Q106A Oscillator

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The Q106A Oscillator module is a combination of the Q106 Oscillator and the Q141 Aid module, all on a single panel.

The Q106A Oscillator is the foundation of any synthesizer providing the basic waveforms used to construct sounds. With a total range of .05hz to 20kHz+, the Q106 operates as a powerful audio oscillator and a full-featured LFO.

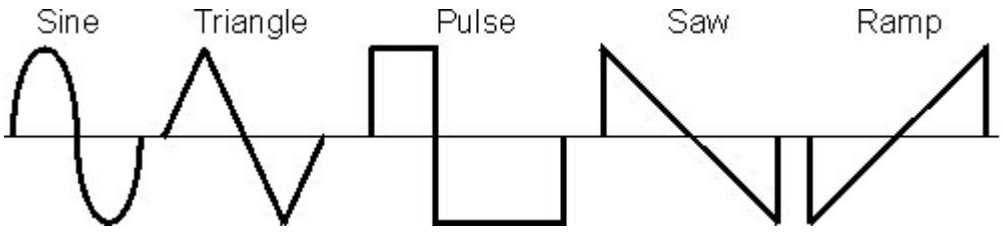
The frequency (pitch) of the oscillator is controlled manually, by voltages from other modules, and by voltages from controllers such as keyboards. Both linear and standard 1-volt-per-octave exponential voltage inputs are provided - each scalable by panel controls.

Five waveforms are available simultaneously - Sine, Triangle, Sawtooth, Ramp and Pulse. The Pulse waveform is adjustable manually and may be modulated via external voltage control. The WAVES section provides an additional source of waveforms with variable amplitude and both polarities, and also a square wave of 50% duty cycle.

The SYNC section provides various styles of synchronization with other oscillators for tuning purposes and effects. Both hard and variable soft sync are offered.

Specifications

Panel Size: Dual width 4.25"w x 8.75"h.
Response: 1/V-per-Octave or variable linear.
Frequency Range: .05hz to 20khz.
Power: +15V@30ma, -15V@30ma, +5@5ma.
Output Waveforms: Sine, Triangle, Saw, Ramp, Pulse, Square.
Waveform Levels: 10V PP and variable.
Sine Waveform THD: 3%.
Pulse Waveform Duty Cycle: 5% to 95% minimum.



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Range Switch
Low=LFO rates

Hard Sync input
Use Saw from
another oscillator

Variable Soft
Sync input

Pulse width
modulation
control and variable
voltage control

1V/Octave
voltage control
inputs

Waveform outputs
10v p-p

Fine frequency
adjustment
+/- 1/2 octave

Variable Linear
voltage control
and AC/DC
coupling

Variable
waveform
outputs, both
polarities

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Usage and Patch Tips

Basics
Oscillators are the main source of sound in a synthesizer. The waveforms are then routed to filters and other modules for modification. Oscillators can also be used to modulate other module's parameters or to trigger envelope generators and sequencers.

Exponential Pitch Control
Pitch of the oscillator is usually controlled by a keyboard but can also be controlled by a sequencer or any module's output. Normally pitch is controlled by a keyboard that produces 1 volt per octave. Each additional volt results in a 2x increase in pitch (frequency). This is called exponential or 1V/Octave response. The main reason for this is to allow controllers to produce the entire audio range of frequencies with lower voltages. A 10 octave range requires only 10 volts of control voltage. If the response was linear then 10 octaves of range would require 512 volts of control signal. There are a total of 3 exponential pitch control connectors on the oscillator and one has an adjustable response. All of these inputs can be used at the same time if needed. In most cases you will simply connect the output from your keyboard into one of the 2 non-adjustable 1V/Octave inputs. It's also common to modulate from another oscillator into the adjustable exponential control connector.

Linear Pitch Control
There is also a pitch control connector which has a linear response. This is normally used to produce vibrato which is a modulation of pitch. The amount of the affect of the modulation signal upon pitch can be adjusted with the front panel control.

Pulse Width Modulation
The width of the pulse waveform can be adjusted manually or from an external control signal such as another oscillator. This produces interesting effects similar to a violin. You'll have to experiment to see how this sounds.

Using the Oscillator to Modulate
The Q106A Oscillator is designed to produce both audio signals and slow moving signals to modulate other modules. Normally this will be done using the 'Low' range which will give you frequencies below 32hz. All of the output waveforms are available and can be used to control an oscillator's pitch (vibrato), an amplifier (tremolo), or a filter's cutoff frequency or resonance. You can also use the oscillator to trigger an envelope generator or to start and stop a sequencer.

Outputs
All outputs are available at the same time and can be patched anywhere you like. The Waves section provides an additional source of waves with variable amplitude and polarity. This output can be feed back into the Linear or Exponential inputs to create additional waveforms.

Sync
The Hard Sync input is used to synchronize multiple oscillators. Use the pulse waveform from a slower oscillator into the Hard Sync inputs on higher frequency oscillators to synchronize them. This will eliminate beating. Strange effects can be created by synchronizing oscillators at non-multiple frequencies. Variable soft sync is also offered for additional effects.

Feedback
You can take one of the outputs from the oscillator and patch it back into the adjustable exponential response connector or the linear response connector and completely change the waveform. You can see what’s happening with an oscilloscope. Almost any type of waveform can be produced this way.

1V/Oct Jacks
When J17 is jumpered at 1-2 then the 2 1V/Oct Jacks are independent, when set to 2-3 they are connected to allow daisy-chaining multiple modules to eases patching.

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Tracking Accuracy

Tracking accuracy determines how closely your oscillators track the keyboard. Human hearing is very sensitive to pitch and some people can discern differences as low as .2%. Tracking is most important on frequencies from 32hz to 4096hz (7 octaves). We think this is the most important parameter of an oscillator.

Test Equipment Used (all have recent calibration):
HP 5335a 9 Digit Frequency Counter
Fluke 3330b Voltage Calibrator

Desired	Actual	% Error
32Hz	32.07hz	+0.22
64hz	64.16hz	+.25
128hz	128.2hz	+0.16
256hz	256.2hz	+0.08
512hz	511.9hz	-0.02
1,024hz	1023.2hz	-0.08
2,048hz	2046hz	-0.09
4,096hz	4094hz	-0.05
8,192hz	8236hz	+0.5
16,384hz	16778hz	+2.3

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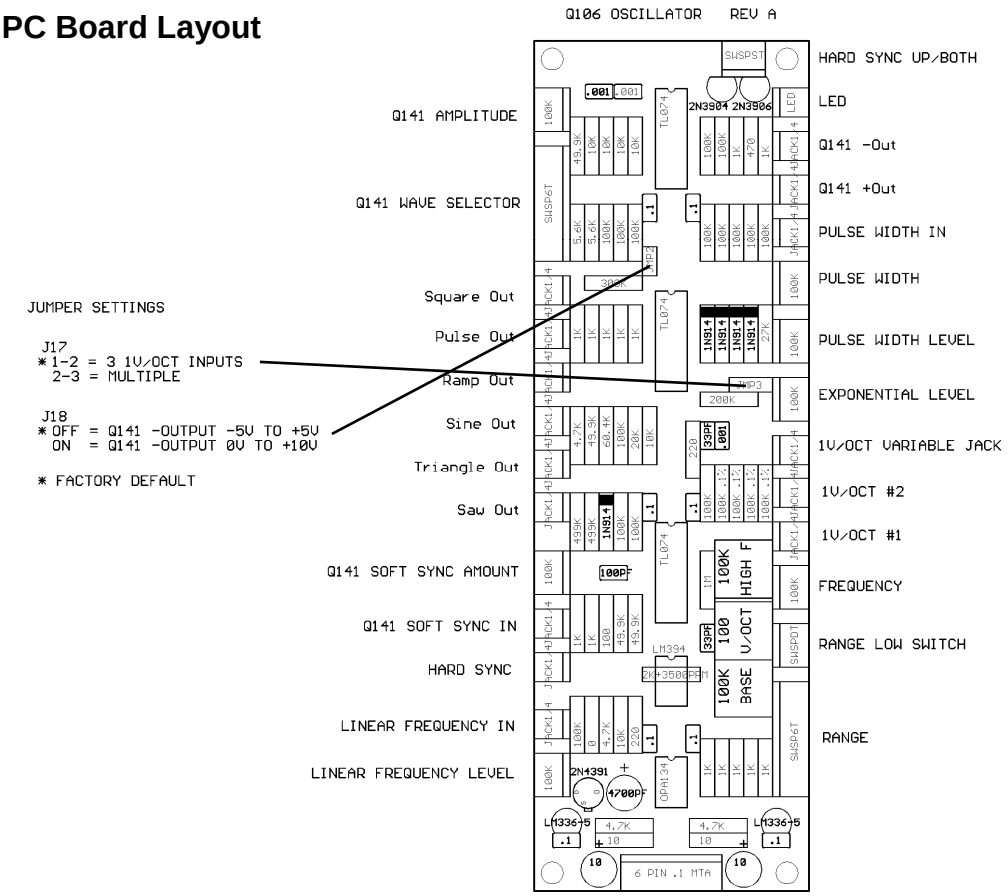
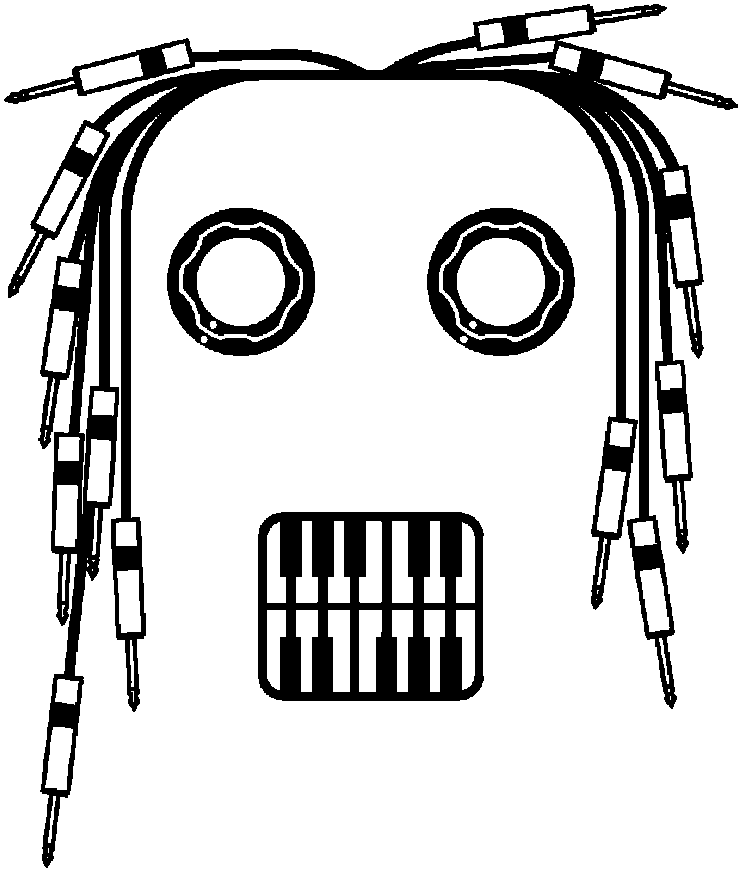
Calibration and Testing

1. Apply power for 10 minutes to warm up circuit.
2. Attach a frequency counter to the Sine output.
3. Attach a voltage calibrator to the far left 1V/Octave input.
4. Set the frequency Range knob on the front panel to 32' and the frequency knob to center (0). Make sure not to bump the frequency knob on the front panel during this procedure.
5. Center the base frequency and high frequency pots.
6. *ADJUSTING V/OCTAVE - Critical for tracking accuracy.* (This can take about 5 min).
   a. Set the calibrator to 0V.
   b. Adjust the base frequency trim pot to 32hz exactly. Something like 32.03
   c. Set the calibrator to 1.000V.
   d. Adjust the V/Octave trim pot to get 64hz. Something like 64.06 (double the previous reading)
      * Turning the V/Octave trim pot clockwise will widen the tracking.
      * You will have to change the base frequency trim pot to get back to 32hz after each adjustment.
      * Switch between 0V and 1.000V and adjust the trim pot to get the two frequencies exactly double.
7. *HIGH FREQUENCY ADJUSTMENT*
   a. Set the voltage calibrator to 7.000V and set the high frequency trim pot for 4096hz
   b. Go back and check for 32, 64, 128, 256.....4096, which should be within .2%-.3%
   c. 8192 may be off as much as 1% (82hz) and 16384 may be off 3% (492hz).

PC Board Layout



Patcher Jack



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