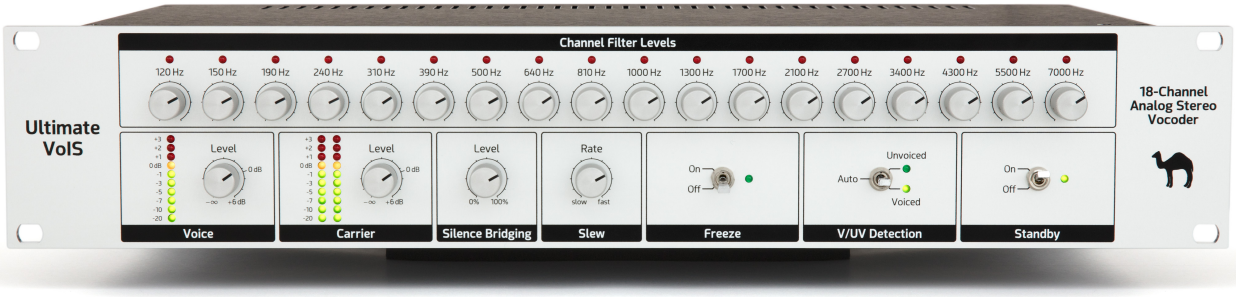
Ultimate VoIS

18–Channel Analog Stereo Vocoder

User's Manual



http://vocoder.hoerold.com

Read all safety warnings and all instructions. Failure to follow the warnings and instructions may result in electric shock, fire, and/or serious injury.

This symbol warns the user that uninsulated voltage inside the unit is high enough to cause electric shock. Therefore it is dangerous to make any kind of contact with any part inside this unit.

This symbol alerts the user that important literature concering the operation and maintenance of this unit is included. Therefore it should be read carefully in order to avoid any problems.

CAUTION

- TO PREVENT FIRE OR SHOCK HAZARDS, DO NOT EXPOSE THIS UNIT TO RAIN OR MOISTURE. THIS UNIT IS FOR INDOOR USE ONLY.
- DO NOT USE THIS UNIT'S POLARIZED PLUG WITH AN EXTENSION CORD RECEPTACLE OR OTHER OUTLETS UNLESS ALL PRONGS CAN BE FULLY INSERTED.
- TO REDUCE RISK OF ELECTRIC SHOCK, MAKE SURE THE POWER CORD IS UNPLUGGED FROM THE WALL SOCKET.
- TO FULLY DISENGAGE THE POWER FROM THE UNIT, DISCONNECT THE POWER CORD FROM THE AC OUTLET.
- DO NOT REMOVE ANY COVERS FROM THE UNIT AS THERE ARE HIGH–VOLTAGE COMPONENTS INSIDE. THERE ARE NO USER SERVICEABLE PARTS INSIDE.
- REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

Caution: If a power cord is not supplied with this device, use a power cord that matches the AC of the power outlet and has been approved by and complies with the safety standards of your particular country. Only power cords with earth connection must be used. The AC voltage of the power outlet must be in the range of 100 V to 240 V.

Contents

Safety Precautions

FOR OPTIMUM PERFORMANCE, PLEASE NOTE THE FOLLOWING WHEN SETTING UP AND USING THE VOCODER:

- **DO NOT OPEN THE VOCODER.** There are no user serviceable parts inside. Opening or removing the covers may expose you to dangerous shock hazard or other risks. Refer all servicing to qualified service personnel.
- Do not spill any liquids into the cabinet. Do not use your vocoder near water.
- Do not insert objects of any kind into the cabinet slots as they may touch dangerous voltage points which can be harmful or fatal or may cause electric shock, fire or equipment failure. Do not place any heavy objects on the power cord. Damage to the cord may cause shock or fire. Do not place the vocoder on a sloping or unstable cart, stand or table as the vocoder may fall causing serious injury or damage to the vocoder.
- The power supply cord you use must have been approved by and comply with the safety standards of your country.
- Do not place any objects onto the vocoder.
- Do not use the vocoder outdoors.
- Do not bend the power cord.
- Do not use the vocoder in areas with high temperature, humidity, dust, or oil.
- Do not cover the vents of the vocoder and allow unrestricted ventilation.

Immediately turn off the power, unplug the vocoder from the wall outlet and move to a safe location, then refer servicing to qualified service personnel under the following conditions:

- If the vocoder has an unusual odor.
- If the power supply cord or plug is damaged.
- If liquid has been spilled or objects have fallen into the vocoder.
- If the vocoder has been exposed to rain or water.
- If the vocoder has been dropped or the cabinet has been damaged.
- If the vocoder does not operate normally by following the operating instructions.

CAUTION

- Allow adequate ventilation around the vocoder so that the heat can properly dissipate. Do not block ventilated openings or place the vocoder near a radiator or other heat sources. Do not put anything on top of the vocoder.
- The power cable connector is the primary means of detaching the system from the power supply. The vocoder should be installed close to a power outlet that is easily accessible.
- Handle with care when transporting. Save packaging for transportation.

Contents

- 18–channel analog stereo vocoder in a rack–mountable aluminum cabinet (2U height)
- User's manual (this document)

Product Features

- **18 Channels** with individual volume controls to manipulate the vocoding characteristics
- **Voice Input** and **Carrier Input** volume controls with peak program meters (PPM)
- **Silence Bridging** with adjustable level to fill silent periods with filtered excitation
- **V/UV Detector** for automatic detection of voiced/unvoiced signals
- **Slew Control** to create unique slurring effects
- **Freeze Switch** to lock the spectral envelope and maintain a fixed formant shape
- **Power Switch** on the rear side and a **Standby Switch** on the front side
- **XLR Connectors** on the rear side

Care and Maintenance

Your vocoder should serve you well for many years to come. The cabinet and the knobs are made of aluminum for a solid tactile feel and precise control. If you wish to clean the cabinet:

- Unplug the power supply.
- Dampen the cloth with a neutral detergent and water, wipe the cabinet and follow with a dry cloth.

Caution: Do not clean with benzene, thinner, alkaline detergent, alcoholic system detergent, glass cleaner, wax, polish cleaner, soap powder, or insecticide. These types of fluids can cause the paint to deteriorate, crack, or peel.

The vocoder is generally maintenance–free:

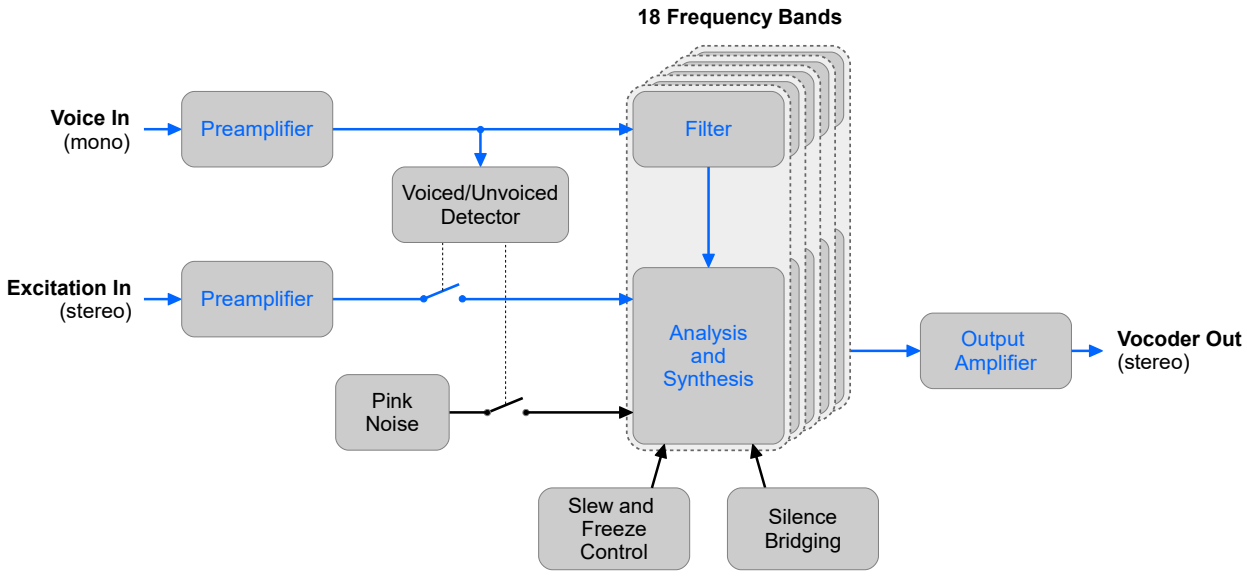
- In case the fuse on the rear side of the cabinet needs to be replaced, please refer to Section "Troubleshooting".
- Allow the vocoder to warm up for at least 30 minutes before using.

Operating Principle

Vocoders play a pivotal role in diverse sound production applications, renowned for their distinctive robotic voices. Broadly, vocoding involves the modulation of a carrier signal by a voice signal.

In our vocoder model, we implement a sophisticated approach by segmenting voice and carrier inputs into 18 distinct frequency bands using band–pass filters. Each band's filtered voice envelope is then superimposed onto the carrier signal within the same frequency band, resulting in the synthesis of a unique signal. The summed output of these bands produces the characteristic vocoder sound.

A noteworthy feature of our vocoder is its ability to generate a stereophonic output from a stereophonic carrier input. Each individually synthesized frequency band is assigned to one of the two audio channels, enhancing the spatial aspect of the output.



Vocoder block diagram

To enhance intelligibility, a voiced/unvoiced detector distinguishes between voiced sounds, such as *a*, *e*, *i*, *o*, or *u*, and unvoiced sounds, such as *s*, *f*, *t*, or *k*. During unvoiced sounds, where the frequency spectrum is broader than the carrier signal, intelligibility is improved by substituting the carrier signal with pink noise.

Silence bridging addresses periods of silence by filling them with the filtered carrier signal. This approach ensures that the carrier frequency characteristics, set through individual channel volume controls, remain consistent during both silent and articulated intervals.

Moreover, the vocoder offers control over the slew rates of the voice envelope impressed upon the carrier signal. Slowing down these rates introduces slurring effects, while stopping them freezes the articulation, effectively transforming the vocoder into a pitch–adjustable formant filter.

Refer to the accompanying diagram for a visual representation. The analog path, depicted in blue, encompasses the signal flow from voice and carrier inputs to the vocoder output. The remaining parts are controlled by a microprocessor for higher precision.

Functions and Controls

Channel Filter Levels

At the heart of the vocoder are 18 independent analysis and synthesis band–pass channels with center frequencies ranging from 120 Hz to 7 kHz.

Each channel has its individual volume control and an LED that indicates when the signal level in that channel reaches 0 dB. This allows precise monitoring and optimizing for best signal–to–noise ratio, knowing that once an LED is lit, the output level matches the input, with a +3 dB headroom before clipping occurs. For the vocoder's stereo effect, each frequency is assigned either to the left or the right stereo channel of the vocoder output.

Voice and Carrier Level Controls

The vocoder contains a single–channel (mono) voice level control and a two–channel (stereo) carrier level control.

The gains for each input can be set between $-\infty$ and +6 dB. The LEDs of the peak performance meters (PPM) indicate the actual signal levels.

The voice and carrier inputs on the rear side of the vocoder only accept pro line levels. Therefore, you may require an appropriate preamplifier if you want to use a microphone.

Silence Bridging

Silence bridging passes the filtered carrier signal through to the vocoder output during periods of silence of the voice signal.

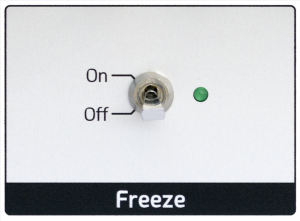
The level of signal passed through is adjustable between 0% (silence bridging turned off) and 100% (maximum available signal level).

Slew Rate

The voice envelope can be slewed, leading to slurring effects.

The strength of slurring is adjustable. If the knob is turned fully clockwise to “fast”, the slew rate has no effect on the vocoded signal. If the knob is turned fully counter–clockwise to “slow”, the voice envelope is slowed to a halt, effectively holding the given articulation.

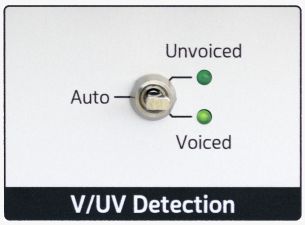
Freeze



The freeze switch holds the envelope signal instantly.

Flipping this switch is equivalent to turning the slew knob fully counter–clockwise. The LED indicates whether the signal is frozen.

Voiced/Unvoiced Detection



The voiced/unvoiced (V/UV) detector enhances intelligibility.

There are three settings available:

- **Auto** detects voiced and unvoiced input automatically
- **Voiced** treats all input as voiced signal
- **Unvoiced** replaces the carrier signal with pink noise

If set to **Auto**, the LEDs indicate the detected type of sound.

Standby

Turning this switch off puts the vocoder into low power consumption mode.

The LED indicates if the vocoder is powered on. To turn power consumption completely off, use the mains switch on the rear side of the vocoder.

First Setup

1. Connect Voice In

Connect a voice source to the XLR input jack **Voice In** on the rear side of the vocoder.

Tip: In the beginning it is best not to use a microphone because it is difficult to talk and listen to the vocoder at the same time.

2. Connect Carrier In

Connect a stereo carrier source to the two XLR input jacks **Carrier Left** and **Carrier Right** on the rear side of the vocoder.

Tip: Your carrier signal should be rich in harmonics. Start out simple with a sawtooth or rectangular signal source. Triangular or sine signals are useless because they have very few to no harmonics and will hardly excite the 18 band–passes.

3. Connect Vocoder Out

Connect the XLR output jacks **Vocoder Left** and **Vocoder Right** on the rear side of the vocoder to an amplifier with speakers attached.

4. Set Up the Vocoder

Turn up all 18 band–pass levels (fully clockwise), turn Silence Bridging to **0%** and Slew Rate to **fast**. Switch Freeze **Off** and V/UV Detection to **Auto**. Switch Standby **Off**.

5. Power Up the Vocoder

Connect the power cord to the AC socket on the rear side of the vocoder. Turn Standby **On**. The green power LED should light up.

6. Adjust the Levels

Turn on your voice and carrier signal sources and adjust the Voice and Carrier Levels to reasonable levels on the PPMs. Use a carrier signal with frequencies between 40 Hz to 100 Hz for a good intelligibility.

Tip: For best signal–to–noise ratio, the more green LEDs light up on the PPM the better, ideally including the yellow LEDs. Avoid the red LEDs, unless you want to use the built–in margin of +3 dB. Beyond that, distortion sets in.

7. Enjoy and Experiment

Play with the knobs and switches to get a feel for the various features available on your vocoder and listen to the effects they create.

Tip: Sometimes one or more of the 18 individual channel LEDs may light up. While this indicates an overload, this usually just adds to the character of the sound. If an overload is not desired, turn down the affected channel levels.

Troubleshooting

Step	Problem	Possible Reason	Solution
1	Power LED is off	1. Standby is Off	Turn Standby On
		2. Mains switch is Off	Turn on mains switch
		3. No power cable plugged in	Plug in power cable
		4. The fuse in the power entry module is blown	Replace the fuse with the correct rating as indicated on the rear panel
2	No signal indicated on Voice PPM	1. No cable connected to Voice In XLR jack	Connect voice cable to XLR jack
		2. No signal sent on cable connected to Voice In XLR jack	Increase signal level on source
		3. Voice Level is too low	Turn Voice Level knob clockwise until reasonable levels are observed on PPM
		4. Power LED is off	Check Step 1
3	No signal indicated on Carrier PPM	1. No cables connected to Carrier In XLR jacks	Connect carrier cables to XLR jacks
		2. No signal sent on cable connected to Carrier In XLR jacks	Increase signal levels on source
		3. Carrier Level is too low	Turn Carrier Level knob clockwise until reasonable levels are observed on PPM
		4. Power LED is off	Check Step 1
4	No vocoder sound	1. No signal indicated on Voice PPM	Check Step 2
		2. No signal indicated on Carrier PPM	Check Step 3
		3. Some or all Channel Levels are turned down	Check settings of Channel Levels
		4. No cables plugged into Vocoder Out XLR jacks	Connect cables to Vocoder Out XLR jacks
		5. Subsequent equipment not set up properly	Make sure the equipment connected to the Vocoder Out XLR cables is set up properly
		6. Slew knob is turned fully counter–clockwise (“slow”)	Turn slew knob clockwise
		7. Freeze switch is turned On	Turn Freeze switch Off
		8. Power LED is off	Check Step 1

Technical Specifications

Line inputs

Type	Balanced XLR connector
Impedance	48 kΩ
Gain	$-\infty$ to +6 dB

Line output

Type	Balanced XLR connector
Impedance	50 Ω
Gain	Appr. +6 dB

Power

Voltage range	100 ~ 240 V AC 50/60 Hz
Power consumption	*tbd* W
Fuse	T 3.15 A 250 V
Mains connection	IEC C14 receptacle

Dimensions

Height × width × depth	Appr. 80 mm × 483 mm × 265 mm
Weight	Appr. 3.1 kg (6.8 lbs)

Channel Assignments

Frequency range	Appr. 108 Hz to 7.6 kHz
Left line output center frequencies	Appr. 120 Hz, 190 Hz, 310 Hz, 500 Hz, 810 Hz, 1300 Hz, 2100 Hz, 3400 Hz, 5500 Hz
Right line output center frequencies	Appr. 150 Hz, 240 Hz, 390 Hz, 640 Hz, 1000 Hz, 1700 Hz, 2700 Hz, 4300 Hz, 7000 Hz

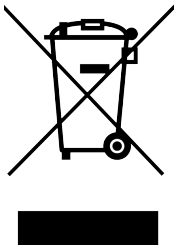
Warranty Information and Contact Details

This product is assembled, tested, and calibrated with care. While no formal warranty is offered, reasonable support will be provided in case of manufacturing defects or issues during normal use.

For assistance, inquiries, or documentation requests, please contact: vocoder@hoerold.com.

Disposing of the Equipment

Within the European Union (European Directive 2012/19/EU):



EU–wide legislation, as implemented in each Member State, requires that waste electrical and electronic products (WEEE) carrying the mark shown on the left must be disposed of separately from normal household waste. When you need to dispose of this product, please follow the guidance of your local authority, or ask the shop where you purchased the product, or if applicable, follow applicable legislation or an agreement you may have. The mark on electrical and electronic products only applies to the current European Union Member States.

Outside the European Union:

If you wish to dispose of used electrical and electronic products outside the European Union, please contact your local authority so as to comply with the correct method of disposal.