Owner’s manual

VF11

MAM
MUSIC AND MORE

Preface

Thank you very much for purchasing the VF11 vocoder. The VF11 is an analog 11-Band vocoder with integrated filterbank function. Several functions and ease of use make it an incredibly creative instrument with unique sonic qualities. In fact, the VF11 is much more than just a simple voice modifier.

VF11 Features

- 11-band vocoder
- Filter bank function
- Gain control for all bands
- Possible mixing of all in and output signal
- Sawtooth generator in synth section with adjustable frequency
- Voiced-Unvoiced detector with integrated noise generator and optimal connection for external signals
- Built in compressor to prevent overdrive
- Extremely low noise floor and clear signal due to built in noise gate
- Ease of use

Contents:

Chapter 1 describes the principle functioning of a vocoder and discusses the technical implementation. Although this basic knowledge is not essential, it explains how to use a vocoder in general and supports the users in realizing their own, creative ideas with the VF11.

Chapter 2 describes the structure and different functions of the VF11..

Chapter 3 discusses the different operations of the VF11 and gives guidelines to the use of the VF11 user interface in conjunction with suitable external Signals.

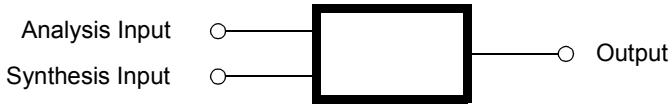
1 Introduction

1.1 General Information

The VF11 is a vocoder with excellent sonic quality, easy of use and professional functionality. In order to use the VF11 to its full potential, the user should familiarize themselves with the functionality of a vocoder and read the owners manual carefully. While just experimenting, the user will find out that the VF11 can create astonishing sound effects, much more than just changing vocals.

1.2 What's a vocoder?

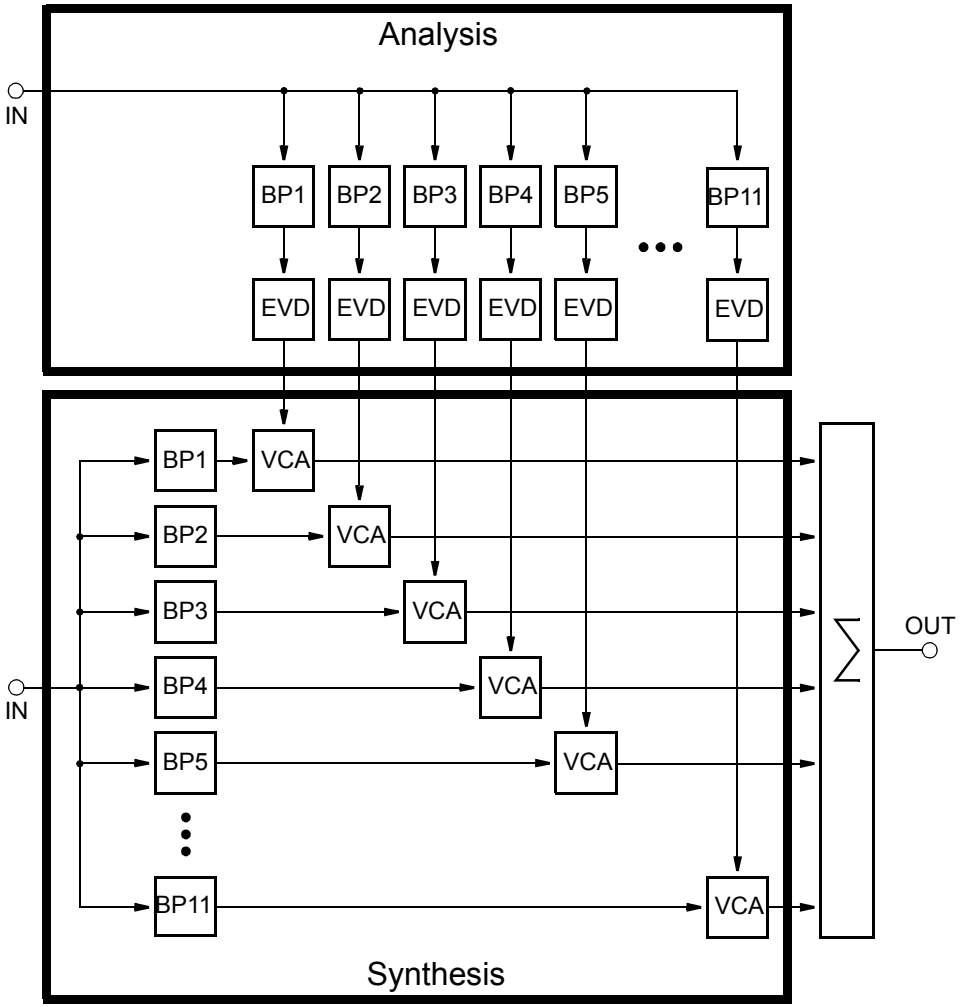
The best way to think of a vocoder is a black box with two Inputs (Analysis, Synthesis) and one output.



Usually the Analysis Input takes a microphone, the synthesis input a sound source i.e. synthesizer. Talking into the microphone creates the illusion of a talking synthesizer at the output. It's astonishing that the pitch is no longer related to the voice, but to the pitch of the synth signal. Playing a sequence on the synth and talking into the the mic causes the synthesizer to 'sing'. Playing a 3-voice chord creates a singing 3-cord synthesizer signal at the output.

These examples are only a fraction of what's possible. By connecting a drum computer to the Analysis-Input you can create sounds which are impossible to describe!

How are these amazing effects created? The vocoder mixes both input signals in a way that superimposes the Analysis-signal over the Synthesis signal. The following picture may explain this:



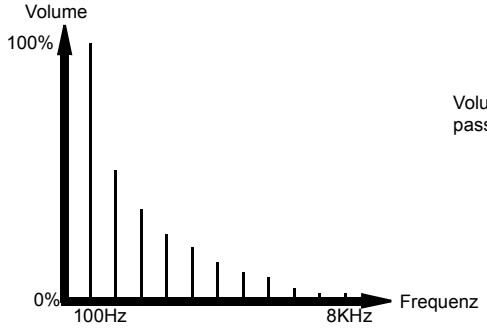
The analysis-unit is basically a spectrum analyzer which measures the amplitudes of frequency-bands, not single harmonics. The separation of the analysis signal is done via the band pass filters (BP1...BP11). The VF11 uses 11 bands which cover a frequency range from 50Hz (BP1) to 12kHZ (BP11). Following each band pass filter is an envelope detector (HDK) which converts the volume-stream of each frequency band into voltage.

Synthesis-unit: This signal is also separated into several frequency bands where the band-pass-frequencies of the synthesis part are identical to the frequencies of the analysis part. The synthesis-signal is then synthesized from the frequencies analyzed from the 11 bands. The core operation of any vocoder is, that the volume of each synthesis-band is controlled by the volume of the related analysis-band. This operation is performed by the following voltage controlled amplifiers (VCAs), which are driven by the voltage of the envelope detector and thereby controlled by the volume of the related analysis band. The output is a signal consisting of all the VCAs mixed together.

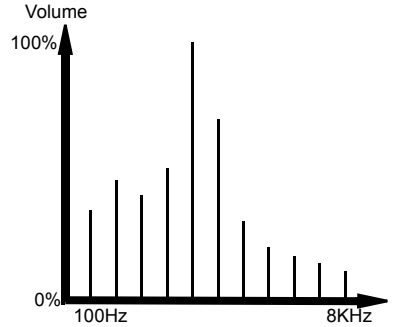
Presume that a microphone is connected to the analysis input and a synth to the synthesis input: As long as you don't talk into the microphone, the value of all analysis bands and therefore the voltage of all envelope detectors is 0. There is no output signal at all. Talking into the microphone changes the envelope detector voltages in relation to the harmonics of the human voice. Vocals like 'o' and 'a' are bass-heavy. In this case, the envelope generators of the lower bands produce higher voltages than the others. This creates more in the lower synthesis bands than the higher ones. 'S' or 'zz' vocals create more in the higher synthesis bands than the lower ones.

To summarize: The volume range of all 11 analysis bands is transposed against the related bands of the synthesis signals. The harmonics of the vocoder output signal differ from the synthesis signal in that way, that the harmonics are 'taken' from the sound of the analysis signal. There are no additional harmonics added within the vocoder itself. This isn't a drawback, since the input signal could be virtually anything. There is no comparable instrument, that gives the user as much creative potential as the vocoder!

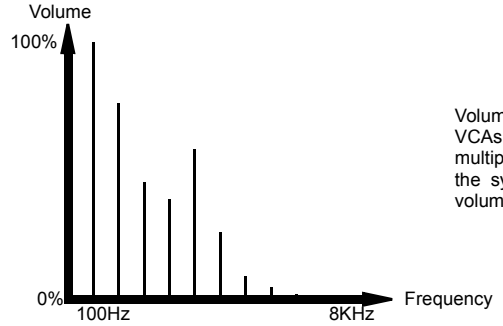
An example illustrates the volume ranges in the analysis and synthesis filters. The vocal 'a' is spoken into a mic connected to the analysis input while on the synthesis input, there is a sawtooth waveform with a fundamental frequency of 100Hz present.



Volume ranges at the output of band pass filters 1...11 in the synthesis unit



Volume ranges at the output of band pass filters 1 ...11 in the analysis unit (equivalent to the voltage ranges of the envelope detectors)



Volume ranges at the output of the VCAs in the synthesis unit created by multiplication of the volume ranges of the synthesis bands and the related volume ranges of the analysis bands.

2 Functions

2.1 VF11 functions - see center pages for illustration

2.1.1 Analysis IN

The VF11 features 2 different inputs at the analysis stage, one for balanced mics (No.26) and another for line-level signals as synthesizers, CD-players, etc.

Knob 1 adjusts the analysis-input-gain and in fact the synthesis-filter intensity 1...11. There is a compressor in the analysis path to avoid overdrive distortion. Optimum input gain is achieved by adjusting the analysis-input gain so that the compressor starts working right at maximum input level which is indicated by the Anl.-Peak-LED.

2.1.2 Synthesis IN / VCO

Synthesis IN The two possible connections are:

- Connecting a external synthesis-signal to (No.24) where the internal VCO is muted.
- Use of the internal VCO (sawtooth) as synthesis signal if nothing is connected to (No.24). The VCO pitch is adjusted by knob 3.

The synthesis-input-gain is adjusted by knob 2. Optimum output gain is achieved by adjusting the level so that the Syn.-Peak-LED is just not lit. Higher output gain causes an overdriven signal and distortion.

2.1.3 Output Mix

The Output Mix-Controllers allow you to add following signals to the VF11's output (No.20):

- the original analysis-signal
- the unmodified synthesis-signal
- the vocoder-output-signal (outputs 1...11 of the filterbank) driven by the analysis-signal
- the vocoder-output-signal (outputs 1...11 of the filterbank) adjusted by knob 4

❍ **Analysis mix (knob 5)**

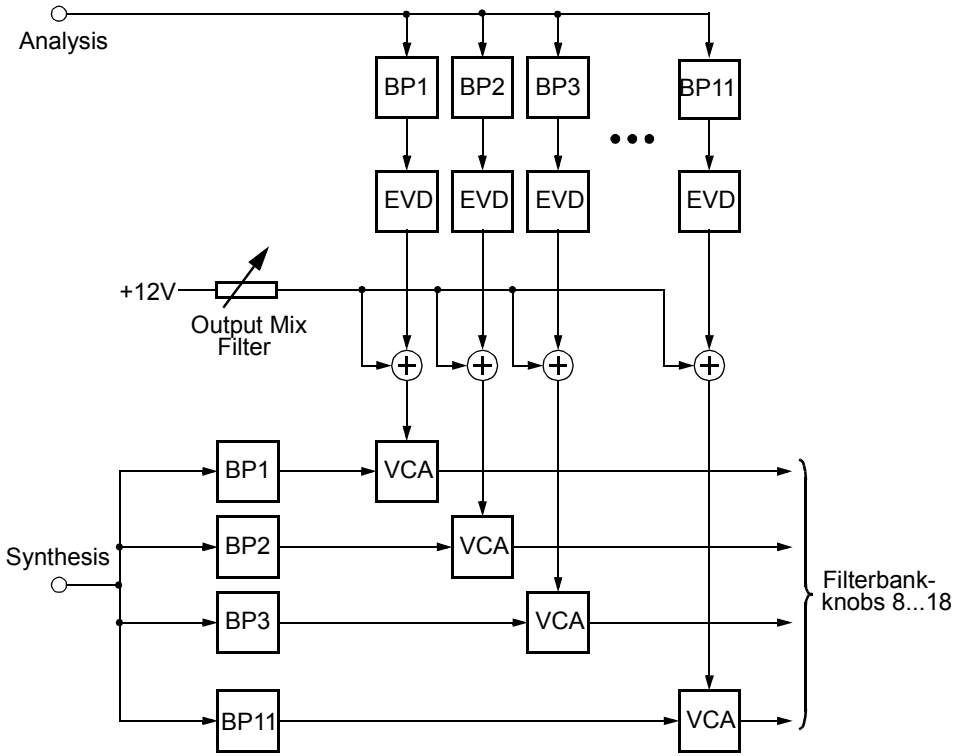
Controls the mix of the inputs 25/26 to the main output. The gain is dependent from the value of the analysis-input-knob 1.

❍ **Synthesis mix (knob 6)**

Controls the output of the synthesis-signal (or VCO) to the main output. The gain is dependent from the value of the synthesis-input-knob 2.

❍ **Filterbank function (knob 4)**

Controls the VCAs in the synthesis section independently from the analysis signal. Explanation as follows:



The gains of the synthesis filters are controlled by the envelope-voltages of the analysis-filters. Knob 4 represents a additional voltage which is added to the envelope-voltages and makes it possible to control the synthesis-filters independently from the analysis signal.

Operating the VF11 as a filterbank:

Disconnecting any source from the analysis signal or turning knob 1 to minimum makes the VF11 behave like a fixed filterbank with 11 band-pass-filters and the synthesis-signal as input. Refer to following facts:

- Input level adjustments of the filterbank using knob 2.
- Filterbank channel gain control using filter-band knobs 8...18.
- Mixing of the entire filterbank output signal to the output using knob 7.
- Mixing the unfiltered signal to the output using knob 6.
- Mixing the vocoder effect (input signal at analysis-input) to output using knob 1.

❍ **Vocoder (knob 7)**

Controls the output-gain of the filterbank.

❍ **Filterbank 1...11 (knobs 8...18))**

Control the gains of the filters individually.

2.1.4 Voiced-Unvoiced-Detector

❍ **What's that?**

You can achieve different effects using harmonic sound sources on the synthesis input and the human voice as the analysis-signal:

- Vocals like 'a' and 'o' are very clear and transparent since the synthesis and analysis signals are very similar.
- Vocals like 's', 't', 'zz', 'f' are not as clearly understandable since the synthesis and analysis signals differ substantially. This is caused by odd-harmonics which are present at the analysis input.

The signal is improved by replacing the unprocessed (harmonic) synthesis signal by a signal of similar characteristics to the analysis signal (unvoiced signal) before entering the filterbank. This operation is performed by a switch that toggles between the unprocessed synthesis-signal and the unvoiced signal. The differentiation of even and odd harmonics and operation of the switch is performed by a so called Voiced-Unvoiced Detector (VUD)

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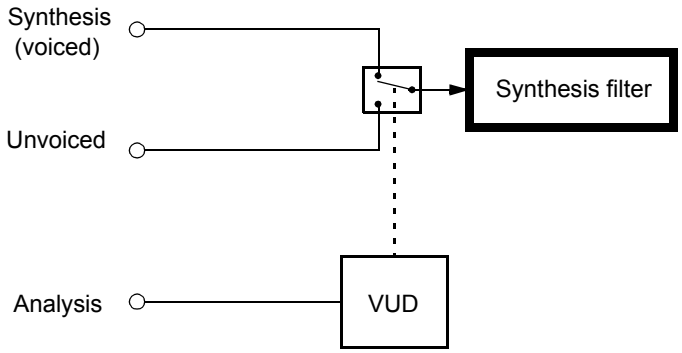


❍ **Practical use of the Voiced-Unvoiced-Detector**

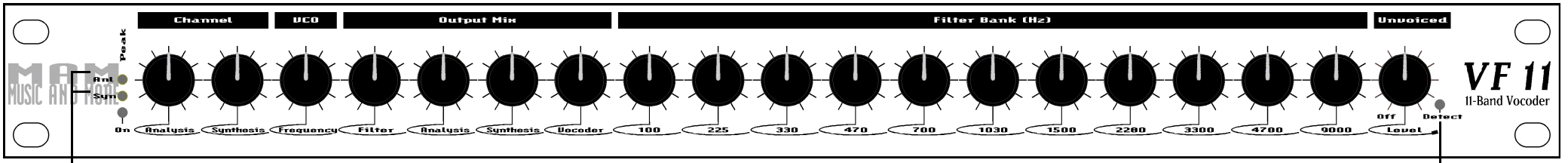
- Selection of the unvoiced-signal (external/internal) The two possible sources for the unvoiced signal are either the internal noise-generator or an external signal connected to Input 20.
- The volume of the unvoiced-signal is adjusted by knob 19.
- The LED to the right of knob 19 presents the actual operation-mode of the VUD:
- LED off means the synthesis signal is used for the output, LED lit shows that the unvoiced-signal is used (external or internal)
- The VUD can be turned off permanently if knob 19 is set to minimum position.
- At the back of the VF11 are two fine tune trimmers which allow to set the threshold for the VUD. The factory setting (both in middle position) is optimal for the human voice and shouldn't need to be changed.

Trimmer V/U: Balance Voiced/Unvoiced
Trimmer moved towards U decreases the unvoiced signal threshold which increases the sensitivity to switch from unvoiced to voiced, trimmed to V decreases the sensitivity (recommended for drum-computers).

Trimmer +/-: Mode normal/inverted
If set to + (unvoiced LED is off when knob 19 at minimum position), the VUD will only switch when odd-harmonics reach the threshold-level. Set to - inverts operation mode (LED lit when knob 19 at minimum position) Trimmer should be set to middle position if vocals are used.

2.2 Front Panel of the VF11

Front view



1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

Overdrive LEDs of the analysis/synthesis signal

Volume control (see 2.1.1/2.1.2)

Pitch of the internal VCO. The VCO ouput is connected to the synthesis input if there is no synthesis signal present (see 2.1.2).

Avtivates the synthesis filters in addition to the analysis signal or if no signal is present (use as a filterbank)

Adjusts summed signal of the synthesis filters 1 to 11 at the output of the VF11 (see 2.1.3)

Adding the synthesis signal to the output of the VF11 (see 2.1.3)

Adding the analysis signal to the output of the VF11 (see 2.1.3)

Individual gain control of the synthesis filters 1 to 11wich are driven either by the analysis signal or knob 4

VUD On/Off LED

Unvoiced signal gain if set to min. VUD is turned off permanently (see 2.1.4)

Rear view

20 21 22 23 24 25 26 27

external input for the unvoiced signal (see 2.1.4.)

Fine adjust of the VUD threshold (see 2.1.4.)

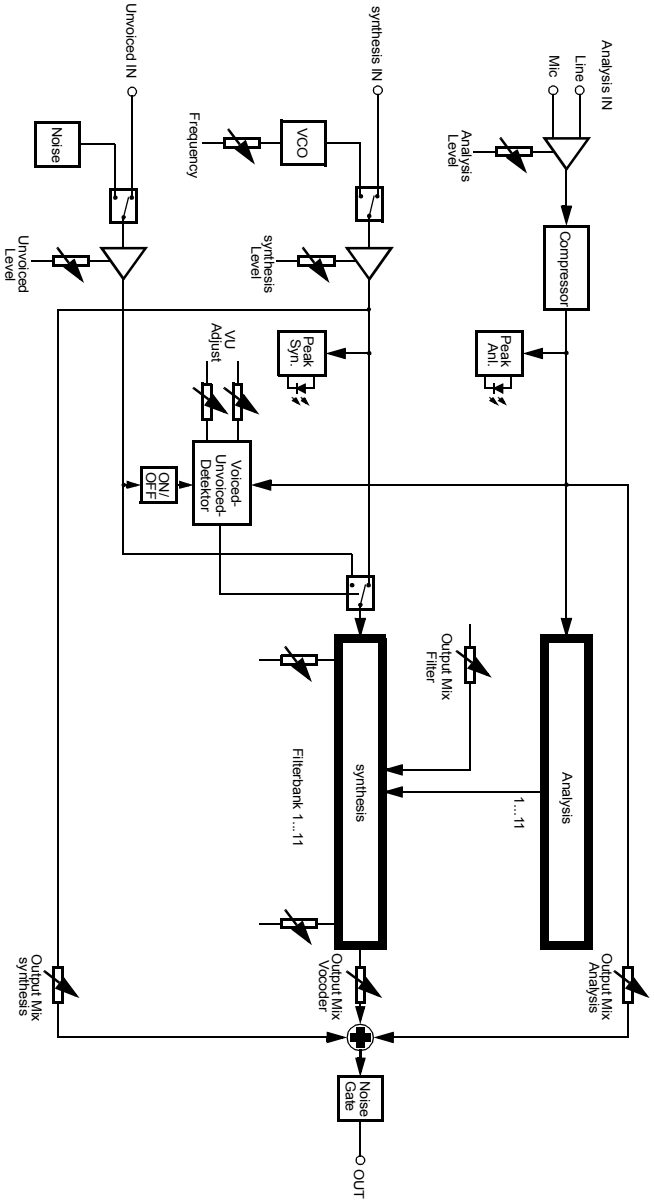
output signal of the VF11

input of the external synthesis signal (see 2.1.2)

analysis inputs Line/Mic (siehe 2.1.1)

connector for the external power supply

2.3 VF11 functions



3 Practical examples - tips

This chapter provides practical examples of VF11 operation and discusses the use of different signals and recommended unit settings. By simply trying out the settings as described, the user should be able to develop skills required to produce the desired effects. The use of different sound sources will show that the potential of a the VF11 is only limited by your personal imagination.

3.1 Use with human voice

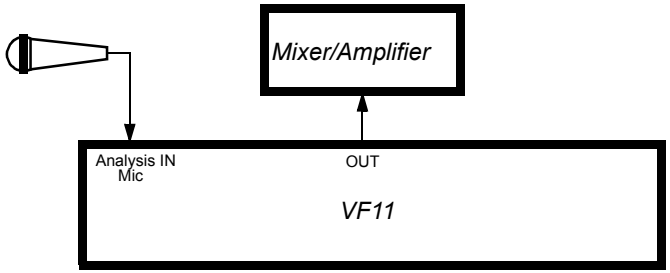
Care has to be taken if the vocoder is driven by a microphone and fed directly into an amplifier system. Low distances to the speakers or high volume can lead to feedback which can lead hearing damage. It is therefore recommended to use lower volume settings especially on the upper bands or to use the VF11 with headphones.

Used with vocals, the VF11 transfers the articulation of the voice to another signal (synthesis signal). The fundamentals and pitch of the synthesis signal are retained, the volume of the synthesis filters is controlled by the voice which adds the ’harmonics of the vocals' to the signal. The synthesis signal starts talking (or singing).You can create following effects:

- Robot voices
- Shifting the pitch of the voice
- Creating multitimbral voices

To achieve clear and understandable results, the sound of the voice and synthesis signal should be as similar as possible. Use for example Saw or Pulse waves with low pulse-width. Best results are experienced with bass signals (approx. 50Hz -200Hz). The signals gets worse with higher pitches because the number of fundamentals decrease in higher frequencies.

❍ Example A: Using the internal VCO and unvoiced signal



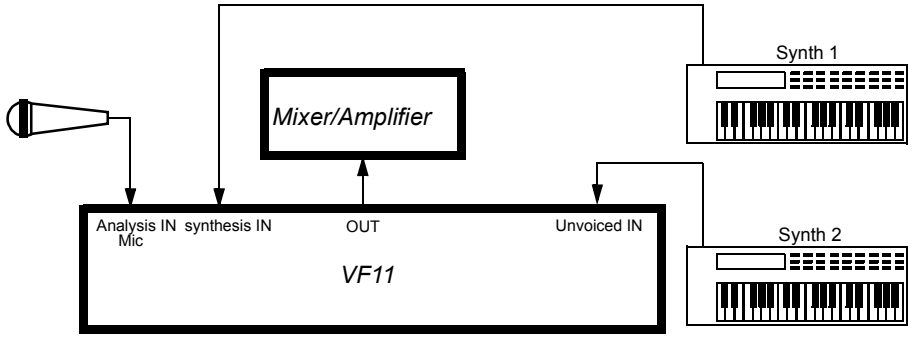
1. Connect VF11 as illustrated and leave all controls at minimum.
2. Adjust the level of the analysis-signal using Input-Trim-knob 1. When talking into the mic, the Anl.-Peak-Led should flash barely.
3. Adjust the level of the synthesis-signal using Input-Trim-knob 2 in the same way. (The internal VCO is used automatically)
4. Move the filterbank knobs 8...18 and the vocoder knob to their mid positions.
5. Talking into the mic makes the internal VCO talk. The pitch can be adjusted by VCO-frequency knob 3.
6. The character can be changed using knobs 8...18.

   ☞ Since the UVD is still turned off, the clearance of the voice can by increased by raising the volume of the upper banks (knobs 17,18). The entire volume can be adjusted using vocoder-knob 7. Because the gain of the filterbanks 1...11 is dependent on the pitch of the analysis and synthesis signal, either one of them can cause distortion if levels are too high. When this happens, decrease the appropriate level(s).

7. Because the gain of the filterbanks 1...11 is dependent on the pitch of the analysis and synthesis signal, either one of them can cause distortion if levels are too high. When this happens, decrease the appropriate level(s).
8. Adding the original voice signal to the mix is done using knob 4.

   Switching in the Voiced-Unvoiced-Detector to increase clearance of signal:The VUD will be turned on, if knob 19 is not set to minimum value. Since there is no unvoiced signal connected, the internal noise-generator is used. knob 19 is used to match the gain of the unvoiced-signal to the synthesis signals. knobs 17 and 18 let you change the character of the unvoiced signal.

❍ Example B: External synthesis and unvoiced signal



Using external signals on these input extends the possibilities enormously.

☞ To increase the clarity of vocals, feed the VF11s synthesis input with a wide-band, harmonic signal (sawtooth, square-wave,etc.) and the unvoiced-input with a non harmonic signal rich in high frequencies (noise).

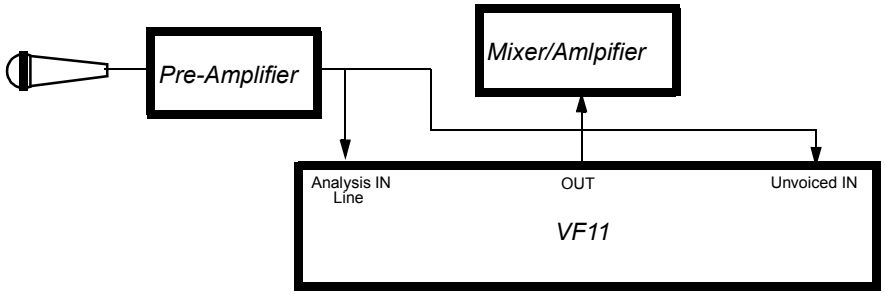
☞ You can make the VF11 sing, when playing a melody on synthesizer 1.

☞ Modulating the pitch on synth 1 (using a LFO) creates a vibrato-vocal-effect. Increasing the pitch of the synthesis-signal or using narrow-band-signals (bells, LoPass-filtered signals) decreases the clearness.

☞ Increasing the pitch of the synthesis-signal or using narrow-band-signals (bells, LoPass-filtered signals) decreases the clearness.

☞ Interesting effects can be achieved using a harmonic unvoiced signal but with a different pitch than that of the synthesis signal..

❍ Example C: Original voice as unvoiced signal



Optimum signal clearance will be achieved if the synthesis signal in the VUD is replaced by the original non-harmonic tones of the voice. Since the unvoiced-input requires line-level voltage, the microphone signal has to be reinforced using a pre-amp.

3.2 Use with instruments

Using a signal other than the vocal on the analysis (and synthesis) input can produce interesting results. For example, using a sequencer or drum-computer on the analysis input makes it possible to superimpose a dynamic sequence or rhythm onto the synthesis signal which works extremely well with percussion. Using the filterbanks individually can produce frequency dependent distortion which is rarely achievable with any other equipment. Examples of effects are:

- Fixed filterbank
- Phaser like effects
- 'Rythmizing' static sounds
- Frequency dependent distortion

❍ Example A: Fixed filterbank

The VF11 can be used as a graphic EQ with 11 bands. Due to the rather steep filters, impressive results can be achieved

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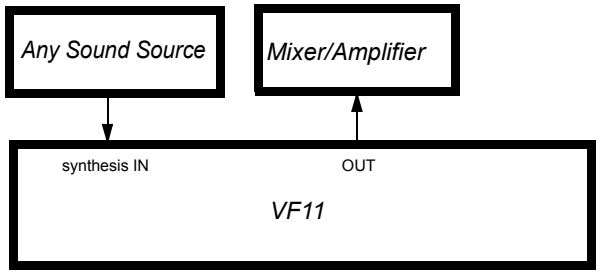


1. Connect VF11 as illustrated and leave all controls at minimum.
2. Adjust the level of the analysis-signal using Input-Trim-knob 1. When talking into the mic, the Anl.-Peak-Led should flash.
3. Because there is no analysis signal connected, the synthesis filters have to be operated using the filter-knob 4 (turn to middle).
4. The sound can be altered using the filterbank knobs 8...18. The overall volume is adjusted using knob 7.
5. Adding the original synthesis signal to the mix is done using knob 5.

☞ Connecting a signal to the analysis input and adjusting the analysis amount using knob 1 adds the vocoder effect to the signal.

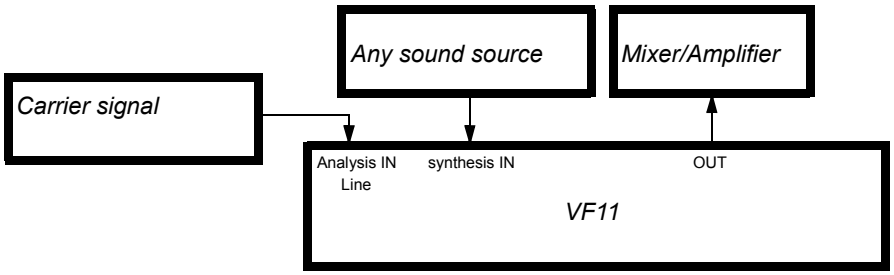
❍ Example B: Creating Phaser like effects and filter-sweeps

These effects can be achieved applying periodical changes to the gain of the synthesis filters. For this purpose, an analysis signal with varying pitch or tonal color is required. The effects intensity is dependent on the modulation depth and the character of the analysis signal.

- **Filtersweep (Bandpass)**
  The filterbank of the VF11 behaves like a bandpass-filter when the pitch of the analysis signal changes periodically. E.g. a sawtooth wave modulated by a LFO would give a vibrato effect. The bandpass becomes smaller with an analysis signals that contain fewer hi-frequency contents. Extreme effects lead to sine waves. At this point, there is only one filter 'open' while the others are closed.

- **Filtersweeps (LoPass)**
  The filterbank of the VF11 behaves like a LoPass-filter if the analysis signal is processed by a LPF. (e.g. a VCF with LFO-modulated cutoff-frequency).

- **Phaser like effects**
  These effects occur using for example a square wave with pulse-width- modulation applied or a mixture of several pitch- modulated tones.



1. Connect VF11 as illustrated and leave all controls at minimum.
2. Adjust the level of the analysis-signal using Input-Trim-knob 1. When talking into the mic, the Anl.-Peak-Led should flash barely.
3. Adjust the level of the synthesis-signal using Input-Trim-knob 2 in the same way.
4. Adjust the gain of the original synthesis signal using knob 5.
5. Change the depth of the effect by adding the filtered signal using knob 7.
6. Change the character of the sound using the filter-band knobs 8...18.

❍ Example C: 'Rythmizing' static sounds

This is certainly one of the most interesting vocoder effects. A static sound suddenly becomes alive and changes with the rhythm of another sound. A very drastic effect can be achieved using a drum computer on the analysis input. The synthesis signal should be a wide band signal like the internal VCO. The result sounds like a snare drum, bass drum and hihat at the output of the VF11 but is only a modified sawtooth waveform. Since each drum sound stimulates the synthesis filters with different strength, the filterbank knobs 8...18 can be used to adjust the volume of the drums individually

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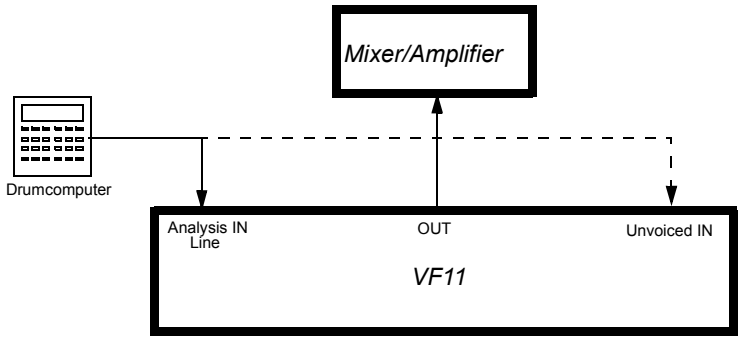

1. Connect VF11 as illustrated and leave all controls at minimum.
2. Adjust the level of the analysis-signal using Input-Trim-knob 1. When talking into the mic, the Anl.-Peak-Led should flash. 1.1 General Information.
3. Adjust the level of the synthesis-signal using Input-Trim-knob 2 in the same way. (The internal VCO is used automatically).
4. Move the filterbank knobs 8...18 and the vocoder-knob to the middle.
5. Single drum sounds can be raised or lowered using filterbank knobs 8...18.
6. The pitch can be adjusted using knob 3. Low frequencies will 'rythmize' bassy sounds (bass drum, low tom,etc.), high VCO frequencies will affect harmonic sounds (snare drum, hihat).

☞ Using the Voiced-Unvoiced-Detector:

Several percussive instruments (Ride, Cymbal, Hihat) contain a non harmonic frequency spectrum. These signals are suited for use with the VUD. Connecting the drum computer to the unvoiced input switches from the synthesis signal to the original drum sound at the output whenever a non harmonic signal is detected. This can enhance the rhythmic effect. Analysis Input Synthesis Input.

☞ Interesting effects can be achieved using selected distortion of the synthesis filters. This can be achieved by overdriving single drum sounds either, by raising the output gain of the synthesis filters 8...18 or by increasing the output level of the filterbank using knob 7.

❍ Example D: Frequency dependent distortion

Standard distortion is described by harmonics added to the entire frequency spectrum of the sound. The result sounds cold and metallic in most cases. Using the VF11, it is possible to distort a sound only within certain frequency spectrums. This is done by distorting single in- and output signals of the filterbank

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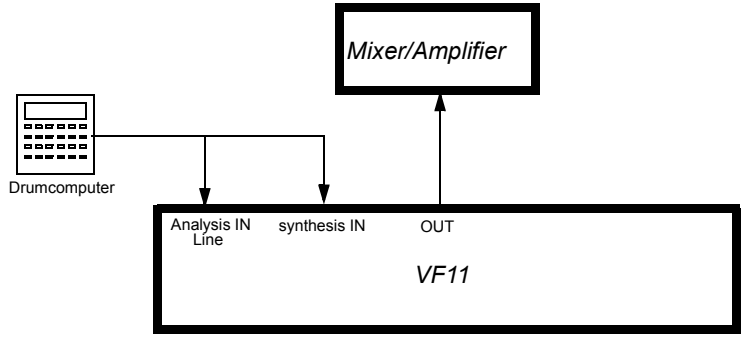

1. Connect VF11 as illustrated and leave filterbanks 8...18 at minimum.
2. Use knob 2 to distort the input signal.
3. Use the synthesis-output knob 5 to add the original synthesis signal to the mix.
4. Start the drum computer and play back a sequence with alternating bass drum, mid tom and hihat sounds for example.
5. Move filter knob 4 to maximum position.
6. Use filterbank knobs 8...18 to add single drum sounds to the mix. Different frequency spectrums show the sounds to appear within following filter banks:

   -bass drum: bands 1, 2

   -mid tom: bands 4, 5

   -hihat: bands 10, 11

   This way, the instruments can be distorted individually using the related filterbank knobs.
7. In addition, knob 1 can be used to feed the drums into the analysis input and let them 'modify their own sound'.

Important safety instructions

1. Please read all instructions carefully before operating the unit.
2. Don't get wet.
3. This unit is capable of creating acoustic signals which can lead to permanent hearing damage. Avoid using the unit for extended periods of high volumes.
4. Make sure that there is sufficient ventilation.
5. Do not place the unit next to a radiator or heater.
6. Connect the unit only to proper mains outlets.
7. Place the unit in a way that no dust, liquids or objects can get into it.
8. If not being used over a period of time, unplug the unit.
9. The unit must only be serviced by qualified personal.
10. Don't try to repair this unit by yourself.

Specifications

Inputs	Analysis: symmetrical mic, line Synthesis (line) Unvoived In (line) Connector for external PSU (AC 12V, 500mA)
Outputs	OUT Mono (Line)
Input impedance	Analysis Mic: 1K Analysis Line: 15 Synthesis: 100K Unvoiced: 10K
Noise Generator	white Noise (Unvoiced internal)
Mid-frequency bands 1...11	100 (50-190), 225, 330, 470, 700, 1030, 1500, 2280, 3300, 4700, 9000 (6800-12700) All values in Hertz
VCO	sawtooth range: 15Hz-600Hz
Power Consumption	4W
Size	482,6 x 190 x 44 mm
Weight	1,6 kg

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