

# KORG



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

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**KEIO ELECTRONIC LABORATORY CORPORATION  
TOKYO/JAPAN**

# KORG MS-20

## 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 (  $\square$  ~  $\square$  ), 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 (  $\nabla$  ~  $\wedge$  ~  $\wedge$ ,  $\square$  ~  $\square$  ~  $\square$  )
  - 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 >

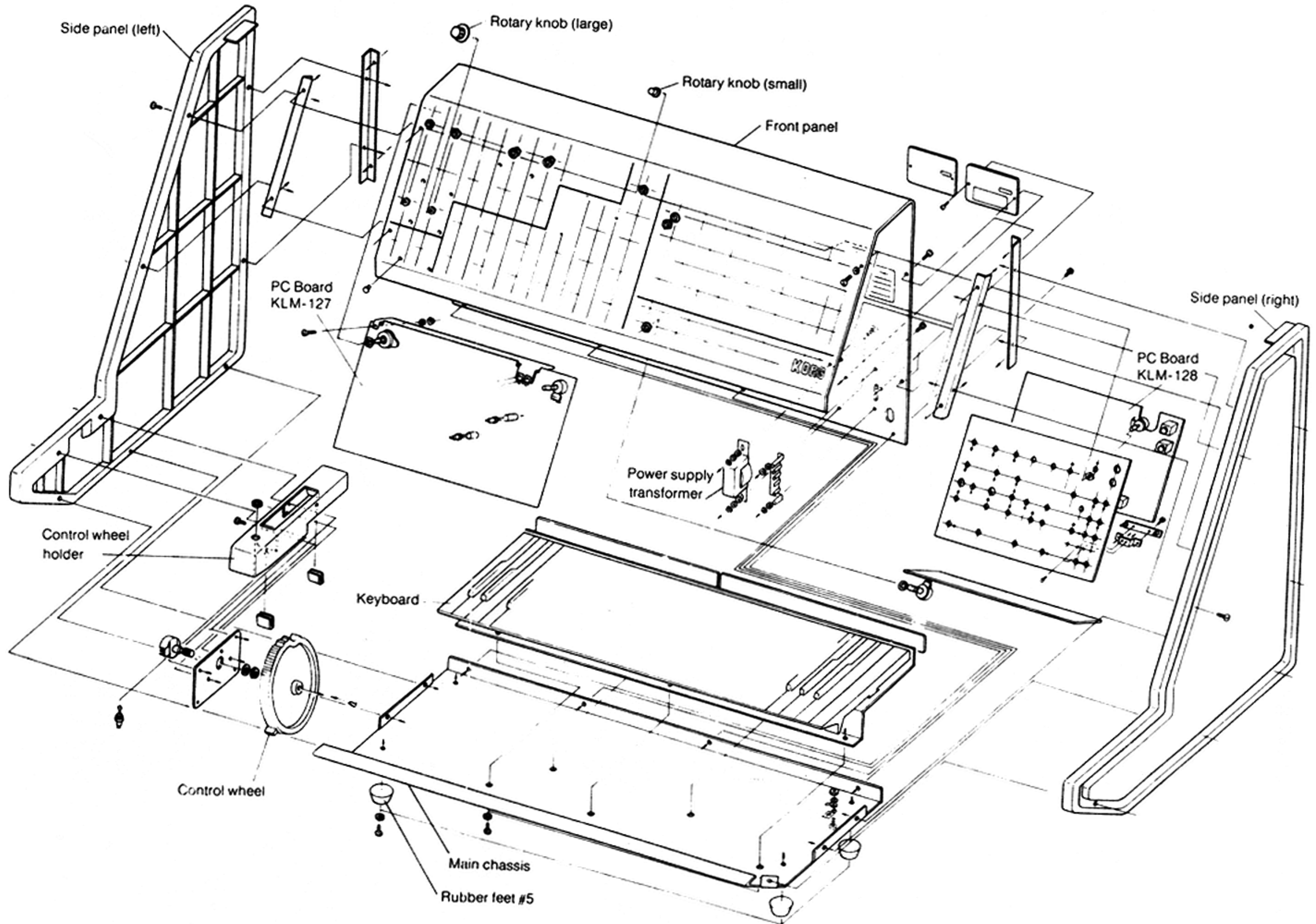
1. Control section
  - Input signal level (0dB max.)
  - Low cut frequency (50 ~ 2,500Hz)
  - High cut frequency (100 ~ 5,000Hz)
  - CV adjust
  - Threshold level
2. Input and output
  - Signal In (auto pad system) (1.0 ~ +14.0V)
  - Amplifier Out
  - Band pass filtered Out
  - CV Out ( $F \infty V$ ) (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)
  - Triangle output ( $\nabla$  ~  $\wedge$  ~  $\wedge$ ) (5Vp-p  $\rightarrow$  0V)
  - Rectangle output ( $\square$  ~  $\square$  ~  $\square$ ) ( $\square$   $\rightarrow$  5V /  $\square$   $\rightarrow$  0V)
8. Noise generator
  - Pink noise output (5Vp-p  $\pm 20$ )
  - White noise output (5Vp-p  $\pm 20$ )
9. Sample and hold
  - Clock trigger input ( $\rightarrow$  GND)
  - Sample signal input (5Vp-p max.)
  - S/H output (5Vp-p max.)
10. Modulation VCA
  - Control voltage input (0 ~ +5V)
  - Signal input (-5V ~ +5V)
  - Signal output (-5V ~ +5V)
11. Manual controller
  - Control wheel output (-5V  $\leftarrow$  0V  $\rightarrow$  +5V)
  - Momentary switch output ( $\rightarrow$  GND)
12. Signal out
  - Signal output (2Vp-p output impedance 3.5k $\Omega$ )
13. Head phones
  - Head phones output ((8 $\Omega$ ) 120m watts 5.6)
14. Power consumption
  - 10 watts
15. Dimensions
  - 569(W) x 309(D) x 249(H) mm
16. Weight
  - 7.7 kgs
17. Accessories
  - Patch cord, connection cord (35 cm x 2, 3 m x 1)
18. Options
  - Stand, hard case, foot pedal (MS-01)
  - Junction box (MS-02)

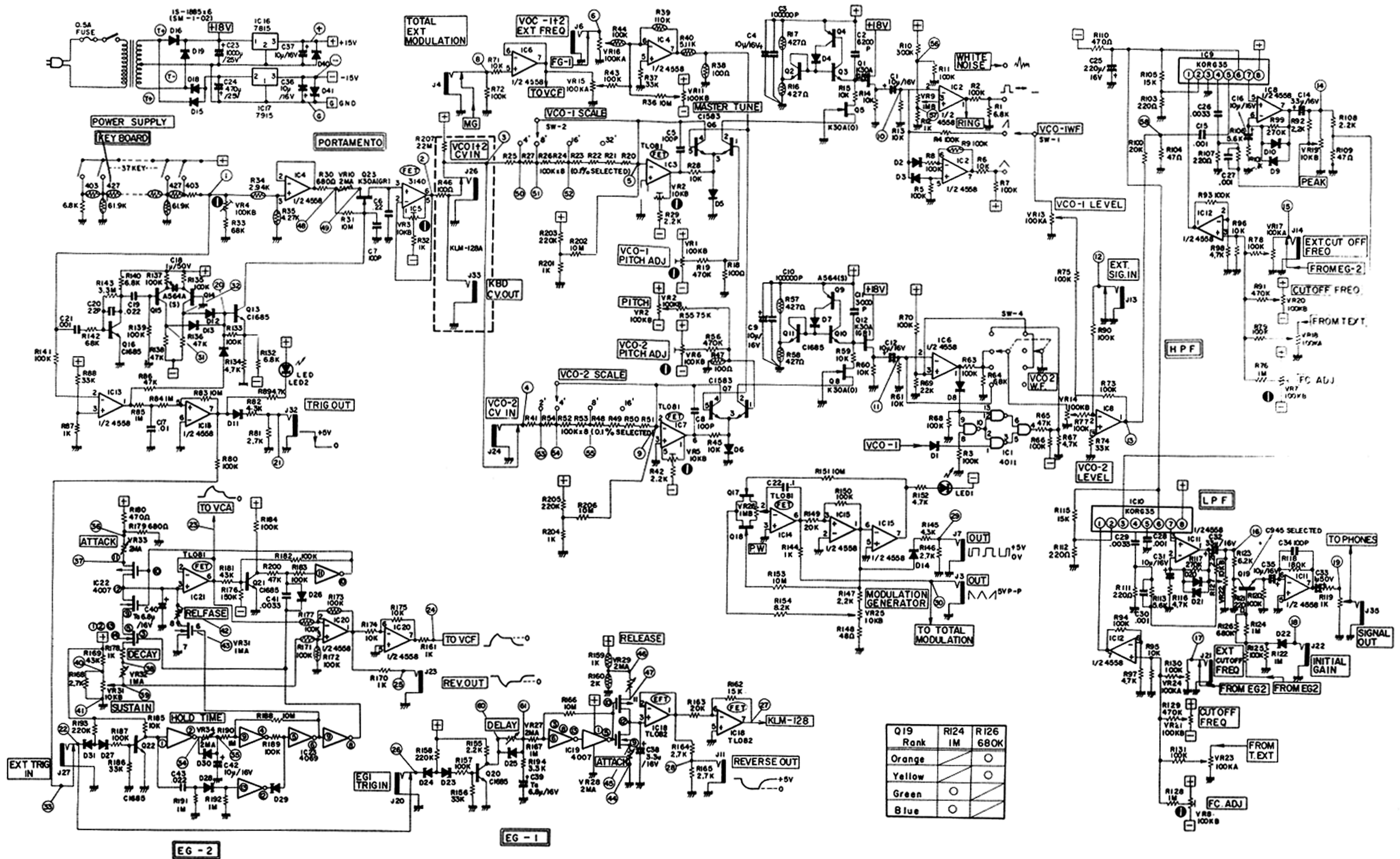
# KORG MS-20

## 2. STRUCTURAL DIAGRAM



# KORG MS-20

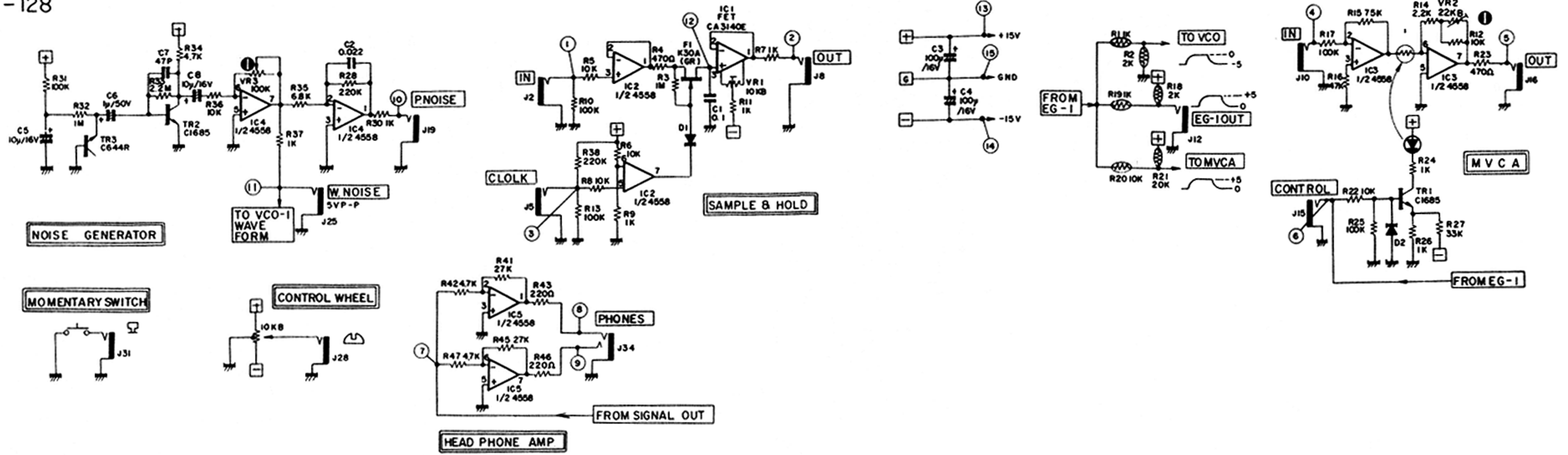
## 3. CIRCUIT DIAGRAM (1)



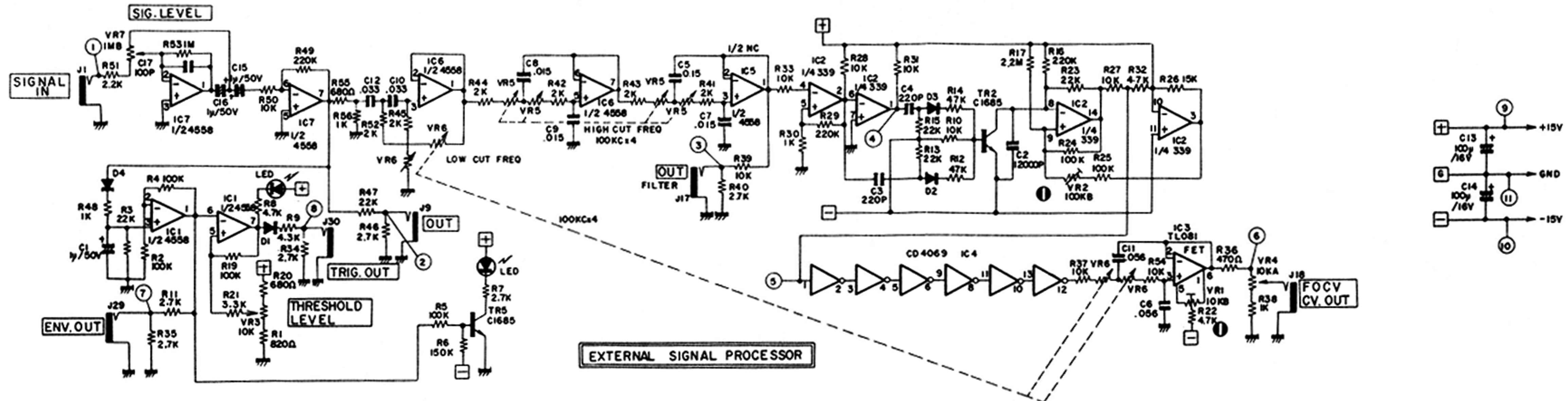
# KORG MS-20

## CIRCUIT DIAGRAM (2)

KLM-128

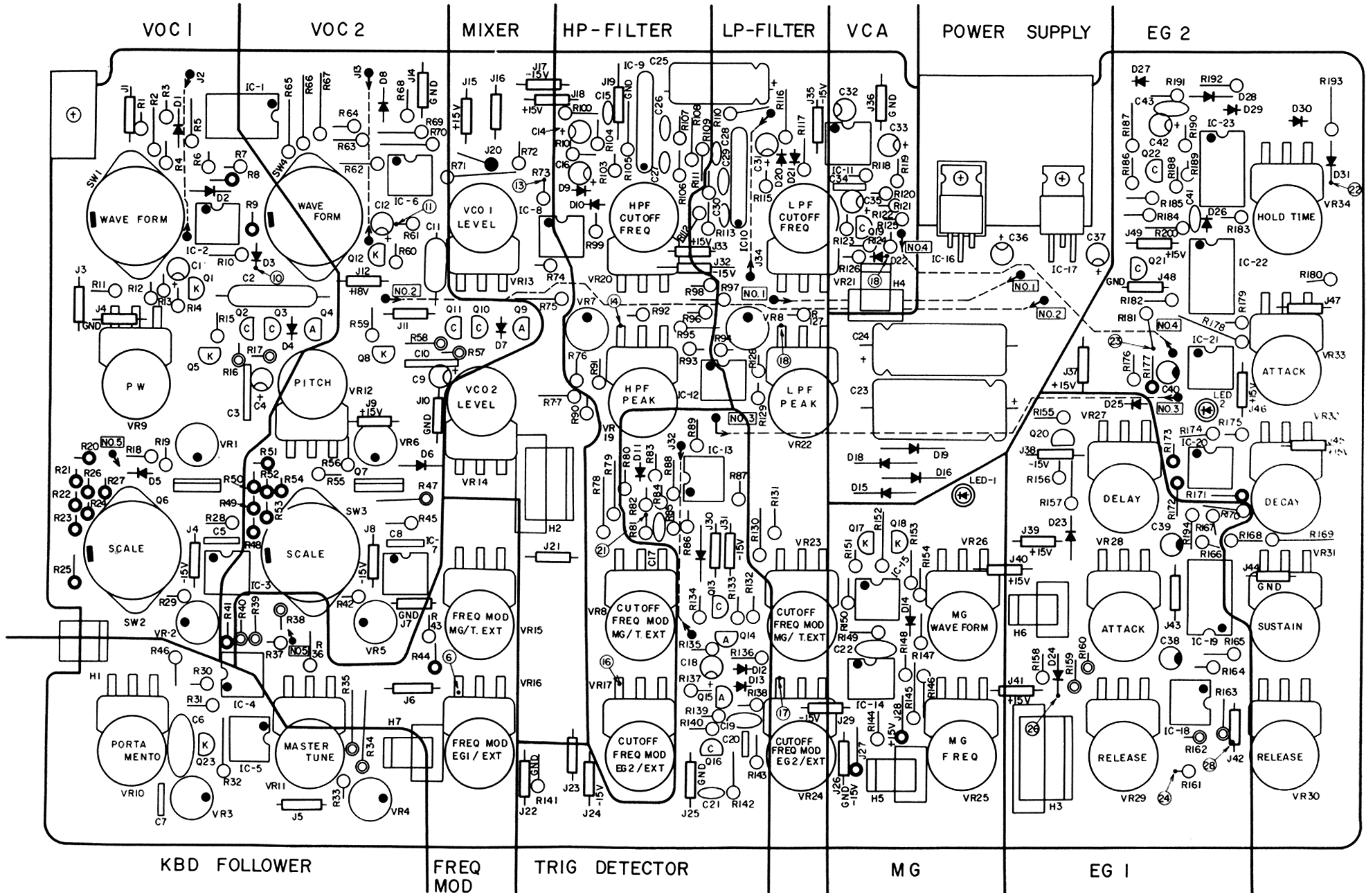


KLM-129



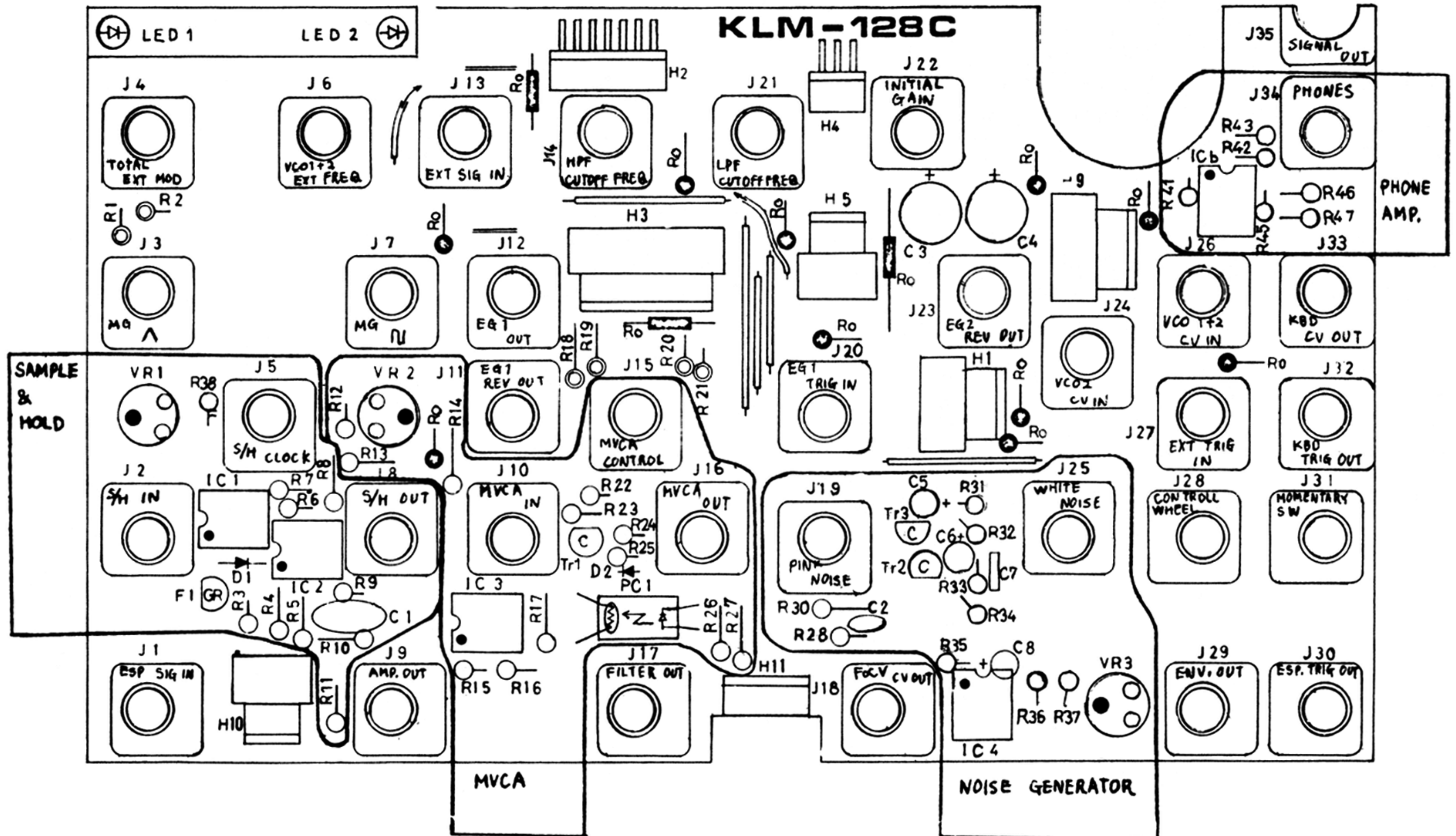
# KORG MS-20

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



# KORG MS-20

## FRONT VIEW OF PRINTED CIRCUIT BOARD KLM-128C



# KORG MS-20

## 5. PARTS LIST

(Mechanical parts not listed)

### ● CARBON RESISTORS

not listed

### ● METAL FILM RESISTORS

1/4W 1% 100 $\Omega$  x 2  
1/4W 1% 403 $\Omega$  x 18  
1/4W 1% 427 $\Omega$  x 22  
1/4W 1% 1k $\Omega$  x 3  
1/4W 1% 2k $\Omega$  x 3  
1/4W 1% 2.94k $\Omega$  x 1  
1/4W 1% 4.27k $\Omega$  x 1  
1/4W 1% 10k $\Omega$  x 1  
1/4W 1% 15k $\Omega$  x 1  
1/4W 1% 20k $\Omega$  x 2  
1/4W 1% 61.9k $\Omega$  x 17  
1/4W 1% 100k $\Omega$  x 23  
1/4W 1% 110k $\Omega$  x 1  
1/4W 1% 5.11k $\Omega$  x 1

### ● SOLID RESISTORS

1/4W 10% 10M $\Omega$  x 7

### ● MYLAR CAPACITORS

not listed

### ● STYROL CAPACITORS

50V-12000pF x 1

### ● 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-3.3 $\mu$ F x 1  
16V-6.8 $\mu$ F x 2

### ● ELECTROLYTIC CAPACITORS

16V-10 $\mu$ F x 12  
16V-33 $\mu$ F x 2  
16V-100 $\mu$ F x 4  
50V-1 $\mu$ F x 6  
25V-470 $\mu$ F x 1  
25V-10000 $\mu$ F x 1  
16V-220 $\mu$ F x 1

### ● POLYSTYRENE CAPACITORS

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

### ● POLYPROPYLENE CAPACITORS

200V-0.22 $\mu$ F x 1

### ● 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

### ● LED

GD4-203RD x 4

### ● PHOTOCOUPLER

HTV-P873-G35-201B x 1

### ● IC

$\mu$ PC-4558C x 17  
081 x 5  
TL-(071)  
(3140)  
082 x 1  
TL-(072)  
(3140)  
MC-14007 x 2  
MC-14069B x 2  
 $\mu$ PD4011C x 1  
 $\mu$ PC339C x 1  
 $\mu$ PC14315 x 1  
 $\mu$ A79M15 x 1  
KORG35 x 2

### ● SEMI-FIXED RESISTORS

SR19R(10kB) x 6  
SR19R(100kB) 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  
24 $\phi$  10KB x 1  
Center click-stop 10KB x 1

### ● ROTARY SWITCH

SRM-1034 1-15mm x 4

### ● KEYBOARD

ESK-431 37 key



### ● TERMINAL LUG BOARD

2L4P x 1

### ● PUSH SWITCH

MS-102 x 1

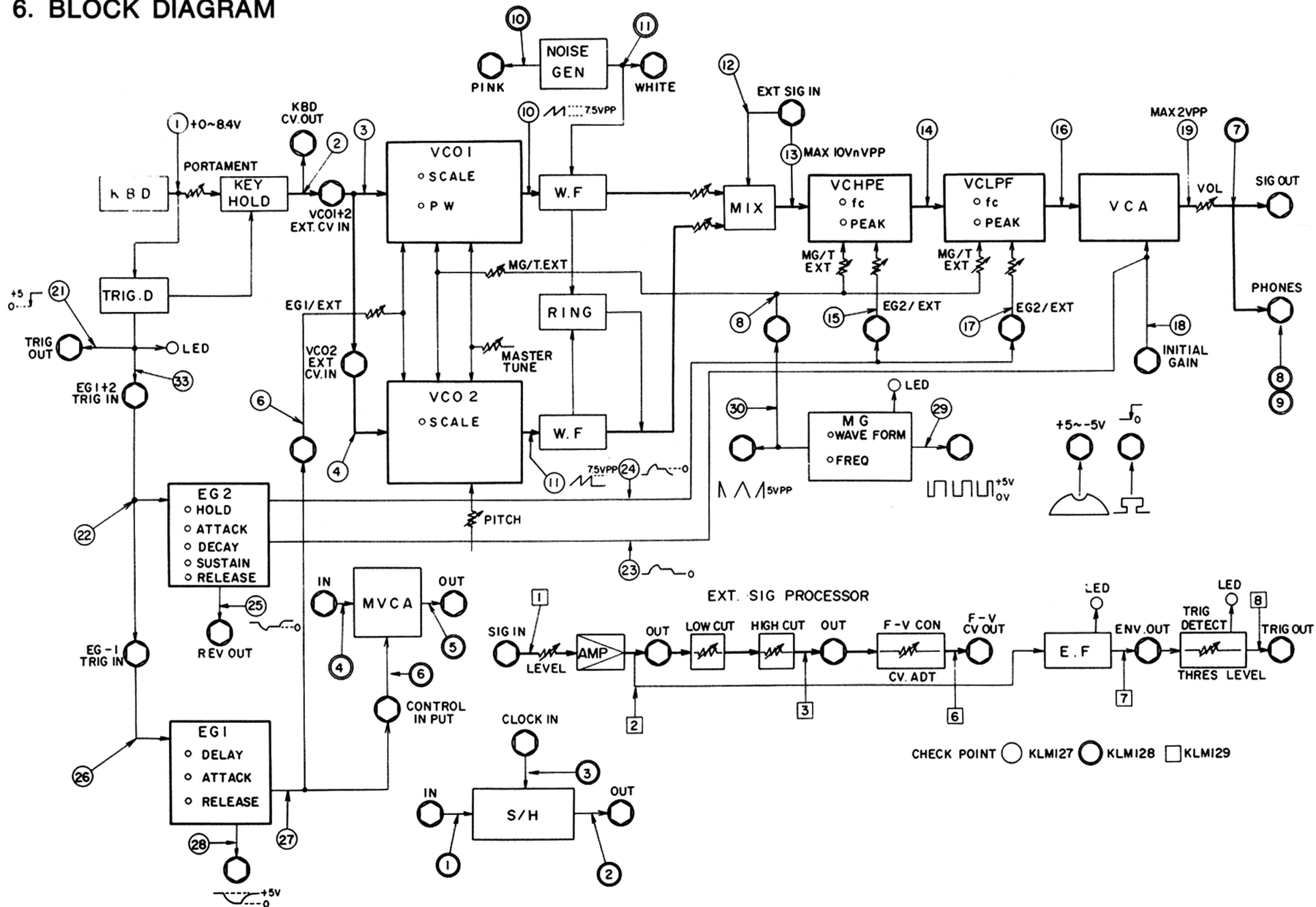
### ● CONNECTORS

 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



# KORG MS-20

## 6. BLOCK DIAGRAM



# KORG MS-20

## 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 ③ and low ④ 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 ⑤ 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 ⑥ 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.

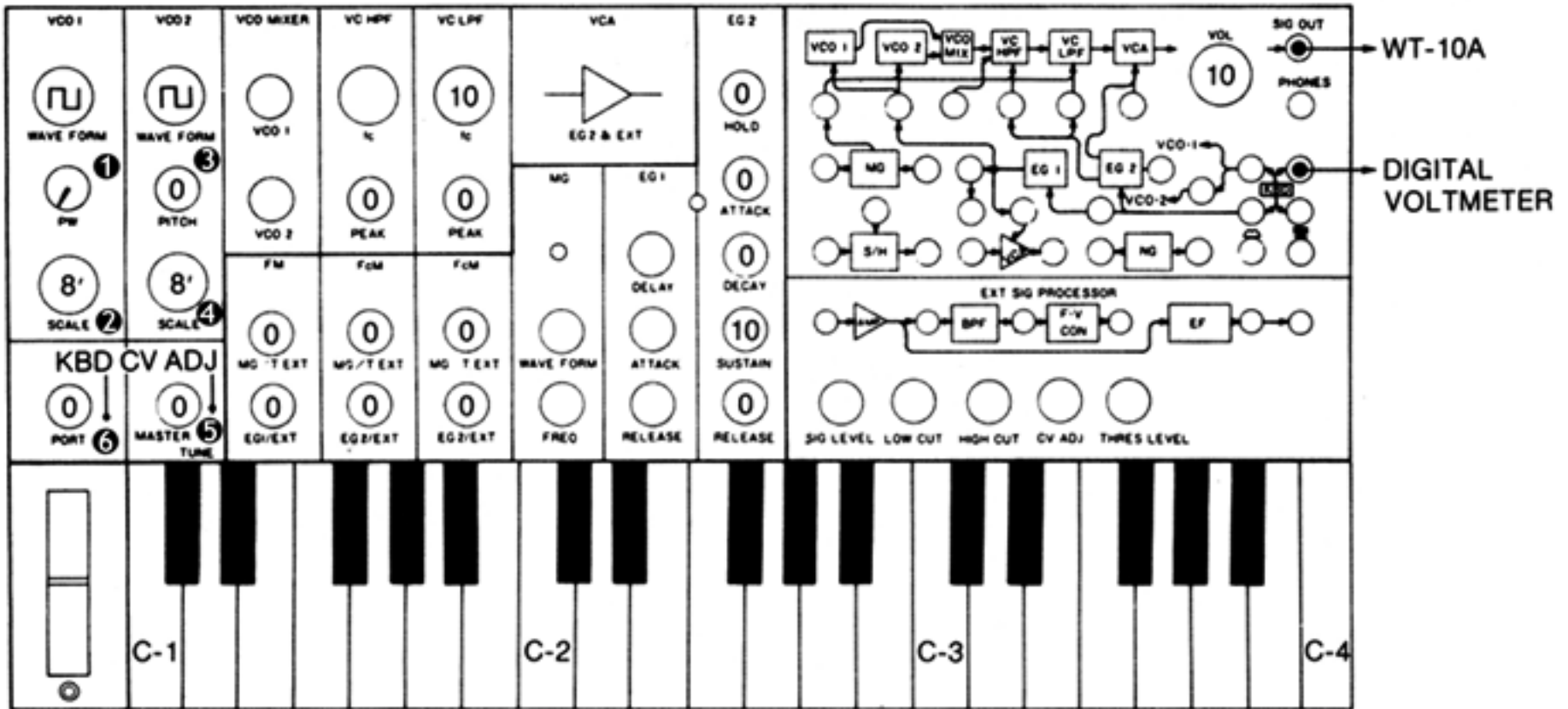


Fig. 1

### 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.

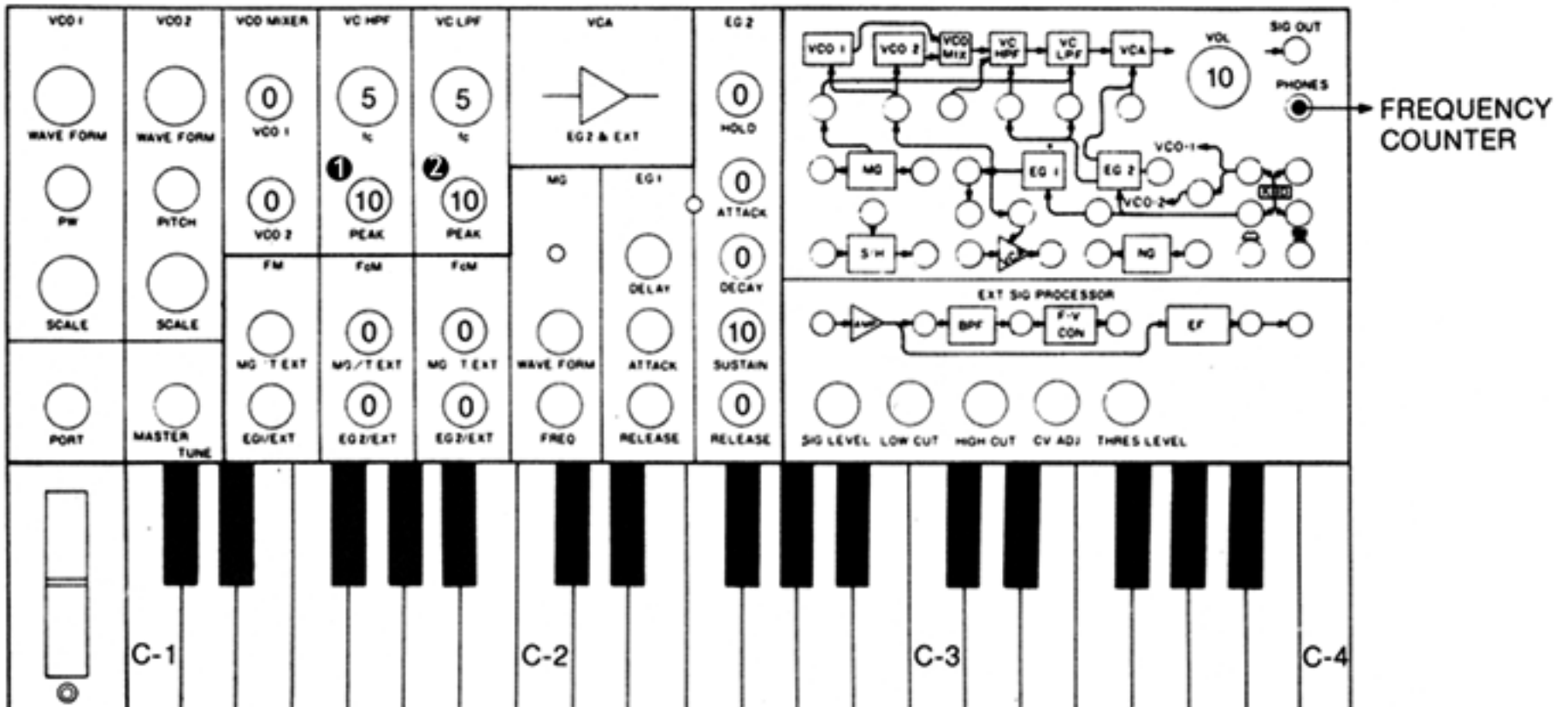


Fig. 2