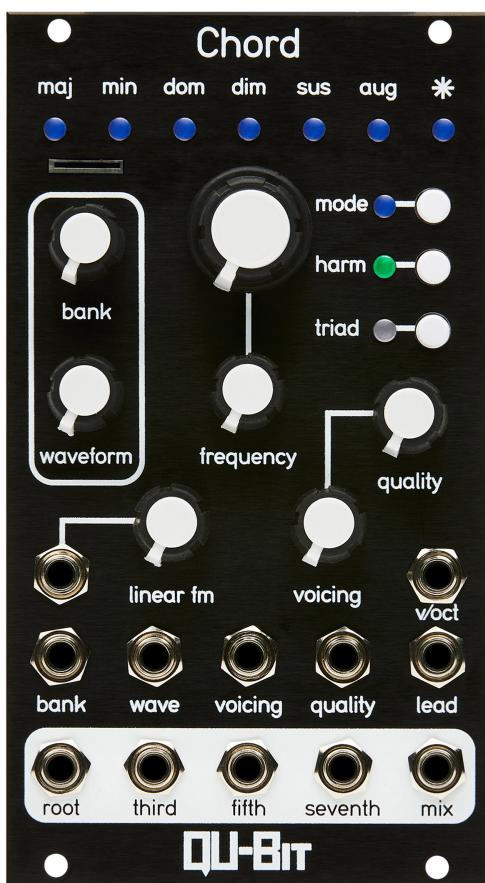


# Chord



# Contents

<b>Description</b>	<b>4</b>
<b>Specifications</b>	<b>5</b>
<b>Installation</b>	<b>6</b>
<b>Marked Diagram</b>	<b>7</b>
<b>Functional Overview</b>	<b>8</b>
1. Frequency . . . . .	8
1a. Coarse Tune . . . . .	8
1b. Fine Tune . . . . .	8
2. Bank . . . . .	8
Factory Banks . . . . .	8
3. Waveform . . . . .	9
4. Linear FM . . . . .	9
5. Voicing . . . . .	9
6. Quality . . . . .	9
7. Mode . . . . .	10
Melody Mode . . . . .	10
Free Poly Mode . . . . .	10
Unison Poly Mode . . . . .	10
8. Harm . . . . .	11
Normal and Melody Mode . . . . .	11
Poly Modes . . . . .	11
9. Triad . . . . .	11
10. V/Oct . . . . .	12
11. Lead . . . . .	12
12. Root . . . . .	12
13. Third . . . . .	12
14. Fifth . . . . .	12
15. Seventh . . . . .	12
16. Mix . . . . .	12
<b>Edit Functions</b>	<b>13</b>
Accessing User Chords . . . . .	13
Creating User Chords . . . . .	13

Creating User Chords on the SD Card . . . . .	13
Creating User Chords on the Chord . . . . .	14
Accessing User Wavetables . . . . .	14
<b>SD Card Information</b>	<b>15</b>
chord_config.txt . . . . .	15
QUANTIZE_AUTOHARM . . . . .	15
LONGFORM_USERBANK . . . . .	15
LFO_MODE . . . . .	15
LEAD_OFFSET . . . . .	16
Custom Chords . . . . .	16
Example . . . . .	16
User Wavetable Creation . . . . .	16
<b>Calibration</b>	<b>17</b>
<b>Appendix</b>	<b>18</b>
Voicings Table . . . . .	18
Quality Table . . . . .	20

## Description

Polyphony is back!

Chord v2 is a plug and play solution for bringing musical polyphony to your system. It contains four oscillator voices, a multitude of waveforms, and intelligent tuning functionality. This new version features an expanded sonic palette and feature set in half the size of the original.

It features three primary modes of operation: Chord, Free Running, and Unison. These three modes allow the oscillators to be tuned as diatonic chords, run independently of each other, or be tuned to the same internal frequency for external v/oct sequencing through independent CV inputs.

The timbral possibilities of the Chord v2 bring its polyphonic tones to life. The module ships with eight banks of waveforms encompassing traditional shapes, vocal synthesis, organ emulation, and chiptune sounds. You can also load custom wavetables using the SD card slot on the front panel.

From harmonic drones to Switched On Bach, the Chord v2 is an unparalleled addition to any Eurorack modular.

- Polyphonic oscillator
- Intelligent tuning system
- Independent output per voice + mix output(5 in total)
- Eight banks of waveforms
- SD card included
- Wavetables compatible with WaveEdit software by Synthesis Technology

Changes from v1:

- Half the size! 14HP down from 28HP
- Eight banks of waveforms
- Full polyphonic mode
- Harmonize in minor mode
- Custom wavetable compatibility
- Expanded chord types
- Improved synthesis engine

## **Specifications**

Depth: 23mm

Width: 14HP

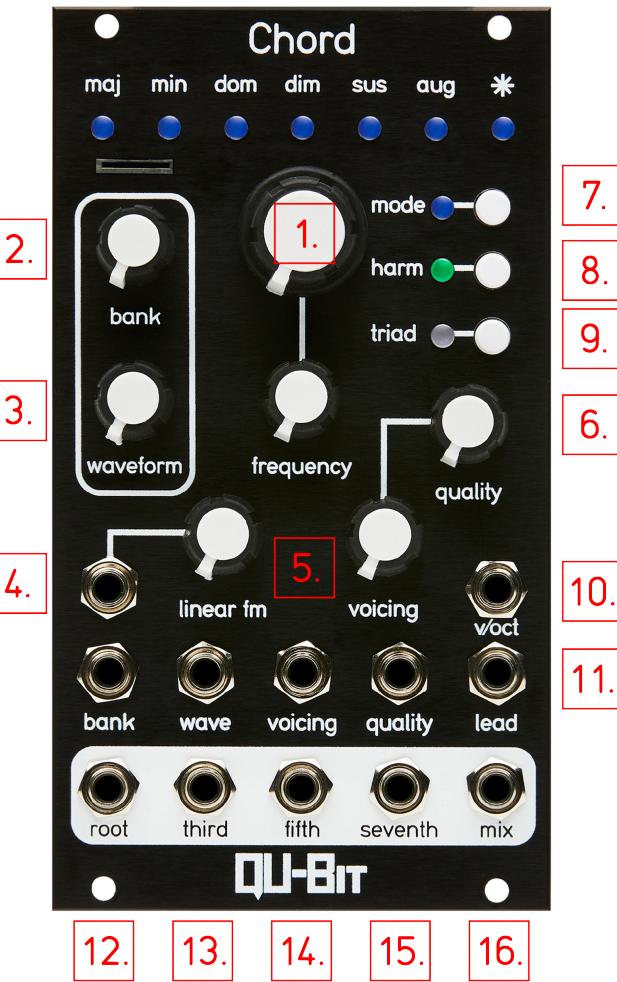
Current Consumption:

- +12V: 122mA
- -12V: 25mA

## **Installation**

To install, locate 14HP 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 module with the red band facing the bottom of the module

## Marked Diagram



# Functional Overview

## 1. Frequency

Controls the frequency of the root note of the chord.

### 1a. Coarse Tune

7 Octaves of range

### 1b. Fine Tune

+/- a perfect fourth from center.

## 2. Bank

Controls which bank of wavetables is selected.

When the knob is turned, the LED bar at the top will indicate which bank is currently selected for 750ms in white.

When the first bank is selected the LEDs will be dark,

When the last bank is selected the Asterick LED will be white.

When custom wavetables are being used, the LED bar will be backlit with a dim white.

CV Range: -5V to +5V.

CV is added to current knob position.

## Factory Banks

1. Bandlimited Traditional Waveforms (Synthesized)
2. SawTooth through a Low Pass Filter (Synthesized)
3. FM (Wavetables)
4. Distorted (Wavetables)
5. Voice (Wavetables)
6. Square with Pulse Width control (Synthesized)
7. Video Game (Wavetables)
8. Organ (Wavetables)

Internal Wavetable Banks were created from the AKWF waveforms available at:

AKWF - Github

For more information on creating, and loading additional waveform banks see User Wavetables section below.

### **3. Waveform**

Controls the selected waveform within the current bank.

Waveforms are blended smoothly into each other.

Synthesized banks are rendered internally, and the Wave Knob/CV adjusts a parameter.

Wavetable banks are smoothly interpolated between to create smooth transitions between unique tables.

CV Range: -5V to +5V.

CV is added to current knob position.

### **4. Linear FM**

FM input with Attenuator

### **5. Voicing**

Controls the inversion, and voicing of the chord. Adjusting the octave distances between the different notes in the chord.

See Appendix 1 for a list of all voicings.

CV Range: -5V to +5V.

CV is added to current knob position.

### **6. Quality**

Controls the quality of the chord, setting the relationship between each of the third, fifth, and seventh outputs in relation to the root.

See Appendix 2 for a list of all voicings.

CV Range: -5V to +5V.

CV is added to current knob position.

## 7. Mode

Controls the behavior of the Lead input Jack.

When the LED is off the Lead Jack is disabled.

When the LED is blue Melody mode is selected. The Seventh Output becomes a separately controllable voice.

When the LED is green Free Poly Mode is selected. All four voices are fully independent.

When the LED is teal Unison Poly Mode is selected. All four notes are tuned together, but each has their own V/oct input.

### Melody Mode

When in Melody Mode, the lead jack controls the frequency of the seventh output.

The seventh output will be tuned to the same note as the fundamental frequency before any 1V/Octave input.

This allows for sequencing of an independent melodic sequence over a chord progression.

The inversions are still applied to the seventh output as if it were the seventh of the chord.

### Free Poly Mode

When in Free Poly Mode the following changes are applied to the controls.

The Coarse knob and V/Oct CV control the Root frequency.

The Fine knob and Lead CV control the third.

The Voicing Knob and CV control the fifth.

The Quality Knob and CV control the Seventh.

### Unison Poly Mode

When in Unison Poly Mode all four oscillators are tuned together, and can be adjusted with the Coarse and Fine Frequency knobs.

The V/Oct input will control the root output.

The Lead input will control the third output.

The Voicing input will control the fifth output.

The Quality input will control the seventh output.

## 8. Harm

Controls the Auto-Harmonization, and Quantization settings.

This will quantize the input V/Oct to the selected Harm mode's scale, and automatically adjust the chord quality to stay within the key.

### **Normal and Melody Mode**

When the LED is off Auto-harm is disabled, and no quantization is done to the V/oct and Lead inputs.

When the LED is blue Auto-harm is Major. Both the V/Oct and Lead input will be quantized to the major scale.

When the LED is green Auto-harm is Minor. Both the V/Oct and Lead inputs will be quantized to the minor scale.

*It's worth mentioning that the minor scale includes a dominant fifth instead of a minor fifth.*

### **Poly Modes**

When the LED is Blue all voices will be quantized to Major.

When the LED is Green all voices will be quantized to Minor.

When the LED is Teal all voices will be quantized to Chromatic.

When the LED is off all voices are unquantized.

## 9. Triad

Changes the signal present at the Mix output.

When the LED is off, all four outputs are mixed into the Mix output.

When the LED is blue, the seventh is omitted from the mix, and the amplitude is increased to compensate.

This is especially useful when using the Lead jack to create a melody separate from the chord progression.

## **10. V/Oct**

0V to 5V input for adjusting the root of the chord.

## **11. Lead**

0V to 5V input that depends on the Mode setting.

## **12. Root**

Audio output of the root of the Chord.

## **13. Third**

Audio output of the third of the Chord.

## **14. Fifth**

Audio output of the fifth of the Chord.

## **15. Seventh**

Audio output of the seventh of the Chord.

## **16. Mix**

Mix of Chord tones based on the Triad Control.

## Edit Functions

### Accessing User Chords

User chords are stored on the SD card. The bank will be filled with empty chords if no SD card is inserted.

To access user chords, hold the Harm button for 3 seconds.

This will disable any auto-harmonization, and the Harm LED will illuminate white.

Quality will select from one of twelve user chords.

Pressing this button again will exit custom chord usage.

**An SD Card is required for the storing/loading of custom chords between power cycles.**

### Creating User Chords

User chords can be created in two ways.

When a chord is saved the Maj/Min LEDS will blink to indicate whether the write was successful or not.

The LEDs will blink Green if the write succeeded.

The LEDs will blink Red if the write failed.

If writing fails multiple times in a row, the SD card most likely needs to be reinitialized by rebooting the module.

### Creating User Chords on the SD Card

Custom chords can be edited on the SD Card

The chord is defined first by the prefix "CHORD\_" Followed by a number 1-12

After that, a comma-separated list of semitone offsets can be used to specify the chord.

Since the root output will always be the root. Only the third, fifth, and seventh are specified.

Here are a few examples where CHORD\_1 is Major, CHORD\_2 is Minor, CHORD\_3 is Dominant, and CHORD\_4 is a Tone Cluster.

CHORD\_1=4,7,11

CHORD\_2=3,7,10  
CHORD\_3=4,7,10  
CHORD\_4=0.2,0.4,0.6

### **Creating User Chords on the Chord**

To create a new chord, first access user chords, and select the chord you want to replace.

Then hold the Harm button, and press the Mode button. This will enter the chord editor for the selected chord.

The Mode LED will begin to blink white.

V/Oct and Lead will be disabled while editing chords.

The Coarse knob will adjust the fundamental (root note) so the chord can be heard at different pitches while editing.

The Fine knob will control the note that will output from the Third jack.

The Voicing knob will control the note that will output from the Fifth jack.

The Quality knob will control the note that will output from the Seventh jack.

All chord tones can be set to any note between the root, and two octaves above the root.

Pressing the Triad button will control whether the chord tones are quantized to semitones or not. It will be illuminated white when the chord tones are quantized. This setting is unique for each chord.

Chords are stored on an SD card if an SD card is present.

To save the chord, and exit the menu press the mode button.

### **Accessing User Wavetables**

Hold Mode button for three seconds to switch between factory and user wavetables.

When user wavetables are selected, the inactive quality LEDs will be a dim white, instead of off.

The Chord will automatically load a .WAV file from the SD Card if it can find one (if there are more than one, only one will be loaded).

For extra fun, try just dropping in a song, or a sample. There are some cool results.

## **SD Card Information**

### **chord\_config.txt**

A number of additional settings can be configured by editing the config.txt file on your SD card.

Here are the available options.

- QUANTIZE\_AUTOHARM
- LONGFORM\_USERBANK
- LFO\_MODE
- LEAD\_OFFSET

#### **QUANTIZE\_AUTOHARM**

When enabled, this quantizes the V/Oct and Lead inputs to the appropriate scales when Harm is enabled.

When disabled auto-harm modes are not quantized, and the modal interchange chords are included.

This is similar to the V1 Chord.

Default Value: 1

#### **LONGFORM\_USERBANK**

When enabled a single-file custom bank of waveforms will be a single bank of 64 waveforms instead of 8 banks of 8 waveforms.

Default Value: 0

#### **LFO\_MODE**

When enabled, the frequency of the chord is reduced below the audible spectrum. This allows the chord to function as four LFOs

The new frequency range is 6 octaves lower than the normal range.

With voicing all the way down the root output will range from 4 seconds to 60Hz

All other voices are related.

Default Value: 0

### **LEAD\_OFFSET**

This value is an offset in octaves for the lead input.

Value can be positive or negative.

Setting this to 1 will set the default lead input to 1 octave above the root output.

Setting this to -1 will set the default lead input to 1 octave below the root input.

Default Value: 0

### **Custom Chords**

Custom chords are loaded/stored on the SD card as well.

See the dedicated section in the manual above for more information on preparing these.

### **Example**

This example will:

- Disable autoharm quantization.
- Set the custom waveforms to be loaded as a single, large bank.
- Sets custom chord 1 to a major seven chord.
- Sets custom chord 2 to a minor seven chord.
- Sets custom chord 3 to a tone cluster close to the root.

```
QUANTIZE_AUTOHARM=0  
LONGFORM_USERBANK=1  
CHORD_1=4,7,11  
CHORD_2=3,7,10  
CHORD_3=0.2,0.4,0.6
```

### **User Wavetable Creation**

User wavetables can be loaded from a single .wav file.

Each wavetable should be mono, 256 samples long, with 64 total waveforms. This makes the entire .wav file 32kB.

User wavetables can be created using the Synthesis Technologies WaveEdit software.

Each .WAV file will be loaded as 8 banks of 8 waveforms.

A config setting in the config.txt file can be changed to map all 64 waveforms to the waveform knob, 8 WAV files can be loaded this way.

No naming convention necessary, but the chord will only load the first .wav file it finds.

## Calibration

The module arrives calibrated using precise test equipment, however there are use cases where a different input standard is desired.

To enter the calibration mode make sure that no CV inputs are inserted into the module, and hold the Triad button for 3 seconds.

The Major LED will become illuminated Red.

When Maj is RED use V/oct jack.

When Min is RED use Lead jack.

When Dom is RED use Voicing jack.

When Dim is RED use Quality jack.

The process is repeated for each of the 1V/octave inputs.

For 1V/Octave:

Insert +1V into the V/Oct jack, and press Triad. The Asterick LED will illuminate.

Increase voltage to +3V, and press Triad. The next LED will illuminate.

Remove voltage from V/Oct, insert +1V into next jack, and repeat.

For other voltage standards, use the voltage for 1 octave above the root, and 3 octaves above the root instead of +1V and +3V.

For example, to calibrate this to be compatible with Buchla modules use +1.2V and +3.6V

# Appendix

## Voicings Table

Here are the available voicings on the knob:

Voicing Index	Voicing Name	Root Factor	Third Factor	Fifth Factor	Seventh Factor
1	Closed	1.0	1.0	1.0	1.0
2	Drop 2 Root Position	1.0	0.5	1.0	1.0
3	Drop 3 Root Position	1.0	1.0	0.5	1.0
4	First Inversion	2.0	1.0	1.0	1.0
5	Drop 3 First Inversion	2.0	1.0	0.5	1.0
6	Drop 4 First Inversion	2.0	1.0	1.0	0.5
7	Drop 4 Second Inversion	2.0	2.0	1.0	0.5
8	Second Inversion	2.0	2.0	1.0	1.0
9	Raise 2 Root Position	1.0	2.0	1.0	1.0
10	Raise 2/3 Root Position	1.0	2.0	2.0	1.0
11	Raise 2/3 First Inversion	2.0	1.0	2.0	1.0
12	Third Inversion	2.0	2.0	2.0	1.0
13	Spread	0.5	1.0	1.0	2.0
14	Spread First Inversion	4.0	0.5	1.0	1.0

Voicing Index	Voicing Name	Root Factor	Third Factor	Fifth Factor	Seventh Factor
15	Spread Second Inversion	2.0	4.0	0.5	1.0
16	Spread Third Inversion	2.0	2.0	4.0	0.5
17	Big Spread Energy	0.5	1.0	2.0	4.0

## Quality Table

The list of available qualities, and their indications are listed below.

Quality	Third	Fifth	Seventh
Major 7	Major 3rd (+4 semitones)	Perfect 5th (+ 7 semitones)	Major 7th (+11 semitones)
Minor 7	Minor 3rd (+3 semitones)	Perfect 5th (+ 7 semitones)	Minor 7th (+10 semitones)
Dominant 7	Major 3rd (+4 semitones)	Perfect 5th (+ 7 semitones)	Minor 7th (+10 semitones)
Half Diminished (-7b5)	Minor 3rd (+3 semitones)	Diminished 5th (+ 6 semitones)	Minor 7th (+10 semitones)
Diminished	Minor 3rd (+4 semitones)	Diminished 5th (+ 6 semitones)	Double Flat 7th (+9 semitones)
Sus 2 Major 7	Major 2nd (+2 semitones)	Perfect 5th (+ 7 semitones)	Major 7th (+11 semitones)
Sus 4 Minor 7	Perfect 4th (+5 semitones)	Perfect 5th (+ 7 semitones)	Minor 7th (+10 semitones)
Augmented 7	Major 3rd (+4 semitones)	Augmented 5th (+ 8 semitones)	Minor 7th (+10 semitones)