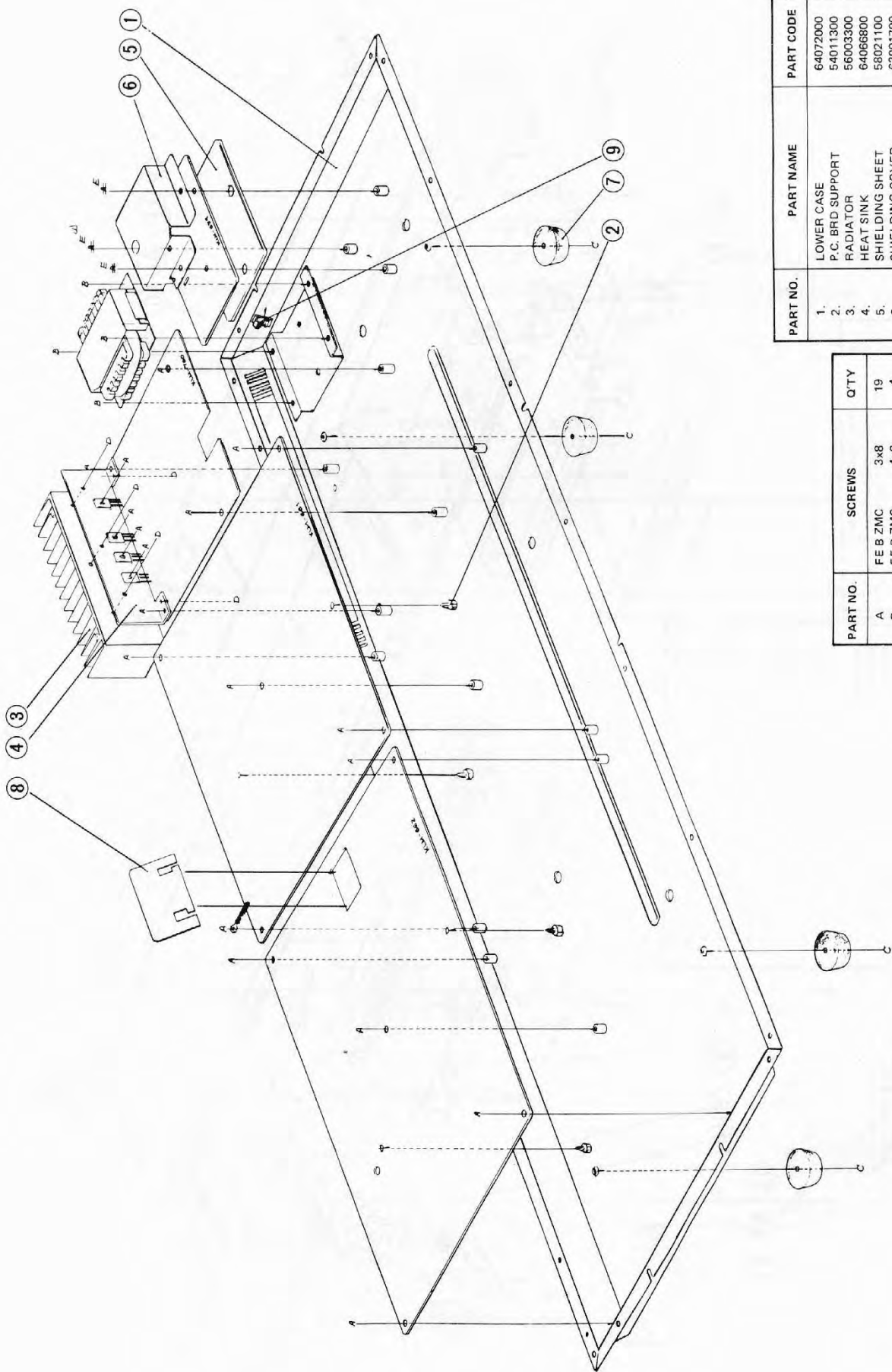
(5) To save all 64 sound programs from the DW-8000 to the computer.



3. STRUCTURAL DIAGRAM

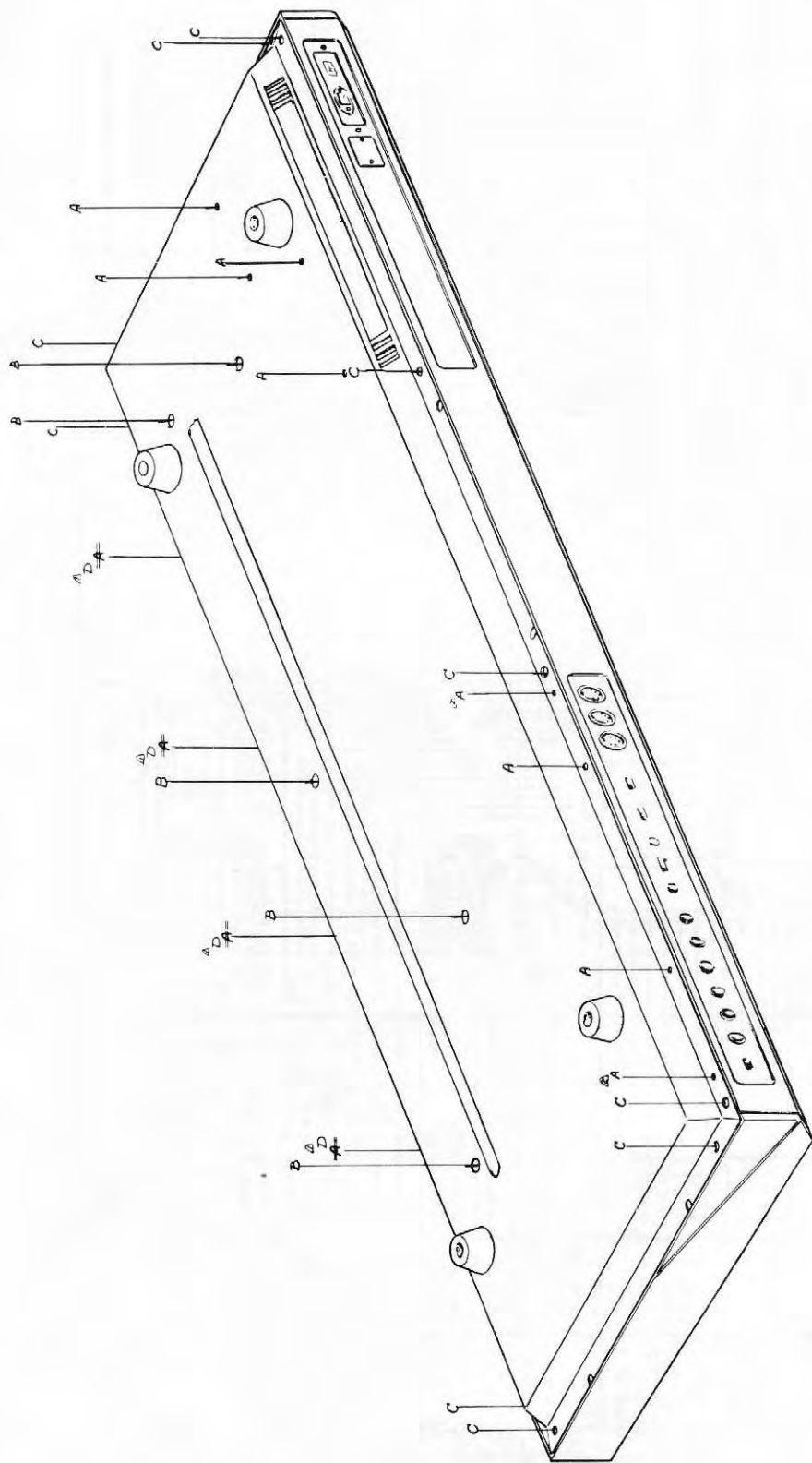
PART NO.	PART NAME	PART CODE	QTY
1.	UPPER CASE	64620800	42
2.	METAL FITTING OF SW	64067100	3x8
3.	UPPER CASE SUPPORT L	64072200	3x8
4.	UPPER CASE SUPPORT R	64072100	3x8
5.	DIN JACK PLATE	64067300	3x8
6.	METAL FITTING OF KEYBOARD SUPPORT	64072300	3x8
7.	SHIELDING SHEET	63001600	3x8
8.	FELT	55007700	3x8
9.	PARAMETER INDEX SHEET	63001800	3x8
10.	LED DISPLAY COVER	63001900	3x8
11.	NAME PLATE	62014700	3x8
12.	SERIAL NUMBER SEAL	62014600	3x8
13.	TACT SW KNOB B NO.3	62014800	3x8
14.	TACT SW KNOB A NO.2	62014900	3x8
15.	TACT SW KNOB A NO.3	62014800	3x8
16.	SLIDE VR KNOB NO.3	54008600	3x8
17.	SPIRAL CLIP	54008600	3x8





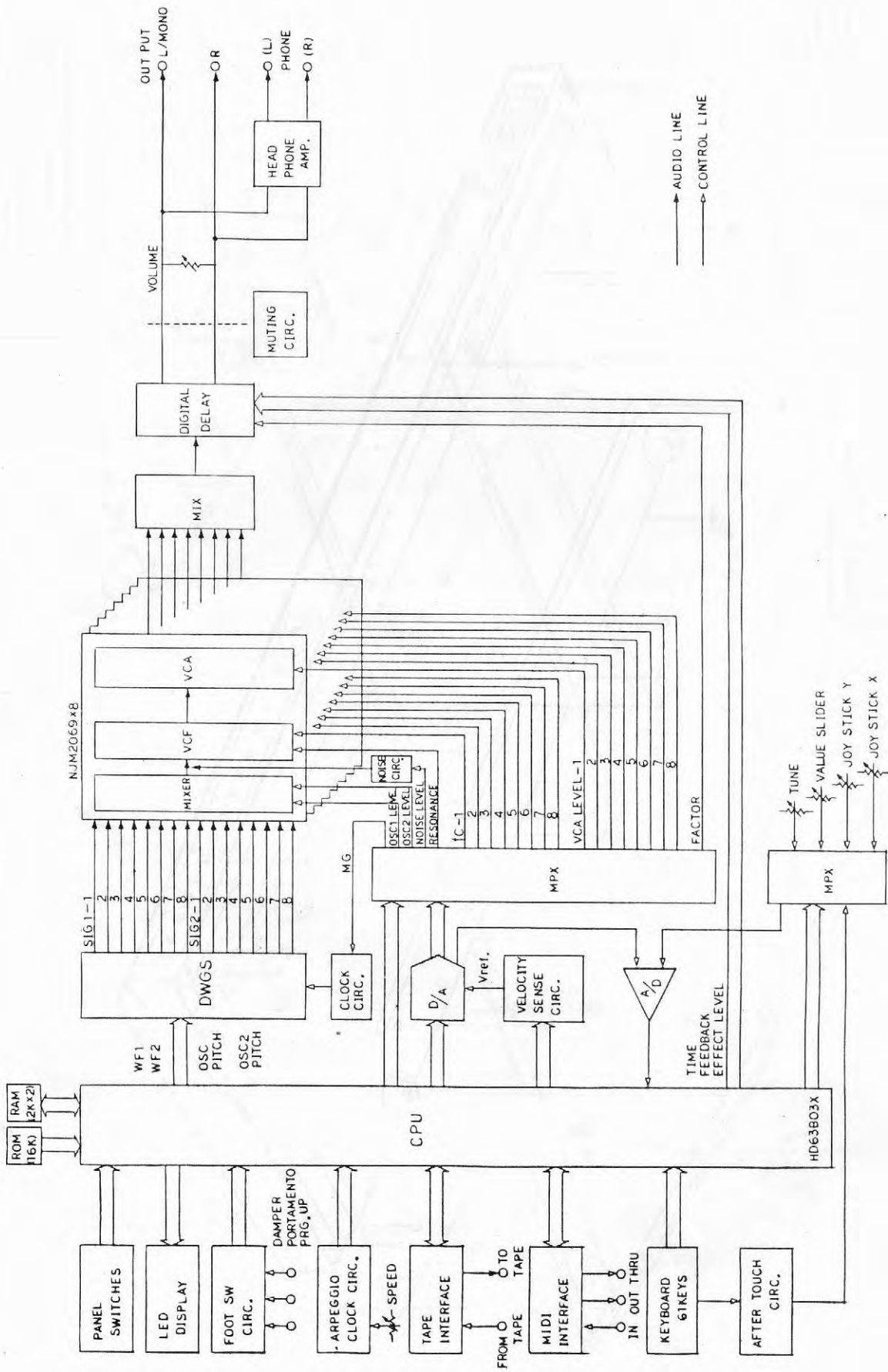
PART NO.	PART NAME	PART CODE
1.	LOWER CASE	64072000
2.	P.C. BRD SUPPORT	54011300
3.	RADIATOR	56003300
4.	HEAT SINK	64066800
5.	SHIELDING SHEET	58021100
6.	SHIELDING COVER	63001700
7.	RUBBER FEET	50009500
8.	P.C. BRD PROTECTOR	63002000
9.	CLAMP	54011100

PART NO.	SCREWS	Q'TY
A	FE B ZMC 3x8	19
B	FE B ZMC 4x8	4
C	TP2G B BZMC 3x12	4
D	TP2G B BZMC 3x8	5
E	FE B ZMC 3x6	3

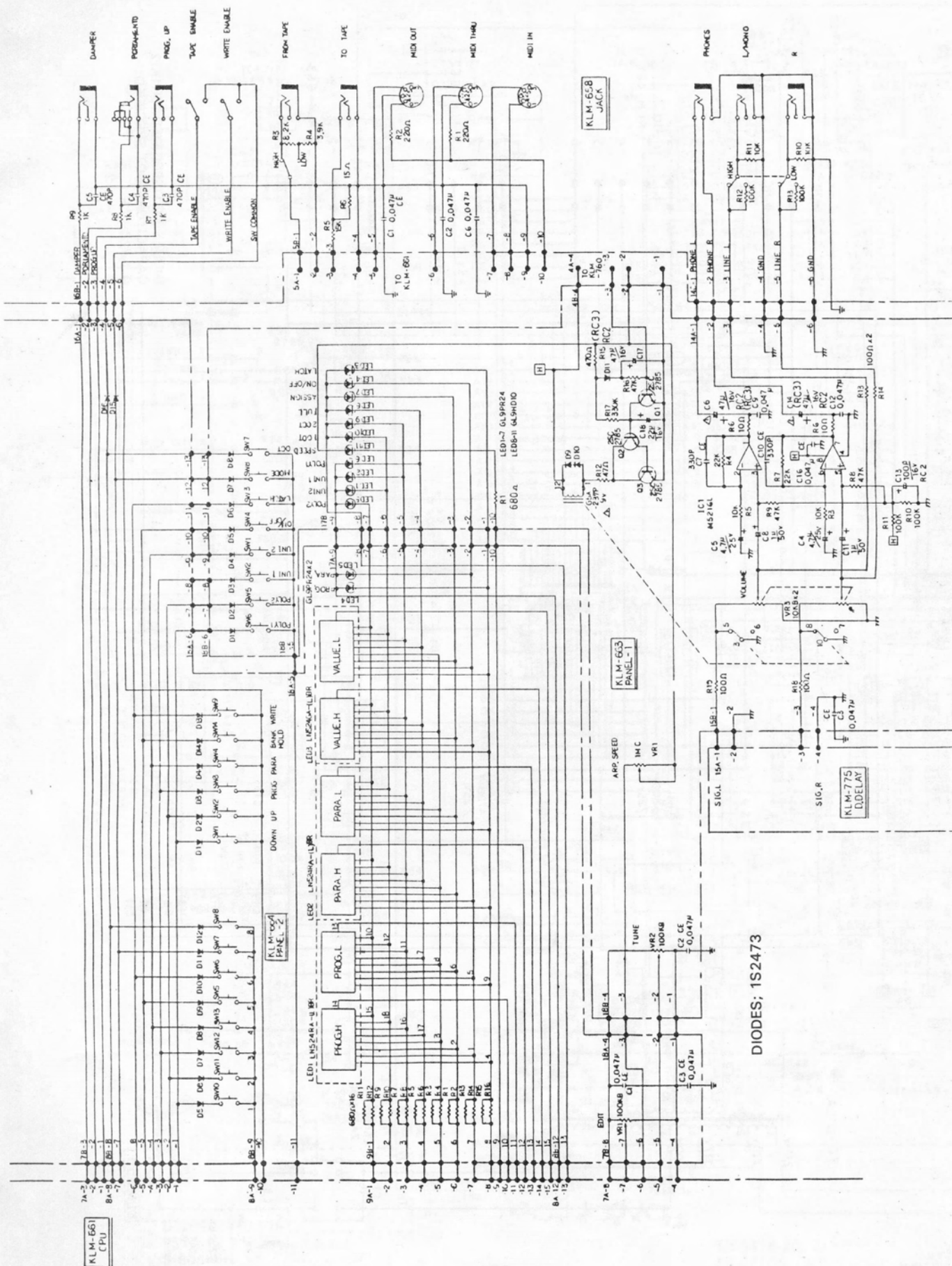


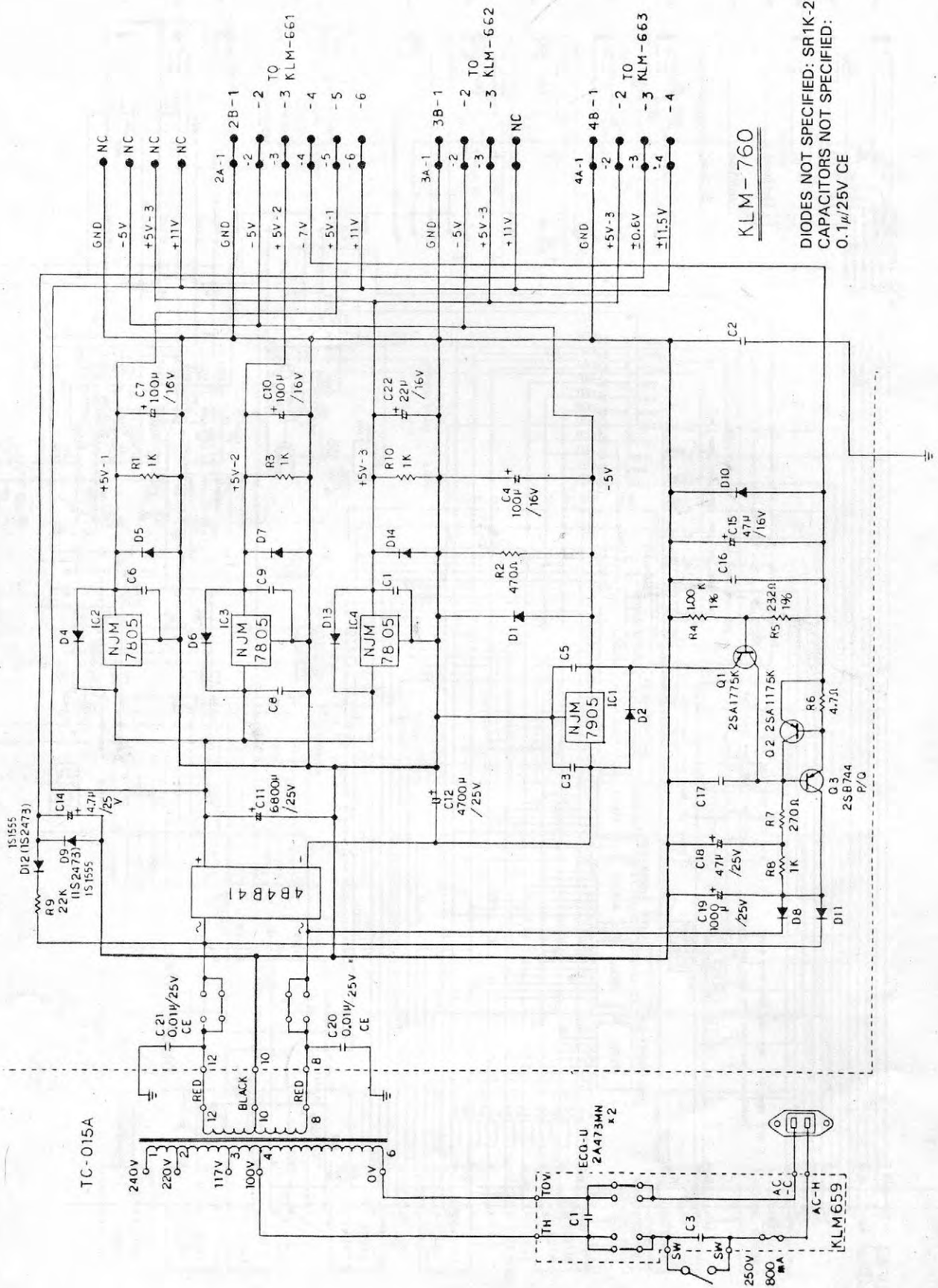
PART NO.	SCREWS	Q'TY
A	TP2G B BZMC 3x8	6
B	FE B BZMC 5x8	5
C	PLAX B BZMC 4x10	10
D	PLAX B BZMC 3x8	4

4. BLOCK DIAGRAM



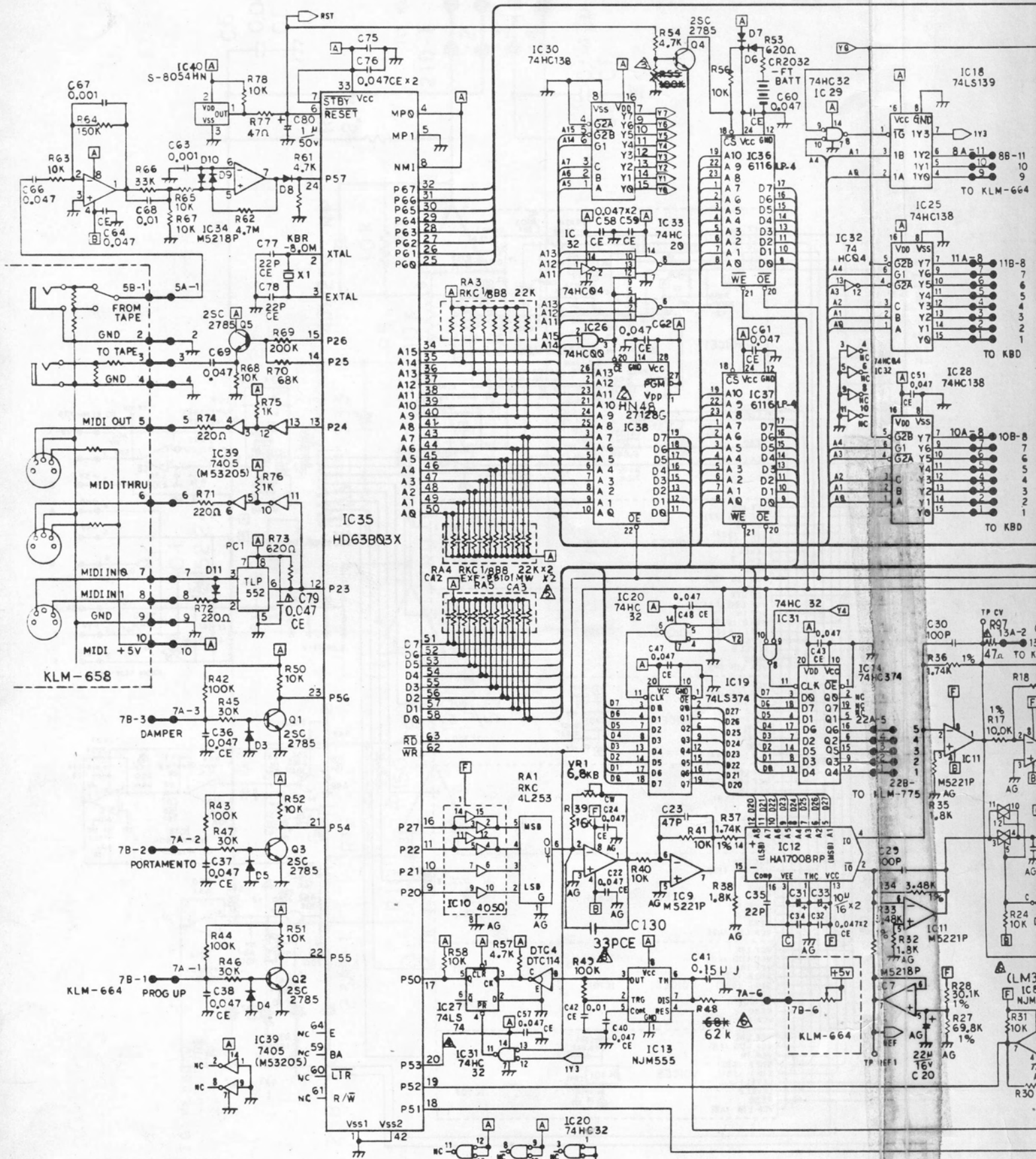
KLM-658, 663, 664





KLM-760

DIODES NOT SPECIFIED: SR1K-2
CAPACITORS NOT SPECIFIED:
0.1μ/25V CE

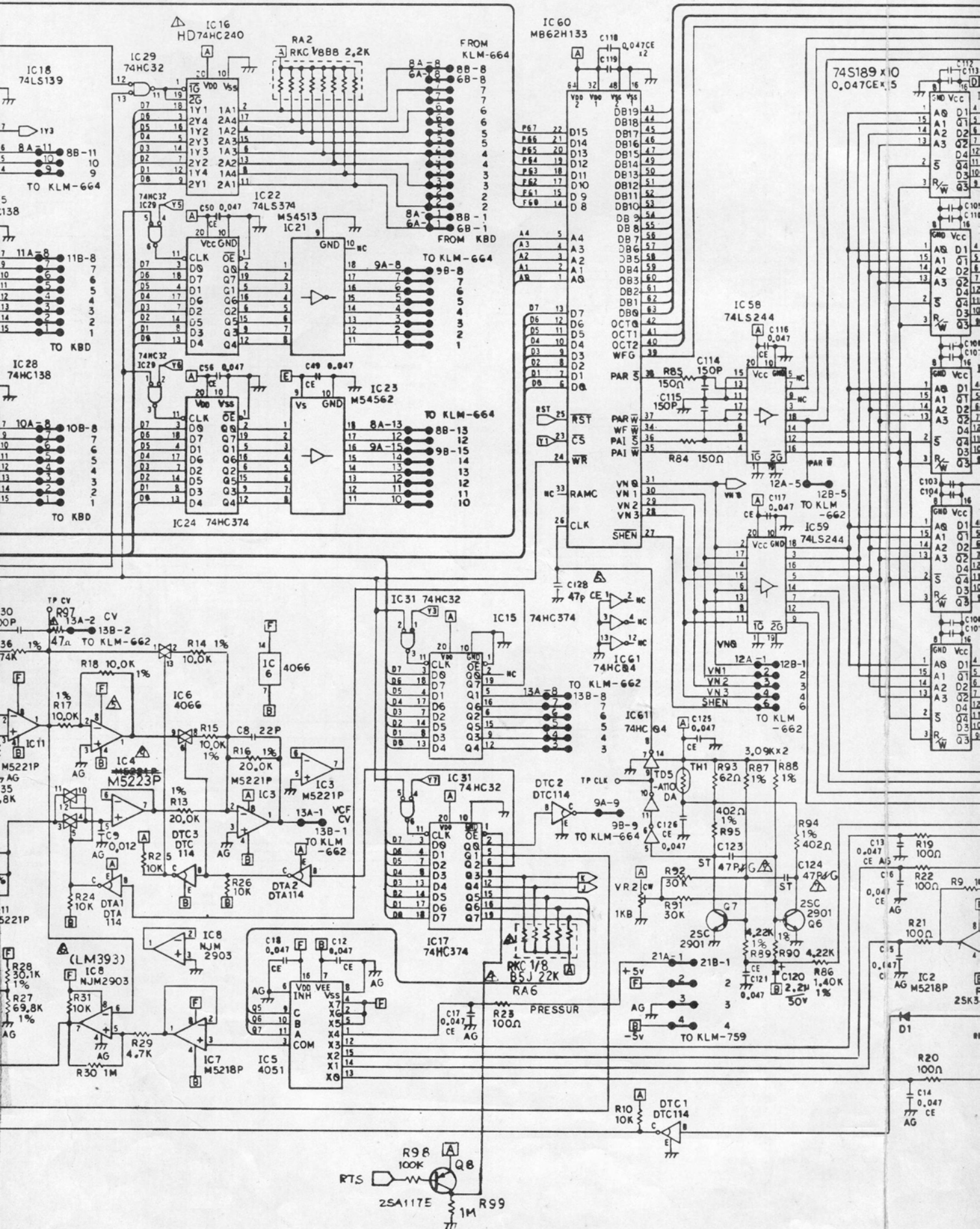


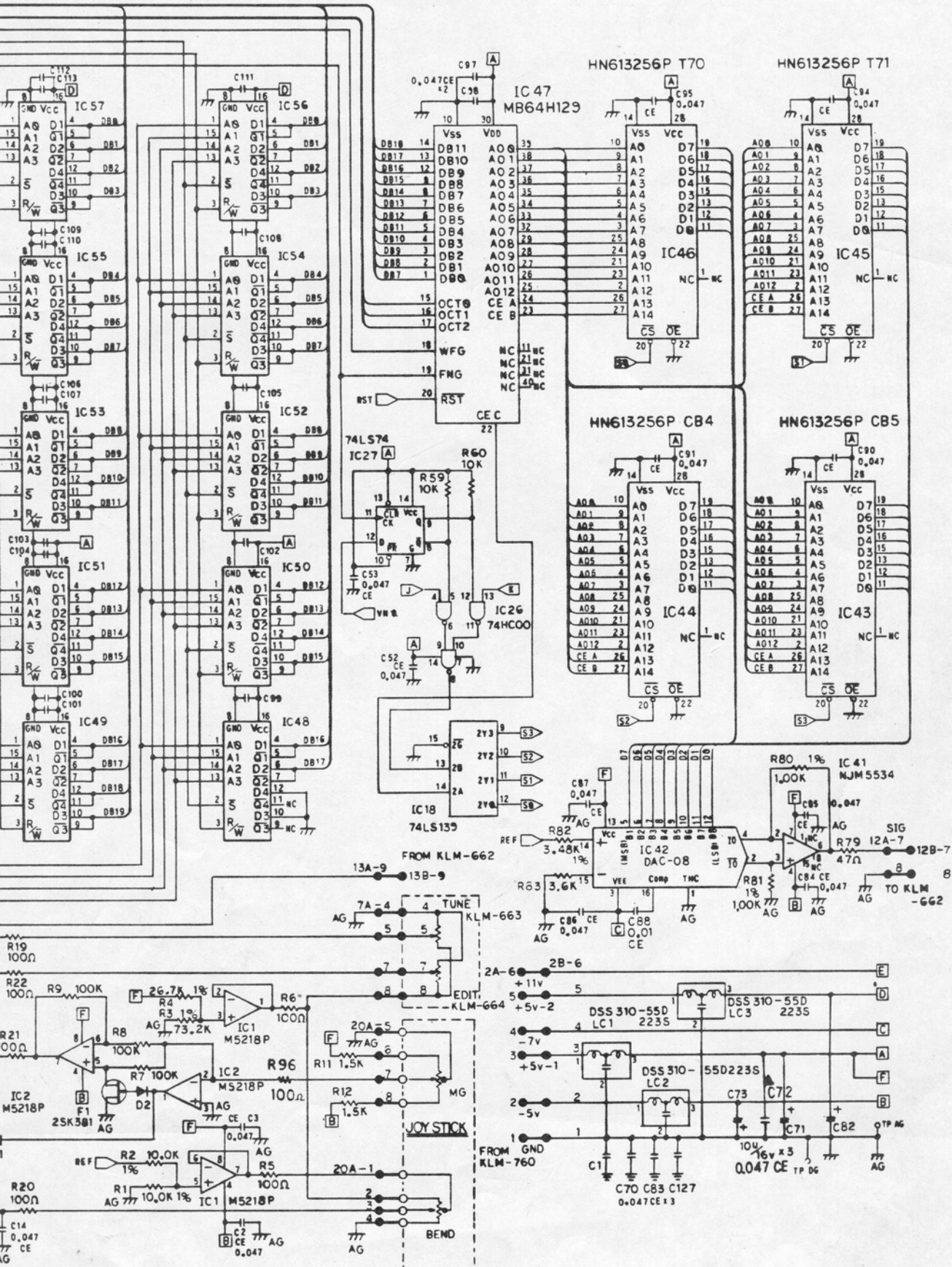
DIODES; 1SS133
PST-518 is substitutive for
S-8054HN.
Be careful of the pin as-
signment.

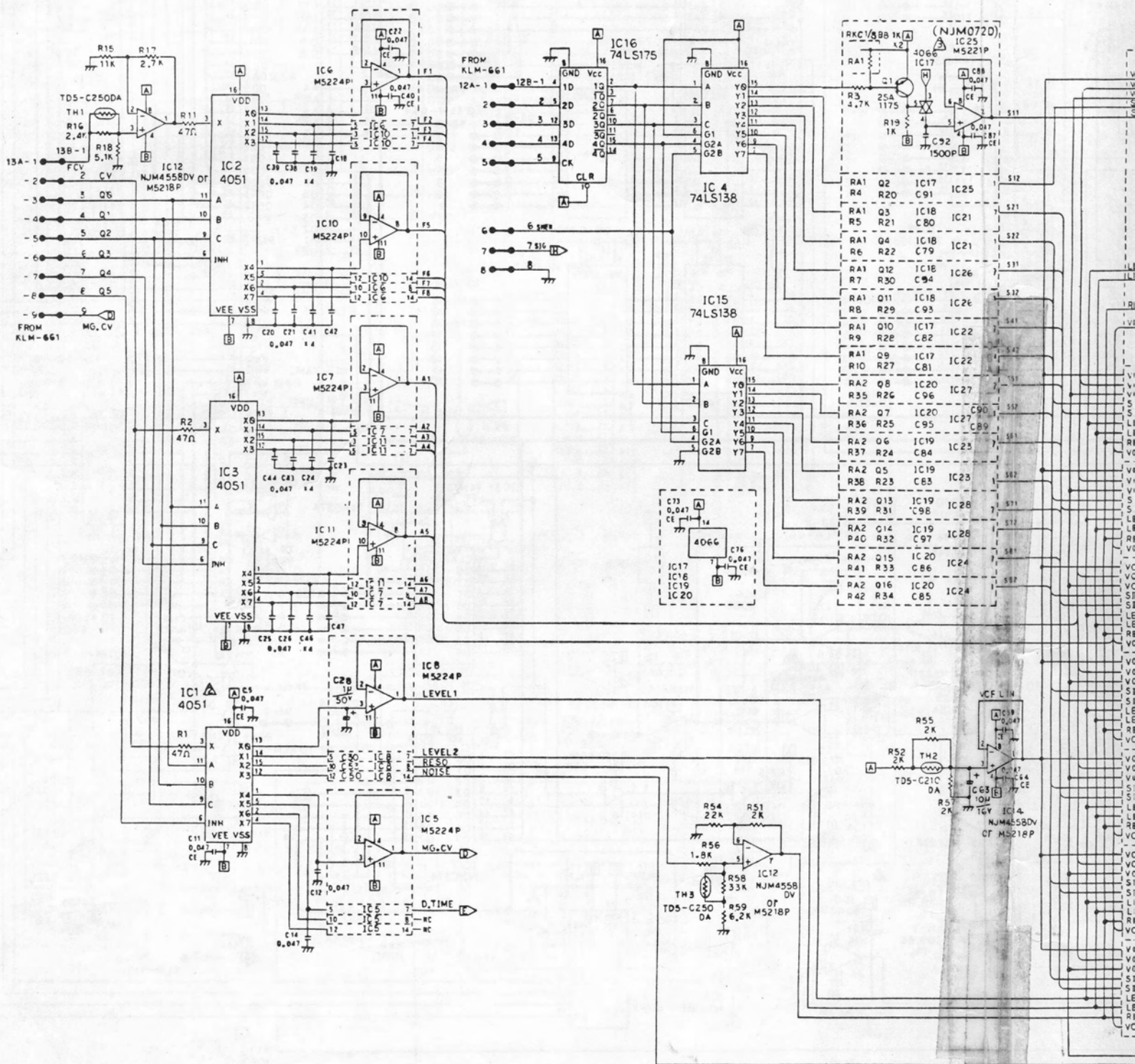


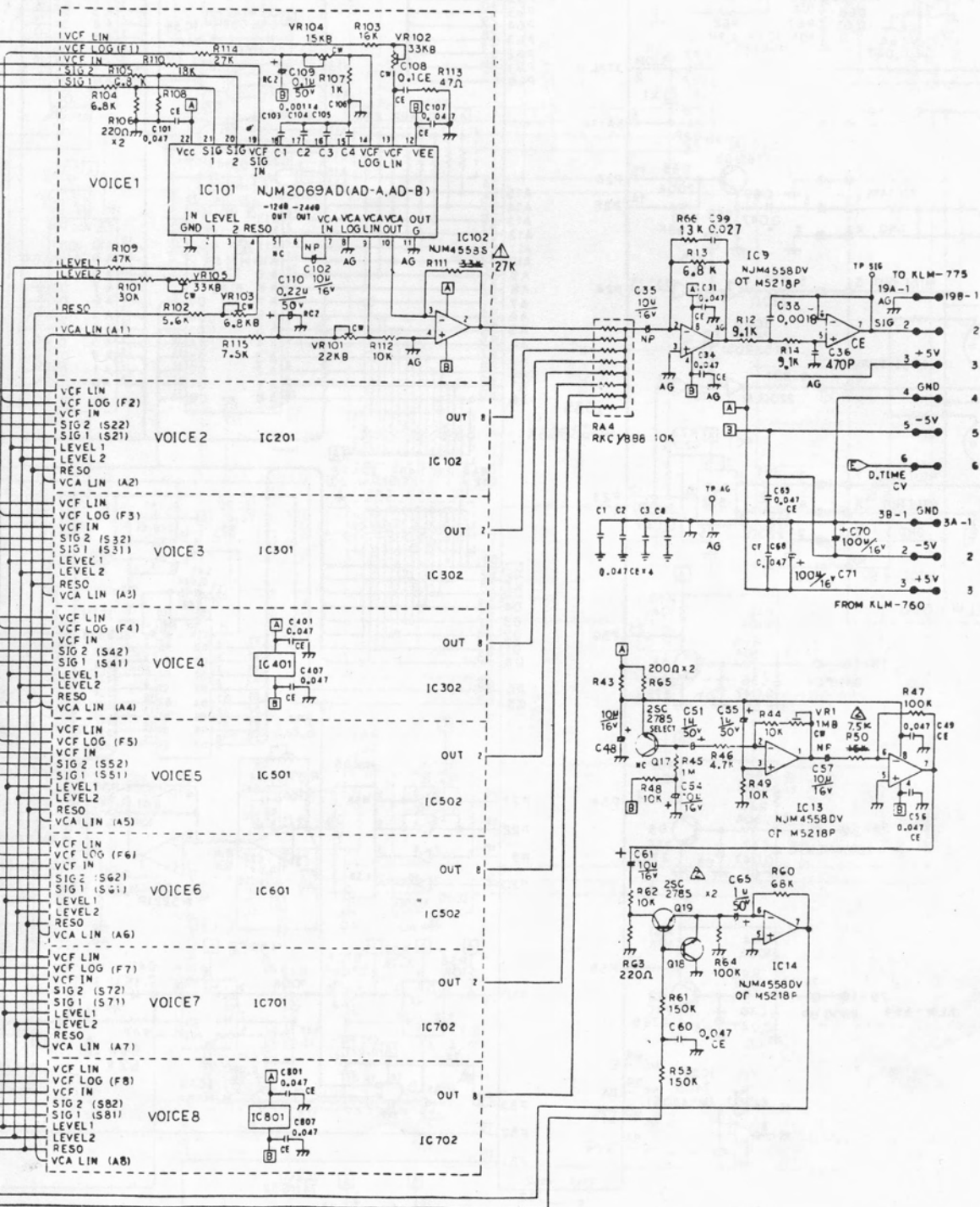
MB8416-20L or
MB8416A-15LP is substitutive
for HN6116LF-4.
NJM4558DV is substitutive
for M5218P.

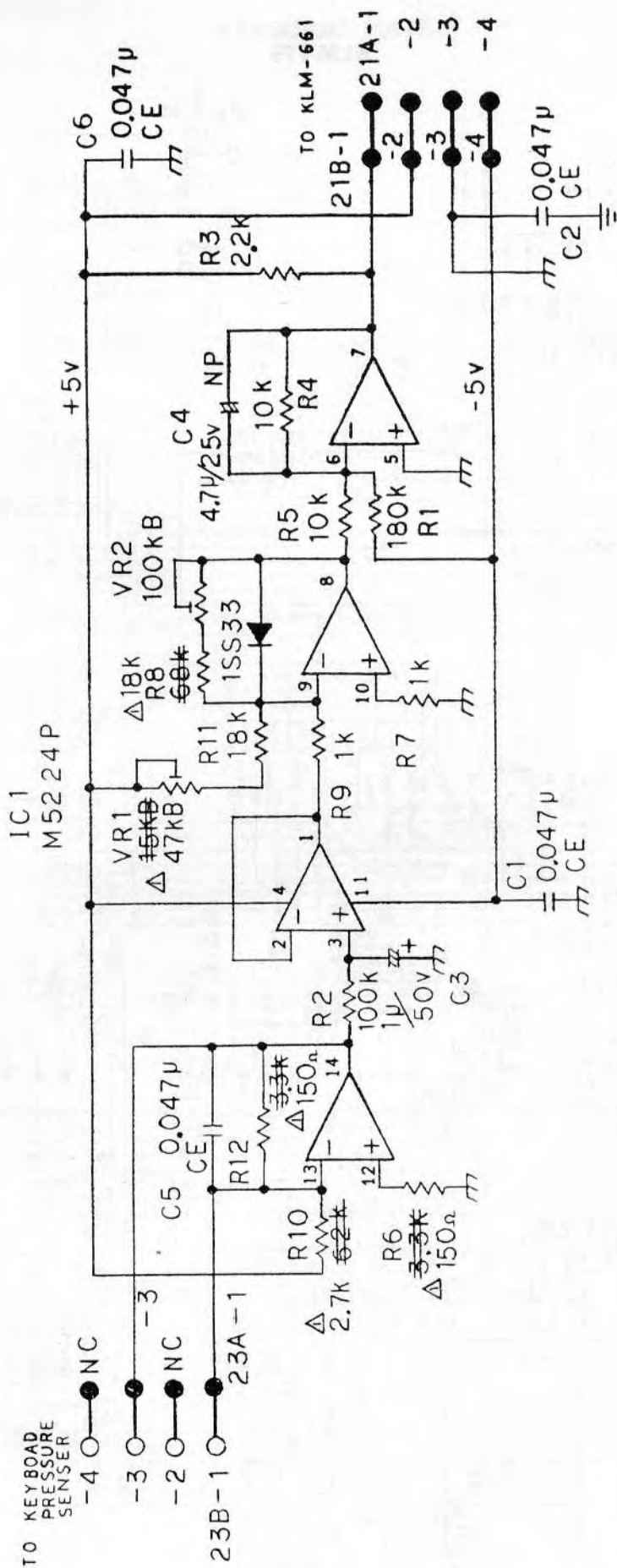
KLM-661

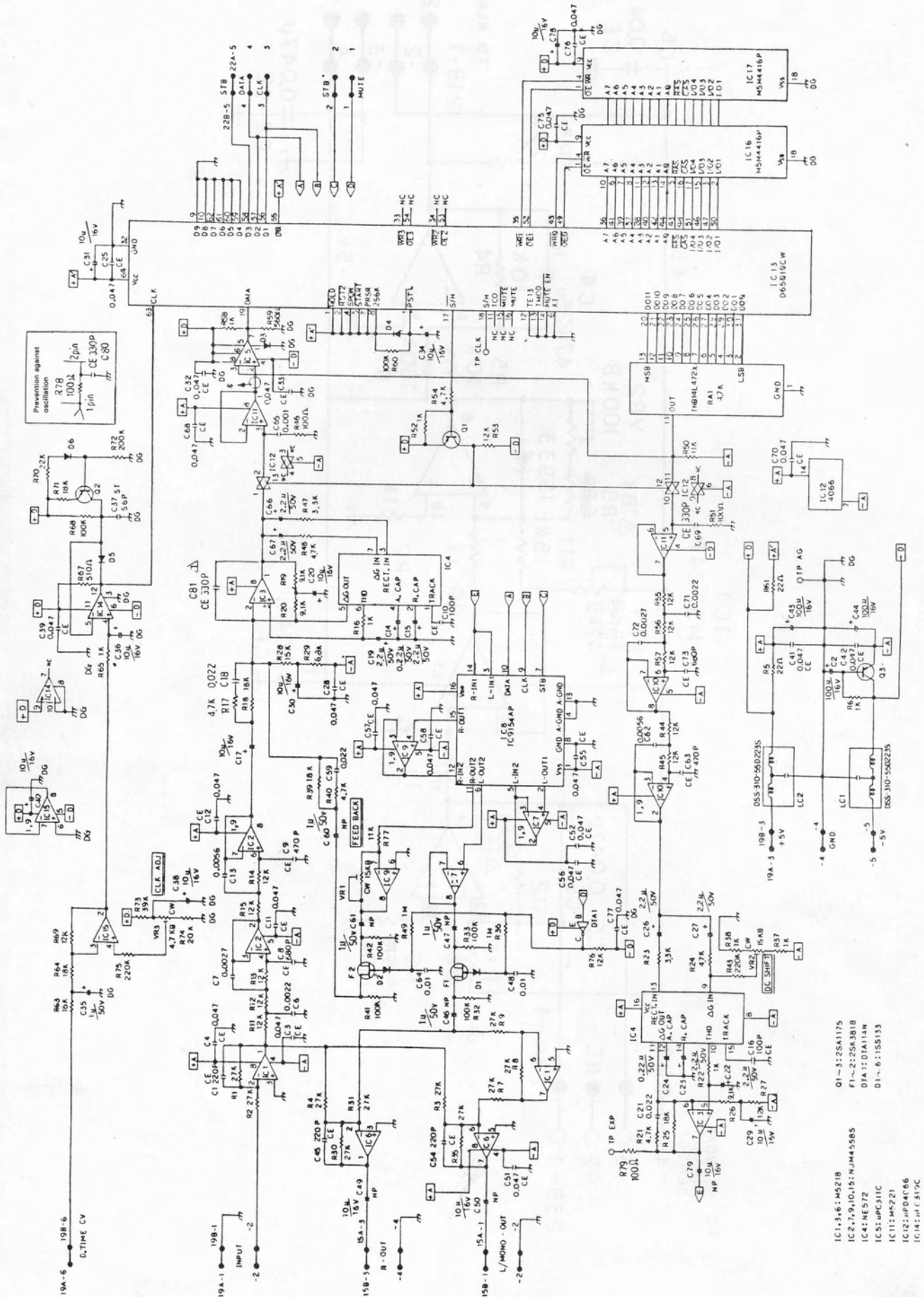




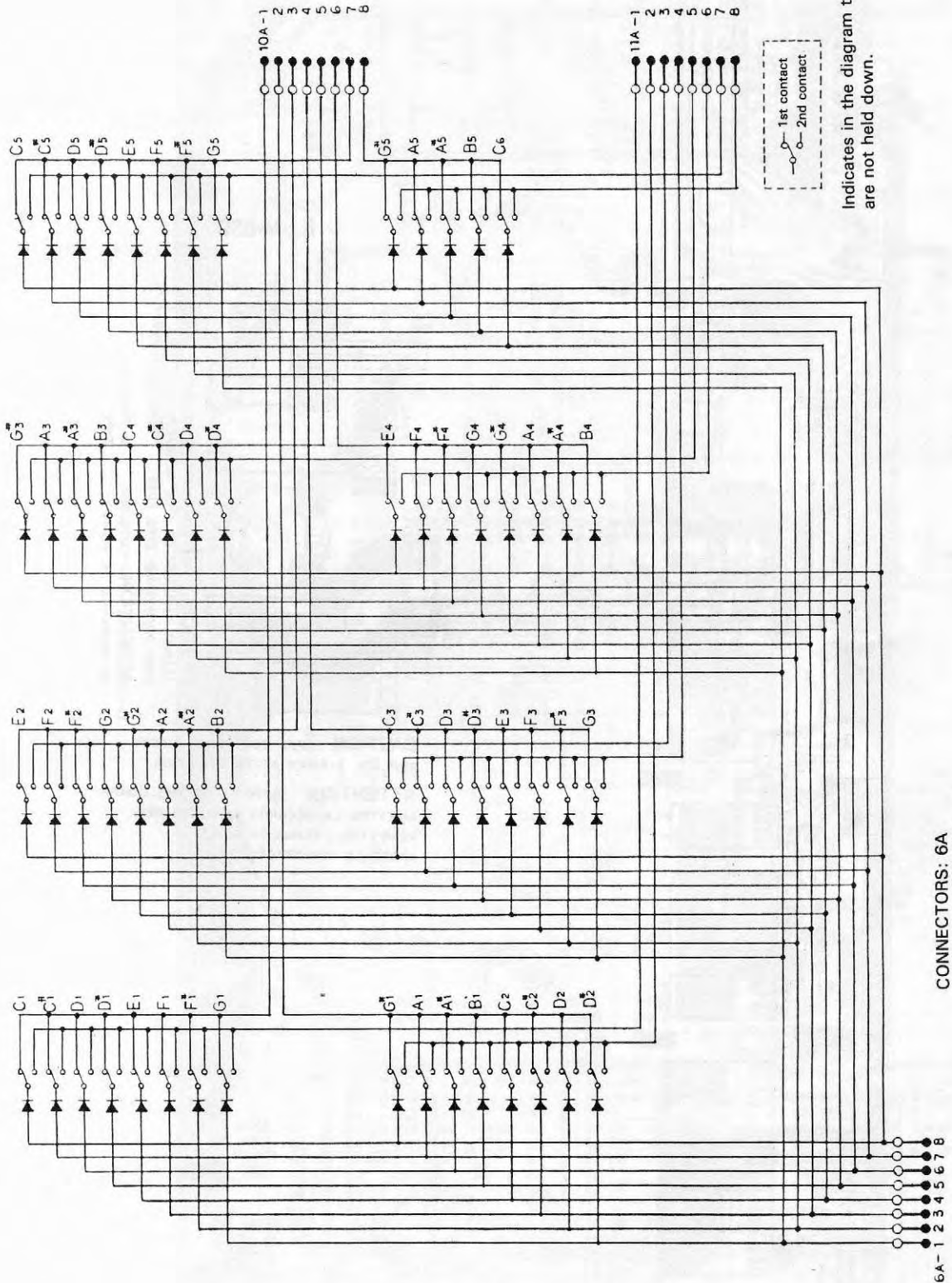








KEYBOARD MATRIX

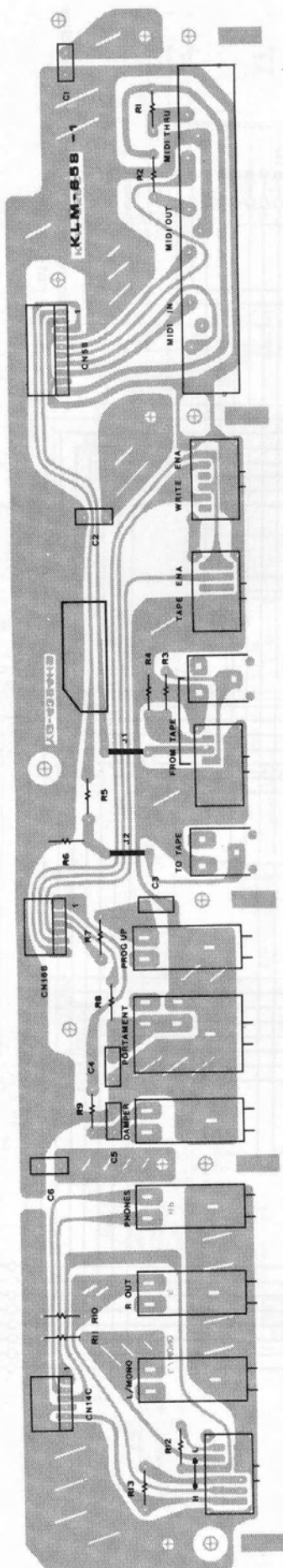


CONNECTORS: 6A
10A
11A

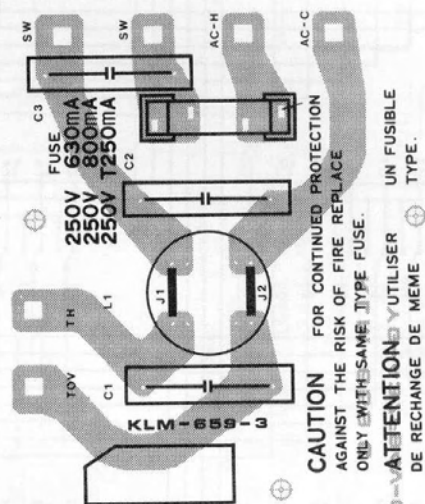
DIODES: 1S1555 or equivalent

6. P.C. BOARD

KLM-658



KLM-659

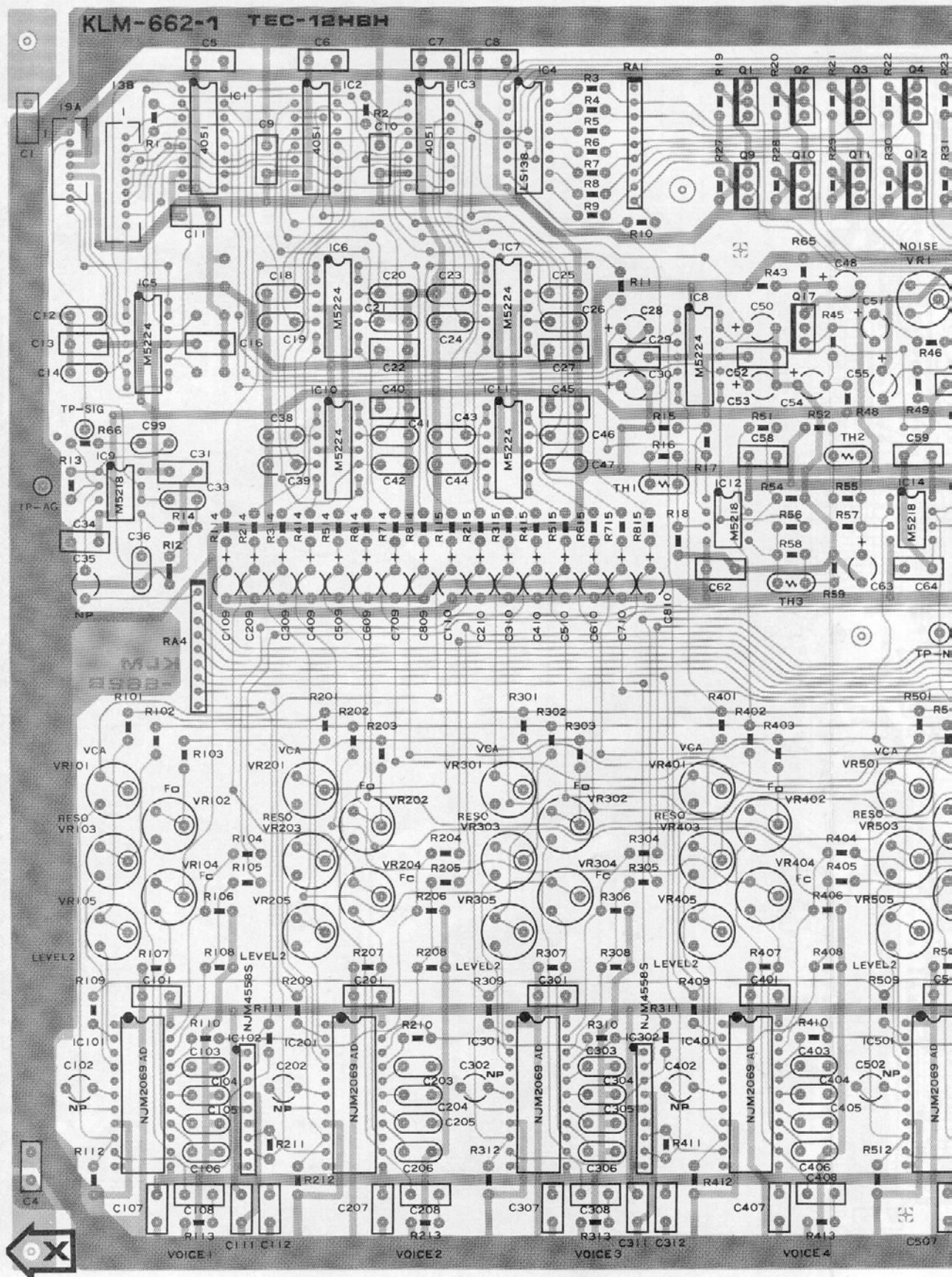


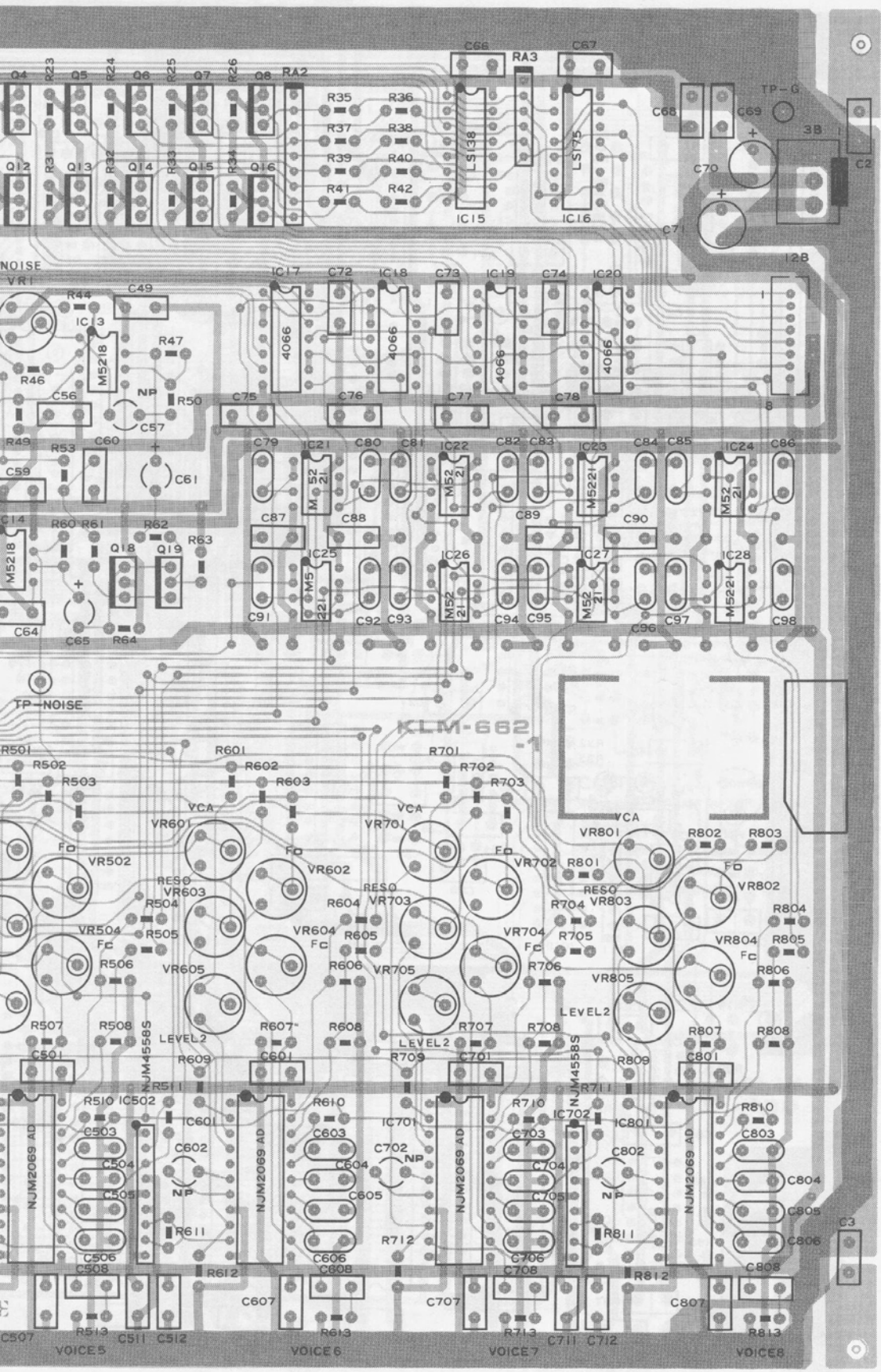
CAUTION FOR CONTINUED SAFETY
REPLACE BARRIER AFTER SARVICING.

ATTENTION AFIN DE NE PAS COMPR-
OMETTRE LA SECURITE DE L'APPAREIL.
REMETTRE L'ECRAN EN PLACE
APRES LE DEPANNAGE.

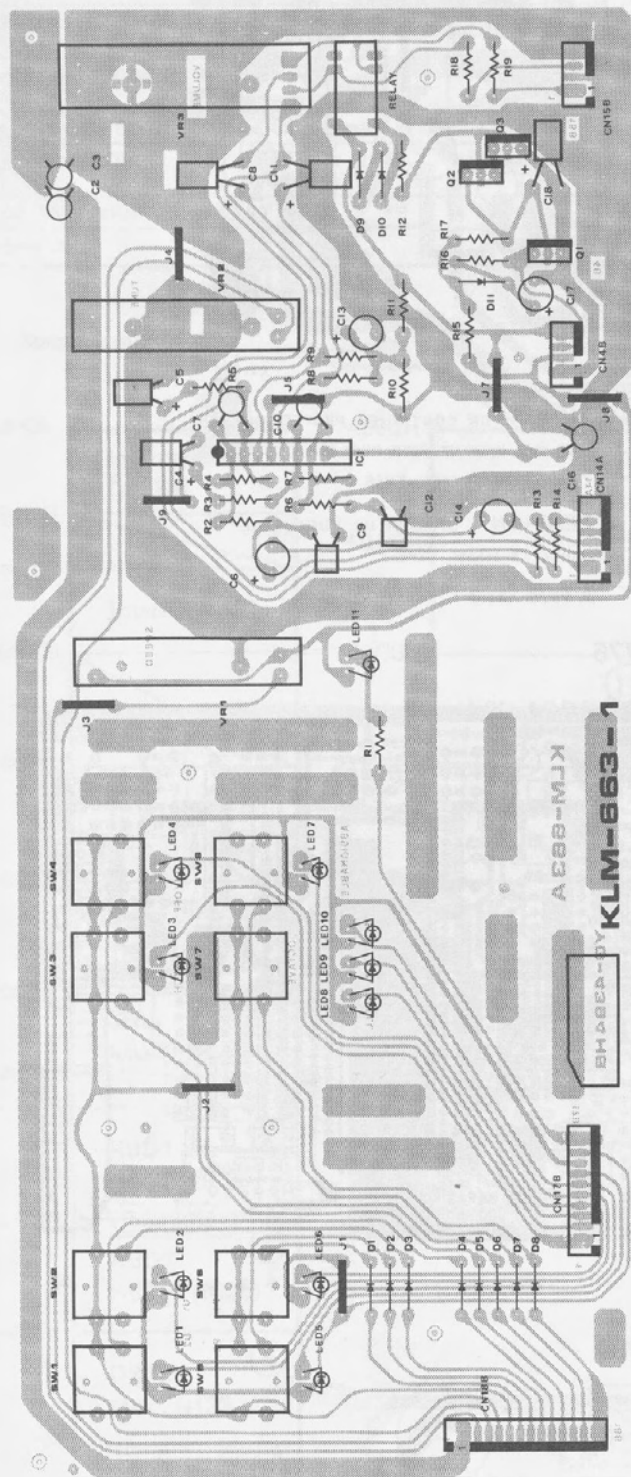
CAUTION FOR CONTINUED PROTECTION
AGAINST THE RISK OF FIRE REPLACE
ONLY WITH SAME TYPE FUSE.

ATTENTION UTILISER
DE RECHANGE DE MEME
TYPE.

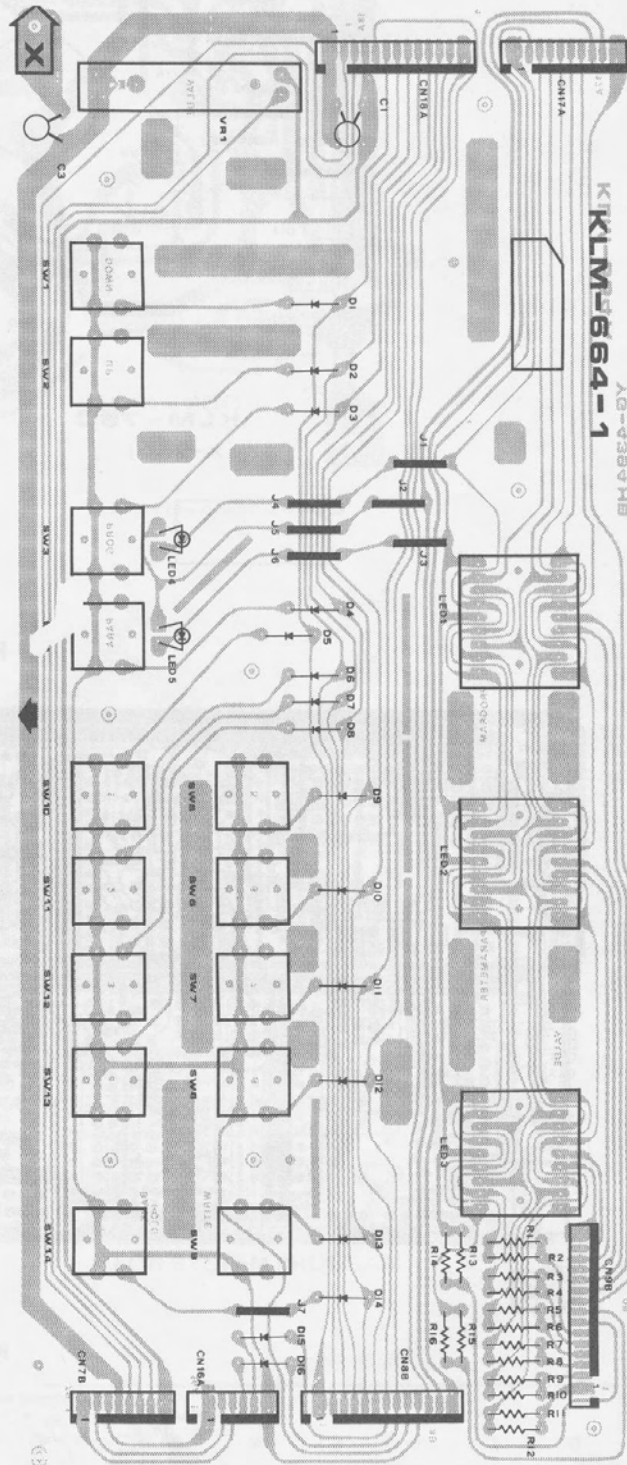




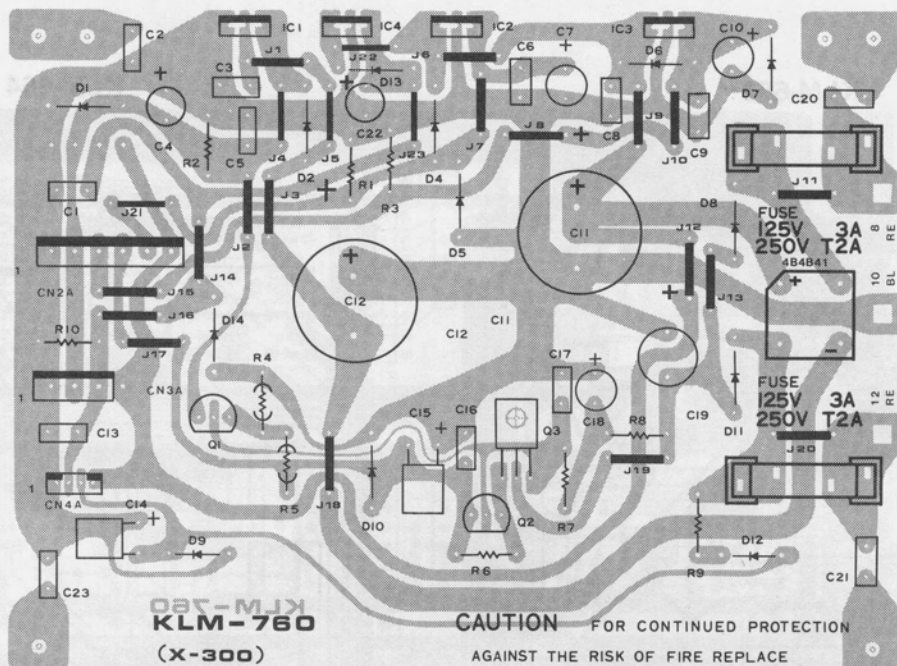
KLM-663



KLM-664



KLM-760

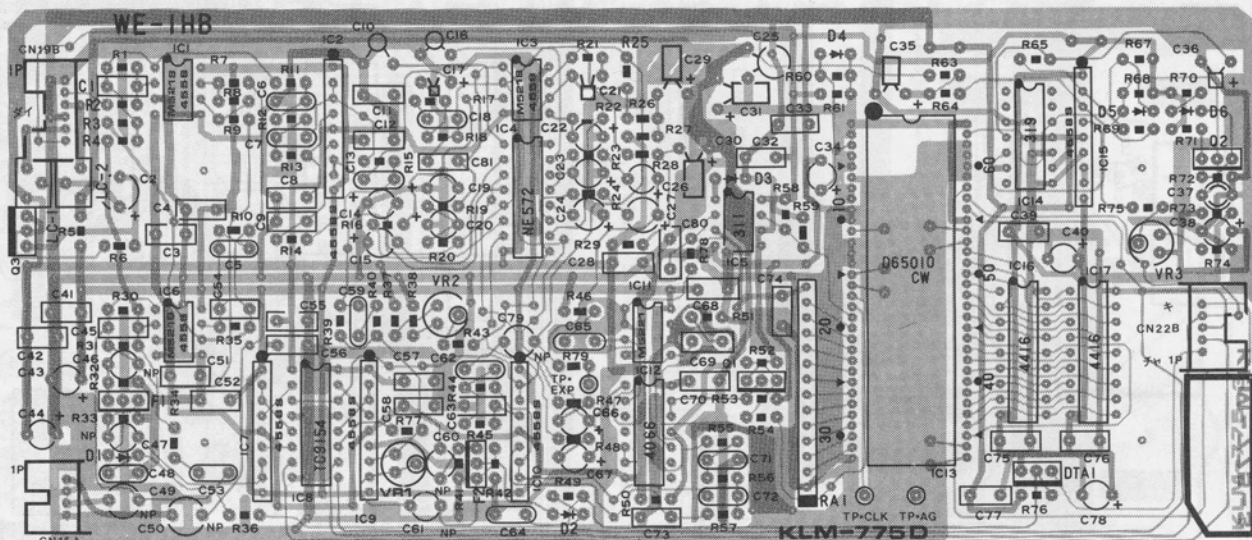


0-VA8TEA-DY

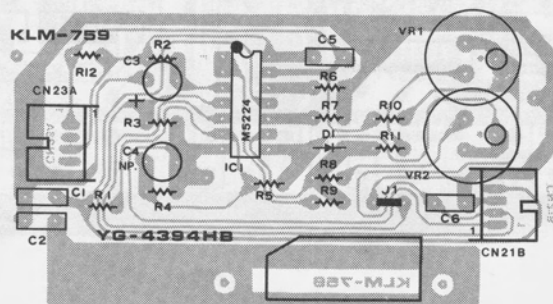
CAUTION FOR CONTINUED PROTECTION
AGAINST THE RISK OF FIRE REPLACE
ONLY WITH SAME TYPE FUSE.

ATTENTION UTILISER UN FUSIBLE DE
RECHANGE DE MEME TYPE.

KLM-775



KLM-759

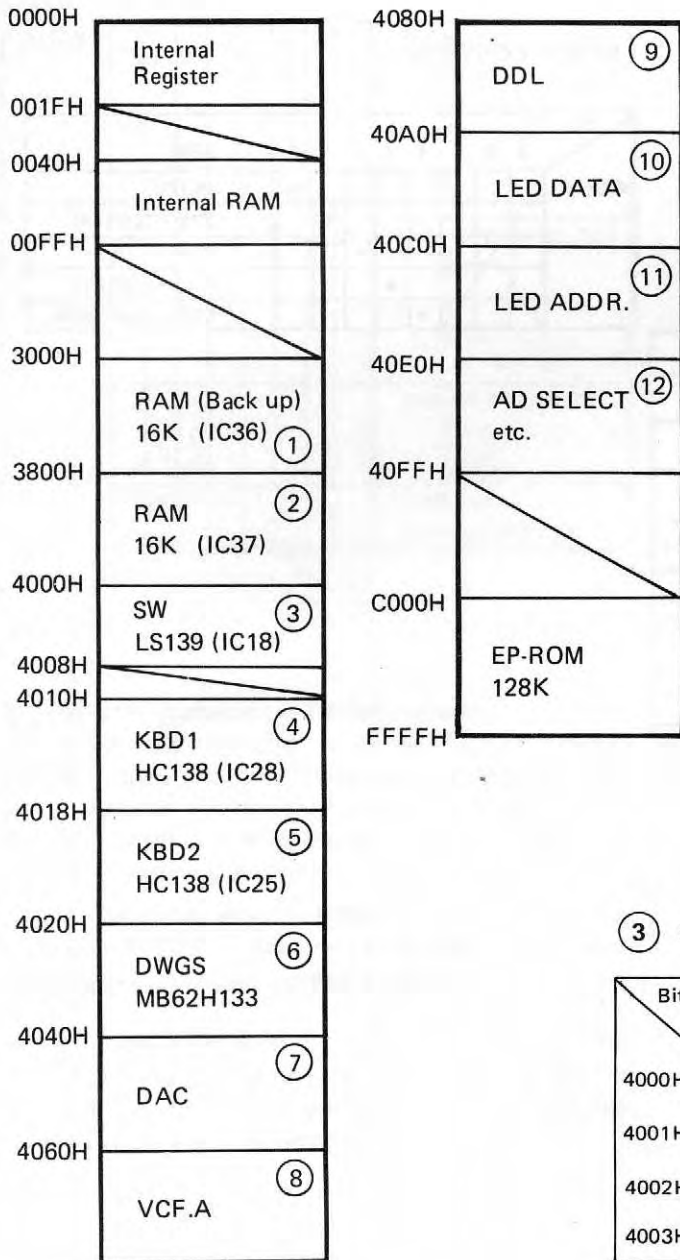


7. CIRCUIT DESCRIPTIONS

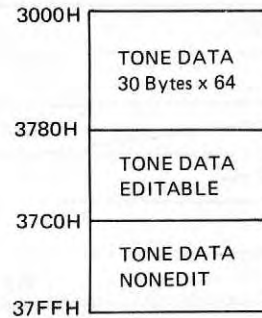
1. Hardware:

NAME	DESCRIPTION	PC BOARD
CPU 63B03X (8 bit, 2MHz)		KLM-661
ROM 27128 (N-MOS 16KB)	System program, data table	KLM-661
RAM1 6116 (C-MOS 2KB)	Tone data, backup	KLM-661
RAM2 6116 (C-MOS 2KB)	System use	KLM-661
Sound source DWGS	2 DC0 x 8 voice	KLM-661
Wave table ROM 613256	(256Kbit x 4) 16 Waveforms	KLM-661
VCF, VCA 2069		KLM-662
Digital delay		KLM-775

2. Memory map



① RAM (Battery Back up) 16K Bytes



② RAM 16K Bytes
FOR SYSTEM PROGRAM

③ SW

Bit	7	6	5	4	3	2	1	0
	4000H	8	7	6	5	4	3	2
4001H	Tape Enab.	Wr. Enab.	WRITE	B.H	PAR	PRG	UP	DOWN
4002H	00T	MODE	LATCH	Arp. On/Off	UNS2	UNS1	POLY2	POLY1
4003H	IRG 1 Reset (LS74)							

④ KBD1 (First Connection)

Bit	7	6	5	4	3	2	1	0
4010H	G1	F1	#F1	E1	#D1	D1	#C1	C1
4011H	#D2	D2	#C2	C2	B1	#A1	A1	#G1
4012H	B2	#A2	A2	#G2	G2	#F2	F2	E2
4013H	G3	#F3	F3	E3	#D3	D3	#C3	C3
4014H	#D4	D4	#C4	C4	B3	#A3	A3	#G3
4015H	B4	#A4	A4	#G4	G4	#F4	F4	E4
4016H	G5	#F5	F5	E5	E5	D5	#C5	C5
4017H				C6	B5	#A5	A5	#G5

⑧ VCF, VCA EG SELECT

Bit	7	6	5	4	3	2	1	0	HEX	JOB
4060H	•	—	—	—	—	—	—	—		Fc 1 ~ 8
	—	1	1	1	1	—	—	—	78	INHIBIT
									58	LEVEL 1
									59	" 2
									5A	RESONANCE
									5B	NOISE
									5C	MG 0V
									5D	DDL 0V
									60	VCA0 EG
									67	VCA7 EG
									70	VCF0 EG
									77	VCF7 EG

⑤ KBD2 (Second Connection)

4018H
 }
 401FH SAME AS KBD1 BIT MAP

⑥ DWGS

Bit	7	6	5	4	3	2	1	0
4020H	VOICE1 OSC1 FREQ. DATA BOTTOM							
4021H	VOICE1 OSC2							
4030H	WAVEFORM V.1 OSC1							
4031H	OSC2							
403EH	WAVEFORM V.8 OSC1							
403FH	OSC2							

⑨ DDL CONTROL

Bit	7	6	5	4	3	2	1	0	JOB
4080H								•	MUTE
							•		STB (TOS154)
						•			CLK
					•				DATA SERIAL
				•					STB (D650100W)

⑦ DAC – HC374 (IC19)

FOR DAC (HA17008) DATA LATCH 8 BIT

Bit	7	6	5	4	3	2	1	0	DISP.
40A0H 0	DOT								PRG H
1									" L
2	DOT								PAR H
3									" L
4									VAL H
5	DOT								" L
6	PRG	PAR			POLY1	UN1	UN2	POLY2	
7	LATCH	ON/OFF	ASSIGN		FULL	200T	100T	TEMPO	

12 AD SELECT etc.

Bit	7	6	5	4	3	2	1	0	
40E0H									AD SELECT
						0	0	0	Bender
						0	0	1	MG
						0	1	0	Edit Slider
						0	1	1	Tune
						1	0	0	After Touch
									WAVEFORM SELECT
				0	0				OSC1 1 ~ 8
				0	1				" 9 ~ 16
				1	0				OSC2 1 ~ 8
				1	1				" 9 ~ 16
									VCF EG POLARITY
				0					
				1					
									ARP. RESET
									ARP. TEMPO LED

3. Using the diagnostics and utility programs

To test DW-8000 functions you can use the built-in diagnostics and utility programs. These are executed by holding down particular number keys (in the synthesizer's "programmer" section) and at the same time turning on the power (i.e., resetting the unit).

1, 2: (1) Displays system ROM version number. The system ROM version number is shown in the value display. Version number 850708 is indicated by "07".

(2) Sets write protect attribute. This is useful when displaying the synthesizer in a shop. It prevents anything from being written into memory. Effective on versions 850709 and later.

5, 6: Reference voltage adjustment mode. Refer to the adjustment procedures.

7, 8: Tuning mode.

Tune fixed, touch sense maximums setting, voice indication.

Refer to adjustment procedures.

5, 8: RAM clear mode.

Erases 64 sound program settings from memory.

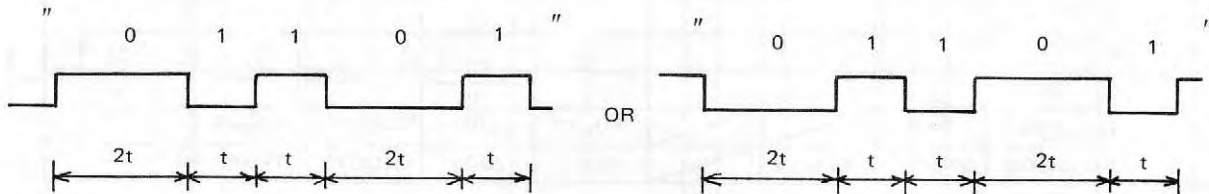
4. Tape interface format

1. Modulation system

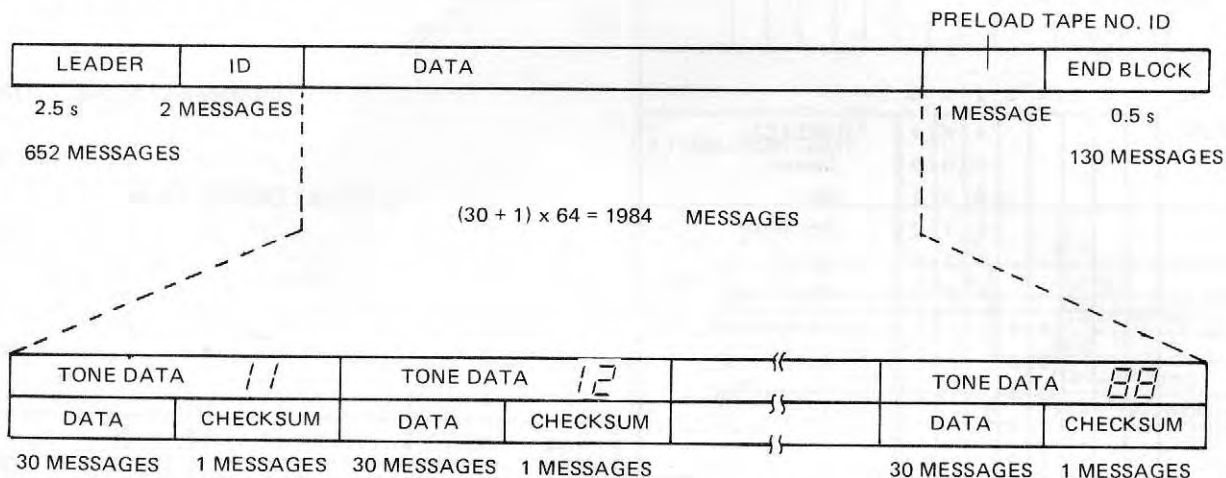
"1" $t = 320 \mu s$

"0" $2t = 640 \mu s$

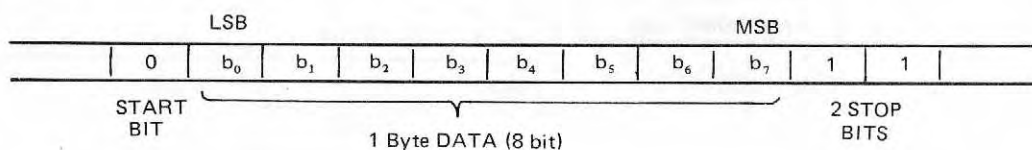
Example:



2. Format of one set of program data



3. Format of one message



3.1 LEADER DATA

"FF H" (652 MESSAGES)

3.2 ID DATA

ID1 "42 H" KORG
ID2 "03 H" X-300

3.3 CHECKSUM DATA

ONE TONE DATA

$\sum_{n=1}^{30} D_n$ AND "FFH"

3.4 PRELOAD TAPE

NORMAL

No. ID (FOR TEST)

"00 H"

3.5 END BLOCK DATA

"FFH"

(130 MESSAGES)

5. Main circuit explanation

1) Keyboard scanning

The CPU outputs 3-bit addresses in the range A0~A2 which are decoded by the address decoder HC138 (IC25, IC28). The output of this decoder goes through connector CN10 (first contact) and CN11 (second contact) to the keyboard matrix for scanning.

Keyboard matrix output goes from connector CN6 through the inverting octal buffer HC240 (IC16 HD specification) to be passed to the data bus D0~D7.

2) Key on/off data and velocity data

Velocity data is computed using the CPU timer to measure the time from when the key contact leaves the first contact until it reaches the second contact.

KEY ON data is generated when the key contact reaches the second contact. Key off data is generated when the first contact is reached after leaving the second contact.

3) After Touch data

The ESK-901 keyboard's after touch unit (sandwich of metal plate, conductive rubber, and metal plate) produces impedance variations which KLM-759 detects as analog voltages over the range of 0V~3.5V.

The voltage passes through the multiplexer 4051 (IC5) to the CPU where, via a DAC, it changes the control voltage for the effect.

4) DWGS system

This board contains the DWGS basic system. The purpose of this system is to get pitch and waveform data from the CPU bus and output a cyclic (repetitive) waveform of constant amplitude.

Oscillator operation

The PAI (phase angle increment) value and PAR (phase angle register) value are added and the result is stored again in the PAR. The PAR value is used as the wave table address. The wave table stores different harmonic configuration data for each octave on the keyboard.

IC47 (MB64H129) performs the processing needed to use the PAR value as the wave table address.

Finally, data read from the wave table is converted to an analog waveform by a D/A converter.

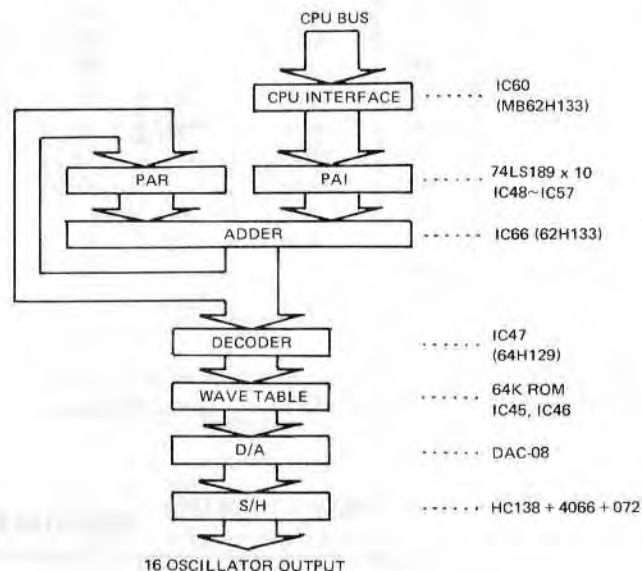
Time division multiplexing enables dual oscillator 6-voice sound source capability.

Maximum simultaneous output of this system is 8 voices x 2 oscillators.

Note: Given a sampling frequency of 50 kHz, PAI data $N = 2^{18} \times f / 50 \times 10^3$ (where f is the pitch frequency) is rounded to an integer value for N and converted to a hexadecimal number.

The main LSI chips are the CMOS gate array IC47 (MB-64H129) and IC60 (MB62H133), the wave-table 256K mask ROM IC45 and IC46 (HN613256), the ten TTL 64-bit RAM chips for PAI & PAR (IC48~IC57; S189), the 8-bit D/A converter IC42 (DAC-08), decoder chips IC50, IC59 (LS244), KLM-662 IC16 (LS175), IC14, IC15 (LS138), as well as S/H analog switches (IC17~IC20; 4066) and OP AMPS (IC21~IC25; 072).

IC60 (MB62H133) is a 64-pin LSI with about 800 gates handling major aspects of the system including the CPU interface, timing generation, and adder.



MB62H133 TERMINAL NAMES

Pin No.	Type	Term	Pin No.	Type	Term	Pin No.	Type	Term
1	Input	A0	23	Input	CS	44	Bus	DB18
2	Input	A1	24	Input	WR	45	Bus	DB17
3	Input	A2	25	Input	RST	46	Bus	DB16
4	Input	A3	26	Input	CLK	47	Bus	DB15
5	Input	A4	27	Output	SHEN	48	Power supply	VSS
6	Input	D0	28	Output	VN3	49	Bus	DB14
7	Input	D1	29	Output	VN2	50	Bus	DB13
8	Input	D2	30	Output	VN1	51	Bus	DB12
9	Input	D3	31	Output	VN0	52	Bus	DB11
10	Input	D4	32	Power supply	VDD	53	Bus	DB10
11	Input	D5	33	Output	RAMC	54	Bus	DB9
12	Input	D6	34	Output	WFW	55	Bus	DB8
13	Input	D7	35	Output	PAIW	56	Bus	DB7
14	Input	D8	36	Output	PAIS	57	Bus	DB6
15	Input	D9	37	Output	PARW	58	Bus	DB5
16	Power supply	VSS	38	Output	PARS	59	Bus	DB4
17	Input	D10	39	Output	WFG	60	Bus	DB3
18	Input	D11	40	Output	OCT2	61	Bus	DB2
19	Input	D12	41	Output	OCT1	62	Bus	DB1
20	Input	D13	42	Output	OCT0	63	Bus	DB0
21	Input	D14	43	Bus	DB19	64	Power supply	VDD
22	Input	D15						

IC47 (MB64H129) is used mainly for wave table ROM address decoding; it is a 40-pin LSI having about 400 gates.

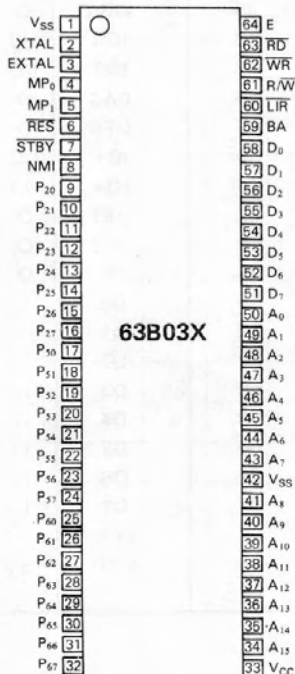
MB64H129 TERMINAL NAMES

Pin No.	Type	Term	Pin No.	Type	Term	Pin No.	Type	Term
1	Input	DB0	15	Input	OCT0	28	Output	AO9
2	Input	DB1	16	Input	OCT1	29	Output	AO8
3	Input	DB2	17	Input	OCT2	30	Power supply	VDD
4	Input	DB3	18	Input	WFG	31	N.C.	
5	Input	DB4	19	Input	FNG	32	Output	AO7
6	Input	DB5	20	Input	RST	33	Output	AO6
7	Input	DB6	21	N.C.		34	Output	AO5
8	Input	DB7	22	Output	CEC	35	Output	AO4
9	Input	DB8	23	Output	CEB	36	Output	AO3
10	Power supply	VSS	24	Output	CEA	37	Output	AO2
11	N.C.		25	Output	AO12	38	Output	AO1
12	Input	DB9	26	Output	AO11	39	Output	AO0
13	Input	DB10	27	Output	AO10	40	N.C.	
14	Input	DB11						

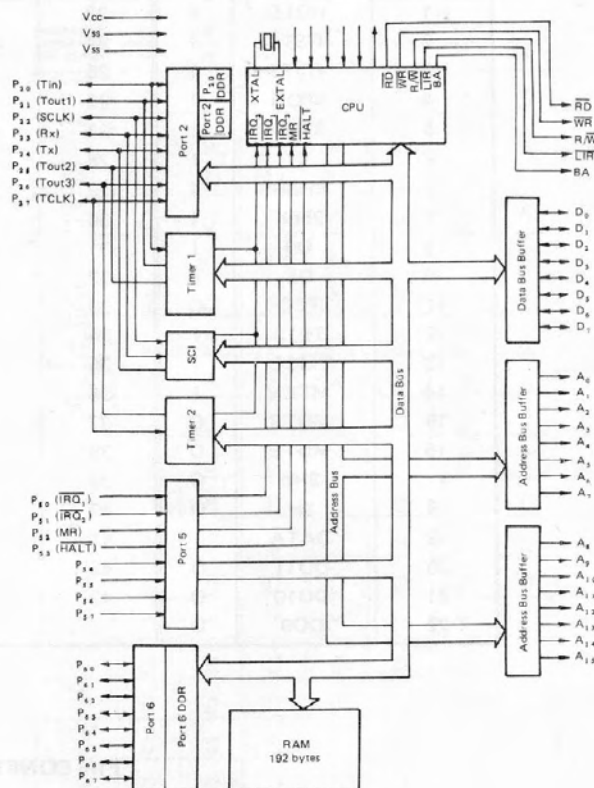
IC45 and IC46 (HN613256) store digitally encoded harmonic waveforms of the harmonics 2, 5, 10, 20, 40, 80, 160 and 320.

Here a waveform including the 320th harmonic refers to addition of the sine value 320 times at a particular phase.

PIN CONFIGURATION



BLOCK DIAGRAM



μPD6510 CW-113 TERMINAL NAMES

Pin No.	Pin Name	I/O	Pin No.	Pin Name	I/O	Pin No.	Pin Name	I/O
1	HOLD	I	23	DO8	O	44	A0	O
2	RST1	I	24	DO7	O	45	WR0	O
3	RST2	I	25	DO6	O	46	IO3	I/O
4	SPON	I	26	DO5	O	47	IO2	I/O
5	STRT	I	27	DO4	O	48	CAS	O
6	X1	I	28	DO3	O	49	OE0	O
7	PRSR	I	29	DO2	O	50	IO1	I/O
8	256K	I	30	DO1	O	51	IO4	I/O
9	D9	I	31	DO0	O	52	OE1	O
10	D8	I	32	GND	0V	53	OE2	O
11	TCO	O	33	WR3	O	54	OE3	O
12	TE13	I	34	WR2	O	55	D0	I
13	TMOD	I	35	WR1	O	56	D1	I
14	MTEN	I	36	A7	O	57	D2	I
15	MUTB	O	37	A4	O	58	D3	I
16	MUTE	O	38	A3	O	59	D4	I
17	SHB	O	39	A5	O	60	D5	I
18	SH	O	40	A2	O	61	D6	I
19	DATA	I	41	A6	O	62	D7	I
20	DO11	O	42	A1	O	63	CLK	I
21	DO10	O	43	RAS	O	64	VDD	+5V
22	DO9	O						

PIN CONFIGURATION



8. ADJUSTMENT PROCEDURES

PROGRAM NO. ASSIGN MODE PARAM. MEMORY	11 POLY1 13	12 POLY1 23	13 POLY1 31	14 POLY1 31	15 POLY1 26	16 POLY1 72	17 POLY1 72	18 POLY1 71	21 POLY1 73
OSC1 oct	11	8	8	8	8	8	8	8	8
waveform	12	16	16	16	16	16	16	16	16
level	13	31	0	0	0	0	31	31	31
A.BEND sl.	14	0	0	0	0	0	0	0	0
mode	15	∩	∩	∩	∩	∩	∩	∩	∩
time	16	0	0	0	0	0	0	0	0
int	17	0	0	0	0	0	0	0	0
OSC2 oct	21	8	8	8	8	8	8	8	8
waveform	22	16	16	16	16	16	16	16	16
level	23	0	31	0	0	0	0	0	0
interval	24	1	1	1	1	1	1	1	1
detune	25	0	0	0	0	0	0	0	0
NOISE level	26	0	0	0	0	31	0	0	0
VCF cutoff	31	63	63	32	44	63	63	63	63
resonance	32	0	0	31	31	0	0	0	0
kbd track	33	0	0	0	0	0	0	0	0
polarity	34	∩	∩	∩	∩	∩	∩	∩	∩
eg int	35	0	0	0	0	0	0	0	0
VCF attack	41	0	0	0	0	0	0	0	0
decay	42	0	0	0	0	0	0	0	0
break p	43	0	0	0	0	0	0	0	0
slope	44	0	0	0	0	0	0	0	0
sustain	45	0	0	0	0	0	0	0	0
release	46	0	0	0	0	0	0	0	0
velocity	47	0	0	0	0	0	0	0	0

PROGRAM NO. ASSIGN MODE PARAM. MEMORY	11 POLY1 13	12 POLY1 23	13 POLY1 31	14 POLY1 31	15 POLY1 26	16 POLY1 72	17 POLY1 72	18 POLY1 71	21 POLY1 73
VCA attack	51	0	0	0	0	0	0	0	0
decay	52	0	0	0	0	0	0	10	10
break p	53	31	31	31	31	31	31	0	0
slope	54	0	0	0	0	0	0	0	0
sustain	55	31	31	31	31	31	31	0	0
release	56	0	0	0	0	0	0	10	10
velocity	57	0	0	0	0	0	0	0	0
MG w. form	61	∧	∧	∧	∧	∧	∧	∧	∧
freq	62	0	0	0	0	0	0	0	0
delay	63	0	0	0	0	0	0	0	0
osc	64	0	0	0	0	0	0	0	0
vct	65	0	0	0	0	0	0	0	0
BEND osc	66	0	0	0	0	0	0	0	0
vct	67	off	off	off	off	off	off	off	off
DOL time	71	0	0	0	0	0	0	3	0
factor	72	0	0	0	0	15	0	0	0
feedback	73	0	0	0	0	0	0	15	15
frequency	74	0	0	0	0	0	0	0	0
int	75	0	0	0	0	0	0	0	0
effect lev	76	0	0	0	0	15	15	15	15
PORTA time	77	0	0	0	0	0	0	0	0
A.T osc mg	81	0	0	0	0	0	0	0	0
vct	82	0	0	0	0	0	0	0	0
vca	83	0	0	0	0	0	0	0	0

Caution:

- 1) This product has been thoroughly adjusted at the factory before shipment. Therefore never turn any Semi Fixed VRs other than those required for servicing.
- 2) After turning on power, wait at least 15 minutes before beginning test and adjustment.
- 3) Be sure to save the data on tape before loading test data as when loading test data into DW-8000, previous data is erased.

1. Clearing RAM and Loading Test Data

- 1) After keeping DW-8000 power on at least 15 minutes, once turn off power and then on pressing number keys [5] and [8].
- 2) Connect to an Amplifier etc. and confirm if there is no sound to check all data of RAM have been erased.
- 3) Load Test Data.

* For convenience, save those chart on tape as Check and Adjustment procedure described below is always made with the data.

2. D/A converter, CV Check and Adjustment Procedure (KLM-661)

- 1) Turn off power and then on pressing number keys [5] and [6] at the same time.
- 2) Confirm if UrEF (Voltage reference) is displayed and becomes Test Mode 1.
- 3) Connect a Digital Voltmeter to Test Points: [TP-AG], [TP-REF1] allocated in left side of the board.
GND side - [TP-AG], +side - [TP-REF1]
- 4) Memorize the value of Digital Voltmeter and then connect as follows.
+side - [TP-CV]
- 5) Adjust VR1 to obtain the same value as one of +side - [TP-REF1].

Remarks: Adjustment value is in range of 3.29V - 3.64V.

Note: Test Mode 1 cannot be cancelled till being reset.
(Power OFF - ON)

3. VCA Level Check and Adjustment (KLM-662)

Turn off power and then on pressing number keys [7] and [8] and Test Mode becomes 2.

Oscillating voice is displayed on LED Display with any single key being played under this mode.

Note: It must be Test Mode 2 though voice displaying is not required.

- 1) Select Program number 11.
- 2) Connect an Oscilloscope to [TP-SG] (GND side – [TP-AG]) and observe amplitude of output waveform.
- 3) Press C5 key and observe waveform described in Fig. 1.
- 4) Adjust Semi Fixed VRs (VR101 – VR801) of oscillating voice (refer to Voice Display) to obtain waveform of amplitude being 0.7VP-P.

Remarks: Allowance of deviation of each voice is under 40mV.

4. OSC 2 Level Check and Adjustment (KLM-662)

- 1) Select Program number 12.
- 2) Make same adjustment as VCA Level one.
- 3) Necessary Semi Fixed VRs for adjustment are among VR105 – VR805 of oscillating voice. (refer to Voice Display)

5. VCF Resonance Check and Adjustment (KLM-662)

1. Level
- 1) Select Program number 13.
- 2) Connect an Oscilloscope to [TP-SG]. (GND side to [TP-AG])
- 3) Press any single key and confirm amplitude of output waveform of each voice is 0.9VP-P. Unless, adjust Semi Fixed VRs among VR103–VR803 of oscillating voice.

Remarks: Allowance of deviation of each voice is under 40mVP-P.

2. fo

- 1) Select Program number 13.
- 2) Connect Chromatic Tuner AT-12 to Output Jack of DW-8000.
- 3) Press any single key and confirm oscillation frequency of each voice on AT-12 Display is C (523Hz), 1 octave, 0 cent.
- 4) Unless, adjust Semi Fixed VRs among VR102 – VR802 of oscillating voice.

Remarks: Allowance of deviation of each voice is 0 cent $\pm$ 10 cent.

3. fc

- 1) Select Program number 14.
- 2) Connect Chromatic Tuner AT-12 to Output Jack of DW-8000.
- 3) Press any single key and confirm oscillation frequency of each voice on AT-12 Display is C (2093Hz), 3 octave, 0 cent.
- 4) Unless, adjust Semi Fixed VRs among VR104 -- VR804 of oscillating voice.

Remarks: Allowance of deviation of each voice is under 0 cent $\pm$ 10 cent.

6. Noise Level Check and Adjustment (KLM-662)

- 1) Select Program number 15.
- 2) Connect a Noise Meter to [TP-SG] (GND side – [TP-AG]).
- 3) Press any single key and confirm value of the meter is –15dbm.
- 4) Unless, adjust VR1 to obtain correct value.

7. DWGS Clock Check and Adjustment (KLM-661)

- 1) Connect a Frequency Counter to [TP-CLK] (GND side to [TP-DG]).
- 2) Confirm the counter value is in range of 6.395MHz – 6.405MHz.
- 3) Unless, adjust VR2 to obtain correct value.

8. Digital Delay MG-CLK Check and Adjustment (KLM-775)

- 1) Select Program number 16.
- 2) Connect a Frequency Counter to [TP-CLK] (GND side to [TP-AG]).
- 3) Confirm the counter value is 20.0kHz. (Effective with 3 figures only.)
- 4) Unless, adjust VR3 to correct value.
- 5) After 3) is confirmed, select Program number 17.
- 6) Confirm the counter value is in range of 35.0kHz – 40.0kHz.

9. Digital Delay Output Waveform Center Position Check and Adjustment (KLM-775)

- 1) Select Program number 17.
- 2) Connect an Oscilloscope to [TP-EXP] (GND side to [TP-AG]). Adjust lit line of the Oscilloscope to 0 volt line of the screen.
- 3) Press C5 key and confirm center of amplitude of output waveform is on 0 volt line of the screen.
- 4) Unless, adjust VR2 to obtain correct position.

10. Digital Delay Feed Back Check and Adjustment (KLM-775)

- 1) Select Program number 18.
- 2) Press C5 key and confirm if delayed sound lasts 2 seconds without no ringing.
- 3) Unless, adjust VR1. (Start to ring when turn to the right. Turn to the left and adjustment point is where ringing stops.)
- 4) After 2) is confirmed, select Program number 21.
- 5) Press C5 key and confirm if there is no ringing with delayed sound.

11. Check and adjustment of keyboard after touch effect

Purpose: This should be performed if the keyboard is replaced or in other cases when it is necessary to assure balanced response and compensate for differences in the weight of individual keys.

- 1) Remove connector CN23 from KLM-759 and connect a digital multimeter (DVM or other device that measures impedance) to the 1-pin (output) and 3-pin (GND or earth).

2) Place a 1,500 gram weight on each key in sequence and note the keys that give the lowest (the low weight key) and highest (the high weight key) impedance values. Mark these two keys (with tape, etc.).

General standard: The low weight key is a white key and has an impedance value of 3 ohms or less.

The high weight key is a black key and has an impedance value of 500 ohms ($\pm 10\%$).

3) Connect an oscilloscope to KLM-759 CN21 1-pin (output) and 3-pin (GND).

Connect to CN23 which was previously disconnected.

4) Place a 500g weight on the front of the low weight key found above.

Adjust VR1 so that output voltage crosses the 0V line (rising from - to +) within 2 to 8 seconds of loading the key with the weight.

(Threshold voltage level adjustment.)

5) Next, put a 1,500 gram weight on the front of the high weight key and adjust VR2 so that the output voltage crosses the +3.5V line within 2 to 8 seconds of loading the key with the weight.

(Buffer amp gain adjustment.)