DACSData

Product Description, Application Notes and Specifications

Product Name: FREQue II - Ring Modulator based effector   **Part Number:** 0050.000

Introduction

Ring modulation is a very distinct electronic effect for audio signals, used frequently in both the "pop" and "classical" musical world of the 1960s ("Ring modulators were to the avant-garde movement of the '60s what TB303s were to acid house" - The Mix Nov. '98). In the classical world the music of Stockhausen is particularly associated with the use of this effect. It was also present on the early EMS VCS3 and Synthi100 synthesizers, as well as on many old and current modular synths.

The Effect

The effect can range from rich bell like sounds to a simpler "beefing up" of a voice played in octaves.   The theory is relatively simple: the ring-modulated output contains frequencies generated by the sum of, and the difference between, the frequencies of the two inputs. For example, two sine wave inputs of 100Hz would give an output containing only a sine wave at 200Hz (100 + 100 = 200, 100 - 100 = 0). Inputs of 100Hz and 50Hz would give an output containing 150Hz and 50Hz. As the relationship between the input frequencies becomes more complex, so the output becomes increasingly inharmonic, unstable, chaotic and musically interesting and useful.

The Past

Ring modulation fell out of use because the relatively low audio quality of the ring modulators was incompatible with the new generation of low noise analogue, and then digital, recorders and effects units. In particular the carrier input (modulating signal) would break through to the output spoiling the purity of the effect.

The Present

The **FREQue II** from DACS is the result of many years R&D on the wildest side of sonic art, making this classic effect available with modern professional studio performance. A radical treatment based on a process ignored by many in the analog domain (Note: 1 Successful modulation presents certain technical difficulties, most particularly that of input breakthrough - DACS use a four stage hand trimmed balanced system to cut this to a minimum), and emulated by some in the digital domain but with results that are far too nice yet not so subtle, and limited in frequency response. The DACS **FREQue II** can produce a colossal range of sounds, from subtle modulation effects to phenomenally freaky transformations. The DACS **FREQue II** exhibits extremely high audio quality while maintaining the integrity of the effect. Unwanted breakthrough of the MODULATOR input is kept to a minimum using sophisticated distortion cancellation techniques. This results in breakthrough of -75dB to -80dB below input level.

The FwS series effectors are finely tuned at the factory using four multi-turn potentiometers to reduce breakthrough and internal partial generation to a minimum. We use the highest quality cermet potentiometers to ensure long-term stability and reliability in performance.

Signal Inputs

As a rule of thumb, both MUSIC and MOD inputs should be between 0VU/+4dBu and +12dBu. This will give an output approximately equal to the two input signals, e.g. +4dBu MOD input with +4dBu MUSIC input will produce an output of around +4dBu. The meters to the left of the WEIGHT controls are calibrated to help with this. There are two LEDs for each input, the lower green and the upper yellow. When the yellow one is illuminating (beginning ca+2dB) levels are fine. If only the green is illuminated, then input levels may be a bit low.

The chaotic or non-linear nature of ring modulation makes it impossible to specify an output level on the basis of input levels alone. The content of the output is determined by the FREQUENCY content of the inputs. The spectral relationship between them need vary only a small amount to produce radical changes in the output signal. A certain amount of experimentation with the spectral controls and input levels will be necessary to get the best results for any particular input combination.

When using the two external inputs there is little practical difference between the MOD and MUSIC inputs. In use you may find very subtle differences between the output if the two inputs are changed over. The main difference is that the MOD input frequency response is flat to DC allowing very low frequency inputs. The internal oscillator, with a lowest frequency of .2Hz, routes to the MOD input when activated.

FREQue II

This unit is the flagship of the range offering tremendous possibilities for modulation and transformation. There are two other features that make the **FREQue** unique:

1. The ability to frequency modulate the internal oscillators, via the other internal oscillator and/or via an external source makes for vast modulation possibilities
2. The addition of the Frequency Shift module which linearly shifts the input frequencies up or down by the frequency of the internal oscillator

OSC1 can be disconnected from the MOD input of Modulator 1 and OSC2 routed there by pressing the OSC1 switch illuminating the light above it. Otherwise each Modulator has an independent oscillator. The frequency of these can be varied externally (V/Hz) via the CV jacks and of course, with OSC 1 disconnected and OSC2 feeding both MOD inputs, internal FM can still be applied to OSC2 from OSC1. The FM switch allows oscillator 1 to modulate the frequency of oscillator 2. The adjacent knob varies the extent of modulation ie the level of the sidebands and thus the spectral content of the output of oscillator 2.

The **FREQue** switch engages frequency shift mode. This shifts the frequencies present in the inputs up (OUT1) and down (OUT2) by a fixed number of cycles per second, rather than by a percentage as happens in pitch shifting. The amount of frequency shifting is set by oscillator 2, whose frequency can be modulated internally or externally while all this is going on. As with all FwS effects, this can be a subtle timbral change or a wild and extreme effect, continually variable between the two extremes.

Application Ideas

This section is not intended to be a comprehensive list of all that can be done with the **FREQue** effectors. Rather it is a list of starting points for you to begin experiments from. Using the FwS series producers and engineers can almost infinitely extend the voices of their existing battery of synthesisers and sound generators and create vast ranges of completely new sounds, add depth and warmth to early digital synthesisers, give drums new power, radically transform voices...

Introduction

We have found that the most satisfactory set up for experimentation is to have the inputs to the units fed from pre-fader auxiliary outputs on a mixer. This means that you have good control of what is going into the units AND you can mix the processed and unprocessed signals together. Some treatments will require mixing with the original signal and some will need to be kept separate. For example adding distortion to a continuous sound will need mixing while gating effects will not.

Tone and music

Feed a stable tone, or a slightly varying tone, into the MOD input and the music or tune into the MUSIC input. If the MOD input is harmonically related to the key of the music the output will tend to be harmonically rich. If the MOD input is not related, then the output will be rough, bell like and/or noisy depending on the frequency of the input.

Try this...

- Use held chords that have a certain amount of vibrato - as the pitch of the chords varies so the harmonic content of the sound will vary.
- Vary the MOD frequency to generate sliding upper and lower harmonics.
- Use randomly generated frequencies from synthesizers on the MOD input.

Drums

Set Up

Feed percussive sounds into the MUSIC input and tones or other sounds into the MOD input. The MUSIC input will then act as a trigger and give a gating effect.

Try this...

- Vary the MOD input frequency to produce output harmonically related to the music.
- Feed the melody into the MOD input and the percussion will 'play the tune', or at least tend to go up and down with it.
- Feed any old music to the MOD to produce and effect similar to scratching.
- Feed the MOD with carefully selected samples synchronized with the percussive sounds.
- Use the internal oscillators set to the 2nd or 3rd range to generate deep bass sub-harmonics on bass drums.
- Use the internal oscillators set to the 4th or 5th range to generate grain, grit and glitter on snares, hi-hats, cymbals and maracas.

Vocal inputs

Set Up

Feed your voice into the MUSIC input and feed a variety of signals into the MOD input - music, tone, noise...

Try This...

- Use the voice to gate the MOD inputs
- Use the voice as a percussion imitator to produce hot rhythm sections from modulated MOD inputs
- On the oscillator controls try the 1st range to produce gating and heavy breathing effects, the 2nd to produce tremolo and panting effects, the 3rd range to produce heavy modulation effects (Dalek among others) while the 4th and 5th ranges will produce higher and higher harmonic effects.

Same signal or L & R of stereo into both inputs

Set Up

Feed the same signal or the left and right of a stereo signal into the MUSIC and MOD inputs.

Try This...

- Mix the output into the original signal to harmonically enhance the signal
- Left and right signals into the MOD and MUSIC inputs respectively on can produce phasing and other spectral phenomena, particularly if the spectral controls are varied
- With dual units try varying the edge and weight controls contrariwise, i.e. turn one up as you turn the other down, to produce stereo effects.

Delay/feedback

Set Up

Use a delay line to process signals going in to or out from the units
Try this...

- Feed audio out back to MUSIC input via delay at tempo or multiple of tempo
- Do the above with long decays on the end of sounds
- Split the signal to both inputs and use delay line on one input to produce weird flanging effects on output
- With dual modules, feed as above, but delay only one side then pan both outputs centrally

Multiple Modulation

Set Up

Feed music into the MUSIC input of one modulator and use the internal oscillator to modulate it. Take this OUT to the MUSIC input of the second modulator and modulate it with the same internal oscillator. The result is that the original signal is reconstituted, and additional higher partials are also added.

Detailed Specifications

- Carrier in +10dBm with no signal
  Carrier out <-65dBm maximum, typically <-70dBm
- Minimum carrier in/carrier out ratio -75dB
- Typical carrier in/carrier out ratio -80dB
- Signal to noise with no carrier -82dB*
- Optimum signal input levels >+4dBm and <+10dBm
- Gain for optimum signal input levels V rms IN ~ V rms OUT
- Freq Response
  Music inputs <20Hz to c.35kHz, Modulator inputs <20Hz to >35kHz, Input Impedance >10k.
- Dimensions 19" rack-mount, 2U, 10" deep

* This is equivalent to a good microphone set to medium gain

Inputs

- Connectors
  ¼" jack, three pole, TIP input signal, SLEEVE 0V
- MOD
  Modulation Input - this feeds one side of Ring Modulator
- MUSIC
  Main Input - this feeds the other side of the Ring Modulator. If Spectral Controls are activated they vary the spectrum of this input
- CV Inputs to each oscillator on ¼" jacks, 0-15V, V/Hz

Outputs

- Connectors
  ¼" jack, two pole, TIP input signal, SLEEVE 0V
- Output for both oscillators

Front Panel Controls

- ***EQ Switch***
  Pressed in this activates Spectral Controls (and illuminates LED)
- ***Weight***
  Bass filter (shelving) ±12dB gain from >30Hz@6dB/8ve
- ***Edge***
  Treble filter (shelving) ±12dB gain from around 8kHz@6dB/8ve
- ***OSC1 Switch***
  Connects OSC2 as oscillator modulating Modulator 1 (disconnected when FREQue activated)
- ***FM Switch***
  Uses OSC1 to Frequency Modulate OSC2 - can work in conjunction with external CV input and FREQue
- ***FM Knob***
  Varies amount of Frequency Modulation
- ***FREQue***
  Activates Frequency Shifter, OUTs 1 and 2 become frequency shifted versions (UP and DOWN respectively) of the combined MUSIC inputs shifted by the frequency of OSC2. OSC switches must be in to activate this mode fully.

Meters on MOD & MUSIC input

Green LED illuminates increasingly brightly from -40dB, orange LED illuminates increasingly brightly from +2dB