

# KORG



## MONOPHONIC SYNTHESIZER SERVICE MANUAL **MS-20**

### CONTENTS

1. SPECIFICATIONS.....	2
2. STRUCTURAL DIAGRAM.....	3
3. CIRCUIT DIAGRAM (1).....	4
CIRCUIT DIAGRAM (2).....	5
4. FRONT VIEW OF PRINTED CIRCUIT BOARD	
KLM-128C .....	6
KLM-127 .....	7
5. PARTS LIST (Mechanical parts not listed) .....	8
6. BLOCK DIAGRAM .....	9
7. ADJUSTMENT PROCEDURE .....	10

**KEIO ELECTRONIC LABORATORY CORPORATION  
TOKYO/JAPAN**

# 1. SPECIFICATIONS

## < CONTROL SECTION >

1. Keyboard
  - C~C 37 keys (3 octaves)
2. Voltage controlled oscillator 1
  - Scale (32', 16', 8', 4') (6 octaves, + cent, - cent)
  - Wave form (  $\wedge$ ,  $\nabla$ , PW (  $\square \sim \square$  ), white noise) (4 modes)
  - Pulse width adjust 1: 1 ~ 1:  $\infty$
3. V.C.O.2
  - Scale (16', 8', 4', 2') (6 octaves, + cent, - cent)
  - Wave form (  $\nabla$ ,  $\square$ ,  $\square$ , ring modulator) (4 modes)
  - Pitch ( $\pm 1$  OCTAVES)
4. V.C.O. master control
  - Master tune ( $\pm 100$  cent)
  - Portamento (max. 00 sec)
  - Frequency modulation intensity by MG/T. EXT ( $\pm 5V$ )
  - Frequency modulation intensity by EG1/EXT (+5V)
5. V.C.O. mixer
  - V.C.O.-1 level
  - V.C.O.-2 level
6. Voltage controlled high pass filter
  - Cutoff frequency (50Hz~15,000Hz)
  - Peak (flat~self OSC)
  - Cutoff frequency modulation intensity by MG/T.EXT (-5V ~ +5V)
  - Cutoff frequency modulation intensity by EG2/EXT (-5V ~ +5V)
7. Voltage controlled low pass filter
  - Cutoff frequency (50Hz~15,000Hz)
  - Peak (flat~self OSC)
  - Cutoff frequency modulation intensity by MG/T.EXT (-5V ~ +5V)
  - Cutoff frequency modulation intensity by EG2/EXT (-5V ~ +5V)
8. Envelope generator 1
  - Delay time (10 sec)
  - Attack time (10 sec)
  - Release time (10 sec)
9. Envelope generator 2
  - Hold time (20 sec)
  - Attack time (10 sec)
  - Decay time (10 sec)
  - Sustain level (0~5V)
  - Release time (10 sec)
10. Modulation generator
  - Wave form (  $\nabla \sim \wedge \sim \nearrow$ ,  $\square \sim \square \sim \square$  )
  - Frequency (1: 1 ~ 1: 80)
11. Manual controller
  - Control wheel (center click) (0.1Hz ~ 20Hz)
  - Momentary switch  $\rightarrow$  GND
12. P. Switch and volume
  - Volume
13. Indicator
  - LED (KBD trigger, MG rate)

## < EXTERNAL SIGNAL PROCESSOR >

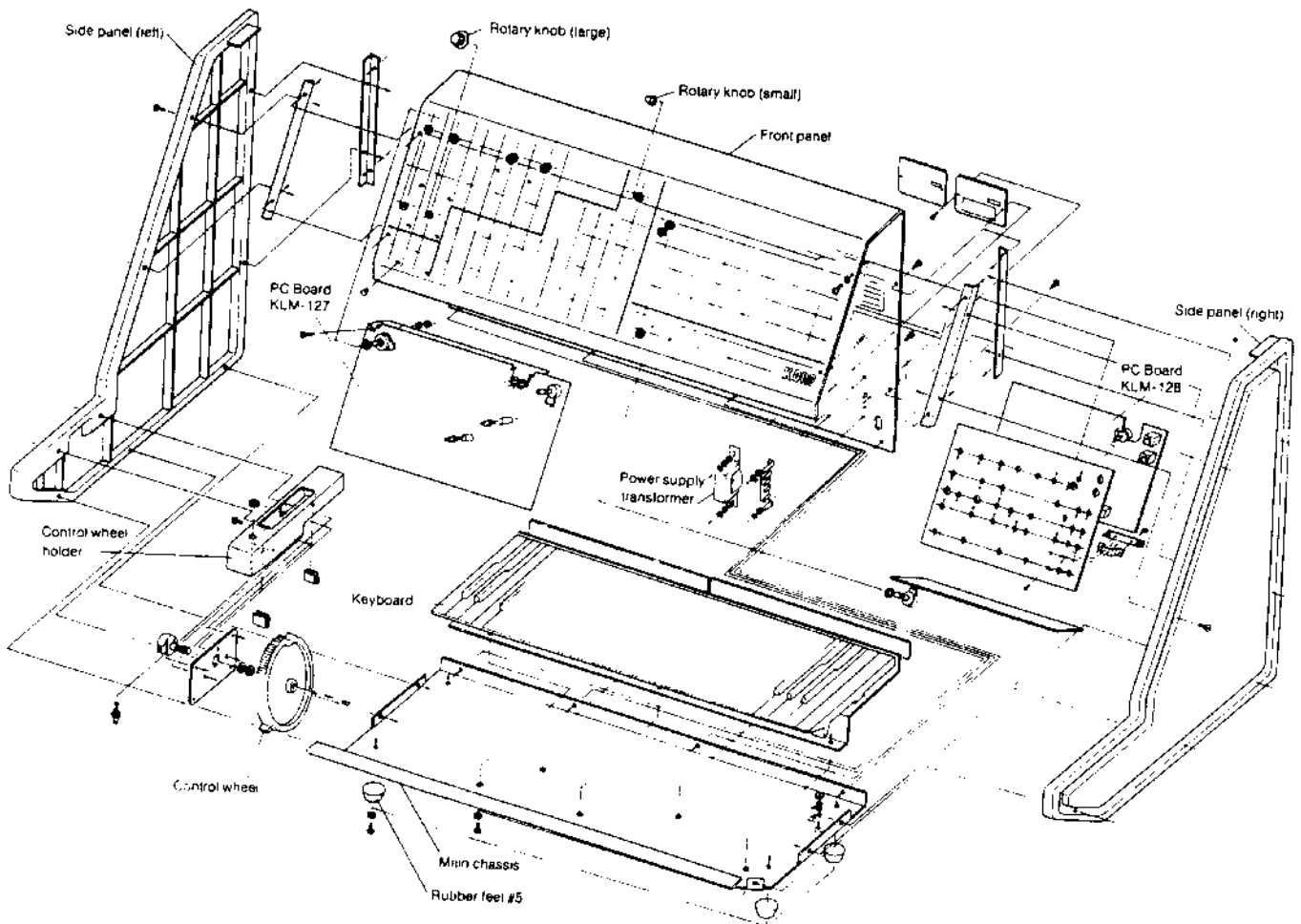
1. Control section
  - Input signal level (0dB max.)
  - Low cut frequency (50 ~ 2,500Hz)
  - High cut frequency (100 ~ 5,000Hz)
  - CV adjust
  - Threshold level
2. Input and output
  - Signal In (auto pad system) (1.0 ~ +14.0V)
  - Amplifier Out
  - Band pass filtered Out
  - CV Out ( $F \infty V$ ) (0 ~ +8.4V)
  - ENV Out (0 ~ +5V)
  - Trig Out (+5V  $\rightarrow$  GND)
3. Indicator (LED)
  - Peak indicator
  - Trigger indicator

## < PATCH PANEL >

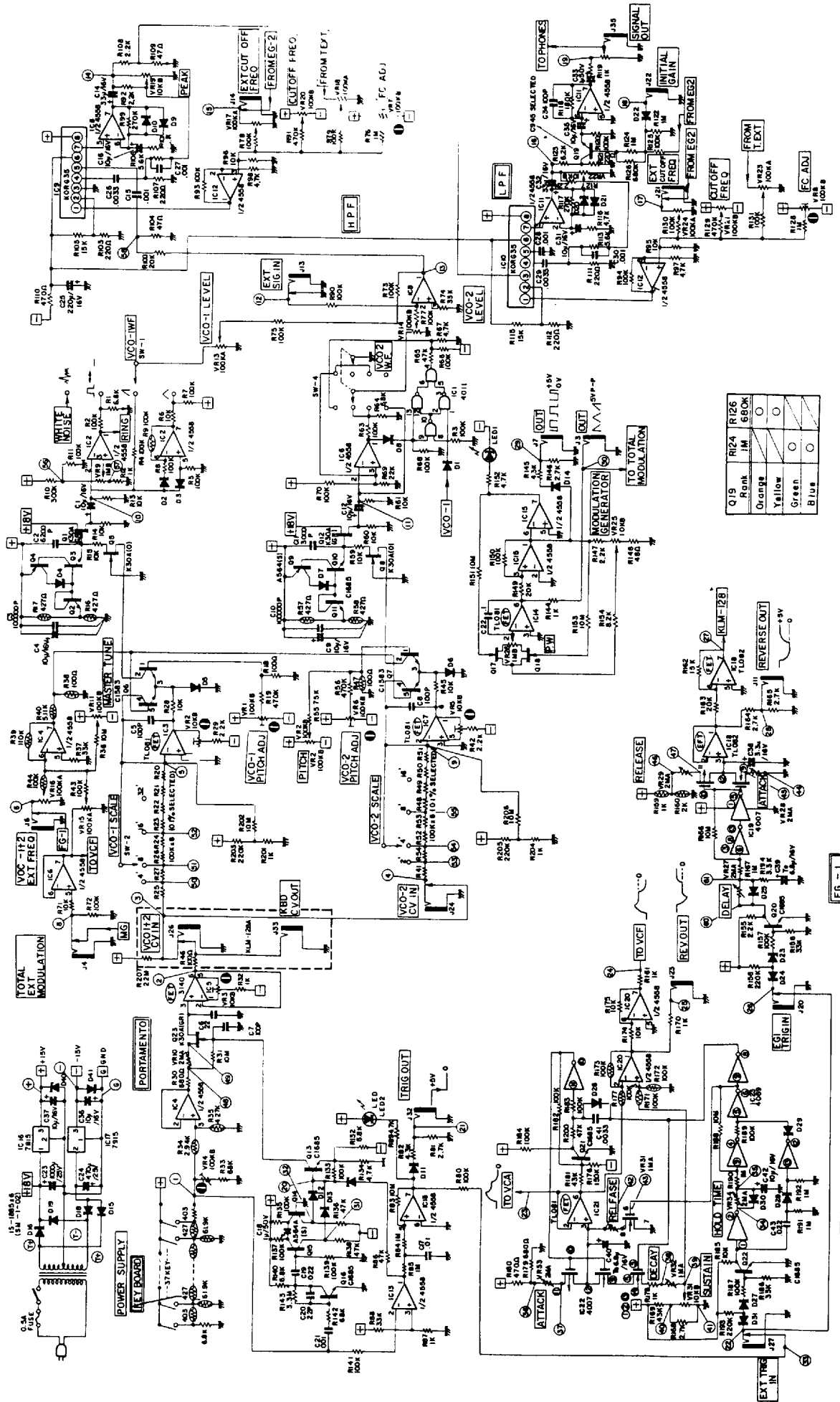
1. Keyboard
  - Keyboard control voltage output (exponential) (0 ~ +8V)
  - Keyboard trigger output (+5V  $\rightarrow$  GND)
  - VCO-1 + VCO-2 control voltage input (linear response) (0 ~ +8V)
  - VCO-2 control voltage input (linear response) (0 ~ 8V)
2. VCO
  - VCO-1 + VCO-2 external frequency control input (OCT/V) (+5V -5V)
3. VCF
  - External signal input (3Vp-p max.)
  - External HP filter cutoff frequency control input (2OCT/V) (-5V ~ +5V)
  - External LP filter cutoff frequency control input (2OCT/V) (-5V ~ +5V)
4. VCO + VCF
  - Total external modulation input (T. ext) (-5 ~ +5V)
5. VCA
  - External initial gain control input (0 ~ +5V)
6. EG
  - EG 1 envelope signal normal output (-5V  $\rightarrow$  0V)
  - EG 1 envelope signal reverse output (+5V  $\rightarrow$  0V)
  - EG 1 + EG 2 trigger input ( $\rightarrow$  GND)
  - EG 1 trigger input ( $\rightarrow$  GND)
  - EG 2 envelope signal reverse output ( $\rightarrow$  0V)
7. MG
  - Triangle output (  $\nabla \sim \wedge \sim \nearrow$  ) (5Vp-p  $\rightarrow$  0V)
  - Rectangle output (  $\square \sim \square \sim \square$  ) ( $\square$   $\rightarrow$  5V  $\rightarrow$  0V)

- |                       |   |                       |  |
|-----------------------|---|-----------------------|--|
| 8. Noise generator    | <ul style="list-style-type: none"> <li>* Pink noise output (5Vp-p <math>\pm 20</math>)</li> <li>* White noise output (5Vp-p <math>\pm 20</math>)</li> </ul>   | 12. Signal out        | <ul style="list-style-type: none"> <li>* Signal output (2Vp-p output impedance 3.5k<math>\Omega</math>)</li> </ul>       |
| 9. Sample and hold    | <ul style="list-style-type: none"> <li>* Clock trigger input (<math>\overline{\text{GND}}</math>)</li> <li>* Sample signal input (5Vp-p max.)</li> <li>* S/H output (5Vp-p max.)</li> </ul>                     | 13. Head phones       | <ul style="list-style-type: none"> <li>* Head phones output ((8<math>\Omega</math>) 120m watts 5.6)</li> </ul>           |
| 10. Modulation VCA    | <ul style="list-style-type: none"> <li>* Control voltage input (0 ~ +5V)</li> <li>* Signal input (-5V ~ +5V)</li> <li>* Signal output (-5V ~ +5V)</li> </ul>  | 14. Power consumption | <ul style="list-style-type: none"> <li>* 10 watts</li> </ul>   |
| 11. Manual controller | <ul style="list-style-type: none"> <li>* Control wheel output (-5V <math>\rightarrow</math> 0V <math>\rightarrow</math> +5V)</li> <li>* Momentary switch output (<math>\overline{\text{GND}}</math>)</li> </ul> | 15. Dimensions        | <ul style="list-style-type: none"> <li>* 569(W) x 309(D) x 249(H) mm</li> </ul>  |
|                       |   | 16. Weight            | <ul style="list-style-type: none"> <li>* 7.7 kgs</li> </ul>  |
|                       |   | 17. Accessories       | <ul style="list-style-type: none"> <li>* Patch cord, connection cord (35 cm x 2, 3 m x 1)</li> </ul>                     |
|                       |   | 18. Options           | <ul style="list-style-type: none"> <li>* Stand, hard case, foot pedal (MS-01)</li> <li>* Junction box (MS-02)</li> </ul> |

## 2. STRUCTURAL DIAGRAM

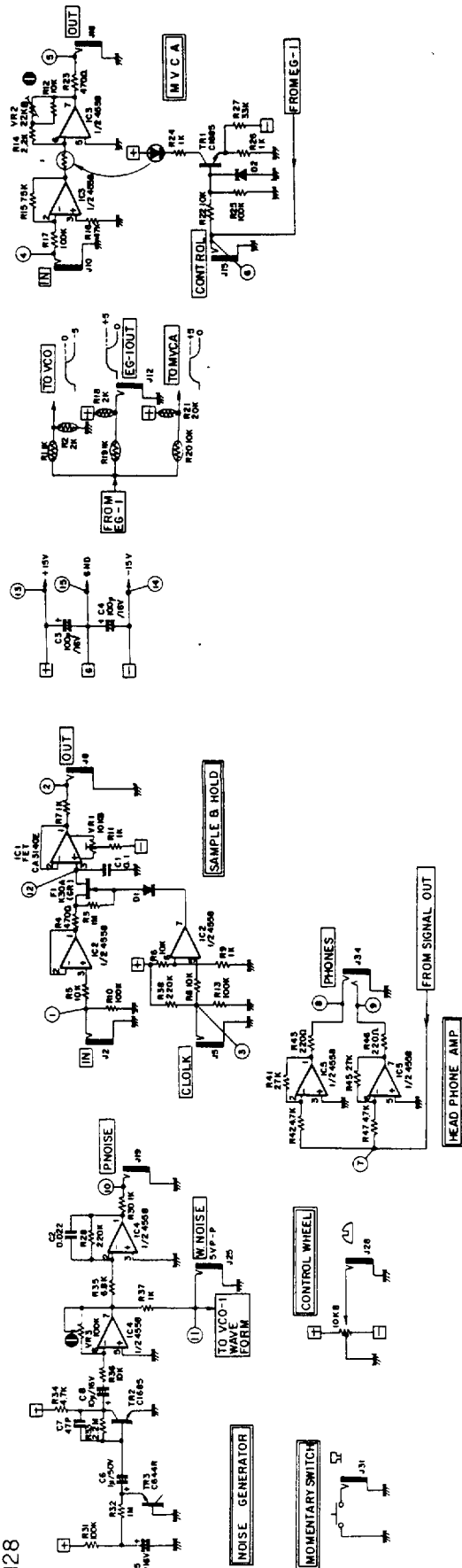


### 3. CIRCUIT DIAGRAM (1)

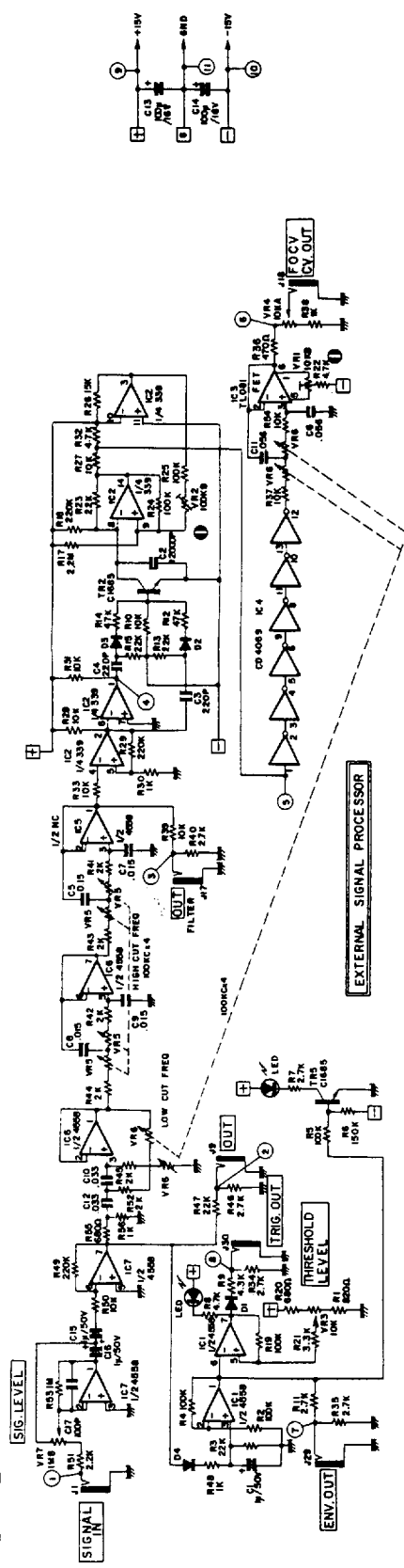


# CIRCUIT DIAGRAM (2)

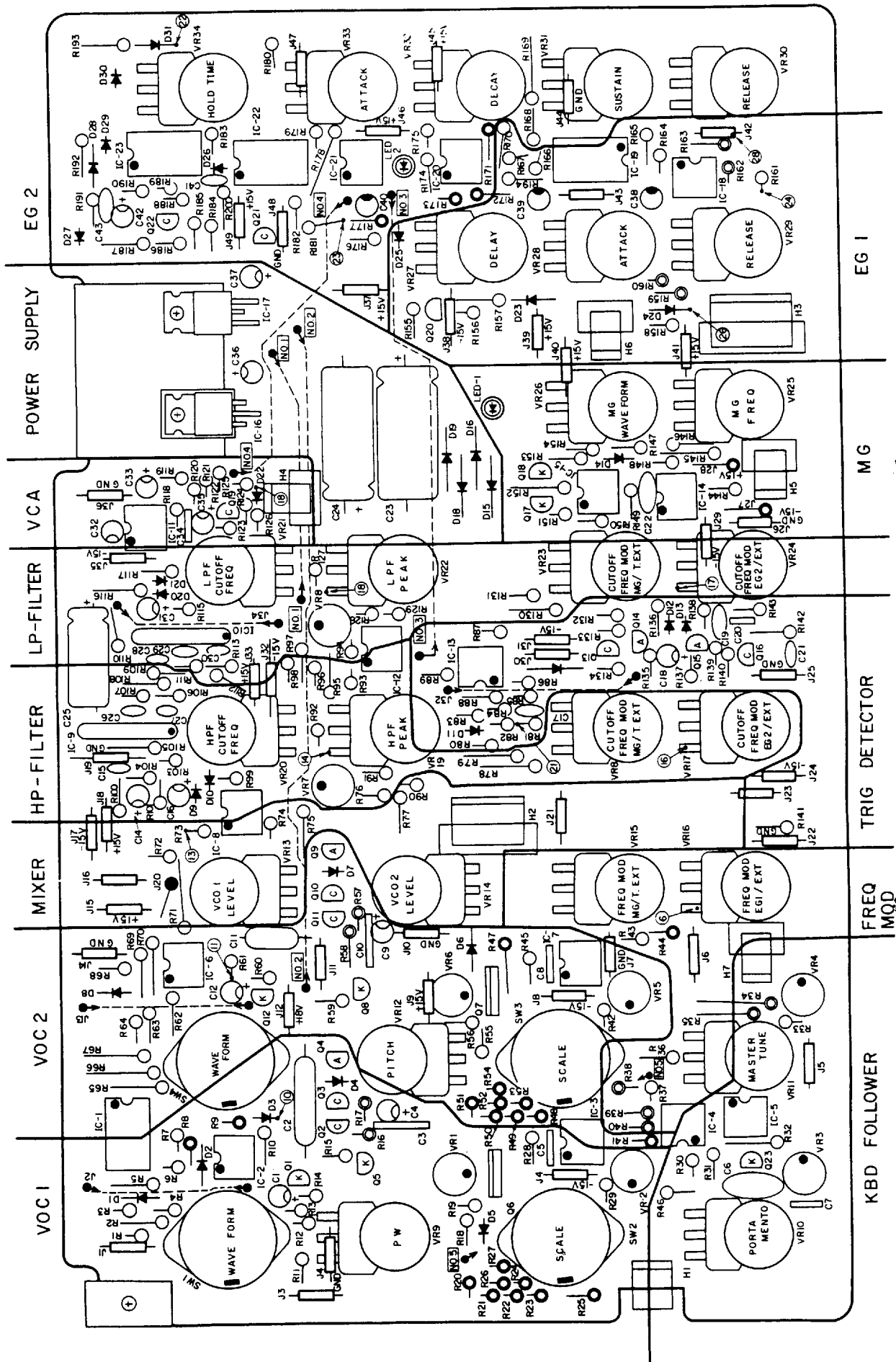
KLM-128



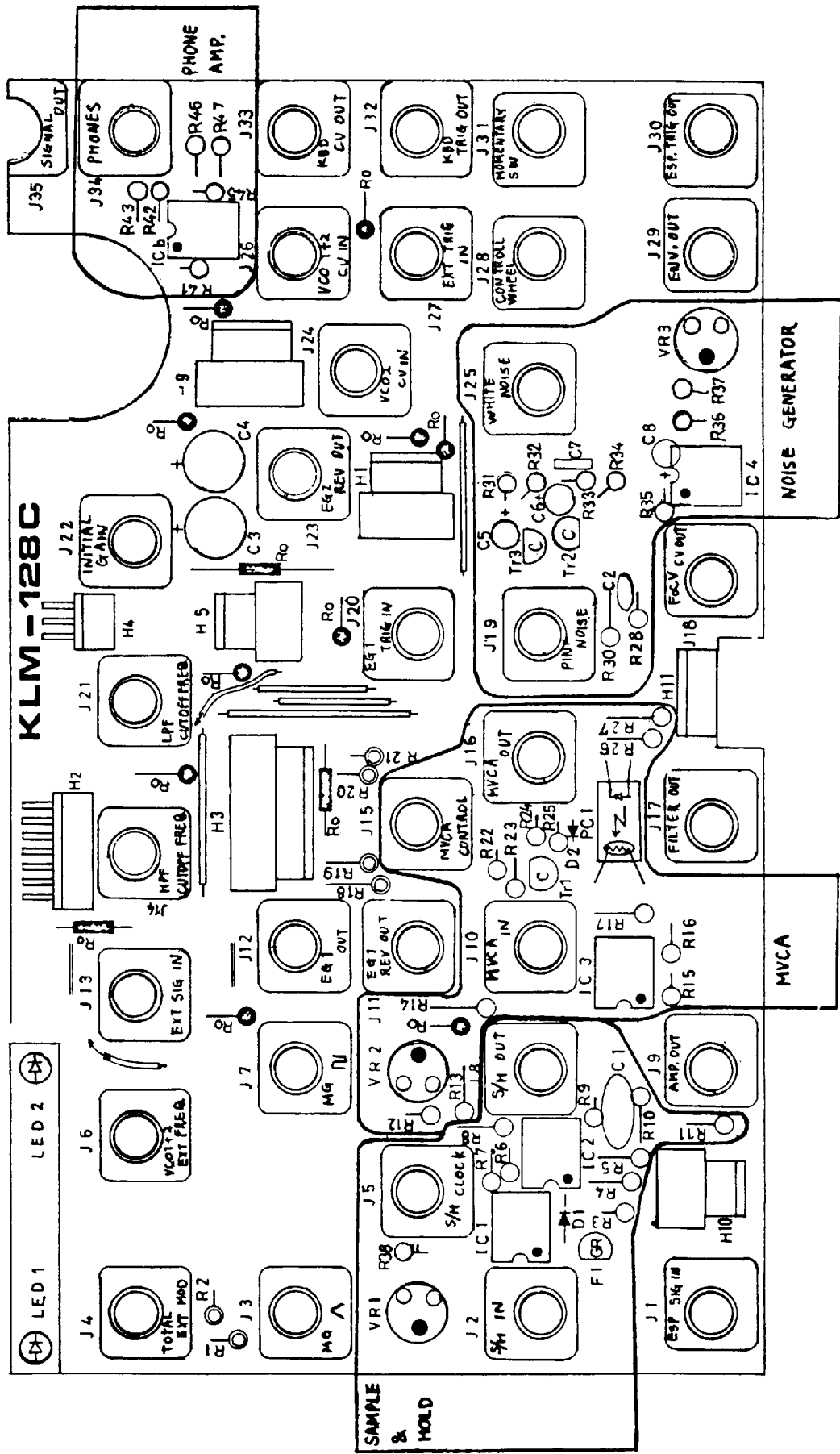
KLM-129



# 4. FRONT VIEW OF PRINTED CIRCUIT BOARD KLM-127



# KLM-128C



# 5. PARTS LIST

(Mechanical parts not listed)

● CARBON RESISTORS  
not listed

● METAL FILM RESISTORS

1/4W 1% 100Ω	x	2
1/4W 1% 403Ω	x	18
1/4W 1% 427Ω	x	22
1/4W 1% 1kΩ	x	3
1/4W 1% 2kΩ	x	3
1/4W 1% 2.94kΩ	x	1
1/4W 1% 4.27kΩ	x	1
1/4W 1% 10kΩ	x	1
1/4W 1% 15kΩ	x	1
1/4W 1% 20kΩ	x	2
1/4W 1% 61.9kΩ	x	17
1/4W 1% 100kΩ	x	23
1/4W 1% 110kΩ	x	1
1/4W 1% 5.11kΩ	x	1

● SOLID RESISTORS

1/4W 10% 10MΩ	x	7
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● MYLAR CAPACITORS  
not listed

● STYROL CAPACITORS

50V-12000pF	x	1
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● CERAMIC CAPACITORS

50V-56pF	x	1
50V-22pF	x	1
50V-100pF	x	5
50V-220pF	x	2
50V-47pF	x	1
25V-100000pF	x	2

● TANTALUM CAPACITORS

16V-3.3μF	x	1
16V-6.8μF	x	2

● ELECTROLYTIC CAPACITORS

16V-10μF	x	12
16V-33μF	x	2
16V-100μF	x	4
50V-1μF	x	6
25V-470μF	x	1
25V-10000μF	x	1
16V-220μF	x	1

● POLYSTYRENE CAPACITORS

50V-3000pF	x	1
50V-6200pF	x	1

● POLYPROPYLENE CAPACITORS

200V-0.22μF	x	1
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● TRANSISTORS

2SA-564(S)	x	4
2SC-945(L)K	x	1
(special selected)		
2SC-1583G	x	2
2SC-1685S	x	13
2SC-644R	x	1

● FET

2SK-30(O)	x	4
2SK-30(GR)	x	4

● DIODES

1S-1555	x	33
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● LED

GD4-203RD	x	4
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● PHOTOCOUPLER

HTV-P873-G35-201B	x	1
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● IC

μPC-4558C	x	17
081	x	5
TL-(071)		
(3140)		
082	x	1
TL-(072)		
(3140)		
MC-14007	x	2
MC-14069B	x	2
μPD4011C	x	1
μPC339C	x	1
μPC14315	x	1
μA79M15	x	1
KORG35	x	2

● SEMI-FIXED RESISTORS

SR19R(10kΩ)	x	6
SR19R(100kΩ)	x	7

● ROTARY VARIABLE RESISTORS

10KB	x	4
100KA	x	8
100KA	x	4
1MB	x	2
2MA	x	6
1MA	x	2
Printed 10KA	x	1
Printed 10KB	x	1
Printed 1MB	x	1
Printed 4-ganged 100KC	x	1
24φ 10KB	x	1
Center click-stop 10KB	x	1

● ROTARY SWITCH

SRM-1034 1-15mm	x	4
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● KEYBOARD

ESK-431 37 key		
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● TERMINAL LUG BOARD

2L4P	x	1
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● PUSH SWITCH

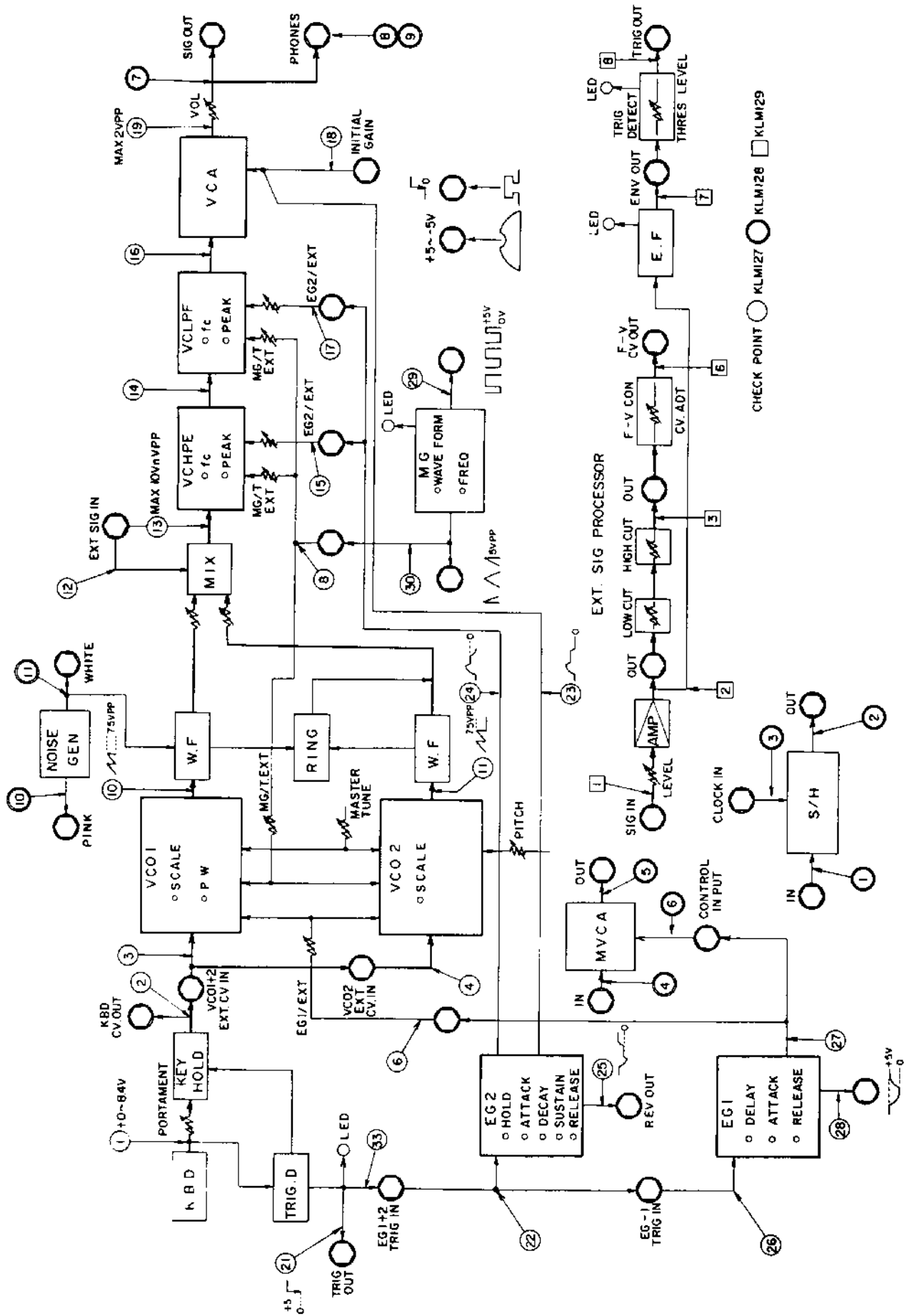
MS-102	x	1
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● CONNECTORS

3P	x	6
4P	x	2
5P	x	2
7P	x	1
8P	x	2
3P	x	3
5P	x	1
Female Connectors		
3P	x	10
4P	x	2
5P	x	3
7P	x	2
8P	x	2



# 6. BLOCK DIAGRAM



# 7. ADJUSTMENT PROCEDURE

## 7-1 Power supply check

1. Positive ripple.  
Should be no more than 2mVp-p.  
Set oscilloscope vertical gain at 10mV/cm and check that power supply ripple is 2mV or less.
2. Negative ripple.  
Same as positive, should be no more than 2mVp-p.

## 7-2. Pitch adjustment

1. VCO-1.  
Perform adjustment with synthesizer controls at "normal setting" (Scale=8, Waveform=  $\square$ , Master Tune, Pitch, and all other knobs at "0"). See figure 1.
  - a. Play C-4 (high C) on the keyboard and adjust the high ① semi-fixed screw until you obtain the correct tuning as indicated by WT-10A (connected to the SIG OUT jack).
  - b. Play key C-1 and adjust the low ② semi-fixed screw.
  - c. Repeat steps a and b as many times as necessary until both are tuned to the correct pitch.
  - d. Check the tuning of C-1, C-2, C-3, and C-4 on the WT-10A meter to make sure pitch deviation is within  $\pm 2$  cents for each.

- e. Change the scale to 32', 16', 8', and 4' and check the tuning of all four C keys to make sure that the pitch deviation of each is within  $\pm 10$  cents.
2. VCO-2.  
Set the VCO-1 level at "0" and the VCO-2 level at "10". Then follow the same procedure as for VCO-1, by adjusting the high ① and low ② semi-fixed screws.

## 7-3. KBD CV adjustment

Use a 4-1/2 digital voltmeter to measure the KBD CV OUT signal.

- a. Measure output voltage first when you play key C-4, then when you play key C-3. The output voltage for C-3 should be exactly half that for C-4. Adjust the KBD CV high ① semi-fixed screw as necessary so that C-3 produces half the voltage of C-4.
- b. Measure C-2 and then C-1 in the same way. Adjust the KBD CV low ② semi-fixed screw as necessary so that C-2 produces exactly half the voltage of C-4.
- c. Repeat steps a and b as many times as necessary until the output voltage of each of C-1, C-2, C-3, and C-4 is exactly half that of the next.

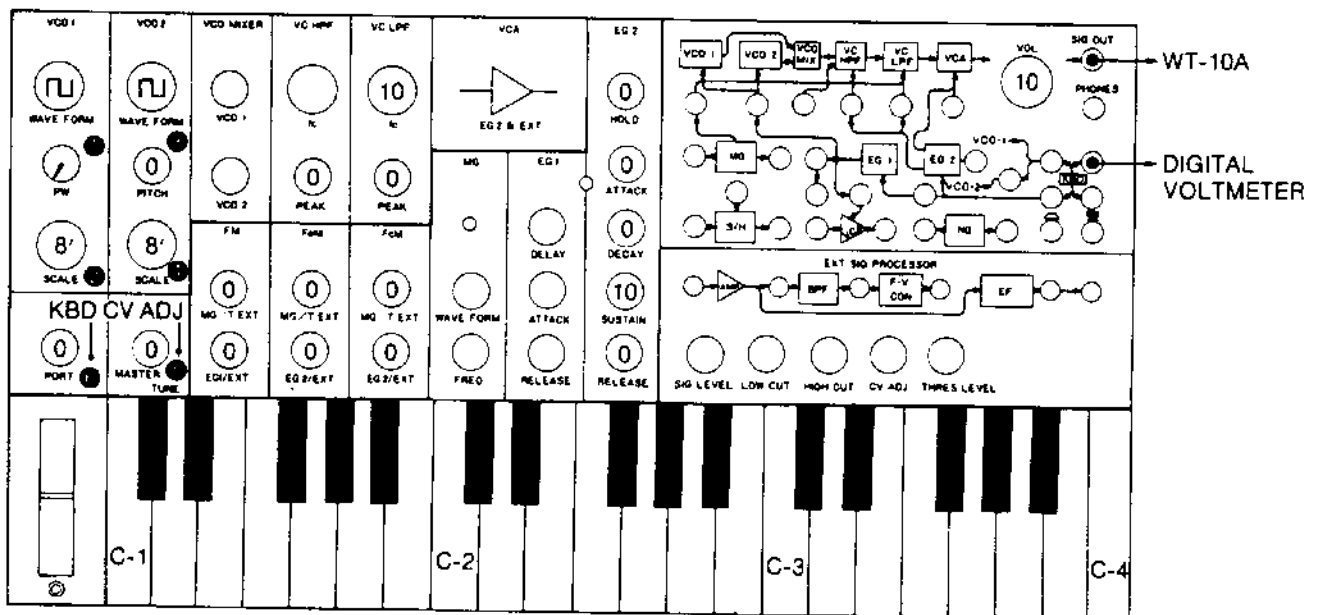


Fig. 1

#### 7-4. VCF Fc adjustment

Connect a frequency counter to the PHONES jack (since a high output level is needed for measurement). Set VCO-1 and VCO-2 level at "0".

##### 1. VC HPF

Refer to the settings shown in figure 2. Set the LPF PEAK knob at "0", and the HPF PEAK knob

at "10". Then adjust the ① semi-fixed screw as necessary so that the HPF oscillation frequency is 500Hz.

##### 2. VC LPF

Set HPF PEAK at "0", and LPF PEAK at "10". Then adjust the ② semi-fixed screw in the same way as you did for the HPF.

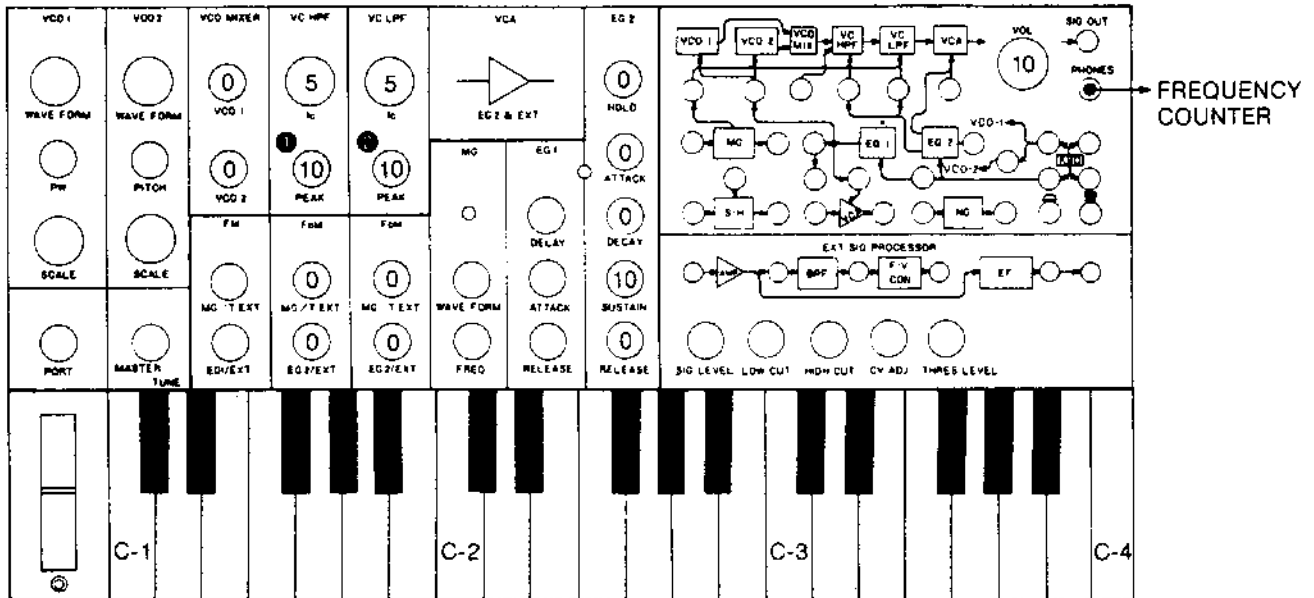


Fig. 2

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<http://www.404manual.com>

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