SYNTHESIZER

SH-1

SERVICE NOTES

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KEYBOARD PARTS

Roland
SPECIFICATIONS

- KEYBOARD .......... 32 keys, 2-1/2 Octaves

- VCO (Voltage Controlled Oscillator)
  Modulator
  Autobend Depth
  Autobend Time (8msec-360msec)
  VCO Range (32', 16', 8', 4', 2')
  Waveform (\[\], [\], [\])
  Pulsewidth Modulation (5%-50%)
  PWM Mode Switch (ENV-1/Manual/LFO)

- SUB OSC (Sub-oscillator)
  1 OCT DOWN \[\] /2 OCT DOWN \[\] /2 OCT DOWN \[\]

- NOISE GENERATOR
  White/Pink Selector

- AUDIO MIXER
  VCO/SUB OSC/NOISE/EXT SIG
  Overload Indicator (EXT SIG)

- HPF (High Pass Filter)
  Cutoff Frequency Control (25Hz-5KHz)

- VCF (Voltage Controlled Filter)
  Cutoff Frequency Control (5Hz-20KHz)
  Resonance (Min-Self Oscillation)
  ENV-1 Polarity Switch (\[\] / [\])
  ENW-1 Control
  MOD Control
  KYBD Control
  EXT SIG ENV FOL/R Control

- VCA (Voltage Controlled Amplifier)
  Hold Control
  Envelope Switch (ENV-1/ENV-2)

- ENVELOPE GENERATOR
  ENV-1
  Attack Time (1.5msec-2.5sec)
  Decay Time (1.5msec-8sec)
  Sustain Level (0-100%)
  Release Time (1.5msec-8sec)
  Gate Trigger Selector Switch
  (Gate/Trig/Gate/LFO)

  ENV-2
  Attack Time (1.5msec-3sec)
  Release Time (1.5msec-8sec)
  Gate Selector Switch (Gate/LFO)

- MODULATOR
  Modulation Mode Switch (Random/\[\], [\])
  Rate (0.2Hz-25Hz)
  Delay Time (0-3sec)
  Rate Indicator

- KYBD/EXT CV GATE SWITCH

- TUNING (+/-700 cents)

- PORTAMENTO (0-2.5sec)

- VOLUME

- TRANSPOSE SWITCH (L/M/H)

- BLENDER
  Bender Lever (-35° - +35°)
  Bender Sensitivity (VCO, VCF)

- POWER SWITCH
  Power Indicator

- CONNECTION JACKS
  Output Jack
  Output Level Switch (L/M/H)
  (standard -20dBm/-8dBm/+4dBm)
  Phones Jack (R/L, stereo)
  Phones Output Level Switch
  (L=-30dBm/H=-23dBm/H=+18dBm)
  External Signal Jack
  External Signal Level Switch (L/M/H)
  (standard 0dBm/-20dBm/-40dBm)
  External Control Voltage Input Jack
  (1V/oct)
  External Gate Voltage Input Jack
  (ON with +7.5V or over)
  Keyboard Control Voltage Output Jack
  (F1=1.417V, C3=4.000V, 1V/oct)
  Keyboard Gate Output Jack
  (OFF = 0V, ON = +14V)

- GENERAL
  Power Consumption .............. 10W
  Dimensions ............ 610(W) x 370(D) x 135(H)mm
  Weight ............ 24(W) x 14.6(D) x 5.3(H)in
  Accessory ......... 6.4kg, 14.1 lbs

- 2.5m connection cord
DISASSEMBLY

Be sure to keep the power plug off from the outlet.
To open the top cover, remove five screws (A1 – A5) at the bottom of the unit.

A1, 3-5: Bind 3x12 Br
A2: Bind 3x6 FeBr

VCOH-3-1
VCOH-3-2
VCOH-3-3
CVH-3-2
CVH-3-1
VCFH-1-1
VCFH-1-2
P3H-26/27/34

KEYBOARD SK-132-D
CIRCUIT DESCRIPTION

1. KCV BOARD ASSEMBLY (CVH-3)

1.1. The current from the constant current source is fed to the resistor chain of 31 resistors connected in series. When a key is depressed, the key voltage develops at the corresponding resistor. (When two keys are depressed, lower key voltage is taken.) The voltage is held by the capacitor in the S & H circuit after the key is released. The voltage is sent to the portamento circuit. Portamento effect is added by the CR circuit (portamento control pot and the above-mentioned capacitor). The portamento time is varied by changing the time constant with the portamento control.

1.2. When a lower key is depressed or released while one or more higher keys are held down, the change in the key voltages is detected and differentiated to generate a pulse, which triggers the envelope generator, during legato keying.

1.3. Bender circuit output voltage can be varied by moving the bender lever, smoothly changing pitch and tone color. The control voltages that are distributed to VCO and VCF can be varied by Sensitivity sliders.

2. VCO BOARD ASSEMBLY (VCOH-3)

2.1. The VCO is a highly stable and precise oscillator whose frequency is controlled by KCV or EXT CV. Linear voltage at KCV or EXT CV is converted by the exponential converter to exponential current, which generates sawtooth wave. The sawtooth wave is changed to square waves, too, by waveform converter. One is the 50% square wave and the other is the square wave whose pulse width is modulated by LFO, ENV-1 or MANUAL. To produce sub-oscillator sound, the square wave frequency is divided into 1/2 or 1/4 by dividers. The two resulting square waves are combined to produce the third wave. Thus three waves are obtained and one wave selected is applied to Mixer as one of the sound sources.

2.2. The LFO is a modulating signal oscillator which generates triangular, square and sine waves of low frequencies. Besides, random note is generated by sampling and holding noise signal with LFO frequency. The sine wave only is affected by Delay Time control.

2.3. Noise is generated from reversely biased base-emitter junction of a transistor. The noise is amplified to the required level and passed through a filter where it is converted to white or pink noise. The resulting noise is used to obtain various effects sounds.

2.4. The Autobend is a voltage generator which is triggered with GATE+TRIG pulse and has DEPTH and DELAY TIME controls. A resulting voltage envelope controls the VCO.
2.5. The overload indicator (LED) lights when the external signal level is excessively high.

2.6. The Mixer has VCO, SUB-OSC, NOISE, and EXT SIG controls.

2.7. The Envelope Follower integrates external signals to make the voltage envelope. This is used to control the VCF, causing wah effects.

2.8. The Headphones amplifier is a Class A amplifier that uses an output transformer.

3. VCF/VCA BOARD ASSEMBLY (VCMH-1)

3.1. The VCF is a voltage-controlled low pass filter. It comprises the 4-stage Operational Transconductance Amplifier circuits, in which the cutoff frequency varies in proportion to the bias current. When Resonance control is raised up beyond a predetermined position, it provides a feedback necessary to start and sustain oscillation.

3.2. The VCA is an amplifier whose gain is controlled by the control voltage from ENV-1 or ENV-2.

3.3. The ENV-1 is triggered with GATE-TRIG, GATE, and LFO signals. The ENV-1 generates the control voltage which varies with time according to the four control settings: Attack Time, Decay Time, Sustain Level, and Release Time. The resulting voltage envelope is used to control the VCO (V00), VCF, and VCA.

3.4. The ENV-2 is triggered with GATE and LFO signals. The ENV-2 has two control settings: Attack Time and Release Time. The resulting voltage envelope is used to control the VCA.

4. POWER SUPPLY BOARD ASSEMBLY (PSH-26, PSH-34, PSH-27)

Provides regulated, stable +15V and -15V. PSH-26 (AC 100V), PSH-34 (AC 117V), or PSH-27 (AC 220/240V) is used.
CAUTION: Be careful when moving the flat cable connections.
IC201......μPC1458C
IC202......LF1174IH
IC501......TA7130P

All diodes are 1N2457.
All PNP Tr's are 2SA826-Q.
All NPN Tr's are 2SC1740-Q.

*C208: 47p (Up To 711099)
ADJUSTMENT

1. Bender Voltage

Connect a digital voltmeter to BENDER TP.
Set Bender Lever at full - position and read the value (negative).
Then set the Bender Lever at full + position and adjust VR202 so that the same reading (positive) is obtained. Tolerance is ±30mV.

2. KCV

Connect a digital voltmeter to KCV TP.
Connect No.33 terminal to GND. While depressing F1, F2, and F3 in order, adjust VR303 to obtain 1V/oct relation. Tolerance is ±2mV.
Next, disconnect F1 from GND. While depressing F1, adjust VR201 to obtain 1.417V. Tolerance is ±1mV.

3. Noise

Connect an oscilloscope to NOISE TP.
Adjust VR301 to obtain noise slightly over 10Vp-p.
4. VCO

When adjusting VCO, be sure to continue to depress respective key.

For the adjustment that follows, use a completely tuned electronic instrument or a tuning meter. Adjustment can be made either by checking for the beat sound or by consulting the Lissajous figure on the oscilloscope.

4. a. WIDTH ADJUSTMENT

1) Set controls on the control panel as shown above.

2) Tune F1 to pitch with TUNING control on the control panel.
   (If this tuning is difficult only with TUNING control, adjust VR312 FREQ control, too.)

3) Tune F2 to pitch with VR313 WIDTH control.

4) Again, tune F1 to pitch with TUNING control.

5) Check to see to which F2 is out of tune, to higher pitch or to lower pitch.

6) Turn VR313 WIDTH control to make the margin of mistune still bigger.
   (If F2 is broadly out of tune, turn VR313 largely.
   If F2 is slightly out of tune, turn VR313 only slightly.)

7) Tune F1 to pitch over again.

8) Repeat steps 5 thru 7 until both F1 and F2 are tuned to pitch roughly.

9) Tune F3 to pitch with VR313 WIDTH control.

10) Tune F1 to pitch with TUNING control.

11) Check to see to which F3 is out of tune, to higher pitch or to lower pitch.

12) Turn VR313 WIDTH control to make the margin of mistune still bigger.
   (If F3 is broadly out of tune, turn VR313 largely.
   If F3 is slightly out of tune, turn VR313 only slightly.)

13) Tune F1 to pitch over again.

14) Repeat steps 11 thru 13 until F1 and F3 are tuned correctly.

15) Set TUNING control the control panel at CENTER position.

16) Tune F1 to pitch with VR312 FREQ control.
4. b. LINEARITY ADJUSTMENT

1) Set Range at 2' and Transpose at M.
2) Tune F1 to pitch with TUNING control on the control panel.
3) Check to see to which F2 (F3) is out of tune, to higher pitch or to lower pitch.
4) Turn VR305 LINEARITY control so that F2 (F3) is out of tune in the opposite side to the above.
   (If F2 (F3) has been out of tune to a higher pitch, set it to a little lower pitch than standard pitch with VR305 LINEARITY control.
   If F2 (F3) has been out of tune to a lower pitch, set it to a little higher pitch than standard pitch with VR305 LINEARITY control.)
5) Repeat above steps 2 thru 4 until each of F1, F2 and F3 is tuned to pitch.

4. c. RANGE ADJUSTMENT

1) Set Range at 32' and Transpose at L.
2) Tune F1 to pitch with TUNING control on the control panel.
3) Raise Range and Transpose switches step by step and adjust VR302 RANGE adj control to tune F1 to pitch.
4) Set Range at 8' and Transpose at M.
5) Tune F1 to pitch with TUNING control on the control panel.
6) Raise Range and Transpose switches step by step and check to see to which the note is out of tune, higher or lower. Then turn VR302 RANGE adj control so that the note is slightly out of tune in the opposite side.
   That is, set VR302 RANGE adj control so that the mistune is bigger at the lower Range/Transpose position.
7) Repeat steps 4 thru 6 until the notes are tuned to pitch at every position of the Range/Transpose switches.
8) If it is very difficult to perfectly tune the note at all positions of Range/Transpose switches, adjustment should be done so that the notes are out of tune in the same side with Range – 8' and Transpose – M position as the center, and that the mistune is smaller in the higher pitch positions.

5. Square Wave

![Square Wave Diagram]

VCOH-3-1
5. a. 50%
Set controls on the control panel and connect an oscilloscope.
Depress a key around the middle of keyboard and adjust VR306 to obtain 50% duty square wave.

5. b. 5%
Set PULSE WIDTH control at 10.
Depress a key around the middle of keyboard and adjust VR304 to obtain 5% duty square wave.

6. VCF
6. a. Resonance.
Connect an oscilloscope and set controls on the control panel as shown.
Adjust FREQ control so that VCF oscillates at about 1KHz.
Adjust VR601 so that VCF is at the onset of oscillating with RESONANCE control at 8 as shown at right.

6. b. Width
Set KYBD and RESONANCE controls at MAX.
Depress A2 and adjust FREQ control so that VCF oscillates at about 1KHz.
While depressing C1 and C2 alternately, adjust VR604 to obtain octave relations.
6. c. Frequency

Set KYND control at 0.
Set CUTOFF FREQ control at HIGH.
Adjust VR603 so that VCF oscillates at 20KHz.

7. VCA
7. a. Cutoff

Connect an oscilloscope to VCA TP.
Set controls on the control panel as shown.
While gradually raising the oscilloscope gain to the maximum, adjust VR605 so that output signal is just about to disappear.

7. b. DC Balance
Set VCO control on AUDIO MIXER control panel at 0.
While depressing a key, adjust VR602 so that output variation is minimum.
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<td>Slide Pot</td>
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<td>10µ 16V ECEA16N10 (Non-polar)</td>
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