MONOPHONIC SYNTHESIZER SERVICE MANUAL MS-20

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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 (V, V, PW (T/L, ~T/L)), white noise (4 modes)
   Pulse width adjust 1 : 1 : 1

3. V.C.O.
   Scale (16', 8', 4', 2') (6 octaves, + cent, - cent)
   Wave form (T, T, T, ring modulator) (4 modes)
   Pitch (±1 OCTAVES)
   Master tune (±100 cent)
   Portamento (max. 100 sec)
   Frequency modulation intensity by MG/T. EXT (±5V)
   Frequency modulation intensity by EG1/EXT (±5V)
   V.C.O.-1 level
   V.C.O.-2 level

<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)
   Amplifier Out
   Band pass filtered Out
   CV Out (F = V) (0 ~ + 8.4V)
   ENV Out (0 ~ + 5V)
   Trig Out (+ 5V)
   Peak indicator
   Trigger indicator

<PATCH PANEL>
1. Keyboard
   Keyboard control voltage output (exponential) (0 ~ + 8V)
   Keyboard trigger output (+ 5V)
   VCO-1 + VCO-2 control voltage input (linear response) (0 ~ + 8V)
   VCO-2 control voltage input (linear response) (0 ~ 6V)
   VCO-1 + VCO-2 external frequency control input (OCT/V) (± 5V)

2. VCO
   External signal input (3Vp-p max.)
   External HP filter cutoff frequency control input (2OCT/V) (± 5V)
   External LP filter cutoff frequency control input (2OCT/V) (± 5V)

3. VCF
   Total external modulation input (T. ext) (± 5 ~ + 5V)
   External initial gain control input (0 ~ + 5V)

4. VCO + VCF
   EG 1 envelope signal normal output (± 5V)
   EG 1 envelope signal reverse output (± 5V)
   EG 1 + EG 2 trigger input (~)
   EG 1 trigger input (~)
   EG 2 envelope signal reverse output (~)
   Triangle output (V, V, V)
   Rectangle output (V, V, V)

5. VCA

6. EG
   EG 1 envelope signal normal output (± 5V)
   EG 1 envelope signal reverse output (± 5V)

7. MG
   Triangle output (V, V, V)
2. STRUCTURAL DIAGRAM

8. Noise generator
   • Pink noise output (5Vp-p ±20)
   • White noise output (5Vp-p ±20)
   • Clock trigger input (1-5V, max. 1Ω)
   • Sample signal input (5Vp-p max.)
   • S.H. output (5Vp-p max.)

9. Sample and hold
   • Control voltage input (0~ +5V)
   • Signal input (−5V~ +5V)
   • Signal output (−5V~ +5V)

10. Modulation VCA
    • Control wheel output
      (−5V ~ 0V ~ +5V)
    • Momentary switch output
      (−5V ~ +5V)

11. Manual controller
    • Signal output (2Vp-p output impedance 3.5kΩ)

12. Head phones
    • Head phones output (8Ω)
    • 120m watts 5.6kΩ

13. Power consumption
    • 120 watts

14. Dimensions
    • 569(W) x 309(D) x 249(H) mm

15. Weight
    • 7.7 kg

16. Accessories
    • Patch cord, connection cord
    • Stand, hard case, foot pedal
    • Junction box (MS-02)

17. Options

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Diagram showing components and connections of the device.
5. PARTS LIST
(Mechanical parts not listed)

<table>
<thead>
<tr>
<th>CARBON RESISTORS</th>
<th>POLYSTYRENE CAPACITORS</th>
<th>ROTARY VARIABLE RESISTORS</th>
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<td>1MA x 2</td>
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- 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
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 = "U", 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 \( \text{screw} \) 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 \( \text{screw} \) 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 ±2 cents for each.

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 \( \text{screw} \) 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 \( \text{screw} \) 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