

\*equations were taken from <http://www.harmony-central.com/Computer/Programming/Audio-EQ-Cookbook.txt>

### Peaking Filter Transfer Function:

$$H(z) = (b0/a0) * \frac{1 + (b1/b0)*z^{-1} + (b2/b0)*z^{-2}}{1 + (a1/a0)*z^{-1} + (a2/a0)*z^{-2}}$$

### Direct Form 1 of Peaking Filter Implementation:

$$y[n] = (b0/a0)*x[n] + (b1/a0)*x[n-1] + (b2/a0)*x[n-2] - (a1/a0)*y[n-1] - (a2/a0)*y[n-2]$$

### Coefficient Calculations:

$A = 10^{(dBgain/40)}$  (For peaking and shelving EQ filters only)

$$w0 = 2*\pi*f0/Fs$$

$$\cos(w0)$$

$$\sin(w0)$$

$$\alpha = \sin(w0)/(2*Q)$$

$$\text{peakingEQ: } H(s) = (s^2 + s*(A/Q) + 1) / (s^2 + s/(A*Q) + 1)$$

$$b0 = 1 + \alpha*A$$

$$b1 = -2*\cos(w0)$$

$$b2 = 1 - \alpha*A$$

$$a0 = 1 + \alpha/A$$

$$a1 = -2*\cos(w0)$$

$$a2 = 1 - \alpha/A$$