Q106 Oscillator

Oct 2001

The Q106 Oscillator generates the basic waveforms needed to construct sounds and to provide modulation signals. The frequency (pitch) of the oscillator is controlled by voltage levels from devices such as keyboards or other oscillators. Both linear and 1/volt per octave exponential inputs are provided and each can be scaled by panel controls. A manual Range switch selects 5 octaves plus a Low range for modulation frequencies (.05hz to 25hz). A manual Frequency control allows adjustment over one octave. The five waveforms available simultaneously are SINE, TRIANGLE, SAW, RAMP, and PULSE. The width of the PULSE waveform can be modulated by an external source and adjusted manually. A hard sync input is also provided which allows several oscillators to be synchronized to prevent beating.

Controls and Connectors

There are 6 sections (listed top to bottom)
- Frequency Range Section
- Hard Sync Section
- Linear Frequency Control Section
- Pulse Width Control Section
- Exponential Frequency Control Section
- Output Section

Frequency Range Section

Frequency Range Control

Selects octaves from 32hz to 512hz with a 'low' setting for modulations.

Frequency Control

Allows fine control of pitch over 1 octave.

Hard Sync Section

Hard Sync Connector

Allows the oscillator to be syncronized with other oscillators to prevent beating and to create strange effects.

Linear Frequency Control Section

Linear Frequency Control Connector

Allows external control of pitch with a linear response.

Linear Frequency Level Control

Determines the amount of affect that the linear control voltage has upon pitch.

Synthesizers.com

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Pulse Width Control Section

Pulse Width Control Connector
Allows external control of pulse width.

Pulse Width Level Control
Determines the amount of affect that the pulse width control voltage has.

Pulse Width Control
Allows manual setting of pulse width.

Exponential Frequency Control Section

1V/Octave Connectors (2)
Allows external control of pitch with an exponential response (usually from keyboards)

Adjustable Exponential Connector
Allows external control of pitch with an exponential response.

Exponential Frequency Level Control
Determines the amount of affect that the exponential control voltage has upon pitch.

Output Section

Sine
Pure mellow sounding waveform with almost no harmonics. Flute-like.

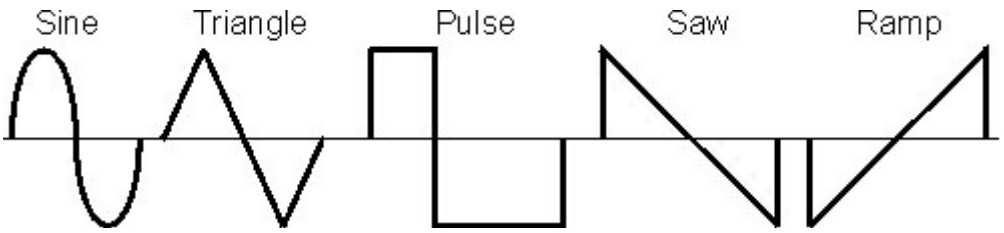
Triangle
Mellow sounding waveform with some harmonics.

Saw
Buzzy sounding waveform with many harmonics. Brass horn-like.

Ramp
Inverse of Saw. Sounds the same but useful for modulation.

Pulse
Hollow sounding waveform with many harmonics. Width can be controlled. Woodwind-like.

Waveforms



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Specifications

Panel Size: Dual width 4.25"w x 8.75"h.
Response: 1/V per Octave
Frequency Range: .05hz to 40khz
Power: +15V@30ma, -15V@30ma, +5@5ma.
Output Waveforms: Sine, Triangle, Saw, Ramp, Pulse.
Waveform Levels: 10V PP
Sine Waveform THD: 3%
Pulse Waveform Duty Cycle: 5% to 95%

Q141 Oscillator Aid

Use the Q141 aid module next to your Q106 oscillator for additional functionality including a soft sync input with amount control, waveform selector, amplitude adjustment, and inverted outputs.

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

Please see the website for additional performance tests.

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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 Q106 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. Use a Q125 Signal Processor to attenuate, amplify, invert or offset any waveform from the oscillator.

Sync
The Oscillator has a Hard Sync input which 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.

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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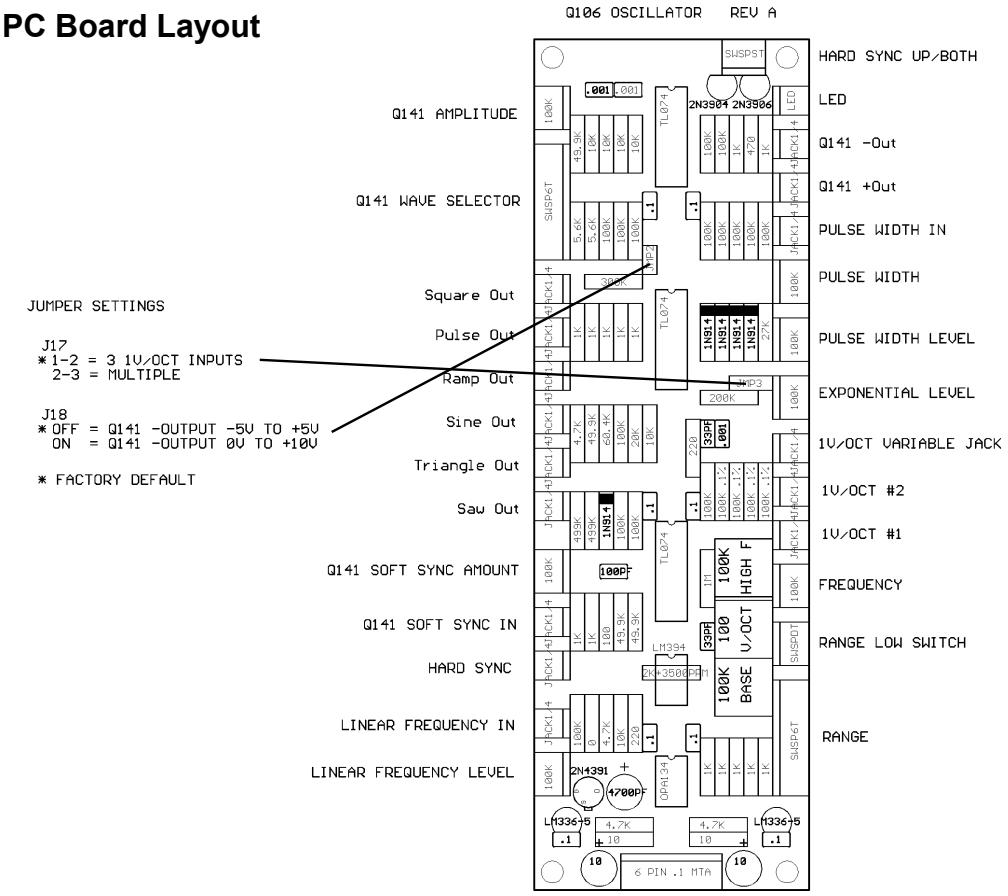
Calibration and Testing

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



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