SYNTHESIZER

SH-7

SERVICE NOTES

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SPECIFICATIONS

A. KEYBOARD: 44 Keys
B. INPUT MODE: EXT CV Gate(S/H)/Two Note/One Note
C. CONTROLLER
   1. Portamento Mode: Down/Normal/Up
      Portamento Time: 0-3sec
   2. Transpose: Low/Medium/High(1 Oct Step)
      a. VCO Mode: LFO/OFF/CV
         Sensitivity: LFO: ±10 Notes max  CV: ±15 Notes max
      b. VCF Mode: LFO/OFF/CV
         Sensitivity: 0-10
      c. VCA Mode: LFO/OFF/CV
         Sensitivity: LFO: -20dB - +15dB max  CV: -30dB - +20dB max
   4. Autobend
      Time: 20ms-700ms
      Polarity: _ (+) / (−)
   5. Total Tuning: ±3.5 Notes
   6. VCO-2 Tuning: ±7.5 Notes
D. VCO-1(A) MIXER
   \[ \begin{array}{c}
   \text{mixing level} \\
   \text{0-10}
   \end{array} \]
   1. Range: 0-10
   2. Waveform: 2'/4'/8'/16'/32'
   3. PWM
      a. Modulation: 0(50%)-10(min)
      b. Mode: LFO(∧)/Manual/ENV-1(∧∧)
   4. Control
      a. LFO: 0-10
      b. Autobend: 0-10
      c. S & H: 0-10
E. VCO-1(B)
   1. Range: 2'/4'/8'/16'/32'
   2. Waveform: \[ \begin{array}{c}
   \text{∧ / ∨ / △ / ▽}
   \end{array} \]
   3. PWM
      a. Modulation: 0(50%)-10(min)
      b. Mode: LFO(∧)/Manual/ENV-1(∧∧)
   4. Control
      a. LFO: 0-10
      b. Autobend: 0-10
      c. S & H: 0-10
   5. Synchro(with VCO-1): ON/OFF
F. VCO-2
   1. Range: 2'/4'/8'/16'/32'
   2. Waveform: \[ \begin{array}{c}
   \text{∧ / ∨ / △ / ▽}
   \end{array} \]
   3. PWM
      a. Modulation: 0(50%)-10(min)
      b. Mode: LFO(∧)/Manual/ENV-1(∧∧)
   4. Control
      a. LFO: 0-10
      b. Autobend: 0-10
      c. S & H: 0-10
   5. Synchro(with VCO-1): ON/OFF
G. AUDIO MIXER
   1. VCO-1(A): 0-10
   2. VCO-1(B): 0-10
   3. VCO-2: 0-10
   4. Noise: 0-10
   5. RING, EXT SIG: RING/EXT SIG
   6. Overload Indicator: LED
   7. Cutoff Frequency: 10Hz-20KHz
I. VCF
1. Cutoff Frequency: 5Hz–20KHz
2. Resonance: Min – Self Oscillation
3. Control
   a. ENV-1: ENV-1:
   b. LFO, S&H: LFO, S&H:
   c. KYBD, PEDAL: KYBD/PEDAL
   d. VCO-2, NOISE: VCO-2/NOISE
   e. ENV FOL’R: ENV FOL’R:
4. EXT SIG Indicator: LED

J. VCA
1. Hold: 0–10
2. Control
   a. LFO: 0–10
   b. ENV-1, ENV-2: ENV-1/ENV-2

K. SAMPLE & HOLD
1. Mode: / / Random
2. Sample Time: 13ms–2s
3. Output Lag: 0–2s

L. LFO
1. Waveform: \ or / / Random
2. Rate: 0.15Hz–25Hz
3. Delay Time: 0–3s
4. KYBD TRIG: ON/OFF

M. RING MODULATOR
Input Mode: VCO-2/EXT SIG

N. NOISE GENERATOR
Output Mode: WHITE/PINK

O. ENV-1
1. Trigger Mode: KYBD GATE+TRIG/KYBD GATE/LFO
2. Attack Time: 1ms–4s
3. Decay Time: 1ms–8s
4. Sustain Level: 0–100%
5. Release Time: 1ms–8s

P. ENV-2
1. Trigger Mode: KYBD GATE+TRIG/KYBD GATE/LFO
2. Attack Time: 1ms–4s
3. Decay Time: 1ms–8s
4. Sustain Level: 0–100%
5. Release Time: 1ms–8s

Q. INPUT
1. CV Input: 1 Volt/1 Oct
2. GATE Input: Vg > 7V
3. TRIG Input: Vt > 5V, Tt > 0.1ms
4. EXT SIG Input
   EXT SIG Input Level: L(-43dB)/M(-18dB)/H(0dB)
5. VCF PEDAL CONT Input:

R. OUTPUT
1. CV Output: 1V/1 Oct.
2. GATE output: Vg=14V
3. PHONES Output:
   PHONES Output Level: L(-24dB)/M(-12dB)/H(CdE)
4. Signal Output:
   Signal Output Level: L(-16dB)/M(-6dB)/H(+6dB)
TO OPEN TOP COVER:
Remove four screws marked *. Raise the unit with the front side up and prop the cover with your hand. At this time, loosen the side block fixing screws not to scratch the side blocks.
CIRCUIT DESCRIPTION

1. KEYBOARD ASSEMBLY  SK-142C
   The keyboard has 44 keys which actuate the KCV circuit.

2. KCV BOARD  CVH-1
   CVH-1 includes the following circuits: CV, GATE, EXT GATE, RETRIGGER, BENDER, PHONES.

2.1. Control Voltage Circuit
   The SH-7 uses the relation of 1 volt/1 octave. When a key is depressed, the corresponding voltage develops across the resistor chain, which is held at the sample and hold circuit by the gate signals. This is the key control voltage.
   To get two KCV's, one for the higher note and the other for lower note, two KCV circuits are provided at the both ends of the resistor chain. The two KCV's are sent to the portamento circuit to add portamento effect.

2.2. Gate Circuit
   The gate signal is generated when a key is depressed. It is used to sample the keyboard control voltage and to trigger the Retrigger, Autobend, LFO, ENV-1, and ENV-2 circuits.

2.3. External Gate Circuit
   The external gate input is shaped to a fixed form of gate signal. This circuit is activated with the external input level of +7 volts or over.

2.4. Retrigger Circuit
   With the Gate Trigger Selector Switch at the KYBD GATE+TRIG position, depress a key and the gate voltage develops to trigger the Envelope Generator. Next, with holding the key down, depress a new key and the Envelope Generator is retrigged.
   (The change in key control voltage is detected and a pulse is generated, which retriggers the Envelope Generator.)
   When using EXT TRIG input, the Retrigger circuit is activated with the external input level of +7 volts or over and the pulse width of 0.1 msec or over.

2.5. Bender Circuit
   The DC voltage developed by the Bender unit is used as the Bender Control Voltage.
   The voltage is also used to control the gain of the LFO, which results in Bender LFO output.

2.6. Phones Circuit
   This circuit amplifies the WCA output to drive the headphones. The output level of this circuit is independent of TOTAL VOLUME.

3. CONTROL BOARD ASSEMBLY  OPH-35
   Switches and controls for the functions described in 2. above, and TOTAL VOLUME control are mounted on this board.

4. BENDER UNIT  PB-4
   The Bender Control Voltage to control the VCO, VCF, and VCA is varied manually with the BENDER lever of the Bender Unit.
5. VCO-1 BOARD ASSEMBLY  VCOH-1
This assembly includes the VCO-1 and AUTOBEND circuits.

5.1. VCO-1
The VCO is an oscillator whose frequency is controlled by voltage. With the SH-7, the voltages include: keyboard control voltage, external control voltage, and other modulation voltage.
All voltages applied to the VCO are summed together and the linear relation between voltage and frequency is changed to anti-log relation by the anti-log converter.
Pulse wave with the frequency corresponding to the voltage is produced. It is sent to a frequency divider to obtain five square waves of feet series (2', 4', 8', 16', 32'). The VCO-1(A) is obtained by the feet series, either singly or by free mixing.
Selected feet series passes the shaping circuit to give the VCO-1(B) output ( /\, /, \[, \[ ). EXT CV or KCV (higher note) is applied to the VCO-1.
Pulse is also produced to synchronize the VCO-2 with the VCO-1.

5.2. Autobend
Input gate signals are differentiated to give Autobend output. The autobend time is variable by controlling the discharge time of the capacitor which is charged with the pulse generated by differentiation. The output is applied to the VCO to bring characteristic effects by momentarily moving the frequency, at the instant a key is depressed.

6. VCO-2 BOARD ASSEMBLY  VCOH-2
The VCO-2 works the same way as the VCO-1 except that VCO-2 does not contain output of mixed feet series. EXT CV, higher key voltage or lower key voltage is applied to control the VCO-2, depending on the Key Mode setting. The synchronization circuit is provided to synchronize the VCO-2 with the VCO-1.

7. LFO BOARD ASSEMBLY  LFOH-1
This assembly contains the S & H and LFO circuits.

7.1. S & H
LFO output ( /\, /) or Random Noise is applied to the S & H input. The input is sampled at the rate of sampling time. The resulting output is a sampled stepwise or random wave. When the lag time (R/C circuit time constant) is increased, each step of the stepwise waveform is rounded.

7.2. LFO
The LFO is a low frequency oscillator which generates sawtooth, square, and sine waves for controlling or modulating the related circuits.
The waveforms include: (1) sawtooth, square, and sine waves for modulating VCO/VCF/VCA; (2) triangular and sawtooth wave for S & H; (3) triangular wave for PWM, and (4) square wave for triggering the Envelope Generator.
The delay time is adjustable. When the DELAY TIME control is raised, pressing a key on the keyboard will produce a delayed entry of a sine wave.
8. VCF/VCA BOARD ASSEMBLY OPH-14
This assembly includes Ring Modulator, Envelope Follower, EXT AMP, Audio Mixer, Noise Generator, ENV-1, ENV-2, HPF, VCF, and VCA circuits.

8. 1. Ring Modulator
The inputs for the Ring Modulator consisting of the balanced modulator IC are carrier input and signal input. When two different frequencies are given to the two inputs, the sum and difference frequencies of the two appear as the output. This circuit is used to obtain peculiar sounds like bells, gongs, and others.

8. 2. Envelope Follower
External signal is amplified by the external signal amplifier, full-wave rectified, and then filtered to obtain an envelope of the external signal.
When the envelope is applied as the control voltage of VCF, tone color and resonance are varied while the external signal passes through VCF. Thus synthesizer effects are added to the external signal from microphone or electric guitar.

8. 3. EXT AMP
This circuit amplifies low level signals from external sources by about +53dB to the level of the VCO signals.

8. 4. Audio Mixer
This circuit mixes outputs of the VCO-1(A), VCO-1(B), VCO-2, Noise Generator, Ring Modulator, and the external input signal. The indicator circuit works to light the lamp when the combination of mixing levels is excessively high.

8. 5. Noise Generator
Junction noise from a reversely biased transistor is used as the signal source and processed at the amplifier and filter to obtain white and pink noises.

8. 6. ENV-1
The ENV-1 generates an envelope for controlling the VCF to vary the tone color, the VCA to give loudness contour, and pulse width modulation of VCO.
The attack time, decay time, sustain level, and release time can be varied to synthesize sounds of instruments and effects.
Three trigger modes are available; GATE+TRIG, GATE, and GATE+LFO.

8. 7. ENV-2
The ENV-2 generates an envelope for controlling the VCA to give loudness contour.
The operation is the same with the ENV-1.

8. 8. HPF
The HPF blocks lower frequencies than the cutoff frequency and passes higher frequencies only. Signals from the mixer passes through the HPF and the tone color is varied. The cutoff frequency is moved by changing the time constant with the slider.

8. 9. VCF
The VCF is a low pass filter whose cutoff frequency is controlled by means of a control voltage. It consists of the four-stage low pass filter of -6dB/oct, a feedback circuit which controls resonance, and a circuit which adds input control vol-
tages and converts the sum to anti-log current. The OTA (Operational Transconductance Amplifier) is used for each stage of the low pass filter and the cutoff point is moved by changing the integration time constant with the control current.

Increasing the amount of feedback boosts the frequencies around the cutoff point. Further increasing it causes the VCF to self-oscillate. This oscillating frequency, independent of input signals, is controlled by the control voltage and works like a VCO.

When key voltage is applied as the control voltage, the cutoff point follows the change in the note scale. Thus the tone color is kept constant. The cutoff point is also controlled by the LFO, ENV, etc. to add effects sound to the tone.

8.10. VCA
The VCA is an amplifier whose gain is controlled by a control voltage. Control voltages from the ENV-1, ENV-2, LFO, Bender, etc. are applied to give various loudness contours.

9. CONTROL BOARD ASSEMBLY OPH-33

10. CONTROL BOARD ASSEMBLY OPH-34
Switches and pots for the control panel are mounted on the OPH-33 and OPH-34.

11. CONNECTION BOARD (Sub Board)
Input and output jacks, level selector switches, and trimmer pots for fine adjustment of VCO frequency and width are mounted.

12. POWER SUPPLY BOARD ASSEMBLY PSH-13/PSH-14
Either PSH-13 (AC 100-117V) or PSH-14 (AC 220-240V) is mounted.
CVH-1 (159H001) (SERIAL NO. UP TO 700549)

CVH-1A (159H001A) (SERIAL NO. 700550 AND HIGHER)

The CVH-2 Board is used with CVH-1 (serial no. up to 700549). CVH-1A (serial no. 700550 and higher) contains the part within itself.

P101 (500B): H CV Width Adj
P102 (500B): H CV Adj
P103 (500B): L CV Width Adj
P104 (10K): L CV Adj
P105 (10K): BENDER OFFSET - H
P106 (10K): BENDER OFFSET - L
P107 (100K): PORTAMENTO OFFSET - H
P108 (100K): PORTAMENTO OFFSET - L

- Resistor 850J
- Resistor CH9/4FX
- Resistor 1/4RJ
- Mylar 50V-Y-K
- Ceramic 50V-Y-K
- Electrolytic 50V
- Tr 28C1740-Q
- Tr 28A828-Q
- POT 2SK30A-GR
- Bi 181555
- Trimmer Pot SR15R
- Trimmer Pot PM04
CVH CIRCUIT

NOTES:
IC101, 102, 103, 105, 106, 108, 110........PC1458C
IC104, 105.................................CA3140T
IC109.................................CA3080G(89)
C101, 103, 104, 115, 116................ Electrolytic
C102, 106, 107, 109, 110, 111, 112, 113, 114, Polypropylene
M105, 108.................................Metal Film Resistor (1%)  
ALL DIODES ARE 1S1555
VR901-905..............................16Ω Rotary Type Potentiometer
S901-905..............................Lever Switch
VCOR-1 (152B001) (SERIAL NO. UP TO 710749)

VCOR-1 - PARTS ON THE FOIL SIDE

VCOR-1A (152B001A) (SERIAL NO. 720750 AND HIGHER)

VCOR-1A

* R394 mounted on the foil side of VCOR-1A.

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Resistor 0R81/4RX
Resistor 1/4RJ
Nylor 50V-V-K
Ceramic 50V-V-K
Tantalum 35V-V-K
Electrolytic 0.009

Styrol 125V-V-K
Tr 2581740-Q
Tr 258382-Q
PIT 28330A-GR
PIT 36-510
D1 151755
Thermistor SD1000

Trimmer Pot SR19R
Trimmer Pot PMB04
NOTES:
IC301, 309, 313..................PC1458C
C301, 302, 305, 306, 307, 310, 311,
314, 316, 318..................Kynar
C303, 308, 313, 315..................Ceramic
C304, 317..........................Polystyrene
C309, 312, 320, 321..................Electrolytic
C319..........................Tantalum
(MS) Metal Oxide Film Resistor (15)
ALL DIGITS ARE 181559.
NOTES:
IC401, 408........µPC1458C
C401, 402, 405, 406, 407, 410, 411, 413, 415........Mylar
C403, 408, 414, 419........Ceramic
C404, 416........Polystyrene
C409, 412, 417, 438................Electrolytic
IMP : Metal Oxide Film Resistor (1Ω)
ALL DIODES ARE 1N1555.
NOTES:
- C501, 502, 505, 506, 507, 508, 509, 526, 535...Mylar
- C503, 504, 512, 513, 515, 519, 523, 524, 527...Ceramic
- C510, 533, 534...Tantalum
- C511, 514, 516, 517, 518, 520, 521, 522, 525, 528, 529, 530, 531, 532, 536, 542, 544, 545, 546, 547...Electrolytic
- C537, 538, 539, 540...Polyester
- C541, 543...Electrolytic (NON-POLAR)

(MF): Metal Oxide Film Resistor (1%), ALL DIODES ARE 1N5815.
PSH-13A (146H013A) 100/117V
PSH-14A (146H014A) 220/240V

*PSH-13 for 100/117V does not contain fuse (F601/602), which is the sole difference.

- Resistor 0R81/4FX
- Resistor 1/4KJ
- Resistor R50J
- Mylar 50V-Y-K
- Electrolytic HC6A
- Tr 25C1140-Q
- Tr 25A73-Q
- D1 1N5403

Trimmer Pot PM804
Trimmer Pot SK198

PM601 (1KB): +15V ADJ
PM602 (1KB): -15V ADJ
PM603 (1KB): +10V ADJ
ADJUSTMENT

1. POWER SUPPLY

Adjust PM601 to set the TP3 voltage at +15.000V.
Adjust PM602 to set the TP1 voltage at -15.000V.
Adjust PM603 to set the TP4 voltage at +10.000V.

Note: When +10.000V is correctly set, -10.000V is expected to be correct. If -10.000V is not attained, distribute the error as shown below.

\[
\begin{align*}
+10.000V & \quad 6mV \text{ error} \\
-9.994V & \quad 3mV \quad \Rightarrow \\
-10.003V & \quad 3mV \quad \Rightarrow -9.997V
\end{align*}
\]

2. KCV BOARD

First, depress F1. Set Portamento Time at maximum.
Adjust PM107 ((KCV-H, TP3) and PM108 (KCV-L, TP4) so that the key voltage is constant when Portamento Mode is switched to "UP" and "DOWN".

CAUTION

*Do not depress any other key.
*During this adjustment, check to see that no abnormal oscillation is caused (using an oscilloscope, etc.).

Set Portamento Time at minimum and proceed to the following.

CV(H)

Connect a digital voltmeter to TP3.
Adjust PM102 to set the voltage at 4.417V with F4 down. Adjust PM101 to set the voltage at 1.417V with F1 down. Repeat the above steps to obtain correct readings.

CV(L)

Connect a digital voltmeter to TP4.
Adjust PM103 to set the voltage at 4.417V with F4 down. Adjust PM104 to set the voltage at 1.417V with F1 down. Repeat the above steps to obtain correct readings.
Bender Offset
Connect a digital voltmeter to TP5.
Keep Bender Lever at full + position and adjust PM105 to set the voltage at +3.200V. Then keep Bender Lever at full - position and adjust PM106 to set the voltage at -3.200V. If ±3.200V is not achieved, adjust so that + and - voltages are equal.

3. LFO BOARD
3. a. LFO Waveform
Connect an oscilloscope to TP2.
Adjust PM202 to obtain exact continuation of the sawtooth waveform.

3. b. S & H
Connect an oscilloscope to TP1.
Adjust PM201 so that the waveform deflects equally in + and - directions from the zero level.

4. VCO-1, VCO-2
Set FREQ and WIDTH controls of VCO-1 and VCO-2 on the rear panel at the middle positions.
Set TOTAL TUNING control and VCO-2 TUNING control at the middle positions.
Set RANGE control at "8", both MOD sliders at "0", and SYNC switch at "OFF".
4. a. VCO-1 WIDTH and FREQ

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.

<table>
<thead>
<tr>
<th>VCO-1</th>
<th>VCO-1A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjust PM303 to set F1 at 174.61Hz.</td>
<td>Adjust PM303 to set F1 at 174.61Hz.</td>
</tr>
<tr>
<td>Adjust PM301 to set F2 at 349.22Hz.</td>
<td>Adjust PM302 to set F2 at 349.22Hz.</td>
</tr>
<tr>
<td>Repeat above steps until the two are adjusted roughly.</td>
<td>Repeat above steps until the two are adjusted roughly.</td>
</tr>
<tr>
<td>Adjust PM301 to set F3 at 698.44Hz.</td>
<td>Adjust PM302 to set F3 at 698.44Hz.</td>
</tr>
<tr>
<td>Adjust PM303 to set F1 at 174.61Hz.</td>
<td>Adjust PM303 to set F1 at 174.61Hz.</td>
</tr>
<tr>
<td>Repeat above steps until the two are adjusted roughly.</td>
<td>Repeat the above steps.</td>
</tr>
<tr>
<td>Adjust PM301 to set F4 at 1396.88Hz.</td>
<td>Adjust PM302 to set F4 at 1396.88Hz.</td>
</tr>
<tr>
<td>Adjust PM303 to set F1 at 174.61Hz.</td>
<td>Adjust PM303 to set F1 at 174.61Hz.</td>
</tr>
<tr>
<td>Adjust PM302 to set F4 at 1396.88Hz.</td>
<td>Repeat the above steps.</td>
</tr>
</tbody>
</table>

Adjust PM309 to set C4 at 2093.0Hz.

*1) If 174.61Hz is not attained by adjusting PM303 only, adjust PM301 also.

*2) The need for repetition arises from close interrelation between PMs' setting.

4. b. VCO-1 Waveform

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Roland
Sawtooth Waveform
Connect an oscilloscope to TP2.
Depress F1 and adjust PM305 to obtain the sawtooth wave of 10Vp-p.
Then depress C4 and adjust PM304 to obtain the sawtooth wave of 10Vp-p.
Repeat the above steps until the specified voltages are obtained.

THE POINT FOR ADJUSTMENT
If F1 voltage is higher than 10Vp-p, set it a little below 10Vp-p with PM305 and if it is lower than 10Vp-p, set it a little above 10Vp-p before adjusting PM304.

![Graphs showing good and no good sawtooth waveforms.]

Triangular Waveform
Connect an oscilloscope to TP3.
Depress F1 and adjust PM306 to obtain correctly matched waveform.

![Graph showing triangular waveform.]

4. c. VCO-1 PWM Pulse Width
With PWM slider at 50% position ("0" position), depress F1 and adjust PM307 to obtain 50% wave. Then with PWM slider at MIN ("10") position, adjust PM308 to obtain 10% wave.

![Diagram of VCO-1(A) with PWM control.]

0 50 100%
0 10 100%

Roland
4. d. VCO-2 PWM Pulse Width
Follow the adjustment for VCO-1.

5. VCF and VCA BOARD

5. a. Ring Modulator
Signal Balance
Connect an oscilloscope to TP2.
Set the oscilloscope gain at the maximum in the AC range. Adjust PM502 so that signal is minimized.
5. b. Modulation Balance
Connect an oscilloscope to TP2.
Adjust PM501 to level the peak values of
Ring Modulator output waveform.

5. c. VCF

Self-oscillation Point
Connect an oscilloscope to TP5.
Adjust PM504 so that VCF is at the
onset of self-oscillating.
(See the setting on the right.)

Frequency
Depress F1 and adjust PM505 to
set the oscillating frequency
at 20KHz (50μsec).
(See the setting on the right.)
Width
Adjust PM506 to obtain correct octave relationship between F2 and F3.

Make sure
F1 remains 20KHz.

5. d. Noise Level

Connect an oscilloscope to TP6. Adjust PM503 to obtain the noise level of 20Vp-p.

5. e. VCA
VCA DC Balance
Connect an oscilloscope to TP8.
With A, D, S, R sliders at 0 and no input signals, adjust PM507 so that output signal is minimized.

Residual Noise

VCA Cutoff
Feed VCO-1 signal set at maximum and adjust PM508 so that output is about to come out.

Residual Noise
FRONT PANEL (072HO37)

KNOB TK-1113 (016-026)

KNOB TK-1114 (016-021)

KNOB (016-041)

KNOB NO.33 (016-033)

BUTTON NO.4 (016-004)

SIDE BLOCK (091HO95)

CABINET (081HO96)

CONTROL PANEL (072HO38)

MONO JACK TJ-254 (009-038)

STEREO JACK TJ-253-8 (009-008)

SLIDE SWITCH SSBO23-12RS (001-182)

HINGE (094HO06)

RUBBER FOOT (111-021)
BOLT, round head
3.1 x 16 Fe

Roland
POWER SWITCH
100V: SD65P001-1 (001-215)
117V: SD65P001-2 (001-216)
220/240V: SD65P502 (001-217)
<table>
<thead>
<tr>
<th>PART NO.</th>
<th>PART AND DESCRIPTION</th>
<th>PART NO.</th>
<th>PART AND DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>081H096</td>
<td>Cabinet</td>
<td>159H001A</td>
<td>CVH-1A (700550 and higher)</td>
</tr>
<tr>
<td>091H094</td>
<td>Side Block, right</td>
<td>052H101A</td>
<td>CVH-1A PCB less parts</td>
</tr>
<tr>
<td>091H095</td>
<td>Side Block, left</td>
<td>152H001A</td>
<td>VCOH-1A (700600 and higher)</td>
</tr>
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<td>VCOH-1A PCB less parts</td>
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<td>Hinge</td>
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<td>Knob TK-1114, small for rotary pot</td>
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<td>OPH-33</td>
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<td>Knob TK-1113, large for rotary pot</td>
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<td>Knob No.33, for slide pot</td>
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<td>Connector 3024-03C, Tr</td>
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<td>(serial no. up to 700599)</td>
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<td>PNB04C3A 102H 1KB (metal film)</td>
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**PARTS ORDERING INFORMATION**

Name of part number of some of the parts is changed from those printed on previously issued parts list. When ordering replacement parts, be sure to follow the description on the present issue.

When ordering parts, be sure to include the following information:

1. **Model and Serial Number**
2. **Part Number**
3. **A Description of the Part**

This parts list includes all standard stock replacement parts. No attempt has been made to include every nut, bolt and screw. If the necessity for a non-listed part arises, please write describing the parts location and function as well as model and serial number of the unit.
**KEYBOARD PARTS**

![Diagram of keyboard parts](image)

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<tr>
<th>Instrument Model</th>
<th>No. of Keys</th>
<th>Keyboard Model</th>
<th>Key Spring</th>
<th>Bus Bar</th>
<th>PCB 6P</th>
<th>PCB 7P</th>
<th>Resistor</th>
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<td>070-052</td>
<td>071H034</td>
<td>052-066</td>
<td>052-067</td>
<td>100 1/4W ±1% CRB1/4FX</td>
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