

Q171 Quantizer Bank

Sep 2014

The Q171 Quantizer accepts an input voltage and produces an output voltage that is locked into a selected group of notes (semitones, scale, chord, etc.) maintaining correct intervals between steps.

The quantizer's primary use is to simplify tuning of an analog sequencer, but there are many other musical applications. Any voltage source can be processed by the quantizer including envelope generators, oscillators, noise sources, etc.

The Q171 can be synchronized with external events and operated as a programmable Sample & Hold using the Gate Inputs. A Gate Output signal occurs whenever a new quantized output signal level is produced.

Three independent channels are provided. Channels produce one of the valid semitone notes (12-notes per-octave) unless an alternate group of notes is selected using the option switches. These option switches narrow the possible outputs to further simplify tuning. Possible note groups include Semitones; Major, Minor, Augmented, Diminished versions of scales; Triad chords; and Root+5th.



Specifications

Panel Size: Single width 2.125"w x 8.75"h.

Quantization Method: Processor controlled ADC/DAC.

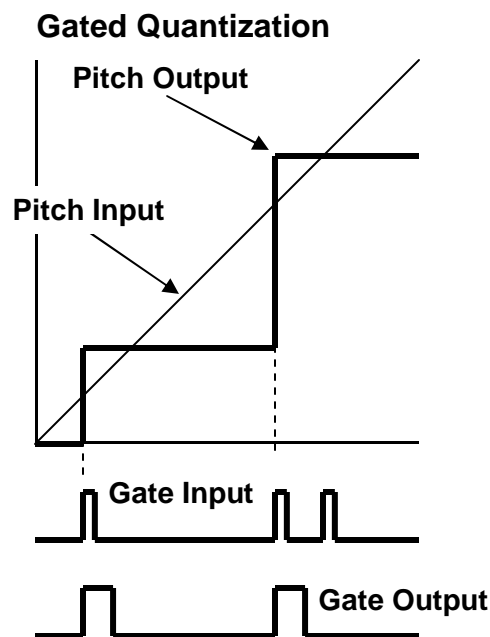
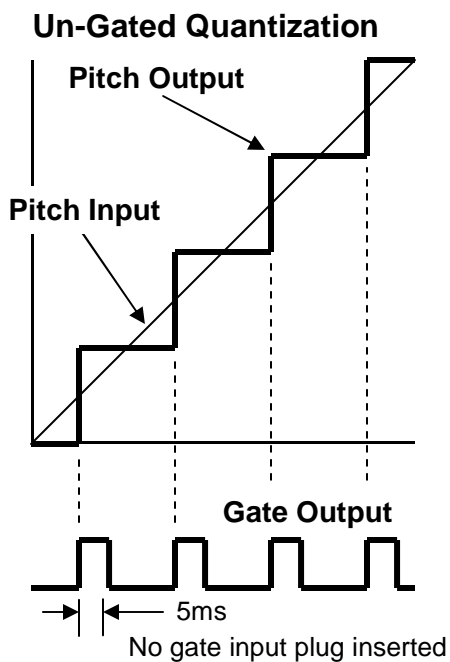
ADC Inputs: 10-bit with precision buffer/scaler.

DAC Outputs: 12-bit with precision buffer/scaler.

Gate Inputs: 0-5V minimum, rising edge.

Gate Outputs: 0-5V, 5ms on, 2ms minimum off.

Power: +15V@30ma, -15V@30ma, +5V@50ma.



This switch controls which channels are affected by the 2 option switches. In the NONE position, semitones are selected.

Input is the voltage to be quantized. Normally this is a pitch voltage from a sequencer but can be any voltage from any source.

This gate input can be used to force a new quantized output. Without it, quantization happens automatically as the input voltage changes.

Channel 2 and 3 operate just like channel 1, according to the option switches



Option switches determine which note intervals are produced at the Pitch outputs.

This is the quantized pitch voltage output. Often this is used to drive oscillators.

A short gate pulse occurs here whenever a new pitch output is produced. Often this is unused or patched to a Q109 Envelope Generator.

Controls and Connectors

Channel Options Switch

Determines which channels the two note group selection switches apply to, otherwise the channel produces notes from the 12-note Chromatic (Semitone) scale.

Scale/Triad/Root+5th Switch

Along with the Major/Minor/Aug/Dim switch, sets the note group used for the selected channel(s).

In the Scale position, the Major/Minor/Aug/Dim switch selects the group of notes produced.

In Triad mode, the 3-note triad chord group is used. In this mode, the Major/Minor/Aug/Dim switch also affects the group of notes produced.

In Root+5th mode, a 2-note group using the Root and the 5th is used. In this mode, the Major, Augmented and Diminished switch positions apply. Major and Minor positions are the same.

Major/Minor/Augmented/Diminished Switch

This 4-position switch, along with the Scale/Triad/Root+5th switch, selects the note group used by the selected channel(s).

The top position selects Major and the bottom position selects Minor. The center position provides Augmented or Diminished options depending on the previous position. If the switch is moved from the Major position down to the center position, the selection is Augmented (A). If the switch is moved from the Minor position up to the center position, the selection is Diminished (D).

Pitch Inputs

Voltage to be quantized. This does not have to be a pitch voltage, it can be any signal within the valid range of 0-10 volts (10 octaves). Voltages below 0 will be quantized as 0 and voltages above 10 will be quantized as 10. To quantize bipolar signals such as -5v/+5v waveforms from an oscillator, use a Q125 Signal Processor to shift (add +5v offset) the signal to produce 0-10v.

Pitch Outputs

Quantized voltage output. The output voltage produced will be the closest match to a note within the selected note group. The output is low impedance capable of driving 6+ oscillators with minimal droop.

Gate Inputs

Allows control of quantizing timing. When no plug is inserted, quantizing occurs continually with timing determined by the internal processor. When a plug is inserted, quantizing occurs on the rising edge of the signal (typically 0 - 5 volts). This allows the quantizer to operate as a Sample & Hold, and to provide control over quantizing timing.

Gate Outputs

Short 5ms pulse (0 - 5 volts) is produced when the quantized pitch output changes. A 2ms off-time is guaranteed.

Usage and Patch Tips

Basics

The fundamental use of the quantizer is to ease tuning of analog sequencers such as our Q119 and Q960. Instead of being able to adjust the sequencer's knobs to any voltage, the quantizer will lock them into a pre-selected scale. In other words, the output will produce only valid notes. This makes setting the sequencer much easier and musical.

Actually, it's the intervals between notes that are important. The specific notes that an oscillator produces is a product of the input voltage and the frequency controls on the oscillator. So, it will still be necessary to set the oscillator's controls to the desired base frequency.

Q171 Quantizer Simplifies Sequencer Tuning



Accidental Melody

Patch a slow oscillator waveform into a Q125 Signal Processor, then to the Q171 pitch input. Use the quantized pitch output to control another oscillator. Use the Gate output to trigger envelope generators just like you would for any basic synthesizer patch. Use the Gain and Offset controls on the Q125 to move the waveform around while experimenting with Q171 channel options. Interesting and musically useful patterns will emerge.

Accidental Melody Patch



Usage and Patch Tips - Continued

Sample and Hold

Use the gate input to control when the Q171 quantizer captures a voltage and converts it. In this example, the Quantizer is being triggered by a Q106 Oscillator using the pulse output. Whenever a pulse is received, the quantizer captures the voltage from the Q110 Noise module, and locks it into one of the valid notes of the selected scale. The resulting voltage is then used to set the frequency of the Q150 Ladder Filter.

Q171 Quantizer Used as a Sample & Hold



QuarterTones

While a quartertone scale setting is not built in, you can achieve quartertones by simply patching the quantizer output through a Q125 Signal Processor set to 50%. You will have to precisely adjust the setting for an accurate output.

Q171 Quantizer for Quartertones



Usage and Patch Tips - Continued

Electronic Blues

A 12-bar blues is a piece based on a fairly basic, but effective riff (sequence) repeated and transposed in specific patterns over 12 bars. Setting up two analog sequencers to control VCOs in an additive way can be very time-consuming because of the precision needed, but with the quantizer this is easy:

Use the first sequencer to play the blues riff through a quantizer patched to the VCOs.

Use a second sequencer to play the transpositions - one step for each round of sequencer 1.



Usage and Patch Tips - Continued

Stepped Glissando

Patch the keyboard pitch output through the Q105 Slew Limiter then through the quantizer set to the chromatic scale. Playing will produce stepped glissando typical of what Vangelis produced on his CS-80.

Perfect Chords

Use the quantizer to produce perfect triad chords.

Set the quantizer to Ch 1,2,3, Scale, and your choice of Major, Minor, Aug, Dim. Patch the keyboard's pitch output voltage through a Q124 Multiple, then to the quantizer like this:

- * Patch one into channel 1 of quantizer, and the output into VCO #1.
- * Patch one through the top part of a Q125 Signal Processor with gain at 0% and offset to something, then into channel 2 of quantizer, and the output into VCO #2.
- * Patch one through the bottom part of a Q125 Signal Processor with offset to something, then into channel 3 of quantizer, and the output into VCO #3.

Vary the offset settings so the quantizer locks into the notes of the Triad scale. Playing the keyboard will then produce perfect triads.

Arpeggiation

Patch a VCO output (Ramp, Saw, Triangle) into a Q125 Signal Processor with the offset set to +5. This converts the bipolar voltages to positive values needed by the quantizer. Adjust the Q125's Gain to below 50%. Set the VCO to LOW (LFO) mode. Patch the output of the Q125 into a quantizer channel and select a scale. The quantizer's output will produce an arpeggiation in the desired scale.

If the Ramp waveform is used, the arpeggiation will be up.

If the Saw waveform is used, the arpeggiation will be down.

If the Triangle waveform is used, the arpeggiation will be up/down.

The VCO's frequency knob controls the arpeggiation speed.

Bipolar/Unipolar Voltages

The default jumpers are set for the quantizer to accept a unipolar voltage range of 0-10 volts. This works best for the majority of quantizer uses dealing with pitch voltages. There are jumpers on the circuit board which allow the quantizer to use a bipolar voltage range of -5 - +5 volts. This might be of use in some special situations even though the range shifting can normally be accomplished with a Q125 Signal Processor.

Calibration and Testing

Adjust the trimpot to exactly 5.000 volts using a precision voltmeter attached to the +5 REF jack.

Loopback calibration further improves accuracy. With the power off, patch each channel's Pitch Output into the corresponding Pitch Input. Apply power and wait 10 seconds. Then turn power off and remove the patch cords. This is only needed once since the results are saved in non-volatile memory.

Voltage variances - Analog inputs and outputs will typically be within 2-5mv of their ideal, with 10mv being the maximum. Typically these variations are in the form of an offset that remains fairly steady throughout the 10 volt range and are undetectable under most circumstances.

Power Connector

6 pin .1" MTA type connector made by AMP. Available from Mouser Electronics or Digi-Key. Modules have a male PCB mount connector and cable harnesses have a female.

Part Numbers:

Female cable mount: #6404416

Male PCB mount: #6404566

Pinout:

1 = +15v

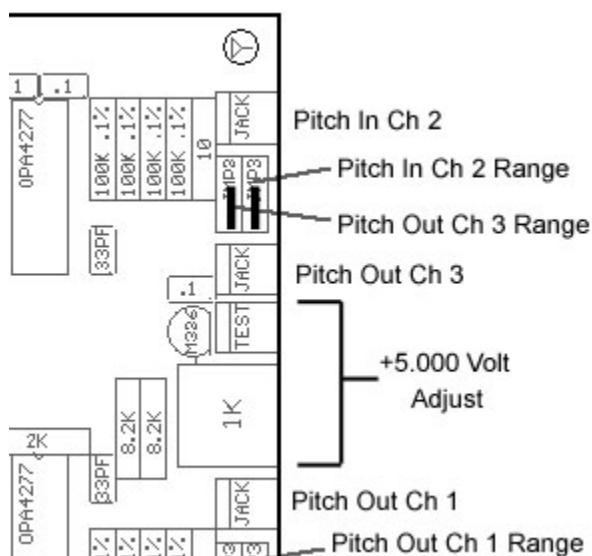
2 = key (pin removed)

3 = +5v

4 = gnd

5 = -15v

Reference Voltage Adjustment Location



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Circuit Board Connector Layout

The following drawing shows all of the connections for the Q171 front panel along with jumper settings and the voltage adjustment. Also shown are connections for the Q172 Quantizer Aid module which are labeled (A) through (I).

