VP-330 SERVICE NOTES

Second Edition

SPECIFICATIONS

Keyboard 49 keys, C-C
Tunable Range ±50 cents
Microphone Input Impedance 3k ohms
Power Consumption 26 watts
Dimensions 905 (W) x 370 (D) x 145 (H)mm

Output (max. 10Vpp)
H: 0dBm (0.775V rms), 6.3k ohms
M: -15dBm, 8.6k ohms
L: -30dBm, 2.2k ohms

Rail H6 (110H006)
Cabinet H228 (081H228)
End block (panel) H23 (091H023)
Bushing no.18 Panel H76 (068-018)
End block H24 (091H024)
Rubber foot G-5 (111-021)

Top panel removal screws 3 x 16mm oval

Keyboard removal screws 4 x 70mm pan
4 x 45mm truss

VH4106
JAH59
PSH42/43
QPH107
EHL6

HVH105
FLH16
AGH19
SK391A

Panel H51A (072H051A)

NO PART NUMBER DESCRIPTION PART NAME
1 010-264 receptacle female NO-3PF or D-3M
2 009-036 jack stereo SG-7713
3 009-012 jack mono SG-7622
4 001-297 switch slide HSW-0372-01-030
5 13129712 switch tablet-push w/LED KHC-11901
6 016H010 tablet white tablet H10
7 016H012 tablet orange tablet H12
8 016H014 tablet green tablet H14
9 016H017 tablet yellow tablet H17
10 029-447 pot. 10kA, VR1, VR5 LF83R-20A14
11 016H004 knob LF83R-20A14
12 029-453 pot. 1MA, VR2 LF83R-20A16
13 029-450 pot. 100kA, VR1, VR3 LF83R-20A15
14 029-447 pot. 10kA, VR1-4, VR7-9 LF83R-20A14
15 029-459 pot. 10kA, VR6 LF83R-20B14
16 13219309 pot. 10kA, VR10 VM10RX25A14
17 016-056 knob small knob no.56
18 019-026 LED red TLR-124
19 001-001 switch power SDA- detail P/LIST
20 13219234 pot. 20kA, VR4 VM10RX20B24
21 13219759 pot. 10kA x 2, gang, VR5 0MT0RX20B14
22 016-057 knob large knob no.57
23 001-202 switch lever 8LE-643-18F
24 029-472 pot. 100kA, VR3 LF83R-016B15L
25 028-762 pot. 50kA, VR2 VM10RX20B54
26 13219231 pot. 50kA, VR1 VM10RX20A55
VP-330

SERIAL NUMBERS

UP TO 951449 WITH 961450 COMPATIBILITY & REMARKS

KEYBOARD SK-1918 SK-3614 NO
TABLET SW. Rocker Push with LBD NO
GENERATOR (Wave terminal) A9H17 A9H19 (All vertical) YES Modification needs Connector housing conversions
MODULATER (BED) ETH09 ETH16 (ETH12, ED1024, W3004, WE3009) NO
FILTER FLH16 A/C FLH16C C YES (C version 9/12 902200 -J 8 not in use) A and C require different adjustment.
HUMAN VOICE HVE58 HVE105 NO
VIBRATO VVR58 VVR106 NO

SERIAL NUMBERS

UP TO 951449 WITH 961450 COMPATIBILITY & REMARKS

PITCH OPH107 OPH117 NO Circuit: identical

FUSE PCB

OPH7 1000V -
OPH8 117V -
OPH9 220/240V -
JACK PCB

JAH59

POWER SUPPLY

PSH42 (100/117V) PSH43 (220/240V)

VP-330 BLOCK DIAGRAM

Serial Number 961450-

OCT. 25, 1980
In the vocoder, a signal from a mic is frequency-analyzed through a group of filters to provide a frequency spectrum featuring human voice. Then the spectrum is duplicated at another group of musical sound filters to obtain the functions equivalent to human mouth and throat and thus to facsimile human voice with musical instrument sound.

1. ANALYZING (FIRST) FILTER AND AMPLITUDE DETECTOR

A mic signal is resolved by a group of filters into frequency band components which are amplitude-detected and routed to the VCA of the Synthesizer (second) Filters. Passing through the 2nd filters, signals are controlled in volume at VCA by the control voltage coming from corresponding frequency band of the 1st filter.

2. SYNTHESIZER (SECOND) FILTER AND VCA

Like the 1st filter, a musical sound being supplied into the 2nd filters is resolved into frequency spectrum components which are proportional to the let filters' output in amplitude. The resultant sound spectrum and volume of 2nd filters outputs are analogous to those of the mic signal. Thus, uniform sound spectrum would be ideal for reproduction of human voice, but it is no longer of a musical sound.

3. EXPANDER

The expander is a combination of a compressor and an expander. The compressor reduces input signal range in amplitude, outputting voltages smaller in amplitude range than that of its input voltage. On the contrary, the expander, for a given range of amplitude input voltages, produces a larger amplitude range of output voltages. Thus, restores signal voltages to their original amplitudes.

4. HIGH SOUND BYPASS FILTER (REJECT FILTER)

Since sounds from musical instruments rarely include high frequency components such as 'fricative' in human voice, the 2nd filter has no spectrum to respond to. Furthermore, such a sound hardly relating to musical intervals, is separated from a mic signal, routed to this circuit and re-sized with the 2nd filter outputs.

5. MUSICAL SOUND DETECTOR

This circuit obstructs the 2nd filter outputs as long as a musical instrument sound is absent and drives the expander and the bypass filter when the sound is sensed.

6. HOLD CIRCUIT

This enables vocoder to hold its output during an interruption in the mic signal, e.g., while the singer inspires. This effect can find some other useful applications. In hold mode, Hold circuit retains sound spectrum and volumes by maintaining voltages constant at Amplifier Detector 1 and Expander. The compressor gain is minimized and the voice Gate is turned off so as to keep voice unchanged even though mic input signal is changing.

CIRCUIT DESCRIPTION

1. ASHV

1-1 Master Oscillator

The frequency is determined by the capacitance of Di49, variable diode. The pitch is adjustable one octave with the change of voltage across Di49 and is stable within 15 cents at the working temperatures of 0° to 40°F (+18°C to 104°F). After replacing the components or repairing at VCU or power standby, frequency adjustment or re-tuning may be required, but they should be made only after soldered portions are restored to their original temperature.

1-2 Tone Divider, Tone Gate

The Master VCU output is divided into one half in DI7 and then subdivided into two to divide into two half. The lower octaves of each of the 12 notes are provided by frequency dividers, Di21-104, and are distributed to the base of pertinent transistor comparators, Q2, Q7, etc. (transistor circuit in the diagram represents the same family). Q2 in this case serves as a Tone Gate.

1-3 Key Trigger Detector

Consists of Q53, Q54 and Q57, detects current variables along the bus bar caused by the on/off of the key contacts, which are transferred to Q57 collector, shaped into gate signal.

1-4 Release Control

This circuit, composed of Q155 and Q156, controls the C1 discharge rate, generating an envelope for the Tone Gate according to the gate signal and the signal from VHC105, Release Control Generator.

When the key is pressed, a ground is placed on Q155 collector for approximately 50ms, discharging capacitor C1 to zero volt. This erases remaining envelopes of precedently played keys, and then, Q155 and Q156 develops a new envelope voltage proportional to a signal from Envelope Generator.

2. VHC105

2-1 Release Envelope Generator

The circuit consists of Q1, Q2 and Q3. While key(s) is pressed, connection terminal JL-3 on VHC105 is held at a voltage set by REL-ENB knob. When the key is released, the voltage decays along with the envelope shaped by the circuit constant, causing the Release Control on ASHV to discharge C1 through R1.

3. FE-105

3-1 Compressor

This compressor system is composed of the Mic Input Detector IC (full-wave rectifiers), Peak Detector IC1, V-C Converter IC2, IC3, IC4 and Q11, Compressor IC5, IC6, and Expander IC8, IC9. One half (positive or negative) of compressor output in IC8 maximum. Gains of the Expander and Compressor are controlled by the voltages from IC1, whose directions are opposite to each other. That is, when the amplitude of one circuit increases, that of the other decreases. When the talker's "Vocoder-UPPER-LOWER" are off, and the BXT, ENVELOPE input less than a certain level, the Expander output remains at the minimum since the EXPANDER control Q13 turns on.

3-2 Analyzing Filter

Ten BPFs with a high Q, composed of Q20 and associated Rs and Cs, divide an input signal along the notes, covering 0.09ms to 7KHz, and let particular bands pass through. A mic signal from Compressor is re-emphasized, accentuated by BPFs corresponding to the spectrum, routed to DI for peak amplitude detection and smoothed. The voltage connects to VOA in the next filter, Synthesizer Filter.

3-3 Vocoder Hold

Q1, Q2, Q3 and Q4 make up this circuit. When Hold jack circuit opens, and 50s later, the Q4 output increases in the positive direction to turn on Q6, which in turn places a ground on IC10—input pin, while the voltage through DI turns off FET switch IC9 connected to R7 and increases discharge time constant, thus the charging voltage from DI is held for 2-3sec.
3-4 Synthesizer Filter, VCA
The filter bank slices up instrument sound spectrum into bands in the same way Analyzer Filter does on the so-called spectrum. Each slice then connects to voltage-controlled amplifier – VCA IC36, whose gain is proportional to the voltage from the 1st filter amplifier detector. During an absence of signal from Analyzer filter, negative peak of triangular wave on pin 4 of IC41 is kept measured by R60 setting, with a respect to pin 5, disabling IC30 to switch its gate.

4. VNH60
This HFP allows only high-frequency components of the signal from the mike to pass, so as to compensate for high-frequency range incoherence of reproduction by voicer circuits. Similar to expander output on and off circuit on PUN61, the gate switch Q3 is provided to output signals from the HFP while the voicer circuit operating conditions are not readily prepared.

5. OPH07
This circuit has basically the same configuration with the OPH09 in the RS95 Roland String Ensemble. See the diagram on page 11 of RS95 Service Data for easier understanding.

5-1 AUTO
Envelope Generator Q1 and Q3 outputs voltage, when triggered by the gate signal, is increased to the voltage set by PITCH SET and then decays. Level Sensit and Decay Time are made longer as PITCH knob being set toward LONG.

5-2 OFF (EXTERNAL CONTROL)
When the EXT PITCH jack connection is not made, TIME, PITCH SET, and NORMAL-DOWN settings are invalid.

When PITCH jack opens, the Q1 collector holds the voltage according to PITCH SET setting and when the jack is closed, the voltage varies in accordance with TIME set.

5-3 MANUAL
In this mode, the trigger and TIME are independent of the S/B. The maximum shift voltage is determined by PITCH SHIFT. Thus, manual range variation is possible within the range by controlling the knob.

5-4 Expander
Like the compressor, the gain of Expander, 108 and 109, is controlled by the voltage from IC20 main direction is opposite to that for the compressor. The gain of mike head amp is 20DB.
The Master VCO should be retuned when:
1. voltages changed in DC lines after modification or repairs at the power supplies;
2. components in the VCO stage are replaced.

When soldered, allow for few minutes to dissipate.

Set controls as illustrated above.
Set VR1A for 442Hz at OUTPUT jack with A3 key being pressed.
VP-330

VP-330 KEYBOARD SK-391A PARTS

<table>
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<tr>
<th>NO</th>
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<th>DESCRIPTION</th>
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<td>Chassis bracket H24</td>
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<tr>
<td>12</td>
<td>098H006</td>
<td>Key stopper H6</td>
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</table>

UNLESS OTHERWISE NOTED:

PNP transistors - 28A733-P or 28A1015-GR
NPN transistors - 28C1815-GR
Diodes ----------- 182473 or 181555
1. STRINGS VCA DC BALANCE

ATTACK R TOB "off" TP.10

While tapping a key repeatedly, quickly, adjust VTR for the least DC level variation.

2. STRINGS VCA GAIN (TP.3)

R A "on" TP.10

While holding C3 key down, adjust VTR for the waveform as shown above.

3. H. VOICE VCA DC BALANCE

Take all "off" "release"

While tapping a key, adjust VTR for the least DC level variation.

4. H. VOICE VCA GAIN

UPPER MAIN 8 "on"

While holding C3 key down, adjust VTR for the waveform shown above.
For the products bearing Serial Number from 901200 to 951499, or furnished with FLH16C, this and next pages are applicable in combination with the previously issued (Sept. 21, 1979) Service Notes which lacks necessary information on FLH16C.

µPC4558C
TLO82CP
LF353N

µPC177C, AN6912
Quad Comparator
Connection Diagram (Top View)

4016B 4066B

Quad Analog Switch
Quad Multiplexer

TC4016BP -- TC4066BP: interchangeable
LF353, XR082, TLO82: functional equivalence.
TLO82 predominantly in use.
FLH16C

**FLH16C ADJUSTMENT**

1. **COMPRESSOR (IC3, IC4) DC BALANCE**
   
   (DC input signal)

   Set VR2 at its midpoint.
   
   While placing intermittent ground on TP-2 by touching one lead to the chassis and the other to connected to TP-2, adjust VR2 for minimum DC level variation.

2. **COMPRESSOR GAIN**

   Apply the signal into MIC IN.
   
   Adjust VR1 for 20Vpp at TP-1.
   
   MIC LEVEL

3. **EXPANDER (IC8, IC9) DC BALANCE**

   (DC input signal)

   While placing intermittent ground to TP-16 (refer to step 1, COMPRESSOR), adjust VR3 for minimum DC variation.

4. **EXPANDER GAIN**

   Feed the signal into TP-25.
   
   Adjust VR4 for 1Vpp at TP-25.

5. **WAVEFORM (IC6)**

   **FREQUENCY**

   Connect oscilloscope to TP-18 through 1001 probe for least INI effect to the circuit.

   Set VR5 for 80pp cycle.

6. **VCA CUTOFF BIAS (IC6)**

   **TEMPORARY GROUND**

   Feed white signal, not less than 0.4Vpp, into HXI INPUT at rear. Adjust HXI SYNTH INPUT LEVEL at front so that the red LED is in the condition between flicker and complete light cutoff.

   Since V66 determines bias voltage for all filter channels, making each channel for manifestation is necessary before VR6 is set in place. Set VR6 for the highest duty ratio and check TP-40 thru TP-49 with scope for the signal level. Connect scope to TP-18. Adjust VR6 for the disappearance of the waveform from screen. Repeated turn to set the bias below cutoff point will result in relatively low VCA output voltage.
ETH16 (151H016) (Etch mask 052H256)

1. Vocoder Compressor (IC2, IC4) Gain

Feed 1kHz, sine wave, 5Vpp into J1-3.

Adjust VR1 for 16Vpp at TF-1.

2. Human Voice Compressor (IC6, IC7) Gain

Feed 1kHz, sine wave, 10Vpp into J1-5.

Adjust VR2 for 16Vpp at TF-2.

3. Strings Compressor (IC6, IC8) Gain

Feed 1kHz, sine wave, 15Vpp into J1-7.

Adjust VR3 for 16Vpp at TF-3.

4. Mixing Amp Expanders

- CH-1 (IC26, IC28) CH-2 (IC27, IC28) -

4a. DC Balance

While placing intermittent ground on TP-6 by touching a lead end to the chassis with the other end connected to TP-6, adjust VR6(VR7) for the least DC level variation at TF-17 (TP-18).

4b. Gain

Feed 1kHz, sine wave, 10Vpp into J1-5.

Adjust VR8(VR9) for 5Vpp at TF-17(TP-18).
5. RND BIAS 1 (VCR MONO) I09, I010

The purpose of this adjustment is to set RND operating point to the center.
First, make an adjustment in either mode: Vocoder or Human Voice, then, check the waveform in the other mode for saturation.

While pressing many keys, adjust VR4 so that both positive and negative peaks are distortion free or, if not, flattened to the same degree or symmetrical (depends on MIC LEVEL set or the number of the keys being played). This adjustment can be made by listening to the sound through a speaker. The signal at RND input pin should be set to the level at which RND output is above a level of distortion. Off-centered operating point causes the sound to be heard as if if were coming from a horn-cone speaker or the like. Adjust VR4 for the clear tones.

6. RND BIAS 2 (STEREO) I016, I017, I018, I019

Human Voice: all “on”

Apply the same procedure described in BIAS 1. Adjust VR5.