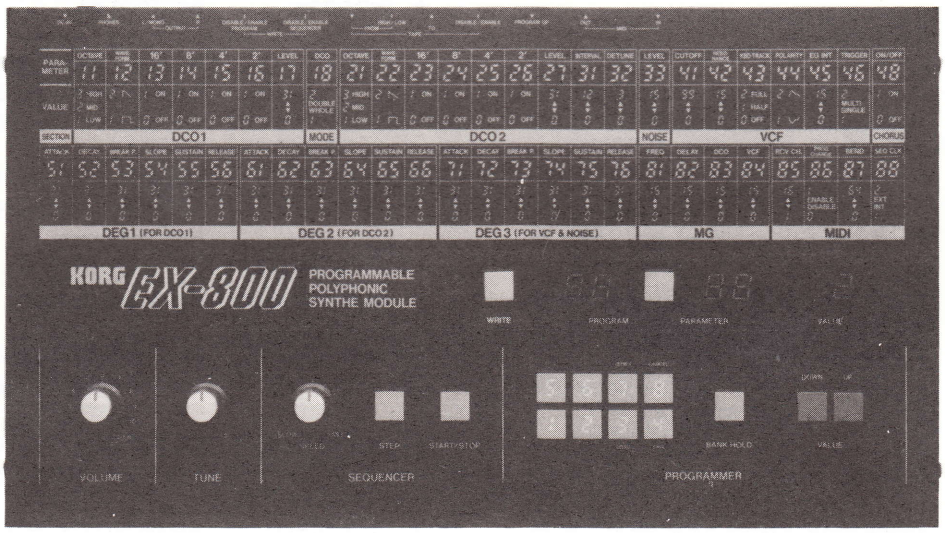
KORG®



KORG PROGRAMMABLE POLYPHONIC SYNTHE MODULES

SERVICE MANUAL EX-800

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KEIO ELECTRONIC LABORATORY CORPORATION
TOKYO/JAPAN

1. SPECIFICATIONS

• Voice	8 Voice (WHOLE mode) 4 Voice (DOUBLE mode)
• DCO 1	Octave (LOW, MID, HIGH), Waveform (⋀, ⊓), 16′ 8′ 4′ 2′ (ON/OFF) Level (0 - 31)
• DCO 2	Octave (LOW, MID, HIGH), Waveform (⋀, ⊓), 16′ 8′ 4′ 2′ (ON/OFF) Level adjustment, Interval (0 - 12 semitones), Detune (−20 cent MAX)
• DCO Mode	(WHOLE, DOUBLE)
• Noise	Level (0 - 15) (White noise)
* VCF	Cutoff Frequency (0 - 99), Resonance (0 - 15), Keyboard Track (OFF, HALF, FULL), EG Intensity (0 - 15) EG Polarity (⋁, ⋀), Trigger mode (for DEG 3 only) (SINGLE, MULTI)
• Chorus	ON/OFF
• DEG 1 (FOR DCO 1)	Attack time, Decay time, Break Point level, Slope time, Sustain level, Release time (ALL 0 - 31).
• DEG 2 (FOR DCO 2)	Attack time, Decay time, Break Point level, Slope time, Sustain level, Release time (ALL 0 - 31).
• DEG 3 (FOR VCF & NOISE)	Attack time, Decay time, Break Point level, Slope time, Sustain level, Release time (ALL 0 - 31).
• MG	Frequency, Delay time, DCO intensity, VCF intensity (ALL 0 - 15).
• MIDI	Receive Channel (1 - 16), Program Change (ENABLE/DISABLE), Sequencer Clock (INT, EXT), Bend (INTENSITY)
• TUNE	+/−50 cents
• Key data receivable range	C_1 ~ C_6/61 keys (36 ~ 96 AT MIDI)

• Power	OFF, Master VOLUME
• Sequencer	START/STOP, STEP, SPEED (Slow - Fast)
• Programs	64 (11 to 88)
• Programmer	Number select buttons (1-8), PROGRAM/PARAMETER, BANK HOLD, UP, DOWN, WRITE switches
• Display	Program Number, Parameter Number, Parameter Value, Bank hold indicator, Edit indicator
• Tape interface	Save, Load, Verify, Cancel
• Input jacks	FROM TAPE (HIGH/LOW), PROGRAM UP (⊓ GND)
• Output jacks	Output (R, L/MONO), HEADPHONES, TO TAPE.
• Tape switch	ENABLE/DISABLE
• Write switch	Program (ENABLE/DISABLE) Sequencer (ENABLE/DISABLE)
• MIDI jack	IN, OUT, THRU
• DC 9V	AC adapter jack (300 mA minimum; use only recommended KORG adapter)
• Dimensions	W: 404 mm × D: 222.5 mm × H: 64.5 mm
• Weight	2.6 kg
• Accessories	AC adapter, Cassette tape of Factory Preload Programs, Rack mount adaptor (×2),Screws (×4), 5-pin DIN cord

2. MIDI IMPLEMENTATION

1 Transmission data

Transmittable data consist of system exclusive messages only. These are used for the computer dump function.

System Exclusive Messages

STATUS		DATA	DESCRIPTION
RAM DATA	11110000	01000010	KORG ID
		00100001	FORMAT ID
		00000001	EX-800 ID
		(0000 * * * *	LSB RAM DATA 1-word
		0000 * * * *)	MSB
		⋮	
		(0000ssss	LSB CHECK SUM DATA
		0000ssss)	MSB
		11110111	EOX
DATA ERROR MESS-AGE	11110000	01000010	KORG ID
		00100001	FORMAT ID
		00000001	EX-800 ID
		00100000	DATA ERROR MESSAGE
		11110111	EOX

NOTE:

1. Data error message is sent if there is a check sum error during memory load. Error message: ($F0_H$, 42_H, 21_H, 01_H, 20_H, $F7_H$)
2. The request sent by the computer must be: $F0_H$, 42_H, 21_H, 01_H, 10_H, $F7_H$ (where "$_H$" means hexadecimal). Memory data is then output in the order: $F0_H$, 42_H, 21_H, 01_H, memory data check sum, $F7_H$ —

2 Reception data

Channel Messages

STATUS	2nd byte	3rd byte	DESCRIPTION
1000nnnn	0kkkkkkk	0--------	NOTE OFF EVENT
1001nnnn	0kkkkkkk	0vvvvvvv	NOTE ON EVENT
			(vvvvvvv ≧ 1)
			vvvvvvv = 0: OFF
1011nnnn	00000001	0vvvv---	DCO MODULATION
1011nnnn	00000010	0vvvv---	VCF MODULATION
1011nnnn	00000111	0vvvvvvv	VOLUME CONTROL
1011nnnn	0ccccccc	00000000	MODE CHANGE
			OMNI OFF (ccccccc=$7C_H$)
			OMNI ON (ccccccc = $7D_H$)
1100nnnn	0ppppppp		PROGRAM CHANGE
1110nnnn	0--------	0bbbbbbb	PITCH BEND

NOTE:

1. CHANNEL NUMBER:
   nnnn = 0_H ~ F_H (ch1 ~ ch16)
2. NOTE NUMBER:
   kkkkkkk = 36 ~ 96
   If received data is outside of this range, it will be transposed to nearest note of the same name.
3. Negative numbers are ignored.
4. OMNI ON/OFF is always interpreted as being accompanied by POLY-ON.
   Separate POLY-ON or MONO-ON messages are ignored.
5. pppppp = 0 ~ 127 (PROGRAM NUMBER)
   However, if number exceeds 63 then subtract 64 to find value as interpreted.
   Example:
   74 = 10
   64 = 0
6. VOLUME CONTROL:
   vvvvvvv = $7F_H$ is the loudest volume. Volume decreases as value approaches 00_H.

System Real Time Messages

STATUS	DESCRIPTION
11111000	SEQUENCER CLOCK
11111010	SEQUENCER START
11111100	SEQUENCER STOP
11111110	ACTIVE SENSING

CAUTION:

ACTIVE SENSING

If FE_H (STATUS 11111110) is ever received, then another FE_H or other MIDI data must be received every 300ms, otherwise the voices will be turned off. If FE_H is never received then operation will continue as usual.

System Exclusive Messages

STATUS		DATA	DESCRIPTION
DUMP DATA	11110000	01000010 00100001 00000001 (0000 * * * * 0000 * * * *) ⋮ (0000ssss 0000ssss) 11110111	KORG ID FORMAT ID EX-800 ID LSB } RAM DATA 1-word MSB } LSB } CHECK SUM MSB } DATA EOX
DATA DUMP REQUEST	11110000	01000010 00100001 00000001 00100000 11110111	KORG ID FORMAT ID EX-800 ID DATA REQUEST EOX

NOTE:

1. EX-800 begins RAM data dump about 300msec after it receives the final $F7_H$ in the RAM data request above.
2. $\sum_{n=1}^{1633}$ (One word of RAM data)n Least significant 8 bits are used for check sum.
3. Send data to EX-800 MIDI IN in the order: $F0_H$, 42_H, 21_H, 01_H, memory data check sum, $F7_H$, Internal.

RAM Data Chart

DATA	RELATIVE ADDRESS	BYTES
MIDI CH	0000_H	1
SEQUENCER DATA	0001_H	256
UNDEFINED	0101_H	1
CHORD MEMORY	0102_H	8
BEND DEPTH	$010A_H$	1
UNDEFINED	$010B_H$	21
PROGRAM DATA	0120_H	1345

NOTE:

1. SEQ DATA is as shown below.

SYMBOL	DATA	NOTE
D.C.	00_H	Fine
	01_H	Rest
	02_H	Tie
1	$1k_1k_1k_1k_1k_1k_1k_1$	MSB = 0: Notes remain for that timing.
3 2 1	$0k_1k_1k_1k_1k_1k_1k_1$ $0k_2k_2k_2k_2k_2k_2k_2$ $1k_3k_3k_3k_3k_3k_3k_3$	MSB = 1: Block end for that timing.

EXAMPLE:

DATA: $B4_H$, 02_H, $B5_H$, 02_H, 01_H, 01_H, $B7_H$, $B9_H$, 34_H, 37_H, BC_H, 02_H, 02_H, 02_H, 02_H, 02_H, 01_H, 01_H, 00_H

2. CHORD MEMORY
   0 $k_nk_nk_nk_nk_nk_nk_n$: KEY DATA
   0 0 0 0 0 0 0 0: END
3. Important: EX-800 does not use undefined data except for check sum.

Panel Control

PARAMETER NO.	PARAMETER	VALUE
85	RCV CH	1-16
86	PROG CHANGE	0·1
87	BEND	0-64
88	SEQ CLK	1·2

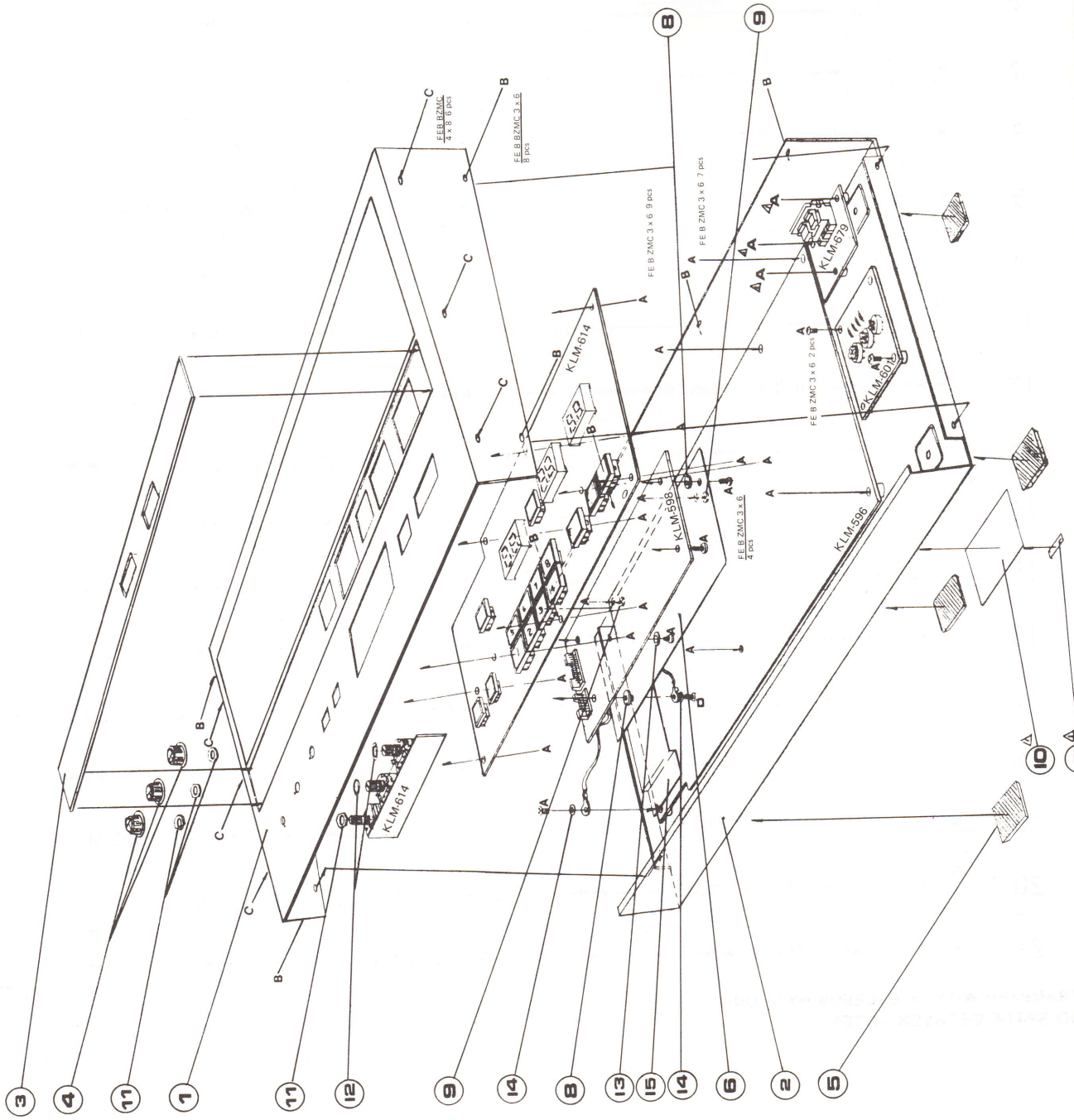
Program Parameter per ONE note

Byte \ bit	7	6	5	4	3	2	1	0
1	DCO 2 WAVEFORM		DCO 1 WAVEFORM		DCO 2 OCTAVE		DCO 1 OCTAVE	
2	DCO 2 FEET ON/OFF				DCO 1 FEET ON/OFF			
3	CHORUS ON/OFF	DCO 2 ON/OFF	UNDEFINED				DCO 2 DETUNE	
4	NOISE LEVEL				DCO 2 INTERVAL			
5	※ DCO 1	LEVEL		VCF EG POLARITY	VCF EG INT			
6	UNDEFINED	DCO 2 LEVEL						※
7	VCF TRIGMODE	VCF CUTOFF						
8	MG DELAY				MG FREQ			
9	MG VCF INT				MG DCO INT			
10	※ DEG 1 DECAY				DEG 1 ATTACK			
11	※	DEG 1 BREAK.P						※
12	※	DEG 1 SUSTAIN			DEG 1 SLOPE			※
13	※		DEG 1 RELEASE					※
14	DEG 2 DECAY				DEG 2 ATTACK			※
15	※ DEG 2 SLOPE				DEG 2 BREAK.P			
16	※	DEG 2 SUSTAIN						※
17	※ DEG 3 ATTACK				DEG 2 RELEASE			※
18	※		DEG 3 DECAY					※
19	DEG 3 SLOPE				DEG 3 BREAK.P			※
20	※ DEG 3 RELEASE			DEG 3 SUSTAIN				
21	VCF KBD TRACK		VCF RESONANCE					※

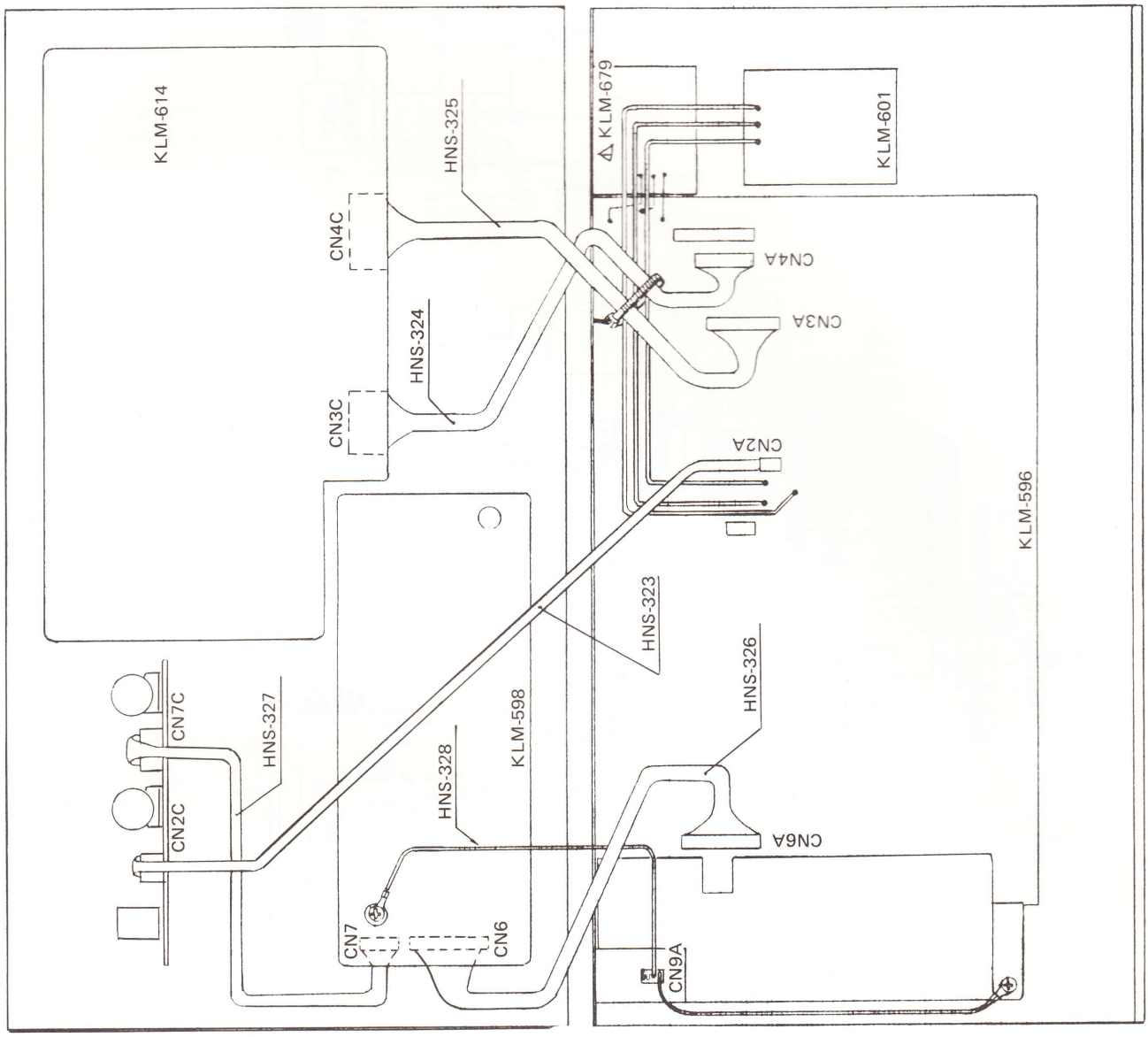
PRAMETER WITH ※ EXCEEDS BYTE UNIT.
NO SPACE BETWEEN NOTES

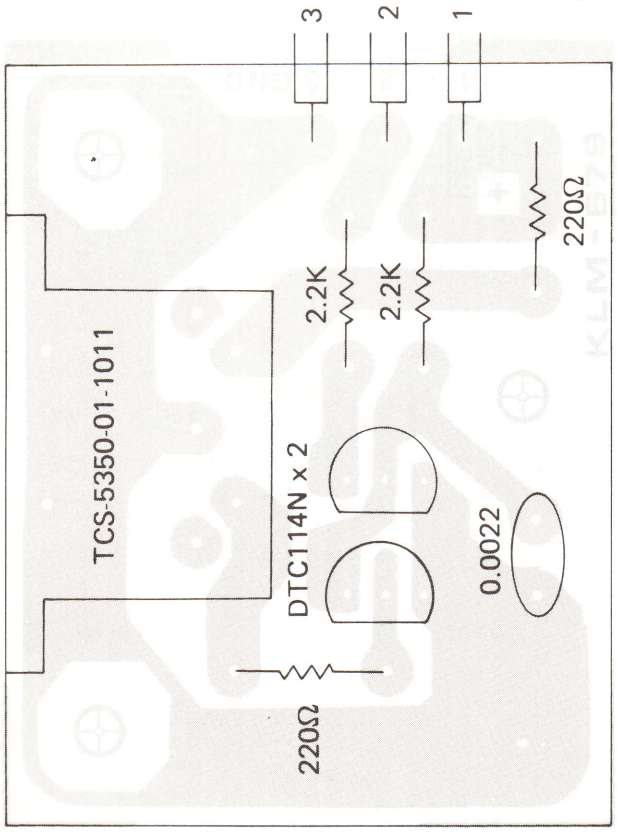
3. STRUCTURAL DIAGRAM

PAPRT No.	PART NAME	PART CODE
1.	UPPER CASE	64064300
2.	LOWER CASE	64064400
3.	DISPLAY COVER	64905500
4.	ROTARY VR KNOB	62009501
5.	RUBBER FEET	50007800
6.	SHIELDING SHEET	58020200
7.	SERIAL NO. SEAL	
8.	ISOLATE WASHER	54009800
9.	ISOLATE WASHER	54007300
10.	MODEL NUMBER SEAL	
11.	VM ZMC 7	77330700
12.	SPW ZMC 7	78230700
13.	PCW 3	78590300
14.	TWU ZMC 3	78430300
15.	SHIELDING SHEET	58020600
A	FE B ZMC 3 x 6	70530306
B	FE B BZMC 3 x 6	70560306
C	FE B BZMC 4 x 8	70560408
D	FE B ZMC 3 x 8	70530308

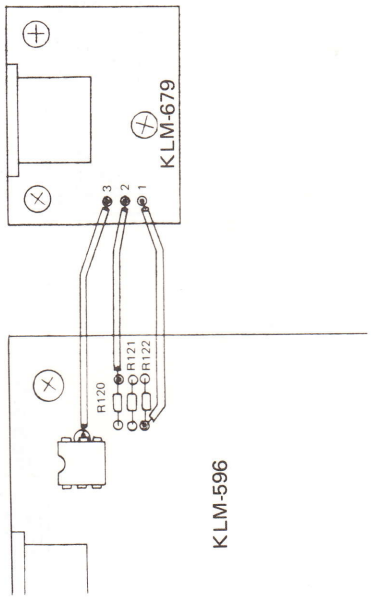


CONNECTOR DIAGRAM

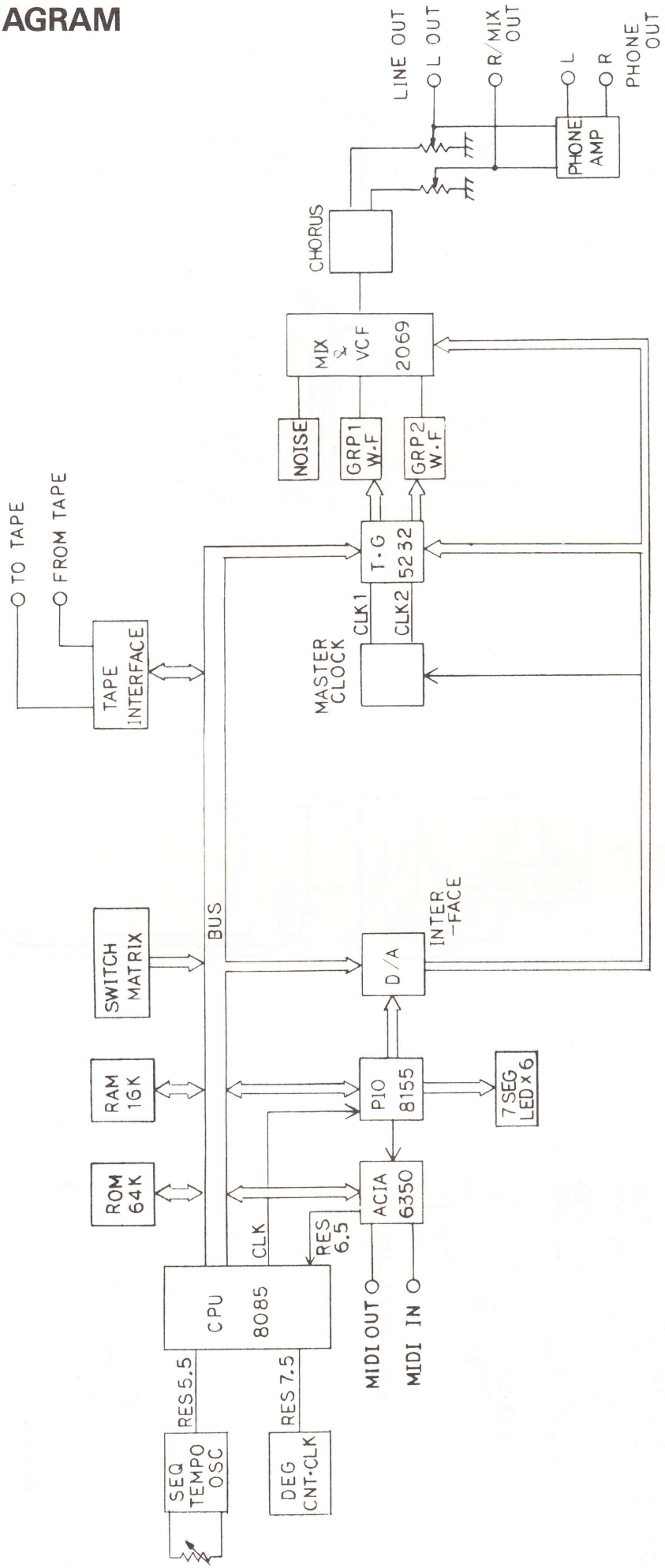




MIDI THRU BOARD



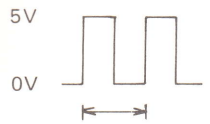
4. BLOCK DIAGRAM



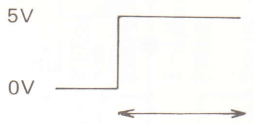
5. CIRCUIT DIAGRAM

KLM-596

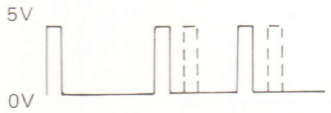
A CPU CLOCK



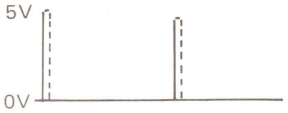
B CPU RESET



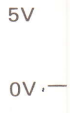
C CPU RES 6.5

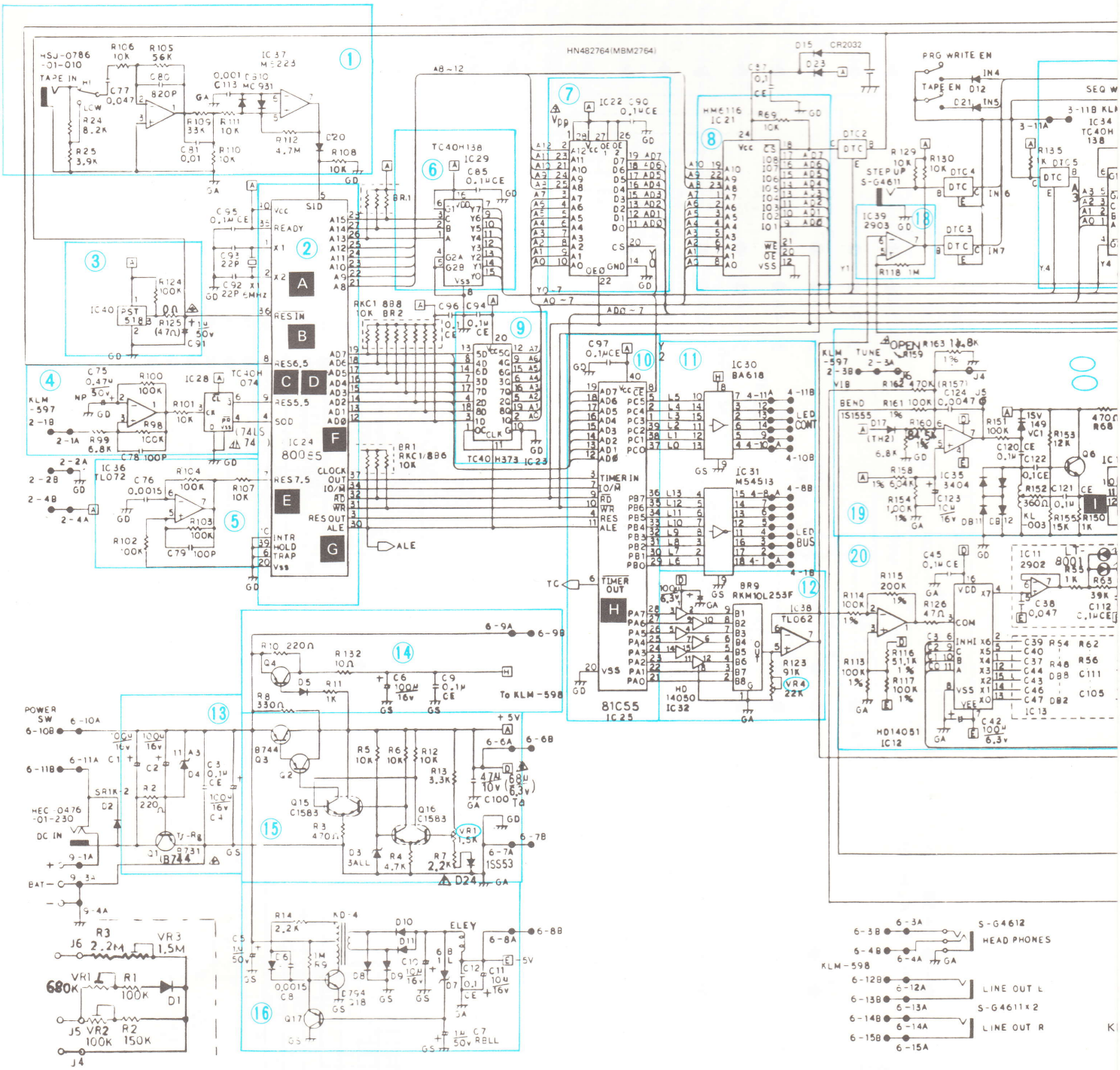


D CPU RES 5.5

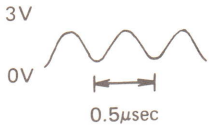


E

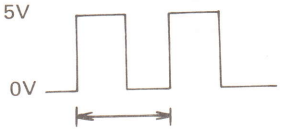




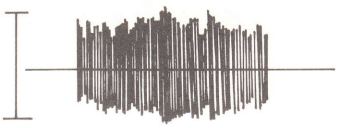
I OSC CLOCK



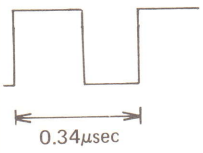
J **K** CLOCK1, 2



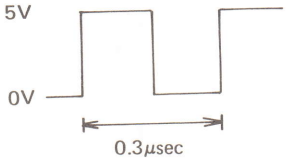
L WHITE NOISE



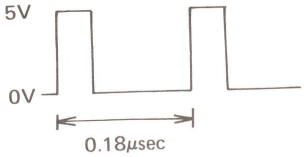
CPU RES 7.5



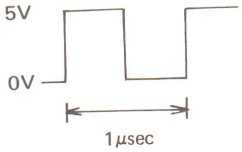
F CPU CLOCK OUT

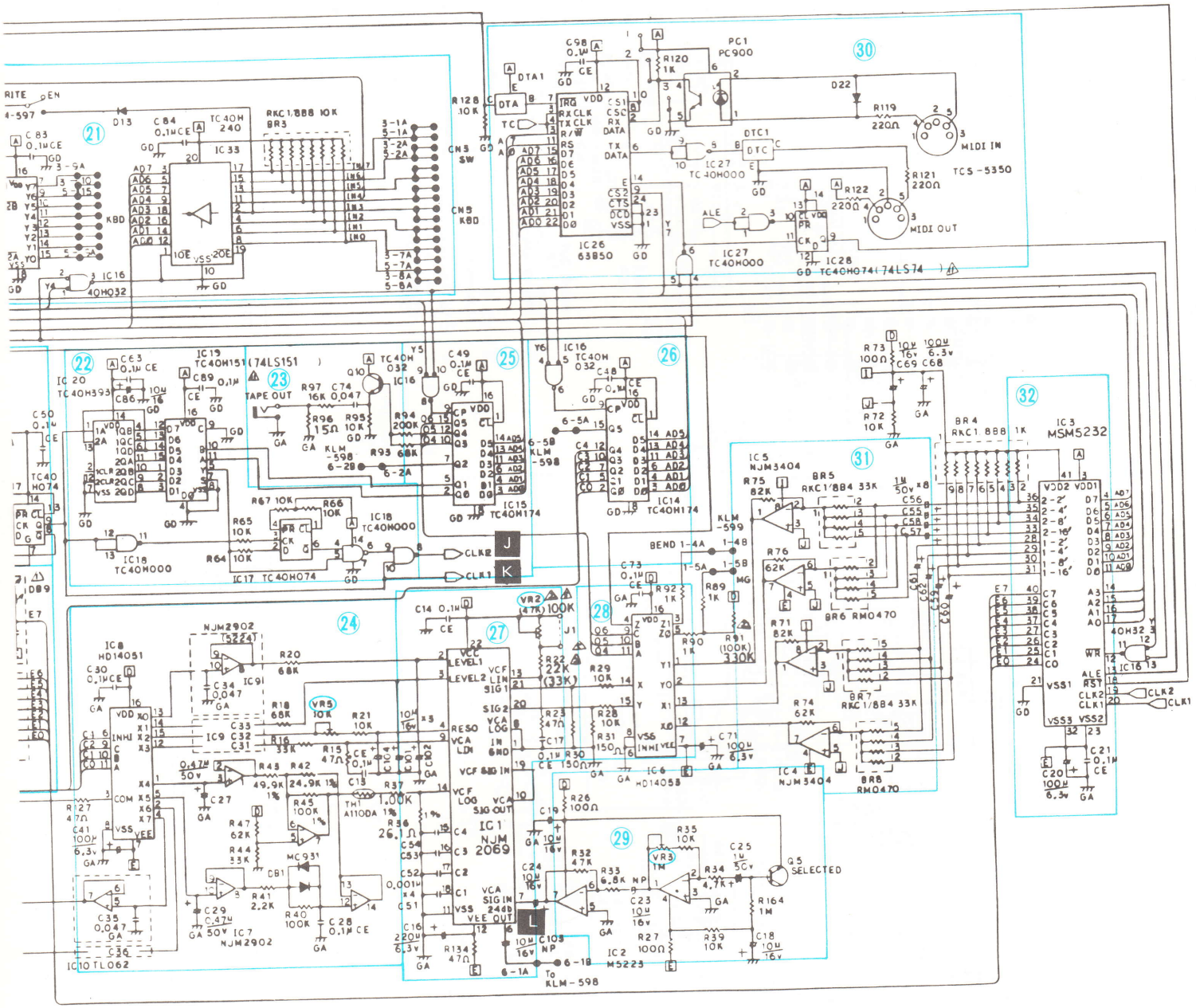


G CPU ALE



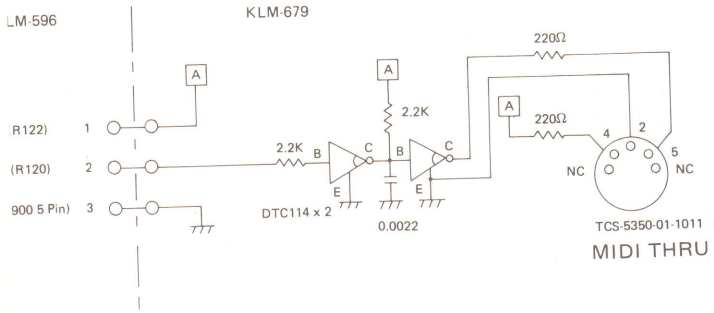
H TIMER OUT



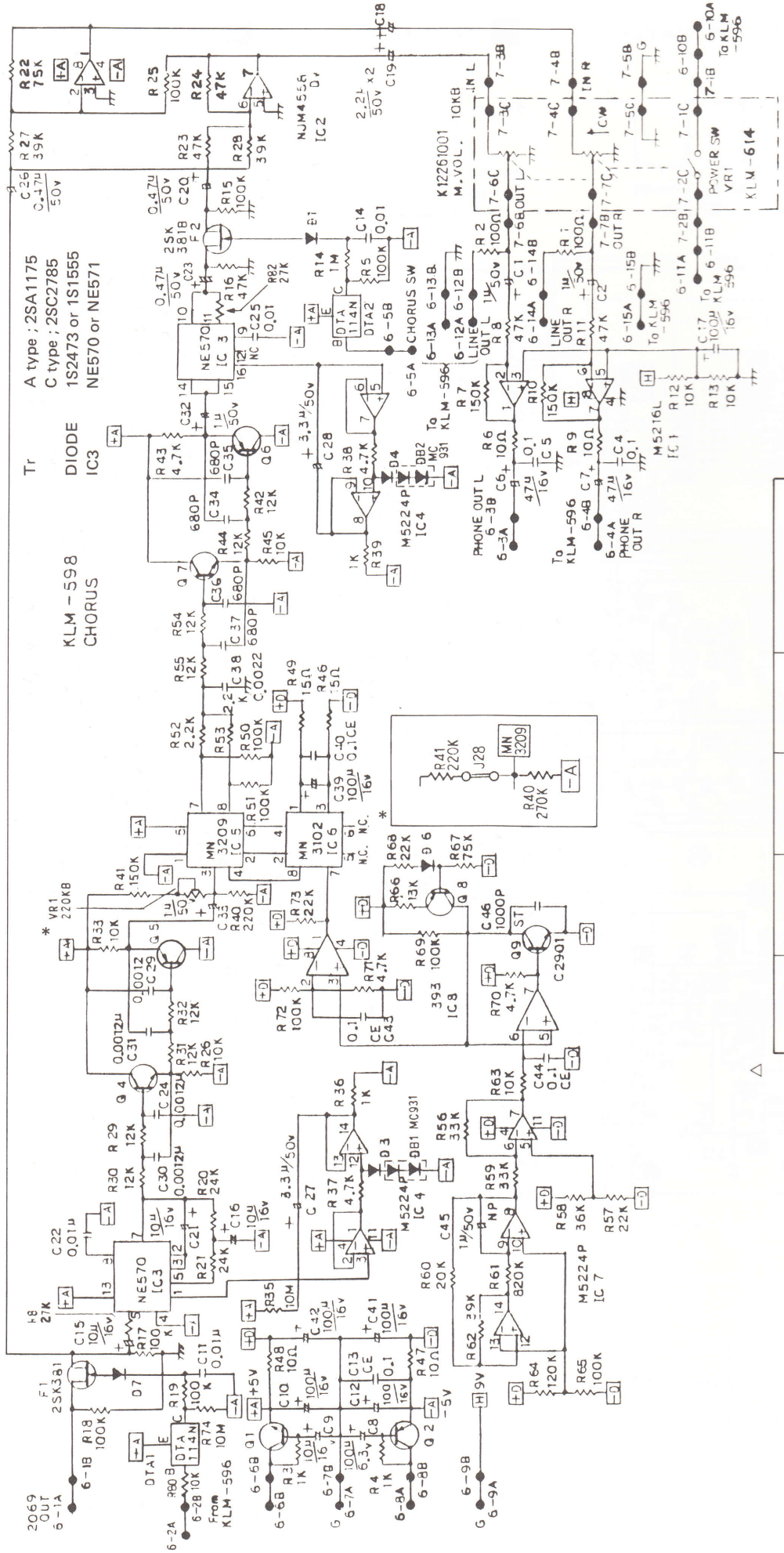


△; MODIFICATION

Value in bracket was used for Old production

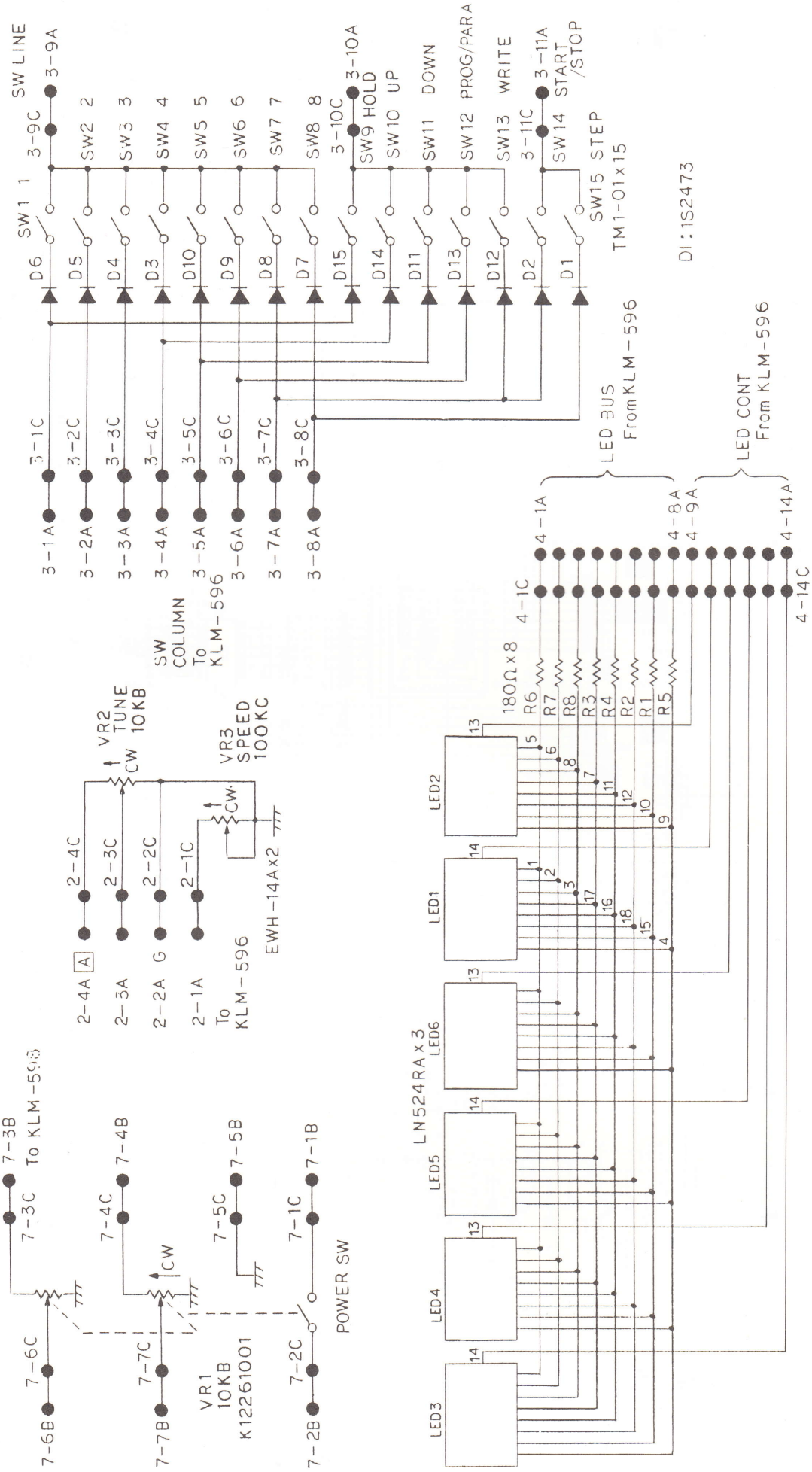


IC-8		IC-12	
OUTPUT	FUNCTION	OUTPUT	FUNCTION
X0	DC01 LEVEL	X0	Each EG signal of 8voice is coming out.
X1	DC02 LEVEL	X1	
X2	RESO	X2	
X3		X3	
X4	CUT OFF	X4	
X5	MG	X5	
X6	VIB	X6	
X7	BEND	X7	



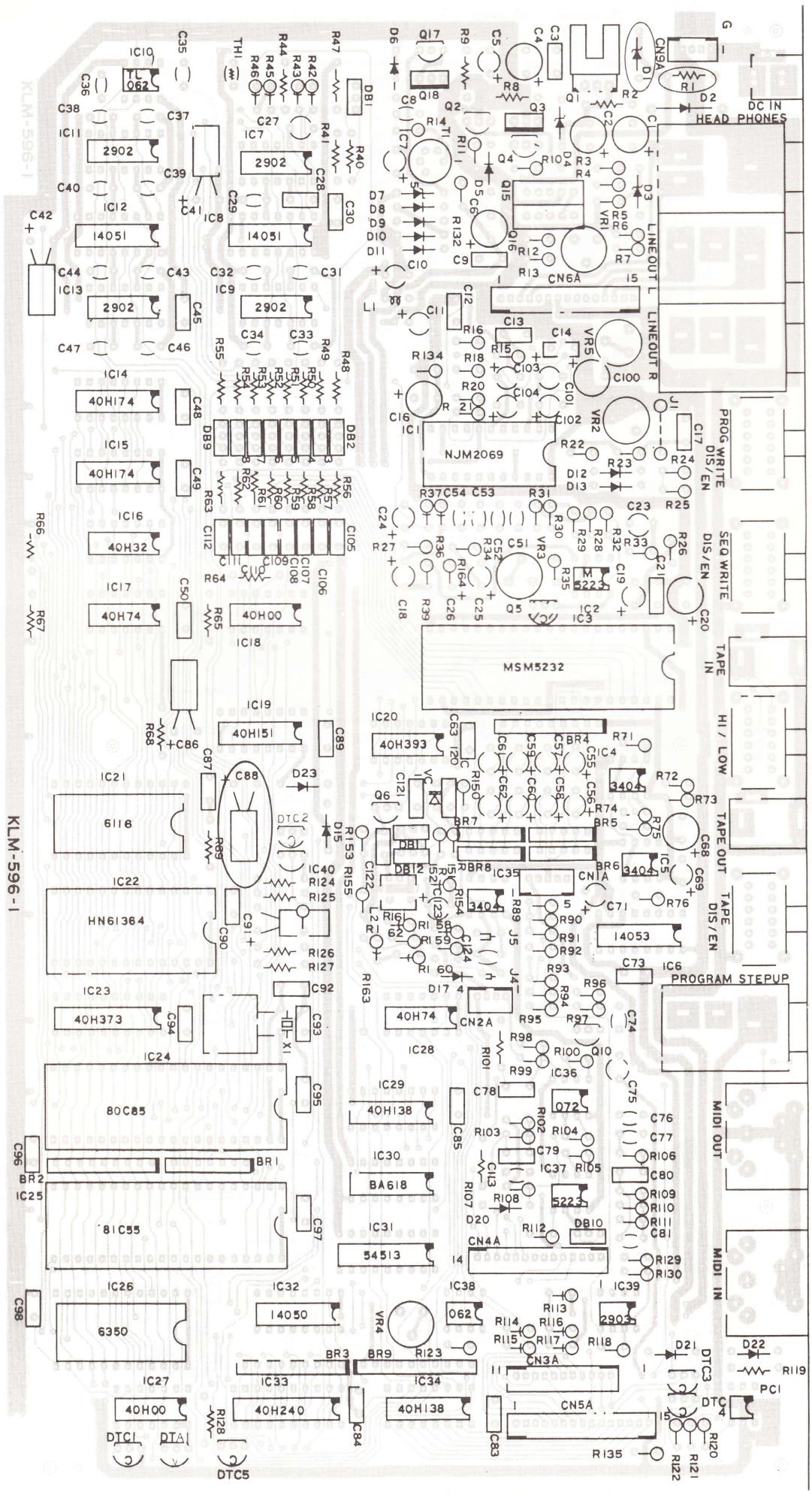
VR1	J28	R40	R41	R81, R82
	○	270K	220K	27K
220KB		220K	150K	27K

△ Till sep production
From oct production

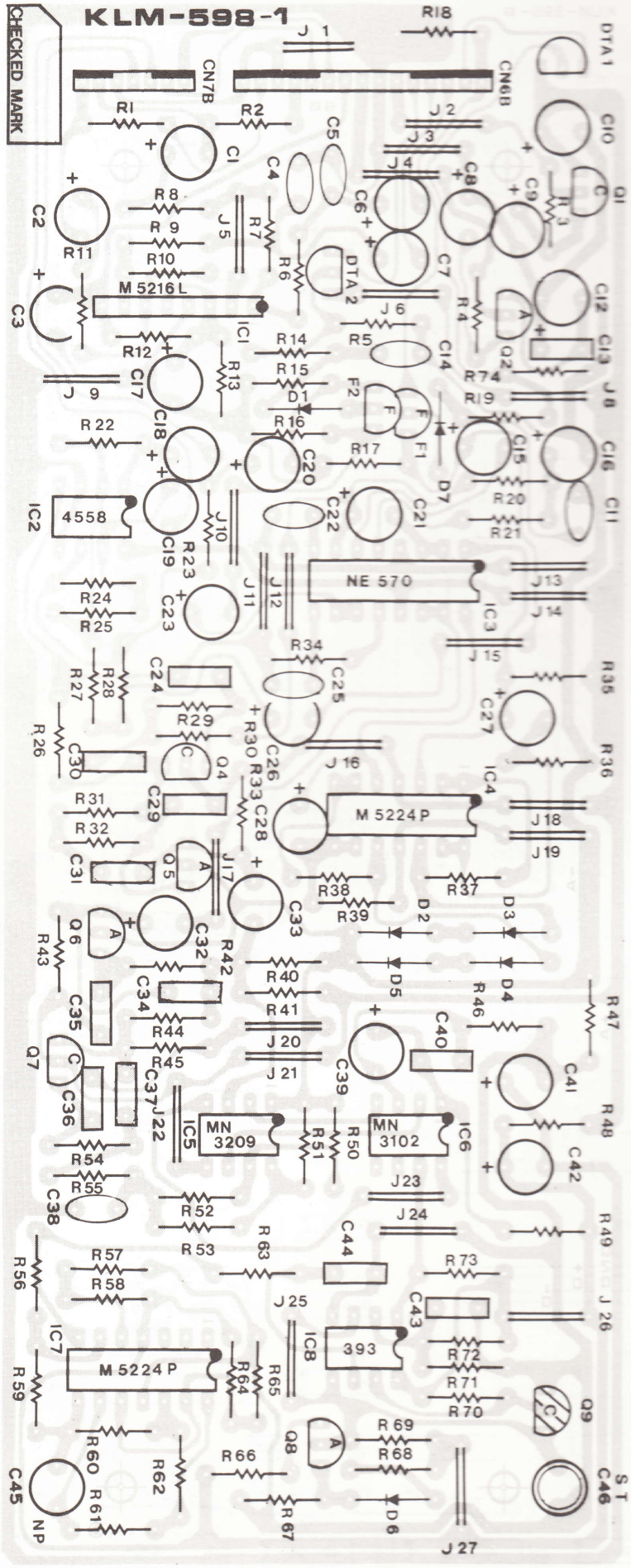

SW LINE
3-9A
3-9C
SW1 1
SW2 2
SW3 3
SW4 4
SW5 5
SW6 6
SW7 7
SW8 8
3-10C
3-10A
SW9 HOLD
SW10 UP
SW11 DOWN
SW12 PROG/PARA
SW13 WRITE
3-11C
3-11A
SW14 START /STOP
SW15 STEP
TM1-01x15
D1:1S2473
D6 D5 D4 D3 D10 D9 D8 D7 D15 D14 D11 D13 D12 D2 D1
3-1C 3-2C 3-3C 3-4C 3-5C 3-6C 3-7C 3-8C
3-1A 3-2A 3-3A 3-4A 3-5A 3-6A 3-7A 3-8A
SW COLUMN To KLM-596
LED BUS From KLM-596
LED CONT From KLM-596
4-1A 4-8A 4-9A 4-14A
4-1C 4-14C
180Ω x 8
R6 R7 R8 R3 R4 R2 R1 R5
LED1 LED2 LED3 LED4 LED5 LED6
LN524RA x 3
VR2 TUNE 10KB
VR3 SPEED 100KC
CW
2-4C 2-3C 2-2C 2-1C
2-4A A 2-3A 2-2A G 2-1A
To KLM-596
EWH-14A x 2
7-3B To KLM-596
7-3C 7-4B 7-4C 7-5B 7-5C 7-1B 7-1C
7-6C 7-6B 7-7C 7-7B 7-2C 7-2B
VR1 10KB K12261001
POWER SW

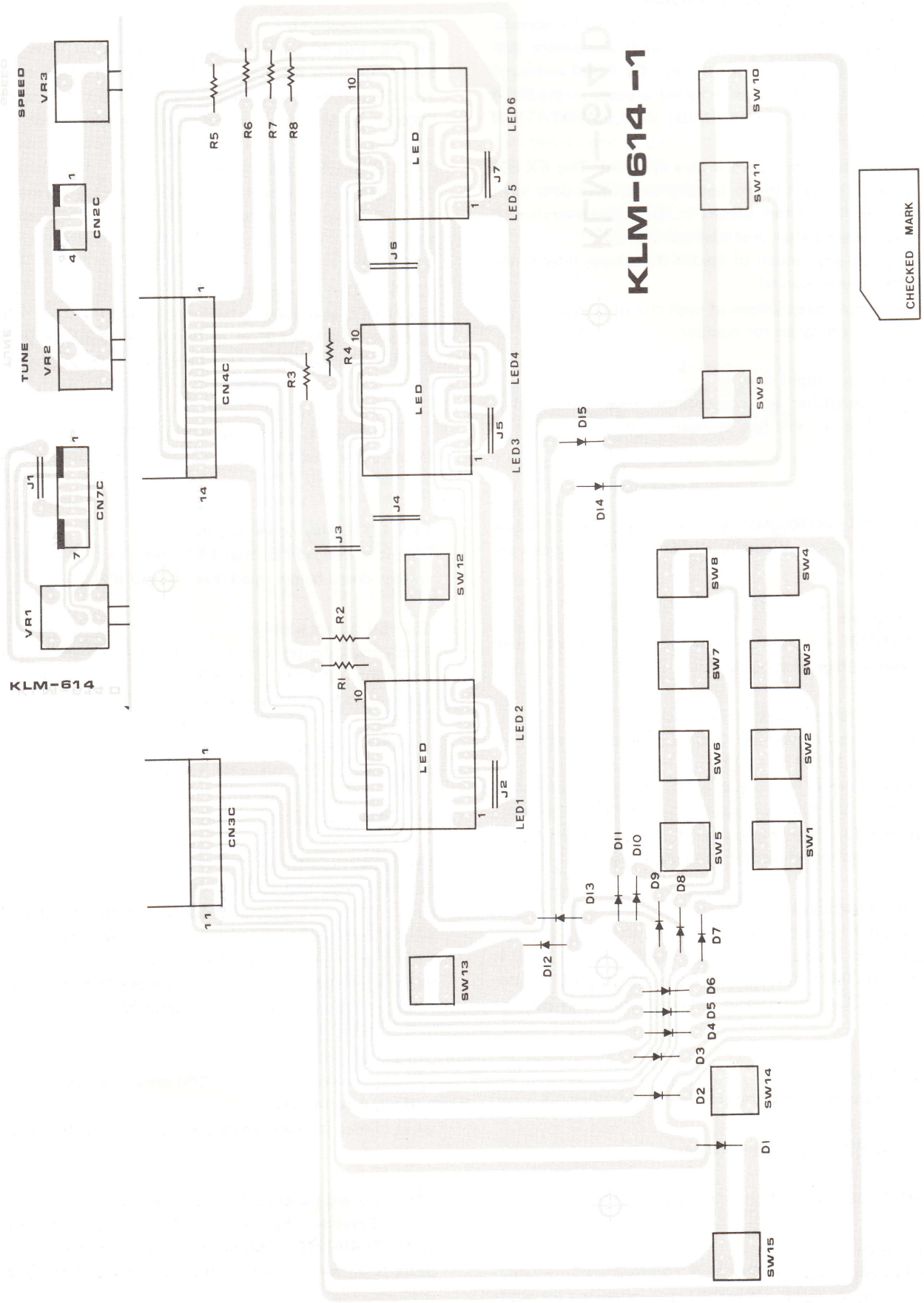
6. PC BOARD

KLM-596



O: EX-800 has no use for these parts. (D1, R1, C88)


KLM-598-1
CHECKED MARK
CN7B
CN6B
M 5216 L
4558
NE 570
M 5224 P
MN 3209
MN 3102
393
M 5224 P


KLM-614
KLM-614 -1
CHECKED MARK
SPEED
VR3
TUNE
VR2
VR1
CN2C
CN7C
CN4C
CN3C
J1
J2
J3
J4
J5
J6
J7
R1
R2
R3
R4
R5
R6
R7
R8
LED
LED1
LED2
LED3
LED4
LED5
LED6
SW1
SW2
SW3
SW4
SW5
SW6
SW7
SW8
SW9
SW10
SW11
SW12
SW13
SW14
SW15
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
D14
D15

7. CIRCUIT DESCRIPTIONS

MAIN CIRCUIT DESCRIPTIONS

The EX-800 is intended to be an expander unit for connection to synthesizers, sequencers, or other equipment that has a MIDI output. It is essentially the POLY-800 without a keybord. However, there are some differences in the MIDI functions, as detailed in the MIDI IMPLEMENTATION notes.

The memory backup system is also different. The EX-800 employs an internal lithium battery to protect data in its memory. The life of this battery is about five years and it should be replaced after that time has elapsed.

For check and adjustment of the EX-800 please refer to the POLY-800 service manual.

Below are simple descriptions of each circuit block.

Refer to circuit diagram for number.

1) Tape interface input circuit:

Consists of amplifier and comparator. When command is executed, data on this line is input to the CPU accumulator's 7th bit.

2) CPU:

A CMOS 8-bit microprocessor IC24 (80C85) featuring low power consumption. Virtually all POLY-800 functions are handled by this CPU.

3) Reset circuit:

IC40 (PST518) is a 3-pin IC used for reset. It generates an initial reset voltage of about 4.2V.

4) Sequencer tempo clock oscillator circuit

The tempo circuit includes IC28 (TC40H074) and 1/2 of IC36 (which is 1/2 of a TL072).

The tempo control is connected to CN2 pin 1 providing 10Hz±20% at the knob's 0 position and 100Hz±20% at the 10 position for CPU interrupts. If this circuit fails, then there will be no sound from the sequencer section.

5) Interrupt oscillator circuit:

This oscillator cycle is used for the EG, MG, LED displays, and S/H time division processing. Oscillator frequency is 2400Hz ~ 3600Hz. Interrupt order is by priority. If this circuit fails, EG operation and LED indication may become erratic.

6) Address Decoder:

TTL circuit decodes addresses for RAM and other ICs.

7) ROM (8192 words x 8bit PROM)

8) RAM (2048 words x 8bit static RAM)

9) Address latch:

IC latches according to CPU ALE (Address Latch Enable) terminal output signal since CPU uses address LSB 8bits together with data bus 8bit input.

10) Peripheral I/O:

PA, PB, and PC ports are all used for output. The internal timer is used for the interface IC26 (63B50) reference clock. The CPU 3MHz clock frequency is divided by 6 to obtain 500kHz. RAM is used for the program working area.

11) LED display drive circuit:

IC30 (BA618) and IC31 (M54513) form a 6 x 8 matrix for time sharing indication by the panel's 7-segment LED display.

12) 8-bit D/A converter:

Uses CMOS noninverting buffer IC32 (HD14050 or "4050"), and BR9 (RKM10L253F or "BR9") a 10-pin (R=25kohm) R-2R ladder resistor in D/A converter with output of 0V ~ 4V.

13) External DC power supply ripple filter:

Diode D2 is used to protect the circuit in case of reverse AC adapter polarity.

14) LED display power supply:

Circuit is designed so that LEDs become dim when battery voltage drops below rated level. (about 6V)

15) +5V power supply:

This circuit design is employed because it maintains normal operation up until just before the batteries drop below rated voltage of Volts (about 6V)

16) −5V power supply:

A type of DC-DC converter.

18) A/D converter comparator.

19) Master oscillator:

Varactor VC1 and coil KL-003 are used in the oscillator circuit. This generates a frequency of about 2MHz at the tune knob's center position. This is divided down (to about 1MHz) to supply the TG. (CL1, CL2)

Bend and vibrato control voltages are D/A converted by IC35 (3404) and applied to the oscillator.

20) EG S/H circuit:

EG values calculated by the CPU are output by time sharing and input to the TG.

LED diodes for each voice are there to smooth the stepped transition.

21) Keyboard panel switch input circuit:

A 9 x 8 matrix is formed by DTC5, IC34 (TC40H138), and IC33 (TC40H240). This handles keyboard and panel switch outputs as well as output from the comparator in circuit diagram (18).

22) Detune circuit:
Lowers frequency by thinning out clock pulses.

23) Tape interface output circuit.

24) CV circuit:
Performs time division output and S/H on CV for VCF and master oscillator.

25) 6-bit latch circuit:
A 6-bit control output circuit with 2 bits for detune, 2 bits for DCO waveform switching, 1 bit for A/D converter, X-Y switching, and 1 bit for noise gate control.

26) 6-bit latch circuit:
A 6-bit control output circuit with 5 bits for S/H control and 1 bit for chorus on/off switching.

27) VCA + VCF circuit:
The IC1 (NJM2069) has three internal VCAs and one internal 24dB/oct VCF (LPF). SIG1 and SIG2 respectively receive mixed DCO1 and DCO2 inputs from the TG; LEVEL1 and LEVEL2 are control input terminals.
The other VCA is for noise only. The 9pin (VCA LIN IN) is its control terminal.
MG, EG INT and CUTOFF, KBD TRACK are controlled separately and input to VCF LOG.
See REFERENCE DATA for details.

28) Analog switch circuit:
Performs DCO waveform switching and joystick A/D converter input switching.

29) Noise generator.

30) MIDI interface circuit:
This is a standard type MIDI interface circuit employing the MIDI interface IC26 (ACIA63B50) and high processing speed photocoupler PC-1. (PC-900)
D22 is used to prevent destruction of the photocoupler LED in case a reverse voltage is applied. R119 (220 ohm) and R121 (220 ohm) resistors are for prevention of damage in case of excessive current.
The circuit is designed to provide a data transmission rate of 31.25 k baud (±1%).

31) Waveform synthesis circuit:
Using the TG's various foot outputs (16', 8', 4', and 2'), this produces 2-waveforms, one by addition on a 1=1=1=1 basis and the other using the ratio 1=1/2=1/4=1/8.
The block resistor BR5 (RKC 1/8 B4 33K) is made up of four 1/8W 33k resistors (1=1=1=1). BR6 (RMO0470) is 10K ohms using R, 2R, 4R, 8R (1=1/2=1/4=1/8).

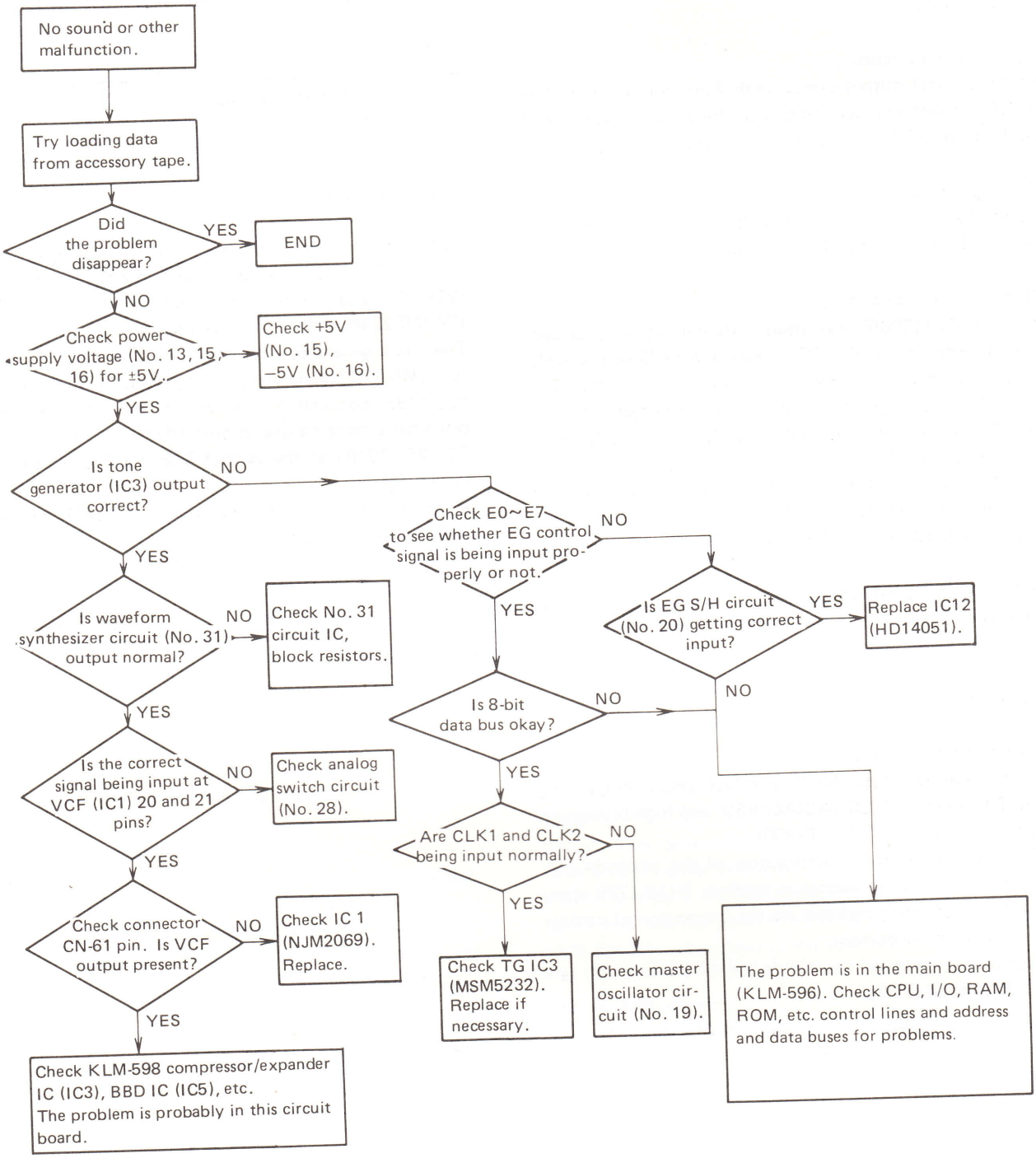
32) TG (Tone Generator):
An IC having eight sets of dividers and VCAs. See REFERENCE DATA for details.

KLM-598, 614

KLM-598 consists of the chorus circuit and headphone amp circuit. The VCF output signal transits noise gate F1 (2SK381) and is input to compressor IC3 (NE570); then IC4 (M5224P) detects the envelope.
The clock generator circuit which drives the BBD IC makes IC7 (M5224P) generate a triangle wave which comparator IC8 (393) converts to a sawtooth wave with a change of pitch for a more natural chorus effect.
F2 (2SK381B) at the output is an FET for chorus on/off switching.
KLM-614 includes the panel section LED display and switch matrix circuitry.

8. TROUBLESHOOTING TABLE

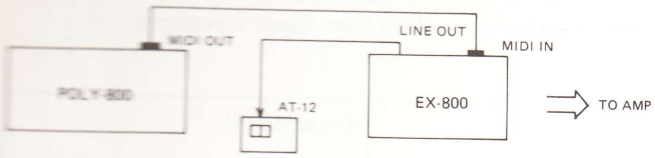
The order in which things should be checked naturally coincides with the signal path in the POLY-800. Please refer to this flow chart to help you pinpoint sources of malfunctions. Remember to save user programs to tape before beginning service procedures.



9. CHECK AND ADJUSTMENT PROCEDURE

ADJUSTMENT PROCEDURE

Use the POLY-800 for check and adjustment of the EX-800. Connections are as shown here. Use a 5-pin DIN cable less than 15m long for connection.



Note: The EX-800 MIDI OUT terminal is for memory dump to a personal computer (via a MIDI interface).

Caution: This product has been thoroughly adjusted at the factory before shipment. Therefore do not adjust anything other than those VRs required for servicing.
BEFORE making any calibration adjustments, Be sure test data is loaded into EX-800.
The following setting chart shows the program data used for service testing. After inputting the data, save it on tape for future time saving convenience.

PROGRAM no. 11 (noise level):

Parameter:	17	18	33	41	43	45	48	71	72	73	74	75	76	83	84	86
Value:	0	1	15	99	0	0	0	0	0	31	0	31	0	0	0	1

PROGRAM no. 12 (master oscillator):

Parameter:	11	12	13	14~16	17	18	41	42	43	45	48	51	52	53	54	55	56	83	84	87
Value:	2	2	1	0	30	1	60	0	0	0	0	0	0	31	0	31	0	0	0	64

PROGRAM no. 13 (cutoff):

Parameter:	11	12	13	14~16	17	18	33	41	42	43	45	48	51	52	53	54	55	56	83	84
Value:	2	1	1	0	31	1	0	12	12	2	0	0	0	0	31	0	31	0	0	0

PROGRAM no. 14 (resonance):

Parameter:	11	12	13	14~16	17	18	33	41	42	43	45	48	51	52	53	54	55	56	83	84
Value:	2	2	1	0	31	1	0	99	15	0	0	0	0	0	31	0	31	0	0	0

1. Power supply circuit (KLM-596, circuit no. 15):

Be sure that the specified AC adapter is being used: 9V, 300mA,

1) +5V check and adjustment:
Use DVM (digital voltmeter) to check KLM-596 connector CN6 Pin 6 and confirm +5V (±0.005V). Adjust VR1 if necessary.

2) −5V check:
Use DVM to check KLM-596 connector CN6 Pin 8 and confirm −5V (within −4.7V ~ −5.7V)

2. D/A converter check and adjustment (KLM-596, circuit No. 12):

1) Select program No.12

2) Set joystick bend control of POLY-800 at center position: BEND INT to 10

3) Connect DVM to KLM-596 IC10 (TL062) Pin 7 and confirm 2.001V ±0.005V. Adjust VR4 if necessary.

Also confirm:
3.984V ±0.005V for an upward pitch bend and
0.024V ±0.005V for a downward pitch bend.

Note: Adjustment is easiest in the joystick circuit although the idea is to obtain a 4V output from IC 38 (TL062) by adjusting the D/A converter when IC 81C55 port A output is all high.

3. Noise level check and adjustment:

1) Select program no. 11.
2) Depress any single key of POLY-800.
3) Connect oscilloscope to KLM-596 CN6A 1 pin and confirm noise level of 0.3Vp-p (± 20%).
4) Adjust VR3 if necessary.

4. Master oscillator check and adjustment:

Set tune knob to center and bend intensity to maximum. Connect AT-12 to line out jack.

1) Select program no. 12.
2) Depress C3 key of POLY-800.
3) Confirm AT-12 indication of −1 OCT, C, 0 cent. If necessary, adjust by turning KL-003 coil.
4) Next, push joystick to maximum upward pitch bend position and confirm AT-12 reading of −1 OCT, G, +35 cents. Adjust KLM-601 VR2 if necessary.
5) At maximum joystick downward pitch bend AT-12 indication should be −2 OCT, F, −35 cents. Adjust KLM-601 VR1 if necessary.

VR3 is a semi-fixed resistor to fix range of tune VR on front panel.
Confirm +40 ~ +70 cents when tune VR is at # max position.
Confirm −40 ~ −70 cents when tune VR is at b max position.
If necessary, Adjust VR3.

5. Cutoff check and adjustment:

1) Select program No. 13.
2) Play C3 key of POLY-800
3) Connect oscilloscope to CN6A pin 1 and observe waveform as in figure 1.
4) Adjust VR2 to obtain maximum waveform amplitude.

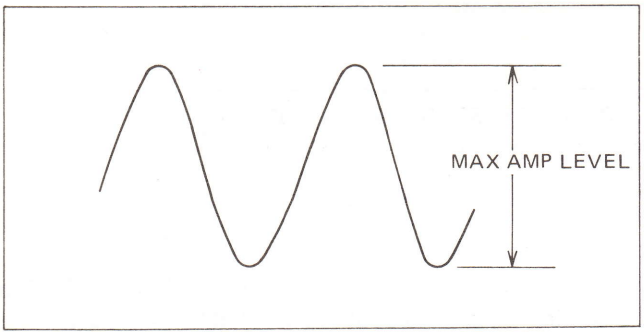


Fig. 1

6. Resonance check and adjustment:

1) Select program no. 14.
2) Play C3 key of POLY-800.
3) Confirm that waveform is as shown in figure 2.
4) Adjust VR5 if necessary to prevent oscillation or to correct waveform deviation from figure 2 example.

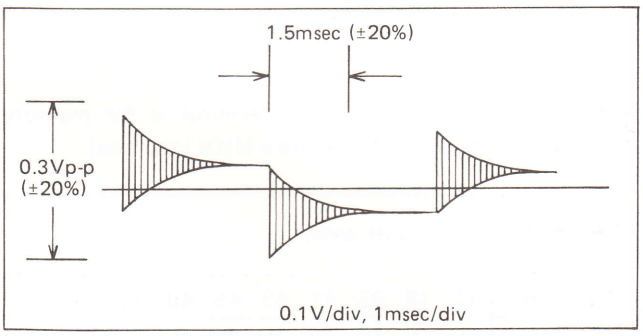


Fig. 2

10. PARTS LIST

PART CODE	SPECIFICATIONS	P.C. BOARD	IDENTIFICATION NO. FUNCTION	Q'TY
	CARBON RESISTORs			
10009000	Y 0Ω	KLM-596		1
10016722	1/6JY 2.2M	KLM-601		1
10113747	S1/4JT 4.7M	KLM-596		1
10413210	S1/4JYTP 10Ω	KLM-598		4
10413215	S1/4JYTP 15Ω			2
10413247	S1/4JYTP 47Ω	KLM-596		2
10413310	S1/4JYTP 100Ω	KLM-598		2
10413318	S1/4JYTP 180Ω	KLM-614		8
10413322	S1/4JYTP 220Ω	KLM-596		2
10413333	S1/4JYTP 330Ω			1
10413347	S1/4JYTP 470Ω			1
10413410	S1/4JYTP 1K			8
		KLM-598		4
10413422	S1/4JYTP 2.2K	KLM-596		1
		KLM-598		2
10413477	S1/4JYTP 4.7K			5
10413510	S1/4JYTP 10K	KLM-596		8
		KLM-598		7
10413512	S1/4JYTP 12K			8
10413513	S1/4JYTP 13K			1
10413520	S1/4JYTP 20K			1
10413522	S1/4JYTP 22K			3
10413524	S1/4JYTP 24K			2
10413527	S1/4JYTP 27K			2
10413533	S1/4JYTP 33K	KLM-596		1
		KLM-598		2
10413536	S1/4JYTP 36K			1
10413539	S1/4JYTP 39K	KLM-596		8
		KLM-598		3
10413547	S1/4JYTP 47K			5
10413562	S1/4JYTP 62K	KML-596		1
10413575	S1/4JYTP 75K	KLM-598		2
10413610	S1/4JYTP 100K	KLM-596		2
		KLM-598		11
10413612	S1/4JYTP 120K			1
10413615	S1/4JYTP 150K			3
10413622	S1/4JYTP 220K			2
10413682	S1/4JYTP 820K			1
10413710	S1/4JYTP 1M	KLM-596		1
		KLM-598		1
10413810	S1/4JYTP 10M			2
10416210	1/6JTP 10Ω	KLM-596		1
10416215	1/6JTP 15Ω			1
10416247	1/6JTP 47Ω			3

PARTS CODE	SPECIFICATIONS	P.C. BOARD	IDENTIFICATION NO. FUNCTION	Q'TY
10416310	1/6JTP 100Ω			3
10416315	1/6JTP 150Ω			2
10416322	1/6JTP 220Ω			3
10416336	1/6JTP 360Ω			1
10416347	1/6JTP 470Ω			1
10416410	1/6JTP 1.0K			7
10416422	1/6JTP 2.2K			2
10416433	1/6JTP 3.3K			1
10416439	1/6JTP 3.9K			1
10416447	1/6JTP 4.7K			2
10416468	1/6JTP 6.8K			3
10416482	1/6JTP 8.2K			1
10416510	1/6JTP 10K			16
10416512	1/6JTP 12K			1
10416515	1/6JTP 15K			1
10416516	1/6JTP 16K			1
10416522	1/6JTP 22K	KLM-596		1
10416533	1/6JTP 33K			2
10416547	1/6JTP 47K			1
10416556	1/6JTP 56K			1
10416562	1/6JTP 62K			2
10416568	1/6JTP 68K			3
10416582	1/6JTP 82K			2
10416591	1/6JTP 91K			1
10416610	1/6JTP 100K			8
		KLM-601		1
10416615	1/6JTP 150K			1
10416620	1/6JTP 200K	KLM-596		1
10416633	1/6JTP 330K			1
10416647	1/6JTP 470K			1
10416710	1/6JTP 1.0M			2
	METAL FILM RESISTORs			
12512261	1/6TP 26.1Ω			1
12514100	1/6TP 1.00K			2
	SN14K2CT26F			
12514604	1/6TP 6.04K			1
	SN14K2CT26F			
12515118	1/6TP 11.8K			1
	SN14K2CT26F			
12515249	1/6TP 24.9K			1
	SN14K2CT26F			
12515499	1/6TP 49.9K			1
	SN14K2CT26F			

PARTS CODE	SPECIFICATIONS	P.C. BOARD	IDENTIFICATION NO. FUNCTION	Q'TY
12515511	1/6TP 51.1K SN14K2CT26F			1
12515845	1/6TP 84.5K SN14K2CT26F			1
12516100	1/6TP 100K SN14K2CT26F			5
12516200	1/6TP 200K SN14K2CT26F			1
BLOCK RESISTORs				
13504533	RKC1/8B4J 33K		BR5, BR7	2
13506510	RKC1/8B6J 10K		BR1	1
13508410	RKC1/8B8J 1K		BR4	1
13508510	RKC1/8B8J 10K		BR2, BR3	2
13810525	RKM10L253F 25K	KLM-596	BR9	1
13890470	RM 0470		BR6, BR8	2
THERMISTOR				
18032310	TD5-A110DA			1
MYLAR CAPACITORs				
20023610	50V 0.1μF K AMZ	KLM-598		2
20402410	50V 0.001μF K AMZV	KLM-596		5
20402412	50V 0.0012μF K AMZV	KLM-598		4
20402415	50V 0.0015μF K AMZV	KLM-596		2
20402422	50V 0.0022μF K AMZV	KLM-598		1
20402447	50V 0.0047μF K AMZV	KLM-596		1
20402510	50V 0.01μF K AMZV			1
		KLM-598		4
20402547	50V 0.047μF K AMZV	KLM-596		16
STYROL CAPACITOR				
20503410	50V JT 1000PF	KLM-598		1
CERAMIC CAPACITORs				
21442220	50V 22PF RTHE40TKSL220J	KLM-596		2
21443100	50V 100PF RTHE50TKSL101J			2

PARTS CODE	SPECIFICATIONS	P.C. BOARD	IDENTIFICATION NO. FUNCTION	Q'TY
21443680	50V 680PF RTHE40TKYB681K	KLM-598		4
21443820	50V 820PF RTHE40TKYB821K	KLM-596		1
21446100	25V 0.1μF RTDSFC80TKY5U104M	KLM-598		37 4
TANTALUM CAPACITOR				
22005247	10V 47UFM	KLM-596		1
ELECTROLYTIC CAPACITORs				
25401310	6.3V 100μF RE.T2	KLM-598		6 1
25401322	6.3V 220μF RE.T2	KLM-596		1
25403210	16V 10μF RE.T2	KLM-598		9 5
25403247	16V 47μF RE.T2			2
25403310	16V 100μF RE.T2	KLM-596 KLM-598		4 6
25406047	50V 0.47μF RE.T2	KLM-596 KLM-598		2 3
25406110	50V 1μF RE.T2	KLM-596		13
25406110	50V 1μF RE.T2	KLM-598		4
25406122	50V 2.2μF RE.T2			2
25406133	50V 3.3μF RE.T2			2
25426110	50V 1μF RB-LL.T2	KLM-596		1
25463210	16V 10μF RBP.T2			2
25466047	50V 0.47μF RBP.T2			1
25466110	50V 1μF RBP.T2	KLM-598		1
TRANSISTORs				
30100328	TR 2SB744 A P/Q	KLM-596	Q3	
30100700	TR 2SB731		Q1	
30201107	TR 2SC1583 G		Q15, Q16	
30202299	TR 2SC2785 K		Q5	
30300528	TR 2SD794A P/Q		Q18	
30400020	TR 2SA1175 K TN	KLM-598		
30420020	TR 2SC2785 K TN	KLM-596 KLM-598		
30420030	TR 2SC2901 K TN			

PART CODE	SPECIFICATIONS	P.C. BOARD	IDENTIFICATION NO. FUNCTION	Q'TY
DIGITAL TRANSISTORs				
30430010	TR DTA-114N T-93	KLM-596	DTA1	1
		KLM-598	DTA1, DTA2	2
30430020	TR DTC-114N T-93	KLM-596	DTC1 ~ 5	5
FET				
30460020	2SK381-34-B	KLM-598	F1, F2	2
DIODEs				
31000800	1S2473	KLM-601		1
31001100	1SS-53	KLM-596	D1	1
31001500	SR1K-2		D2	1
31400100	1S1555 TP-3	KLM-596		1
		KLM-598		5
31400300	1S-2473 T-77	KLM-596		13
31400300	1S-2473 T-77	KLM-614		18
VARACTOR				
31020400	1SV-149 B/C			1
LED				
31201500	LT-8001P		DB2 ~ 9	16
31203200	LED LN524RA	KLM-614		3
ZENER DIODEs				
31422300	HZ-6B1L-TD	KLM-596	D7	1
31422400	HZ-3ALL-TD		D3	1
31422700	HZ-11A3-TD		D4	1
DOUBLE DIODEs				
31430100	MC-931 TP	KLM-598	DB10 ~ 13	4 2
ICs				
32002021	MN-3209	KLM-598	BBD	1
32002022	MN-3102		BBD driver	1

PART CODE	SPECIFICATIONS	P.C. BOARD	IDENTIFICATION NO. FUNCTION	Q'TY
32003011	TC-40H000 P	KLM-596	Quand 2-input and gate	2
32003021	TC-40H074 P		Dual D-type positive edge-triggered flip flop with set, reset	2
32003026	TC-40H138 P		3 to 8 demultiplexer	2
32003030	TC-40H151 P		8 to 1 data selector/multiplexer with strobe	1
32003041	TC-40H174 P		Hex D-type flip flop with reset	2
32003043	TC-40H032 P		Quand 2-input positive or gate	1
32003047	TC-40H240 P		Octal buffer/line driver with 3-state output	1
32003058	TC-40H373 P		Octal D-type transparent latch with 3-state output	1
32003063	TC-40H393 P		Dual 4-bit binary counter	1
32004016	HD-14050 BP	KLM-596	Hex buffer	1
32004017	HD-14051 BP		8-Channel analog multiplexer/demultiplexer	2
32004039	HD-14053 BP		Triple 2-channel analog multiplexer/demultiplexer	1
32004063	HD 63B50P		CMOS asynchronous communications interface adaptor	1
32006009	MSM-5232RS		8-Channel tone generator	1
32006010	MSM-80C85ARS		CPU	1
32006011	MSM-81C55RS		2048 bit CMOS static RAM with I/O ports and timer	1
32007003	BA-618		LED driver	1
32009001	NJM-4558D-V	KLM-598	OP amp	1
32009015	NJM-2903 D			1
		KLM-598		1
32009027	NJM-20690		3-VCA and 1-VCF	1
32009028	NJM-3404AD	KLM-596		3
32011020	M5224 P	KLM-598		2
32011024	M-5223	KLM-596		2
32011025	M-54513			1
32011026	M-5216L	KLM-598	Head phone amp	1
32012005	MBM-2764-30Z		8K byte prom	1
32013001	PST-518	KLM-596	System reset	1
32021011	TL-072		Dual BI FET OP amp	1
32021022	TL-062		Dual BI FET OP amp	2
32025002	NE-571	KLM-598		1
PHOTO COUPLER				
33000900	PC-900	KLM-596		1

PART CODE	SPECIFICATIONS	P.C. BOARD	IDENTIFICATION NO. FUNCTION	Q'TY
		CERAMIC OSCILLATOR		
33500900	EF0-A6ROMO1			1
		P.C. BOARD (without parts)		
34059600	KLM-596		MAIN BOARD	1
34059800	KLM-598	KLM-598	JOYSTICK BOARD	1
34060100	KLM-601	KLM-601	SUB BOARD	1
34061400	KLM-614	KLM-614		1
		SEMI-FIXED RESISTORs		
35001422	H0651A 220KB	KLM-598		1
35201215	H1051A 1.5KB	KLM-596	VR1, +5V ADJ	1
35201310	H1051A 10KB		VR5, RESONANCE ADJ	1
35201322	H1051A 22KB		VR4, D/A ADJ	1
35201410	H1051A 100KB			1
35201468	H1051A 680KB	KLM-601	VR2, PITCH BEND ADJ (UP)	1
			VR1, PITCH BEND ADJ (DOWN)	
35201510	H1051A 1MB	KLM-596	VR3, NOISE GAIN ADJ	1
35201515	H1051A 1.5MB	KLM-601		1
35202415	H1021A 150KB			1
		ROTARY VRs		
36017900	EWH-14AP15B14	KLM-614		1
36018000	EWH-14AP15C15			1
36203500	K12261001-5N1211-10KBX2	KLM-614		1
		SLIDE SW		
37303900	R-S47836	KLM-596	TAPE, WRITE E/D	4
		PUSH SW		
37507000	TM1-01	KLM-614		15
		COILs		
40201200	KD-4	KLM-596	DC-DC CONVERTER	1

PART CODE	SPECIFICATIONS	P.C. BOARD	IDENTIFICATION NO. FUNCTION	Q'TY
40201300	ELEY-471KA		DC-DC CONVERTER	1
40201400	KL-003		OSC	1
		AC ADAPTERs		
40502600	KAC-301	100V		1
40502700	KAC-302 UNI/117V	UNI		1
		117 2P		1
40502800	KAC-303 JAM/CSA	JAM		1
40503000	KAC-305 240AU	240 AU		1
40503100	KAC-306 240GE	240 GE		1
		240 RM		1
40503200	KAC-307 240AF	240 AF		1
40503300	KAC-308 220GE	220 GE		1
		220 SE		1
		GAF		1
		FEMKO		1
		PHONE JACKs		
45001400	SG-4611#01	KLM-596	3P with SWITCH	3
45001700	S-G 4612 #01		STEREO	1
		POWER JACK		
45400300	HEC-0470-01-230		POWER JACK	1
		MINI-PHONE JACK		
45400900	HSJ-0786-01-010 3.5	TAPE I/O		2
		DIN JACK		
45403100	5PIN TCS-5350-01-1011	MIDI I/O		2
		HARNESSes		
47042300	HNS-323			1
47042400	HNS-324			1

PART CODE	SPECIFICATIONS	P.C. BOARD	IDENTIFICATION NO. FUNCTION	Q'TY
47042500	HNS-325			1
47042600	HNS-326			1
47042700	HNS-327			1
47042800	HNS-328			1
CONNECTORS				
47408804	S4P W-P2604 #51	KLM-596		2
		KLM-614		1
47408805	S5P W-P2605 #51	KLM-596		1
47408807	S7P W-P2607 #51	KLM-598		1
		KLM-614		1
47408811	S11P W-P2611 #51	KLM-596		1
47408814	S14P W-P2614 #51			1
47408815	S15P W-P2615 #51			1
		KLM-598		2
47408911	L11P W-P2811 #51	KLM-614		1
47408914	L14P W-P2814 #51			1
IC SOCKETs				
48001282	28P DICA-28CTI	KLM-596		1
48005222	22P C472211			1
RUBBER FEET				
50007800	KOC-F48000			4
LITHIUM BATTERY				
52001200	CR2032 T-4	KLM-596		1
WIRE BUNDLER				
54007200	PLT-1M			1
ISOLATE WASHER				
54007300	B-1725K			2
54009800	YD-20D			2

PART CODE	SPECIFICATIONS	P.C. BOARD	IDENTIFICATION NO. FUNCTION	Q'TY
SHIELDING SHEETS				
58020200	KOC-F40304			1
58020600	KOC-F40307			1
DIN CORD				
60201900	5P DIN CORD 1.5M			1
ROTARY VR KNOB				
62009501	KOE-E40087			3
PUSH SW KNOB				
62013800	22100304-1 No.1	KLM-614	GRAY	1
62013801	22100304-2 No.2		GRAY	1
62013802	22100304-3 No.3		GRAY	1
62013803	22100304-4 No.4		GRAY	1
62013804	22100304-5 No.5		GRAY	1
62013805	22100304-6 No.6		GRAY	1
62013806	22100304-7 No.7		GRAY	1
62013807	22100304-8 No.8		GRAY	1
62013900	22100304		GRAY	4
62013901	22100306 BLUE	KLM-614		2
62013902	22100307 ORANGE			1
UPPER CASE				
64064300	KOC-C20131			1
LOWER CASE				
64064400	KOC-C20132			1
RACK MOUNT ADAPTER				
64064500	KOC-C30215			2

PART CODE	SPECIFICATIONS	P.C. BOARD	IDENTIFICATION NO. FUNCTION	Q'TY
		PUSH SW GUIDE		
64619500	TM1-01	KLM-614		15
		DISPLAY COVER		
64905500	KOC-C30064			1
		SCREWS, WASHERS (Please refer to structural diagram)		
70060512	FE P BZMC 5X12			4
70530306	FE B ZMC 3X6			22
70530308	FE B ZMC 3X8			1
70560306	FE B BZMC 3X6			8
70560408	FE B BZMC 4X8			6
77330700	VN ZMC 7			1
78060500	WM BZMC 5X12			4
78230700	SPW ZMC 7			2
78430300	TWU ZMC 3			2
78590300	PCW 3			2
		INNER CARTON		
80019010	K6S			1
				1
80219010	KOC-I10014/5			1
				1
80219011	KOC-I40088			1

MEMO

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