

SW 1630 BODE FREQUENCY SHIFTER

A frequency shifter is an audio signal modifier which shifts the entire frequency spectrum of the applied signal by a given amount. The Model SW 1630 Bode Frequency Shifter allows the amount of shift to be accurately and continuously controlled over a span of -5000 Hz to +5000 Hz, utilizing voltage and/or manual control. The relationship between the control voltage sum and the amount of shift may be either linear or exponential. Up-shifted and down-shifted outputs, as well as a continuously variable mixture of the two, are available simultaneously and independently. Variable threshold squelch and zeroadjust fine tuning controls are provided.

The Model SW 1630 Bode Frequency Shifter changes the ratios between the frequency components of an audio spectrum, thus producing a variety of novel sound quality transformations. Applications include a wide variety of tone color modification, P.A. feedback suppression, linear frequency modulation, novel tape feedback effects, and the generation of dynamically varying clangorous tones.

- + Less than 0.1% total hum and noise
- + Variable threshold squelch minimizes apparent carrier bleedthrough due to input signal background noise
- + Accurately shifts input signals over the audio frequency range of 30 Hz – 16 kHz
- + Amount of shift is continuously variable from -5 kHz, through zero to +5 kHz
- + Amount of shift is accurately voltage variable – either linear or exponential control mode is available
- + Less than 1% total unwanted modulation and distortion products

PANEL FEATURES

The Model SW 1630 front panel has one signal input jack, three pairs of output jacks and one set of three control input jacks. The signal input is medium impedance (50K ohms) and will accept levels up to +12 dBm. Signals appearing at the output jacks are nominally the same level as that of the input. The upward shifted spectrum appears at the OUTPUT A jack pair, the downward shifted spectrum appears at the OUTPUT B jack pair, and the mixture of the two appears at the MIXTURE OUTPUT jack pair. Each of the control inputs has an impedance of 100K ohms +1%. The nominal range of the control voltage sum is +5V. The AMOUNT OF SHIFT control and the SCALE switch determine the basic amount of shift as set by the panel controls; the SCALE switch also determines whether the relationship between the control sum and the amount of frequency shift is linear or exponential. The SCALE switch has six positions. In the ZERO position, the AMOUNT OF SHIFT rotary control and the control input jacks have no effect. The switch is placed in this position when the instrument is to be calibrated.



When the switch is in the „EXP“ (exponential) position, the span of frequency shift is 2-2000 Hz and a one volt increase in the control sum doubles the amount of frequency shift. In the absence of external control voltages, the AMOUNT OF SHIFT rotary control covers the entire span. As in other SYNTH-WERK voltage-controlled modules, the effect of the control voltages is added to that of the AMOUNT OF SHIFT control. The remaining four positions of the SCALE switch establish a linear relationship between the control sum and the amount of frequency shift. These positions select +5, +50, +500, or +5000 Hz total amount of shift. In all positions of the SCALE switch, except „ZERO“, sweeping the AMOUNT OF SHIFT rotary control through its rotation is equivalent to a 10V change in the control sum. Other panel controls include SQUELCH THRESHOLD, ZERO ADJUST. (each with their LED lamp indicators), and MIXTURE. SQUELCH THRESHOLD adjusts the threshold at which the squelch circuit goes into effect. Whenever the level of the input signal falls below threshold, the squelch circuit suppresses the output signals. The ZERO ADJUST is used to calibrate the amount of frequency shift prior to use. The LED associated with this control actually blinks once every cycle of frequency shift. Thus, with the SCALE switch in the ZERO position, the ZERO ADJUST control is set until its associated LED blinks very slowly. Finally, the MIXTURE control determines the relative proportions of outputs A and B which appear at the MIXTURE OUTPUT

APPLICATIONS

In shifting the components of the input audio spectrum by a given amount, the SW 1630 Bode Frequency Shifter changes the original ratios between the overtones and other frequency components of the input signal. Rather than being a transposing device, this instrument is a means for achieving an extremely wide variety of tone color modification. Whether the amount of frequency shift is large or small, static or time varying, or whether the input signal is simple or complex, the processed outputs will generally be musically interesting. Here are some typical applications:

1. When the input signal is a quasi-pitched sound, such as that produced by a drum, the frequency shifter will alter the apparent pitch. In the case of a drum sound, varying the amount of frequency shift will appear to change the „size“ of the drum. In conjunction with a 912 envelope follower and 911 envelope generator, a trigger occurring at the beginning of each drum sound may result in a rapidly varying „amount of shift“ contour, which gives a whole new class of percussion sounds which glide or swoop each time they begin.

A drummer may also use a pedal controller, or modulating oscillator, to vary the amount of shift, thus creating radical changes in the processed sound while he is playing.

2. When an audio signal is shifted by a small amount (a few Hz) and then remixed, interesting chorus effects are generated. The two main outputs may be routed to separate listening channels to create novel stereo effects. Modulation of the amount of shift by a slowly varying control signal enhances the richness of sound and feeling of ambience.

3. A pitched sound which is rich in harmonics becomes clangorous when passed through the Bode Frequency Shifter. When the Model SW 1630 is used with Moog voltage-controlled oscillators, it is convenient to control the amount of shift and the frequency of the input signal with the same control voltage. This arrangement produces a clangorous sound whose relationships between overtones, and therefore its perceived timbre, remain constant as the pitch of the sound is varied. Furthermore, exciting new timbres are created when the oscillator tones are dynamically filtered before being shifted.

4. Using two sine oscillators, one fed to the signal input and the other to a control input, a wide range of frequency modulation is possible. If the amplitude of the control signal is dynamically varied a class of clangorous tones is produced whose overtone strengths constantly vary with time.

5. Feedback in high power public address systems is a severe problem during live performances. A SW 1630 Frequency Shifter, inserted in the line between the mixer and the power amplifier, shifts the entire spectrum of the signal which drives the speakers. If the amount of shift is set at just a few cycles per second, then the sound appearing at the speakers will appear to be virtually unchanged to the listener's ears, but the regenerative effect, which leads to feedback howl, will be greatly reduced. This application enables microphone gains to be increased by as much as 15-20 dB.

6. The output of a tape recorder may be mixed with its input to produce well known tape echo effects. The SW 1630 Bode Frequency Shifter, inserted in the line from the recorder's output to input, allows new tape echo effects. These effects are characterized by „spiraling“ of the echoes either upward or downward in pitch.

7. When the frequency spectrum of speech is shifted, its quality and apparent pitch are drastically altered without significantly affecting the intelligibility.



The **Model SW 735** is the rack version of the Bode Frequency Shifter including a power supply. From an electrical point of view it is identical to the Model SW 1630.

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