Chord

Polyphonic Oscillator



Description

The Chord is a plug and play solution for bringing musical polyphony to your system. It is a four voice oscillator with individual and summed outputs. All voices are tuned together, allowing for quick and easy sequencing of chord progressions. Outputs morph through sine, triangle, sawtooth, and square waveforms, offering a timbre control that ranges from subtle waveshaping, to powerful spectral filtering. In addition to its robust synthesis engine, the harmonize function can choose appropriate chord types based on an incoming bassline at the v/oct input. From harmonic drone to Switched On Bach, the Chord is an unparalleled addition to any Eurorack modular.

- Tuned chords
- Morphing between waveforms
- Harmonize feature can choose chord quality based on incoming bassline CV
- No music theory knowledge necessary

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Installation

To install, locate 28 HP of space in your Eurorack case and confirm the positive 12 volts and negative 12 volts sides of the power distribution lines. Plug the connector into the power distribution board of your case, keeping in mind that the red band corresponds to negative 12 volts. In most systems the negative 12 volt supply line is at the bottom. The power cable should be connected to the Chord with the red band facing the bottom of the module.

Specifications

Format: 28 HP Eurorack module

Depth: 23mm (Skiff friendly)

Max Current: +12V = 122mA, -12V = 10mA


Chord
1
2
3
4
5
root
3rd
5th
7th
mix
6
7
fine
8
9
10
harmonize
triad
v/oct
11
14
spread
drop 3
drop 2
close
17
third
second
first
root
20
half dim
dom 7
min 7
maj 7
12
15
18
21
waveform
13
voicing
16
QU-BIT
inversion
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quality
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General Functions Overview

1. Root Output:
Individual root chord tone audio output

Amplitude: 10Vpp

2. 3rd Output:
Individual 3rd chord tone audio output

Amplitude: 10Vpp

3. 5th Output:
Individual 5th chord tone audio output

Amplitude: 10Vpp

4. 7th Output:
Individual 7th chord tone audio output

Amplitude: 10Vpp

5. Mix Output:
Summed audio output for all chord tones

Amplitude: 10Vpp

6. Coarse Frequency Knob:
Coarse pitch control of all audio outputs

7. Fine Frequency Knob:
Fine pitch control for all audio outputs

8. Harmonize Button:
Button that, when pressed, will enable or disable auto harmonization

If the button is illuminated, *harmonize* will be enabled
If the button is unilluminated, *harmonize* will be disabled

When enabled, the *quality* control will no longer be active and the chord quality will be determined in relation to the voltage present at *v/oct*
The Chord will treat the voltage present at *v/oct* as a bassline.
The chord quality will be chosen according to the diatonic and modal interchange chords based on the Major scale.

The *harmonize* setting will save in between power cycles

9. Triad Button:
Button that, when pressed, will enable or disable the 7^{th} chord tone from the *mix* output

If the button is illuminated, *triad* will be enabled and the 7^{th} chord tone will be omitted from the *mix* output
If the button is unilluminated, *triad* will be disabled and the 7^{th} chord tone will be included in the *mix* output

The *triad* setting will save in between power cycles

Note:
If *triad* is enabled, 3^{rd} inversion will be a root position chord transposed an octave higher.

10. V/Oct Input:
Unipolar positive volt per octave input for pitch of the root chord tone

Range = 0V – 5V

11. Waveform Indication LEDs:
Indication of the currently selected waveform

12. Waveform Knob:
Sets the waveform for all audio outputs

If the knob is far left, *waveform* will be set to *sine wave*
If the knob is far right, *waveform* will be set to *square wave*

This control smoothly morphs between all waveforms

13. Waveform Control Voltage Input:

Unipolar positive control voltage input for *waveform*

Range = 0V – 5V

14. Voicing Indication LEDs:
Indication of the currently selected voicing

15. Voicing Knob:
Determines the octave placement of each chord tone in the chord
(See **Understanding Voicings** for more information)

If the knob is far left, *voicing* will be set to *close*
If the knob is far right, *voicing* will be set to *spread*

16. Voicing Control Voltage Input:
Unipolar positive control voltage input for *voicing*

Range = 0V – 5V

17. Inversion Indication LEDs:
Indication of the currently selected inversion

18. Inversion Knob:
Determines which chord tone is the lowest sounding note
(See **Understanding Inversions** for more information)

If the knob is far left, *inversion* will be set to *root*
If the knob is far right, *inversion* will be set to *3rd*

19. Inversion Control Voltage Input:
Unipolar positive control voltage input for *inversion*

Range = 0V – 5V

20. Quality Indication LEDs:
Indication of the currently selected chord quality

21. Quality Knob:
Sets the intervallic relationship between each chord tone
(See **Understanding Chord Qualities** for more information)

If the knob is far left, *quality* will be set to *maj 7*
If the knob is far right, *quality* will be set to *half dim*

22. Quality Control Voltage Input:
Unipolar positive control voltage input for *quality*

Range = 0V – 5V

Understanding Triads and Seventh Chords

In tonal harmony, a musical scale consists of seven notes.
These notes act as the building blocks of any chord that exists within the given scale.
Any chord that exists within the scale is known as a diatonic chord.
Chords formed from other scales that start on the same root note are known as modal interchange chords.
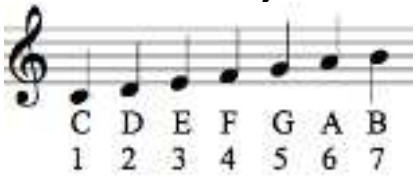
A chord is a combination of three or more notes.
A triad is a chord with three notes that are stacked in thirds from the lowest note to the highest note.
A seventh chord is a chord with four notes that are stacked in thirds from the lowest note to the highest note.

A root note is the foundation on which a chord is built.
In a C Major triad, the root note is C.
In a C Major 7 chord, the root note is C.

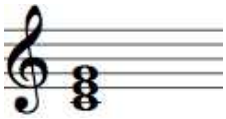
The 3rd of a chord is the third note above the root note within the scale.
The 5th of a chord is the fifth note above the root note within the scale.
The 7th of a chord is the seventh note above the root note within the scale.
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All triads consist of a root note, a 3rd, and a 5th.
All seventh chords consist of a root note, a 3rd, a 5th, and a 7th.

Example:

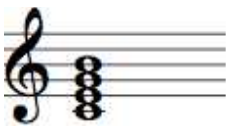
Here is the C Major Scale:



A C Major triad can be built by stacking a 3rd and a 5th on top of the root note, C:
C E G



Similarly, a C Major 7 chord can be built by stacking a 3rd, a 5th, and a 7th, on top of the root note, C:
C E G B
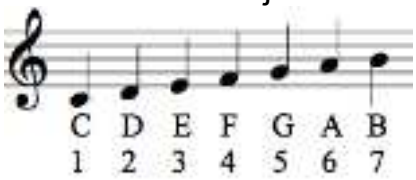


Understanding Chord Qualities

Chord quality is defined by the specific interval of the 3rd, 5th, and 7th in relation to the root note.
The lowering of specific notes by a semitone is required when building different chord qualities.

Example:

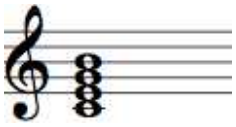
Here is the C Major Scale:



C Major 7:

A simple stacking of thirds is all that is needed:
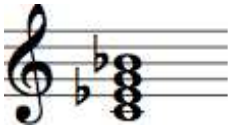
C E G B



C Minor 7:

The 3rd and the 7th must be lowered by a semitone:

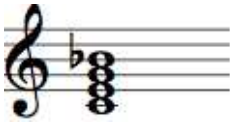
C Eb G Bb



C Dominant 7:

The 7th must be lowered by a semitone:

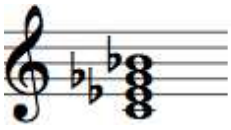
C E G Bb



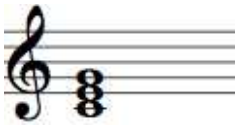
C Half Diminished:

The 3rd, 5th, and 7th must be lowered by a semitone:

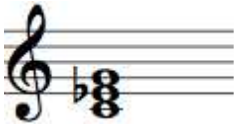
C Eb Gb Bb



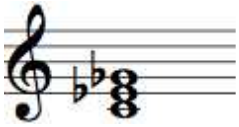
C Major Triad:
A simple stacking of thirds is all that is needed:
C E G



C Minor Triad:
The 3rd must be lowered by a semitone:
C Eb G



C Diminished:
The 3rd and 5th must be lowered by a semitone:
C Eb Gb



Understanding Inversions

A chord is in root position when the root note is the lowest sounding note in the chord.
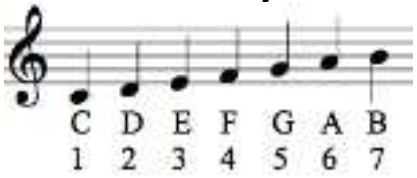
A chord is in first inversion when the 3rd is the lowest sounding note in the chord.

A chord is in second inversion when the 5th is the lowest sounding note in the chord.

A chord is in third inversion when the 7th is the lowest sounding note in the chord.

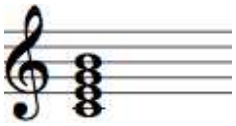
Example:

Here is the C Major Scale:



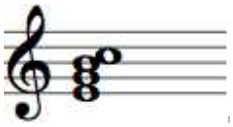
Root Position C Major 7:

C E G B



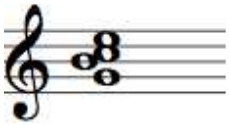
1st Inversion C Major 7:

E G B C



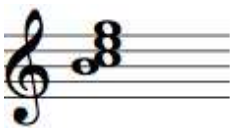
2nd Inversion C Major 7:

G B C E

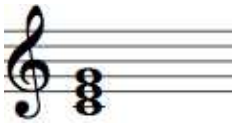


3rd Inversion C Major 7:

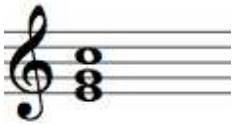
B C E G



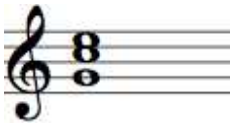
Root Position C Major Triad:
C E G



1st Inversion C Major Triad:
E G C



2nd Inversion C Major Triad:
G C E



Note:
The root is not always the lowest sounding note.
A triad cannot be in third inversion because it does not have a 7th in the chord.

Understanding Voicings

A chord voicing determines the octave placement of each chord tone in the chord.

Close Voicing is when each note is as close to each other as possible.
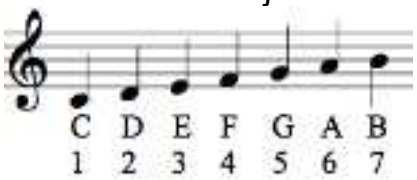
Drop 2 Voicing is when the second highest note moves downward by an octave.

Drop 3 Voicing is when the third highest note moves downward by an octave.

Spread Voicing is when the lowest note moves downward by an octave and the highest note moves upward by an octave.

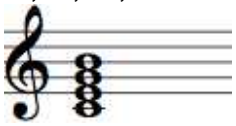
Example:

Here is the C Major Scale:



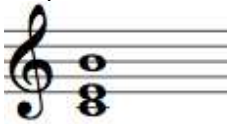
C Major 7 Close Voicing:

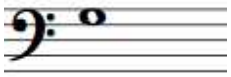
C, E, G, B



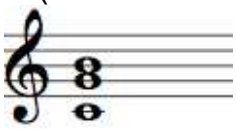
C Major 7 Drop 2 Voicing:

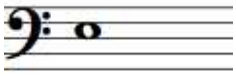
G (down an octave), C, E, B



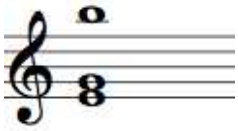


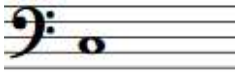
C Major 7 Drop 3 Voicing:
E (down an octave), C, G, B





C Major 7 Spread Voicing:
C (down an octave), E, G, B (up an octave)





Note:
This example is for root position only.
The same rules apply when using inversions.
For example, the second highest sounding note will always move down an octave when using the Drop 2 Voicing, regardless of the inversion.

Understanding Harmonization

When *harmonization* is enabled, the Chord will automatically harmonize diatonic and modal interchange chords of the Major scale based on the voltage present at *v/oct*. The Chord will treat the voltage present at *v/oct* as a bassline.

Here are the chord qualities that will be selected based on the specified *v/oct* values:

V/Oct Voltage		Quality	Relationship to Scale
0V	=	Major 7	(Diatonic)
0.08V	=	Major 7	(Modal Interchange)
0.17V	=	Minor 7	(Diatonic)
0.25V	=	Major 7	(Modal Interchange)
0.33V	=	Minor 7	(Diatonic)
0.42V	=	Major 7	(Diatonic)
0.50V	=	Dominant 7	(Modal Interchange)
0.58V	=	Dominant 7	(Diatonic)
0.67V	=	Major 7	(Modal Interchange)
0.75V	=	Minor 7	(Diatonic)
0.83V	=	Dominant 7	(Modal Interchange)
0.92V	=	Half Diminished	(Diatonic)

This repeats for 1V – 5V.

Example:

1.08V = Major 7
4.92V = Half Diminished

Note:
The starting pitch will be the frequency defined by the coarse pitch knob.