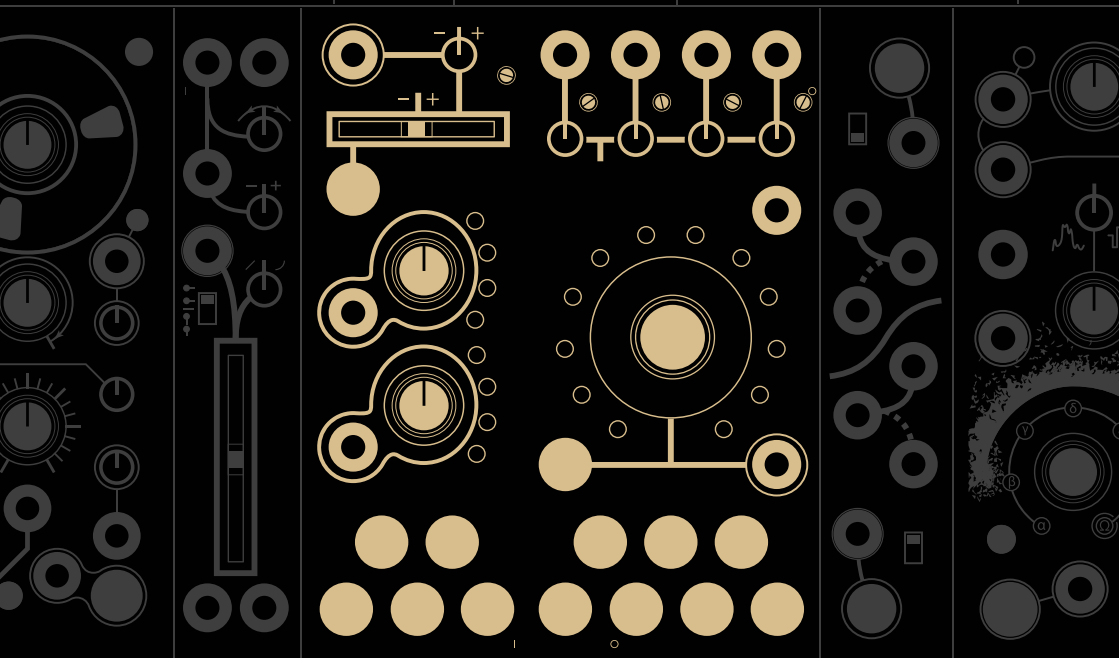
INSTRUŌ | SPECIALIST SYNTHESIZERS



harmonàig

Diatonic Harmonic Quantiser

User Manual

Contents

Description

The **harmonàig** is a four voice voltage quantiser designed with intuitive harmonic capabilities. It brings the possibility of composing and performing chord progressions, and harmonising in a polyphonic manner, to what is traditionally a monophonic instrument.

No deep understanding of music theory is needed!
Quickly sweep through modalities and chord voicings on-the-fly, and explore a vast array of harmonic tones and colours. Explore practical music theory in a familiar context and build your relationship with tonalities that suit your own personal style.

The modal music system is used by the **harmonàig** to allow immediate exploration of musical tonalities whilst keeping everything diatonically relevant. Built in modal harmonisations give extensive foundations for a wide spectrum of tonalities. With additional capabilities for user defined chord voicings and note clusters, the creative options are endless.

In practice, users can experiment with chordal composition as quickly as they would a monophonic bass or lead line. All that's needed are a few more oscillators!

Features

- CV input with built in attenuverter
- Individual CV outputs for up to four chord tones
- Slew controls for each CV output
- Transposition functionality
- Intuitive harmonisation and voice leading capabilities
- Modal and harmonic minor scale presets
- Four custom chord slots
- Large horizontal keyboard interface

Installation

1. Confirm that the Eurorack synthesizer system is powered off.
2. Locate 18 HP of space in your Eurorack synthesizer case.
3. Connect the 10 pin side of the IDC power cable to the 2x5 pin header on the back of the module, confirming that the red stripe on the power cable is connected to -12V.
4. Connect the 16 pin side of the IDC power cable to the 2x8 pin header on your Eurorack power supply, confirming that the red stripe on the power cable is connected to -12V.
5. Mount the Instruō **harmonàig** in your Eurorack synthesizer case.
6. Power your Eurorack synthesizer system on.

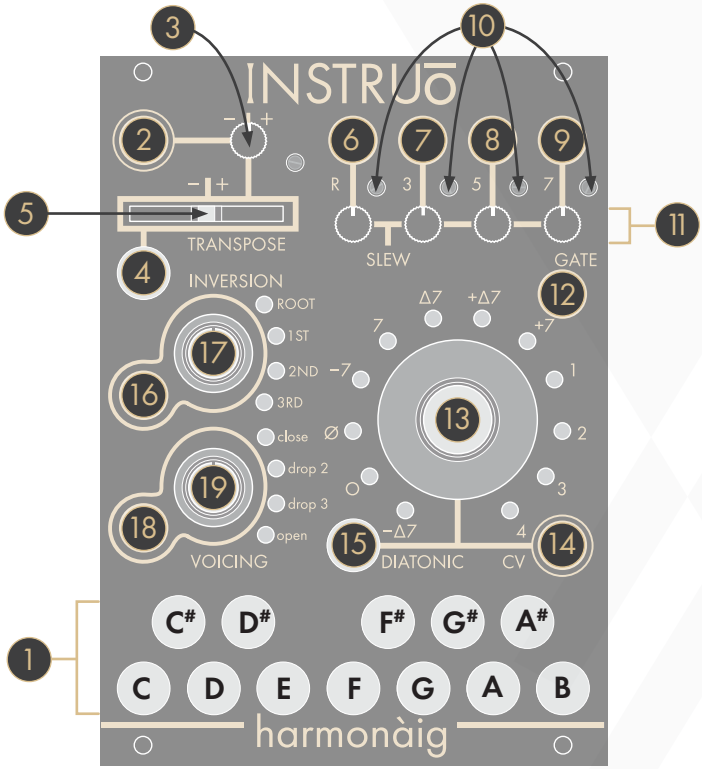
Note:

This module has reverse polarity protection.
Inverted installation of the power cable will not damage the module.

Specifications

- Width: 18 HP
- Depth: 27mm
- +12V: 120mA
- -12V: 20mA

harmonàig | ˈhaːməni | noun (musical tone) an overtone accompanying a fundamental tone at a fixed interval, the combination of simultaneously sounded musical notes to produce a pleasing effect



Key

1. Keybord Buttons
2. CV Input
3. CV Attenuverter
4. Transpose Button
5. Transpose
6. R CV Output
7. 3 CV Output
8. 5 CV Ouput
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10. Calibration Trimmers
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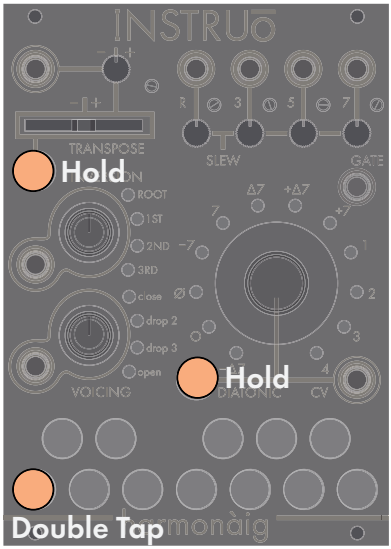
Tuning

The **harmonàig** can be set **Unison Mode** to easily tune all of the controlled oscillators. This disables the harmonisation functionality so that **R CV Output**, **3 CV Output**, **5 CV Output**, and **7 CV Output** generate the same voltage.



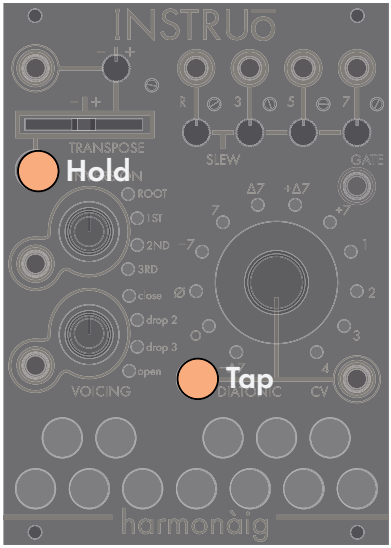
To enter **Unison Mode**, press and hold both the **Diatonic Button** and the **Transpose Button** in that order, then double tap the **C Button**. The amber illumination of the **C Button** indicates that **Unison Mode** is active.

To exit **Unison Mode**, press the illuminated **C Button**.

Calibration Trimmers: The Calibration Trimmers are used to independently scale the voltage range of each output. These are factory calibrated with precision test equipment.

Calibrate at your own risk.

Global Modes



To switch between **Quantiser Mode** and **Performance Mode**, press and hold the **Transpose Button** and then tap the **Diatonic Button**.

Inversion, **Voicing**, **Chord Quality**, and **Transpose** controls are available in both modes.

Quantiser Mode: The default behavior of the **harmonàig** is as a harmonising quantiser. In **Quantiser Mode**, a single control voltage signal present at the **CV Input** will be quantised and output from the **R CV Output**. The control voltage is then duplicated and offset at calibrated intervals and generated from the **3 CV Output**, **5 CV Output**, and **7 CV Output**. The offsets are dependent on the **Chord Quality**, **Inversion**, **Voicing**, and **Transpose** parameters and vary on a per output basis.

Performance Mode: The secondary behavior of the **harmonàig** is as a harmonising performance keyboard. In **Performance Mode**, the **Keyboard Buttons** become a playable interface. Each button corresponds to a different root voltage. When a voltage is active, the corresponding button will be illuminated. The **CV Outputs** are dependent on the **Chord Quality**, **Inversion**, **Voicing**, and **Transpose** parameters and vary on a per output basis. The gate output will be high as long as a voltage is held.

Pitch Control

Keyboard Buttons: The **Keyboard Buttons** will enable and disable chromatic voltages available in the desired quantised scale.

- We will refer to the **Keyboard Buttons** as the **C**, **C#/D♭**, **D**, **D#/E♭**, **E**, **F**, **F#/G♭**, **G**, **G#/A♭**, **A**, **A#/B♭**, and **B Buttons**.
- Currently active voltages will be illuminated white.
- Enabled voltages are illuminated amber.
- Disabled voltages are unilluminated.

CV Input: The **CV Input** is a bipolar control voltage input for the quantiser.

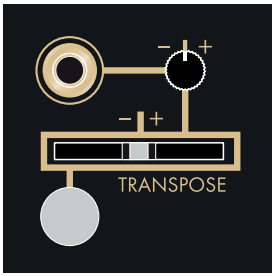
- Control voltage present at the **CV Input** will be quantised and harmonised at the **R CV Output**, **3 CV Output**, **5 CV Output**, and **7 CV Output**.
- Input Range: -/+10V (20 octaves).

CV Attenuverter: The **CV Attenuverter** scales and inverts the signal present at the **CV Input** before it is quantised.

Transposition

Transpose Button: The **Transpose Button** will cycle through three **Transpose** fader control settings.

- If the **Transpose Button** is unilluminated, the **Transpose** fader is disabled.
- If the **Transpose Button** is illuminated amber, **Quantised Offset Mode** is selected.
- If the **Transpose Button** is illuminated soft white, **Global Quantised Offset Mode** is selected.
- If the **Transpose Button** is illuminated white, **Global Fine Tune Mode** is selected.



Transpose: If the **Transpose** parameter is disabled, the **Transpose** fader will not function.

Quantised Offset Mode: When engaged, the **Transpose** fader can shift through a quantised -/+2V range (four octaves) of the selected voltages.

- The value set by the **Transpose** fader sums with the signal present at the **CV Input**.

Global Quantised Offset Mode: When selected, the **Transpose** fader will globally offset the quantised voltages between a -/+2V range (four octaves).

- The offset shifts in semitones and affects all four **CV Outputs** simultaneously.
- This mode allows for a global re-tuning to an entirely new tonal centre without the need of re-tuning each individual oscillator.

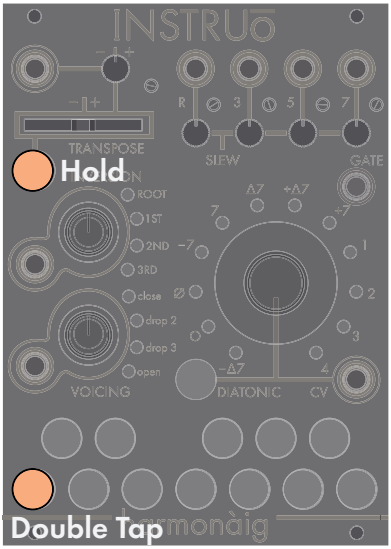
- **Global Quantised Offset Mode** will automatically time out to avoid accidental detuning.

Global Fine Tune Mode is selected, the **Transpose** fader will globally offset the quantised voltages between a -/+1V range (two octaves).

- The offset is unquantised and affects all four **CV Outputs** simultaneously.
- This mode allows for a global fine tune adjustment of the voltages.
- **Global Fine Tune Mode** will automatically time out to avoid accidental detuning.

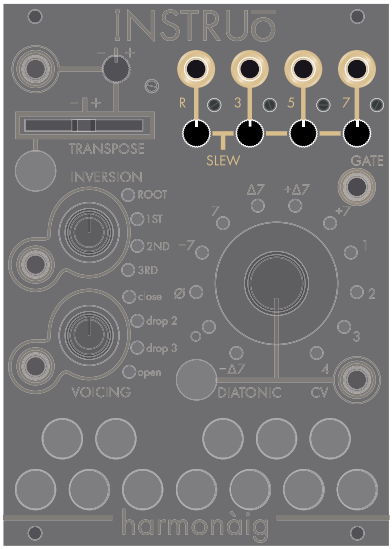
Transpose Settings: The LED of the **Transpose** fader will illuminate when the parameter is set above or below the 0V point found at the centre dent of the **Transpose** fader.

- All **Transpose** settings will be retained between power cycles.



To reset the two global **Transpose** offsets immediately, press and hold the **Transpose Button** and double tap the **C Button**.

Outputs



There are three ways to change voltages:

1. A change in voltage at the **CV Input**. The change in voltage must be enough to latch to an enabled quantised note.

2. Moving the **Transpose** fader when set to **Quantised Offset Mode**. In **Quantiser Mode** this will move -/+2 octaves within the enabled scale. In **Performance Mode,** octave jumps will be applied.

3. Pressing a **Keyboard Button** in **Performance Mode**.

R CV Output: Root chord tone output.

- Output Range: -/+10V.

3 CV Output: Third chord tone output.

- This output will generate a voltage with an interval offset defined by the **Chord Quality** parameter.
- Output Range: -/+10V.

5 CV Output: Fifth chord tone output.

- This output will generate a voltage with an interval offset defined by the **Chord Quality** parameter.
- Output Range: -/+10V.

7 CV Output: Seventh chord tone output.

- This output will generate a voltage with an interval offset defined by the **Chord Quality** parameter.
- Output Range: -/+10V.

Slew: The **Slew** knobs set the duration of time it takes for the control voltage signal to reach its final voltage level.

- This is also known as **Portamento**, **Slide**, or **Glide**.
- The **Slew** parameters individually affect their corresponding control voltage outputs.
- Turning the knob anticlockwise decreases the amount of slew applied to the control voltage. If the knob is fully anticlockwise, control voltage will be stepped.
- Turning the knob clockwise increases the amount of slew applied to the control voltage.

Gate Out: The **Gate Out** generates a pulse signal with every new voltage.

- Trigger signals are generated in **Quantiser Mode**.
- Gate signals are generated in **Performance Mode**.
- The gate signals in **Performance Mode** will be held high as long as a voltage is held.
- The **Gate Out** behaviour can be changed to trigger on key press in **Performance Mode** by deselecting all scale tones in **Quantiser Mode** before entering **Performance Mode**.
- Output voltage: +10V.
- Trigger duration: ~5ms.

Harmony

Chord Quality: The **Chord Quality** parameter designates the type of chord that is selected, raising or lowering the voltage present at at the **3 CV Output**, **5 CV Output**, and **7 CV Output**.

Turning the knob from anticlockwise to clockwise will switch through the following chord qualities:

- Minor Major 7th
- Diminished 7th
- Half Diminished (Minor 7 Flat 5)
- Minor 7th
- Dominant 7th
- Major 7th
- Augmented Major 7th
- Augmented Dominant 7th

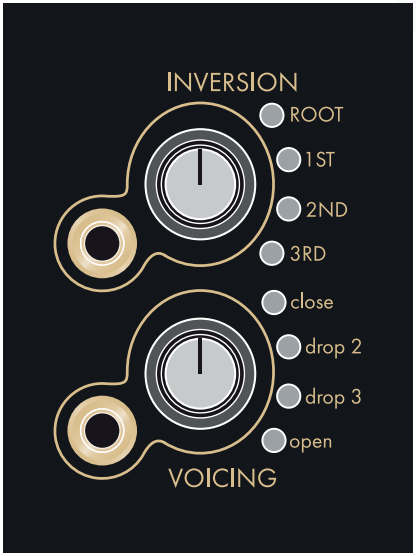
When a chord quality is selected, the corresponding LED will illuminate.

Chord Quality CV Input: The **Chord Quality CV Input** is a bipolar control voltage input for **Chord Quality**.

- Control voltage is summed with the knob position.
- Input range: 0V - 5V.

Diatonic Button: The **Diatonic Button** switches between the automatic harmonisation functionality and manual/CV control of the **Chord Quality** parameter.

- If the button is unilluminated, the **Chord Quality** parameter will ignore the **Chord Quality** knob and the **Chord Quality CV Input**. **Chord Quality** is determined by the internal modal harmonisation.
- If the button is illuminated, the **Chord Quality** parameter is directly controlled by the **Chord Quality** knob and **Chord Quality CV Input**.



Inversion: The **Inversion** parameter allows for selection between four degrees of chord inversion.

A chord inversion is a reordering of the notes within a chord. The collection of chord tones remains the same, but the order (from lowest to highest in pitch) will alter.

Turning the knob from fully anticlockwise to fully clockwise will switch through **Root Position**, **1st Inversion**, **2nd Inversion**, and **3rd Inversion**.

Inversion CV Input: The **Inversion CV Input** is a bipolar control voltage input for the **Inversion** parameter.

- Control voltage is summed with the knob position.
- Input Range: 0V - 5V.

Voicing: The **Voicing** parameter allows for selection between four available chord voicings.

- Different voicings displace notes within the chord to other octaves. The collection of chord tones remains the same, but the interval spread between them alters, changing the density of the sound.
- Turning the knob from fully anticlockwise to fully clockwise will switch through **Close Voicing**, **Drop 2 Voicing**, **Drop 3 Voicing**, and **Spread Voicing**.

Voicing CV Input: The **Voicing CV Input** is a bipolar control voltage input for the Voicing parameter.

- Control voltage is summed with the knob position.
- Input Range: 0V - 5V.

Modal Scales

The implementation of the modes in **harmonàig** allows for quick exploration of different scales and harmonic centres.

To enter the **Modal Scale Menu**, press and hold the **Transpose Button**.

- The selected modal scale indicated by the corresponding illuminated soft white **Keyboard Button**, while the other modal scale options are indicated by dimmer soft white illuminated **Keyboard Buttons**.
- Pressing the **Diatonic Button** will switch between the **Ionian Modes** and the **Harmonic Minor Modes**.
- Select a modal scale by pressing one of the **Keyboard Buttons**.
- Exit the **Modal Scale Menu** by pressing the **Transpose Button**.
- In **Quantiser Mode**, a collection of chromatic scale tones can be enabled. **harmonàig** will quantise the **R CV Output** to the closest enabled note. The **3 CV Output**, **5 CV Output** and **7 CV Output** will quantise to interval offsets that outline the selected **Chord Quality**.
- If the mode is changed while this occurs, alternate modes can be auditioned in real time.

Ionian Modes:

C Button = Ionian
D Button = Dorian
E Button = Phrygian
F Button = Lydian
G Button = Mixolydian
A Button = Aeolian
B Button = Locrian

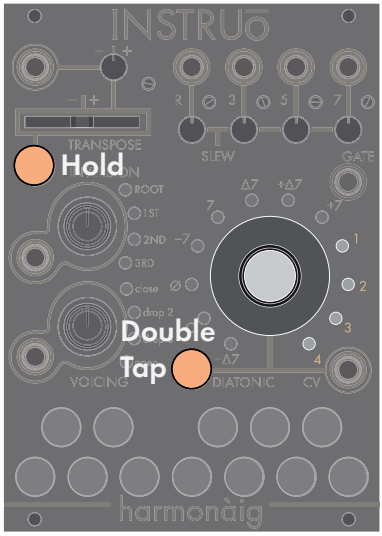
Harmonic Minor Modes:

C Button = Aeolian #7
D Button = Locrian #6
D#/E♭ Button = Ionian #5
F Button = Dorian #4
G Button = Phrygian #3
G#/A♭ Button = Lydian #2
B Button = Super Locrian

Programming Custom Chords

To program custom chords, press the **Diatonic Button** to enable manual/CV control over the **Chord Quality** parameter. Select the desired custom chord slot.

It's best to ensure there is no control voltage present at the **Chord Quality CV Input** to avoid unintended deselection of the custom chord slot.



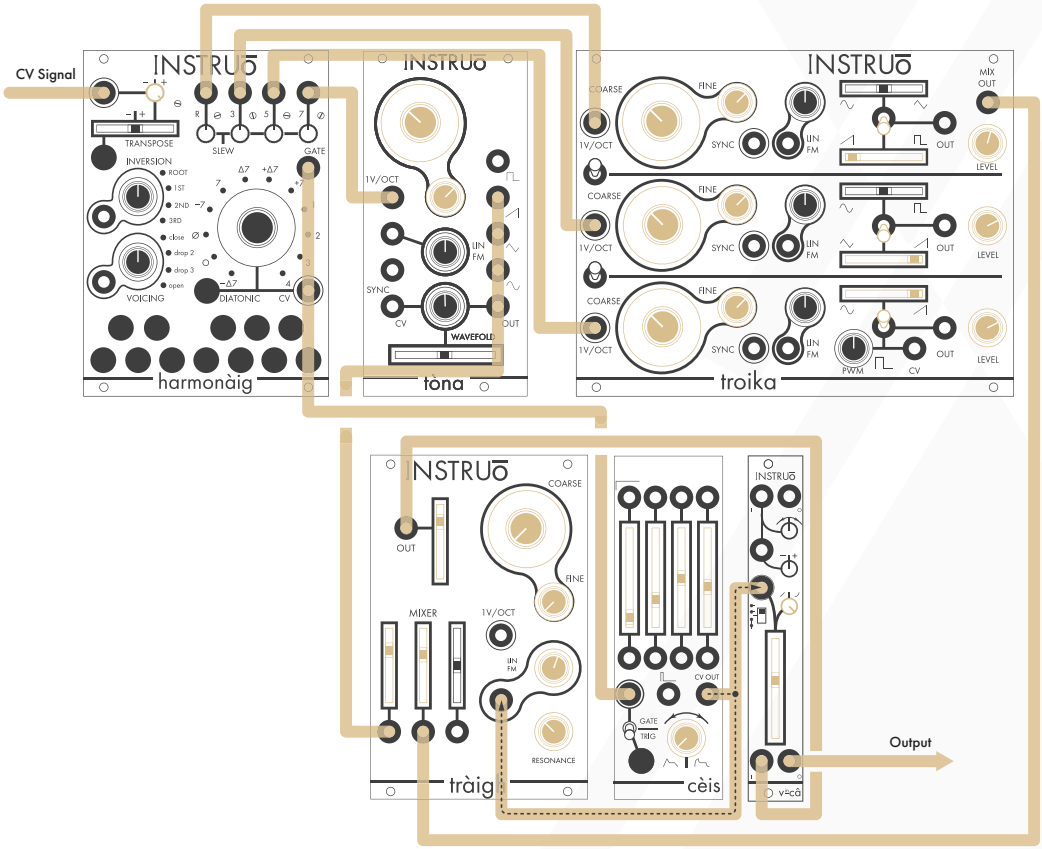
Press and hold the **Transpose Button** and double tap the **Diatonic Button**. The **Transpose Button** must remain held until the custom chord is programmed.

- Pressing **Keyboard Buttons** will select the desired voltages for the custom chord.
- The selected **Keyboard Buttons** will pulse, indicating the selected notes in the custom chord.
- To clear a note selection, multi-tap the lowest desired note until all defined notes are layered in unison. This is indicated by a single pulsing **Keyboard Button**.
- Release the **Transpose Button** and the custom chord will be saved until a new custom chord is programmed.

Patch Examples

East Coast Chords:

Summary: The incoming CV signal gets quantised and harmonised via the **harmonàig**. The **harmonàig** sends voltages to all oscillators while simultaneously triggering the envelope generator. The CV output of the envelope generator opens the filter and VCA, allowing the mixed oscillator signals to pass through. More traditional East Coast patches would incorporate separate envelope generators for the filter and VCA.



Audio Path:

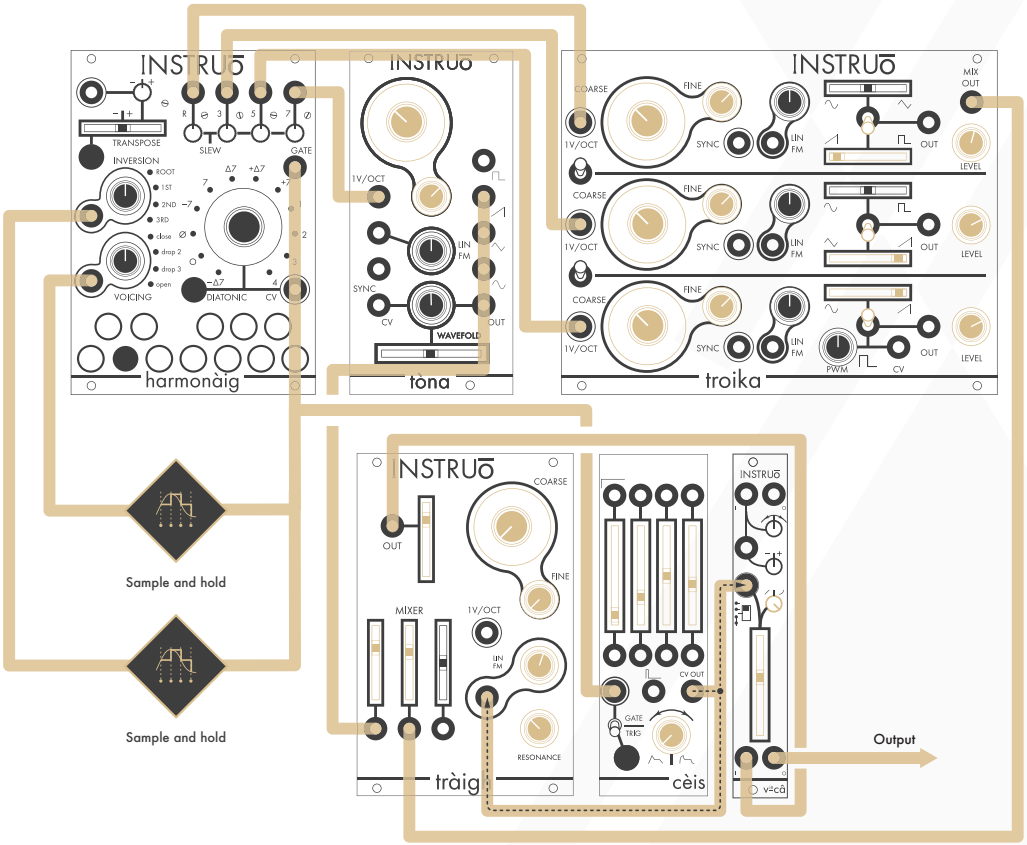
- Connect the desired waveform outputs of four separate oscillators to a mixer.
- Connect the output of the mixer to the audio input of a filter.
- Connect the audio output of the filter to the audio input of a VCA.
- Monitor the output of the VCA.
- Set the fundamental frequencies of all oscillators to unison.
- Set the individual levels of the mixer to desired positions.
- Set the cutoff frequency of the filter to a desired position.
- Set the resonance of the filter to a desired position.
- Set the level of the VCA to a desired position.

Control Path:

- Connect a CV signal, such as a sequence or random voltage, to the **CV Input** of **harmonàig** and turn the **CV Attenuverter** to a desired position.
- Connect all **CV Outputs** of **harmonàig** to the 1V/Oct inputs of all four oscillators.
- Connect the **Gate Output** of **harmonàig** to the trigger input of an envelope generator.
- Connect the CV output of the envelope generator to a multiple.
- Connect one copy of the envelope generator CV signal to the cutoff frequency CV input of the filter and set the corresponding CV attenuator to a desired position.
- Connect a second copy of the envelope generator CV signal to the CV input of VCA and set the corresponding CV attenuator to a desired position.
- Set the envelope stages to desired positions.

Western Chordal Keyboard:

Summary: The **harmonàig** sends voltages to all oscillators while simultaneously triggering the envelope generator. The CV output of the envelope generator opens the filter and VCA, allowing the mixed oscillator signals to pass through. More traditional East Coast patches would incorporate separate envelope generators for the filter and VCA. If the random voltage generators are used, pressing a **Keyboard Button** will seed new random voltages that modulate the **Inversion** and **Voicing** parameters.



Audio Path:

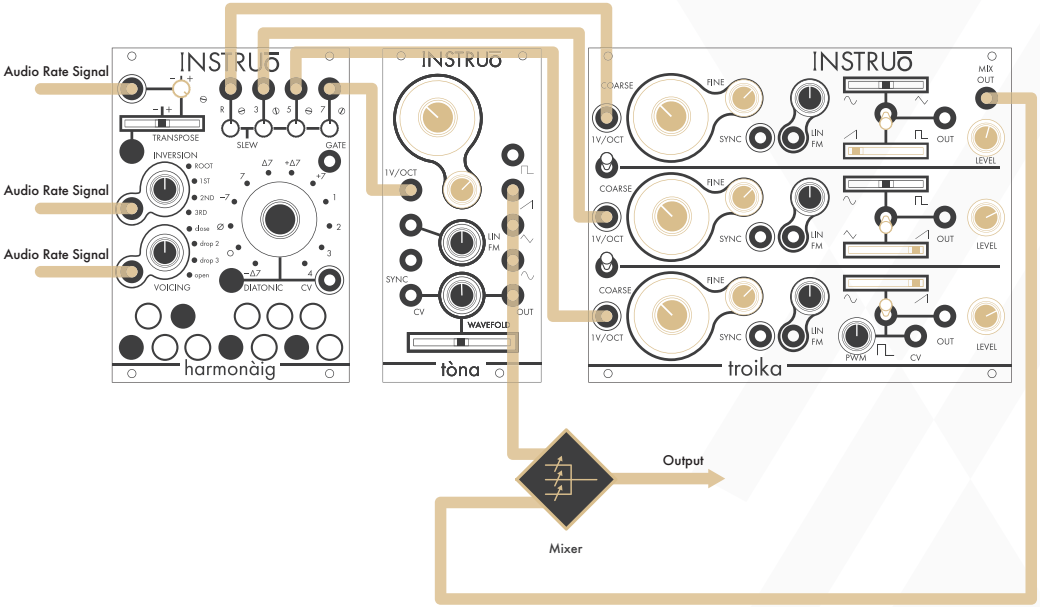
- Create an **East Coast Synth Voice** audio path.

Control Path:

- Create an **East Coast Synth Voice** control path.
- Ensure that the **Diatonic Button** is unilluminated.
- Enter **Performance Mod**e by pressing and holding the **Transpose Button** and then pressing the **Diatonic Button**.
- Pressing the **Keyboard Buttons** will change the root note and chord quality allowing for performance-based control.
- For added modulation, multiply the **Gate Output** of the **harmonàig** and connect the gate signal to the clock input of two separate random voltage generators.
- Connect the CV outputs of the random voltage generators to the **Inversion CV Input** and the **Voicing CV Input**.

Audio Rate Swarm:

Summary: The incoming audio rate signal gets quantised and harmonised via the **harmonàig**. The **harmonàig** sends voltages to all oscillators simultaneously. More modulation is added when other audio rate signals are present at the **Inversion CV Input** and the **Voicing CV Input**.



Audio Path:

- Connect the desired waveform outputs of four separate oscillators to a mixer.
- Monitor the output of the mixer.
- Set the individual levels of the mixer to desired positions.

Control Path:

- Connect an audio rate signal from a separate oscillator to the **CV Input** of **harmonàig** and turn the **CV Attenuverter** fully clockwise

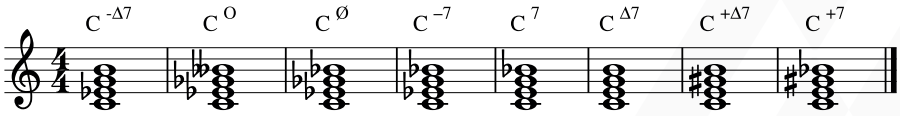
- Connect all **CV Outputs** of **harmonàig** to the 1V/Oct inputs of all four oscillators.
- Enabling and disabling the **Keyboard Buttons** will change the timbre of the sound.
- For further modulation, send different audio rate signals to the **Inversion CV Input** and **Voicing CV Input**.

Modal Music Theory and Implementation

Chord Quality: The harmonic engine behind the **harmonàig** allows for diatonic harmonisations within the Ionian modal system and the modes of the Harmonic Minor scale.

There are 8 available four part chords (7th chords) that can be derived from these scales:

- Minor Major 7th
- Full Diminished 7th
- Half Diminished (Minor 7 Flat 5)
- Minor 7th
- Dominant 7th
- Major 7th
- Augmented Major 7th
- Augmented Dominant 7th



The 7th chords are ordered in a way that progresses from most flattened chord tones to most sharpened, approximately. This order is arbitrary, but makes some sense when arranged around a single control knob. The chord tone makeup of each 7th chord is as follows:

–Δ7	Minor major 7th	Root	Min 3rd	Perfect 5th	Maj 7th
O	Diminished 7th	Root	Min 3rd	♭5	Diminished 7th
Ø	Minor 7 5	Root	Min 3rd	♭5	Min 7th
–7	Minor 7th	Root	Min 3rd	Perfect 5th	Min 7th
7	Dominant 7th	Root	Maj 7th	Perfect 5th	Min 7th
Δ7	Major 7th	Root	Maj 3rd	Perfect 5th	Maj 7th
+Δ7	Augmented Major 7th	Root	Maj 3rd	Augmented 5th	Maj 7th
+7	Augmented Dominant 7th	Root	Maj 3rd	Augmented 5th	Maj 7th

Inversion and Voicing

Inversion: An inversion is a reordering of the notes in a chord.

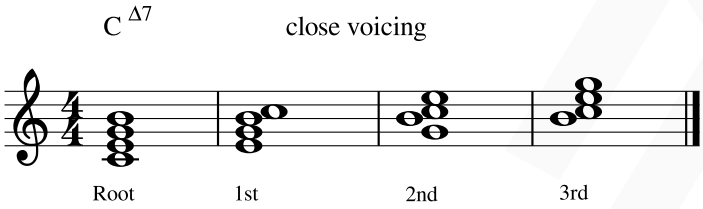
For example, a C major 7th chord contains its Root (C), a major third (E), a perfect fifth (G) and a major seventh (B).

As this chord is inverted, the lowest note in the voicing is moved up an octave.

The chord tones remain the same but the tonal character will change as the notes are reordered.

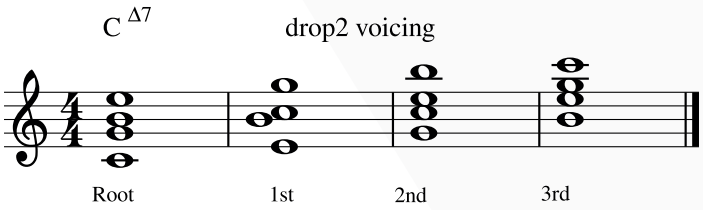
Voicing: Voicings determine how close or spread out the notes are within a chord.

The **Close Position** voicing is the most condensed voicing, where all the notes in the current chord will be within the span of an octave.

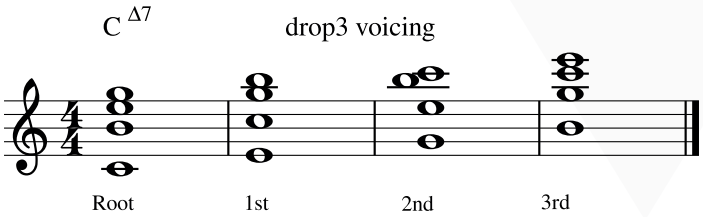


The **Drop 2** and **Drop 3** voicings may be most familiar to guitar and piano players (The voicings themselves will be familiar, although the terminology may differ). Both **Drop** voicings are derived from the **Close Position** voicing.

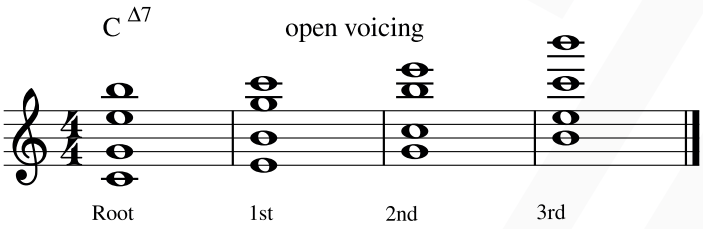
In the **Drop 2** voicing, the second highest note in the voicing is dropped down an octave.



In the **Drop 3** voicing, the third highest note is dropped down an octave.



The **Open** voicing is a variation on the **Drop 2** voicing. One other chord tone of the inversion is shifted by a further octave to add more musically relevant distance between the notes of the chord.

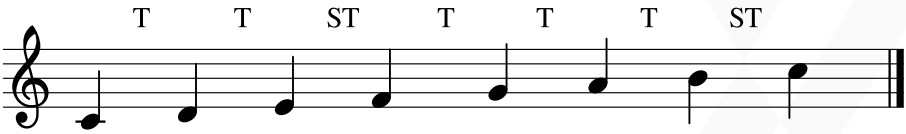


This results in more distance between the chord tones, allowing the total character of the chord to be less cluttered and dense. Compositionally, musical accompaniments will often make use of spread out voicings as they leave more 'space' for a melody.

Deriving Chords From A Scale: The following is a brief overview of how chords are derived from scales/modes, and how a scale degree defines its quality within the context of particular scales/modes.

To begin, we will consider the major scale as our starting point.
We will begin with C major as our key signature for the first example.
This keeps the scale entirely on the white keys of a keyboard.

Every scale has a formula which is determined by the pattern of note intervals between each scale degree. For the major scale/Ionian mode (and the Ionian mode series), these consist of only whole tones (T) and semitones (ST).



C Ionian uses the following notes:
C D E F G A B (C)

All white keys on a piano.

This gives the formula:
Tone, Tone, Semitone, Tone, Tone, Tone, Semitone.

Every scale degree has a chord quality to match.
The chord tones that build each scale degree's chord can be found by simply stacking scale degrees skipping one between each chord tone.

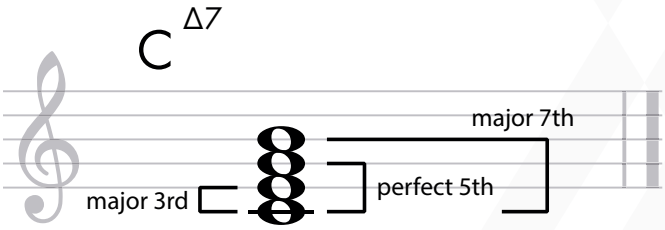
The scale degrees for C Ionian are as follows:

1st	2nd	3rd	4th	5th	6th	7th	8th / 1st
C	D	E	F	G	A	B	C

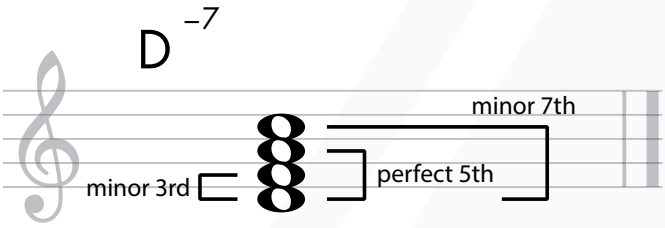
Four part 7th chords use the **Root/1st**, **3rd**, **5th** and **7th** degrees in their makeup.
This process can be used to create chords for any degree of the scale. Simply skip tones in-between the notes of the chord.

The first chord of our scale is made up of the notes **C, E, G, B**.
C to **E** is a **major 3rd** interval (4 semitones, which determines this will fundamentally be a major chord).
C to **G** is a **perfect 5th** interval (7 semitones. Simple major triad so far. No augmented or diminished modifications).
C to **B** is a **major 7th** interval (11 semitones).

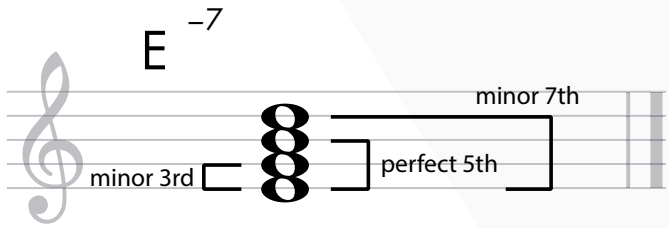
This means the first scale degree of C Ionian is a major 7 chord.



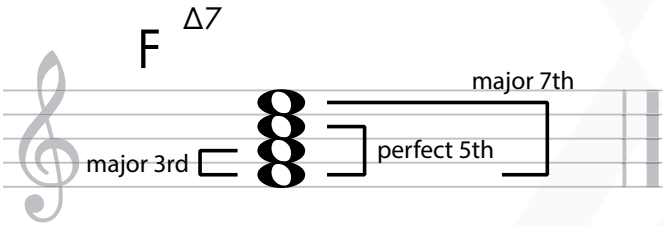
Moving to **D**, we follow the same process except **D** is now our Root note.
The **Root, 3rd, 5th and 7th** notes are: **D, F, A, C**.
D to **F** is a **minor 3rd** interval (3 semitones, minor chord this time)
D to **A** is a **perfect 5th** (7 semitones).
D to **C** is a **minor 7th** (10 semitones).
This results in a **D minor 7th** chord as the second degree of **C Ionian**.



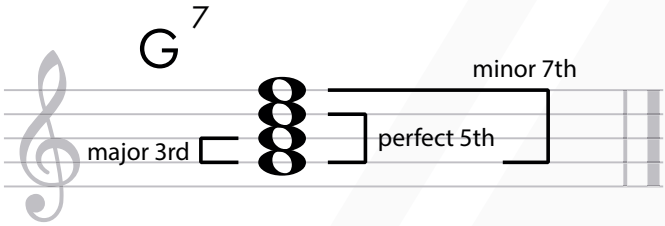
E as the root gives us **E, G, B, C**.
Another **minor 7th** chord.



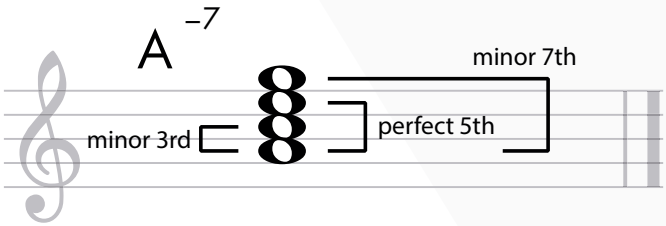
F is back to a **major 7th** chord with **F, A, C, E** chord tones.



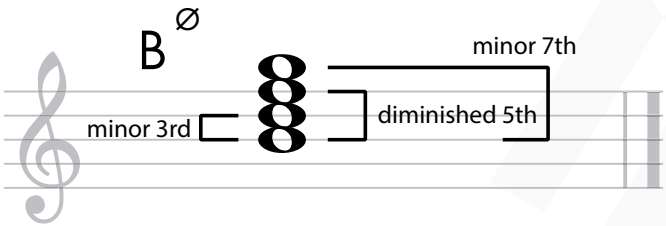
G results in a new 7th chord type. **G, B, D, F.**
G to **B** is a **major 3rd** interval.
G to **D** is a **perfect 5th.** So far nothing new. Standard major triad so far.
G to **F** results in a **minor 7th** interval.
Major 3rd with a **flattened** 7th degree is called a **dominant 7th** chord.



A returns to another **minor 7th** chord. A, C, E, G.



B is our final scale degree which, like G, has a new 7th chord type.
The notes are **B, D, F, A.**
B to **D** is a **minor 3rd** (3 semitones).
B to **F** is a **diminished 5th** (6 semitones).
B to **A** is a **minor 7th** (10 semitones).



In classical music contexts, this chord is commonly referred to as a **half diminished** chord.
In jazz and popular music, the more common term is **minor 7 flat 5**.
A bit more of a mouthful than **half diminished**, but much more descriptive. It is a **minor 7th** chord with its **5th** degree **flattened** to the tritone interval.

We now have a chord quality for every degree of our scale!

CΔ7	D–7	E–7	FΔ7	G7	A–7	B–7(♭5)

This is the foundation for a lot of western music. Many songs use only these available chords in their progressions.

Modal Scales: Much of western music is based upon the **Modal** system.

The modes are very easily derived.
The following will outline a method for deriving the modes of a scale.

We successfully constructed a scale of 7th chords for the C major scale/C Ionian mode.

The modes of the major scale start with Ionian and are often referred to as the 'Ionian modes'. This can get a little confusing when the same word refers to both the first degree of the system and also the system itself.

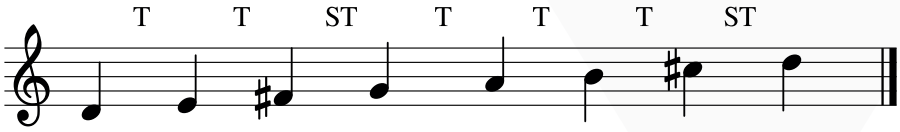
For consistency, we will refer to the system of modes as simply 'the modes.' When talking about a specific mode, we will specify the root note and the name of the mode.

For example:
C Ionian, F# Mixolydian, A Lydian, etc.

The C major scale/C Ionian has seven degrees. **C, D, E, F, G, A, B**.
Each of these degrees of the scale has its own mode.
The first mode is **Ionian**.
In this case **C Ionian**.

The modes are:
Ionian
Dorian
Phrygian
Lydian
Mixolydian
Aeolian
Locrian

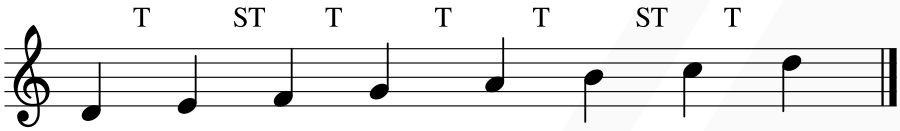
They are derived from the 7 degrees of the first mode. Ionian has the formula Tone, Tone, Semitone, Tone, Tone, Tone, Semitone (T, T, S, T, T, T, S). This can be applied to any starting note and will result in that Root's major scale/Ionian mode. Let's use D as an example. We want to apply the Ionian formula to D to give us D Ionian.



As Ionian, this can also be considered as the **D major** scale.
The key of **D major** has **two sharps, F#** and **C#**.
These are contained in our newly defined **D Ionian** scale.

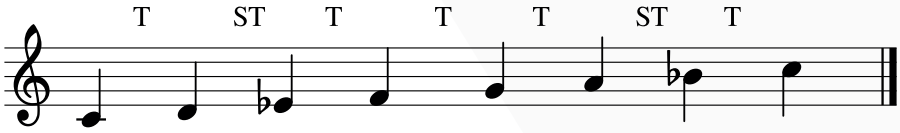
The modes are derived from the degrees of the original mode.

C Ionian over one octave is played **C, D, E, F, G, A, B, C,** consisting of all white keys. If we keep this scale in mind but simply start on the D and play all white notes D to D we get:
D, E, F, G, A, B, C, D.
If we consider the D as our Root/harmonic centre, we hear it as a very different scale which has its own unique formula: **T, S, T, T, T, S, T**.



Sure... It's just the major scale offset by one note.
Big deal right?
But let's try comparing it more closely to our original major scale.
Let's build C **Dorian**.

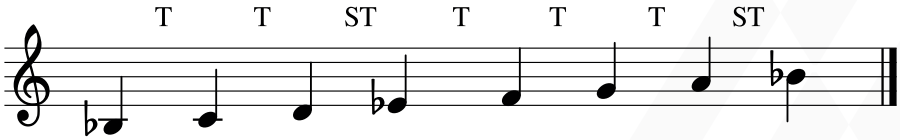
Starting on **C** and playing to the new formula: **T, S, T, T, T, S, T**.



Now things look a little different.
We have **2 flats.** B♭ and E♭.
That gives us the key signature for **B♭ Major**.

Which makes perfect sense!

If we go down a tone from our first degree we hit **B♭**, which if considered as one degree down from **C Dorian**, we get **B♭ Ionian**!

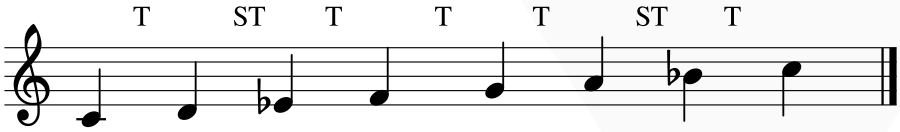


This whole pattern is deceptively simple in many ways.
Considering the modes in relation to their Ionian degree or major key, and you can easily get your bearings and relative context in relation to a particular specific major scale.

Where the modes become much more musically interesting is when they are harmonically considered for their own unique merits.
Let's look again at our new **C Dorian** scale.

There are **two flattened notes** when compared to **C Major.**
E♭ is a big deal in this case. It is a **minor third** in the scale.
That has immediately brought us to a **minor tonality**.

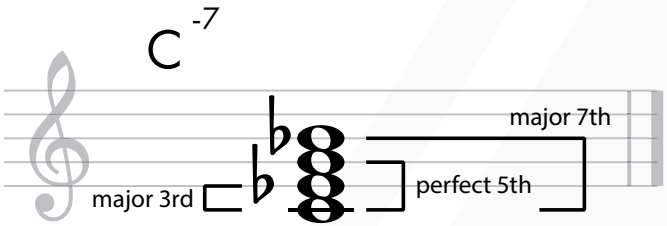
When using the bare minimum and constructing a Root degree triad or even 7th chord, we get a minor chord.
C, E♭, G = minor triad
C, E♭, G, B♭ = minor 7th chord



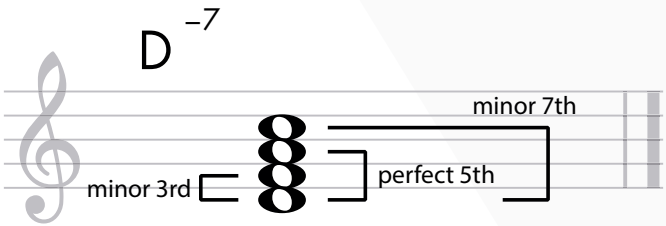
With the **minor 3rd** degree and the **B♭** at the end of the scale, we are very close to a pattern that is generally considered as the **Natural Minor** scale.
There is the difference of a **sharpened 6th** degree (**A**) from the **Natural Minor** scale.
Dorian therefore sits closer to a minor scale but with a raised 6th degree.
This 'light note' in a 'dark scale' is the characteristic tone of the mode. It has a distinctive tonality.

Dorian Chord Scale:
The chord pattern for the **Dorian** mode can be constructed in the exact same fashion as that of the **Ionian** mode.

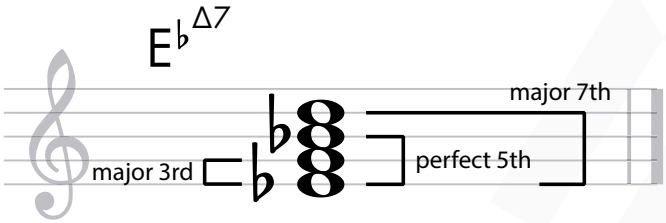
Chord 1
C, Eb, G, B♭
Root, minor 3rd, perfect 5th, minor 7th



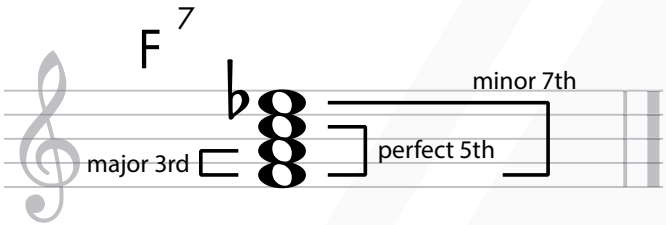
Chord 2
D, F, A, C
Root, minor 3rd, perfect 5th, minor 7th



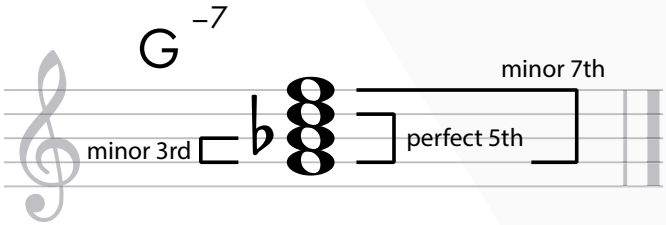
Chord 3
E♭, G, B♭, D
Root, major 3rd, perfect 5th, major 7th



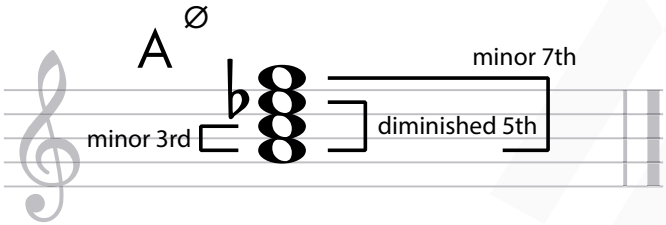
Chord 4
F, A, C, E♭
Root, major 3rd, perfect 5th, minor 7th



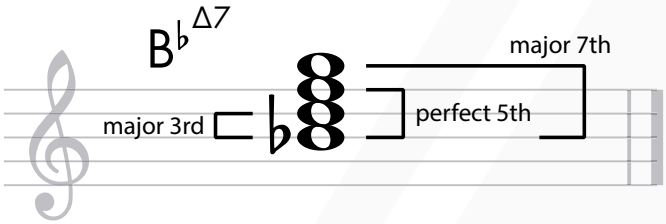
Chord 5
G, B♭, D, F
Root, minor 3rd, perfect 5th, minor 7th



Chord 6
A, C, E♭, G
Root, minor 3rd, diminished 5th, minor 7th



Chord 7
B♭, D, F, A
Root, major 3rd, perfect 5th, major 7th



This process is simply repeated for every degree of the Ionian mode and gives a range of scales each with their own distinct tonal characteristics.
We'll refrain from going through every mode in this way.
Trust us, it works!

Non-diatonic Notes: Each mode has **7** notes in it, however one octave contains **12** notes...
What chord quality do the **5** remaining non-scale tones produce?

Good question!

For each musical mode incorporated into the **harmonàig**, a particular chord quality was cherry picked from various sources.
The primary chord quality method utilises **modal interchange** chords.
Modal interchange is a term used to describe the use of scale degrees that are not necessarily part of the home key/mode.
Considering the modes in parallel to one another, there will be some notes that don't overlap, but fill in some of the gaps left in the home key.

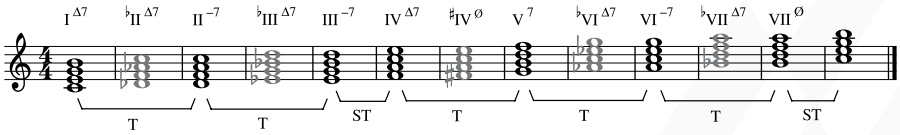
Ionian	IΔ7	II–7	III–7	IVΔ7	V7	VI–7	VII–7(♭5)
Dorian	I–7	II–7	♭IIIΔ7	IV7	V–7	VI–7(♭5)	♭VIIΔ7
Phrygian	I–7	♭IIΔ7	♭III7	IV–7	V–7(♭5)	♭VIΔ7	♭VII–7
Lydian	IΔ7	II7	III–7	#IV–7(♭5)	VΔ7	VI–7	VII–7
Mixolydian	I7	II–7	III–7(♭5)	IVΔ7	V–7	VI–7	♭VIIΔ7
Aeolian	I–7	II–7(♭5)	♭IIIΔ7	IV–7	V–7	♭VIΔ7	♭VII7
Locrian	I–7(♭5)	♭IIΔ7	♭III–7	IV–7	♭VΔ7	♭VI7	♭VII–7

For the Ionian mode:
The ♭II is borrowed from the Phrygian mode.
The ♭III from the Dorian mode.
The #IV is from the Lydian mode.
The ♭VI is again from the Phrygian mode.
The ♭VII is drawn from the Mixolydian mode.

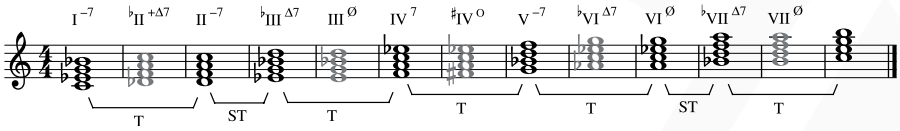
Not all non-diatonic notes of all modes have appropriate parallel chords that can be borrowed. Due to this, many of them were chosen through less 'scientific' means.
A combination of choices between 'most harmonically relevant,' i.e. choosing chord qualities that contained the most chord tones diatonic to the mode, and more simply, what sounded best.
The full breakdown of what chord tones are included chromatically for each mode are as follows:

Ionian Modes

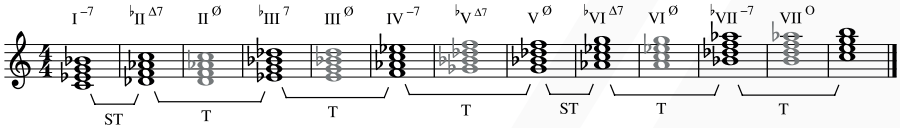
Ionian



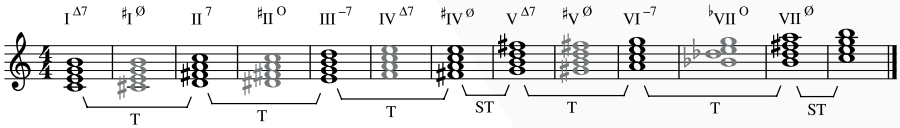
Dorian



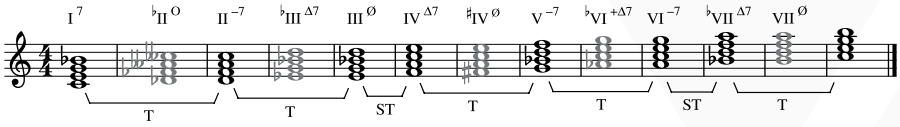
Phrygian



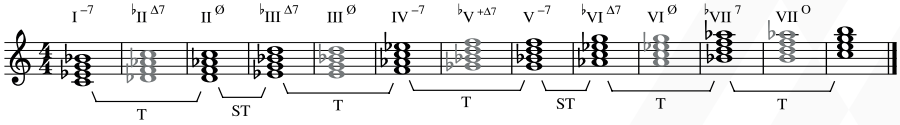
Lydian



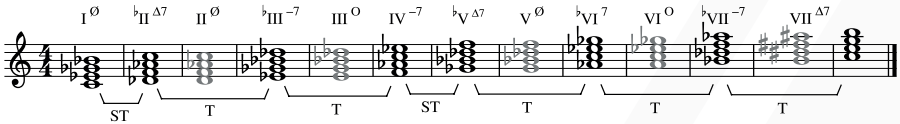
Mixolydian



Aeolian

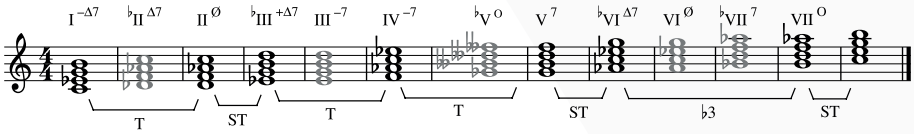


Locrian

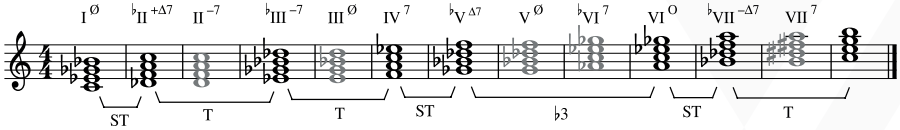


Harmonic Minor Modes

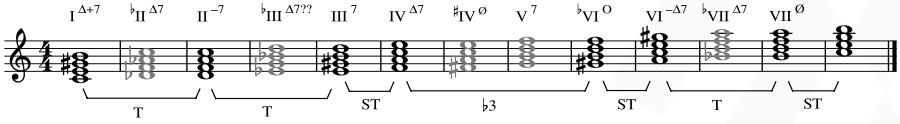
Aeolian #7



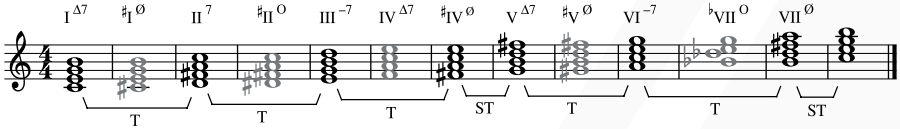
Locrian #6



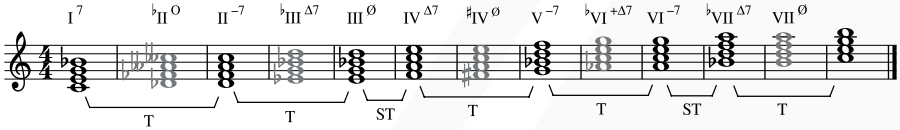
Ionian #5



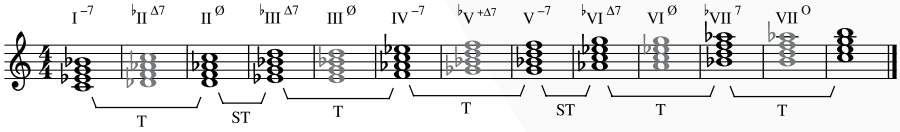
Dorian #4



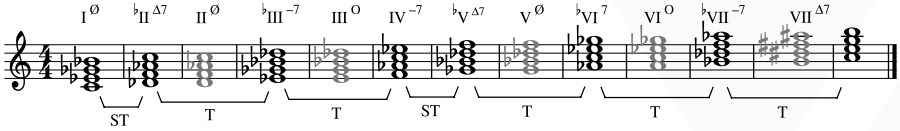
Phrygian #3



Lydian #2



Super Locrian



Manual Author: Jason Lim / Collin Russell
Manual Design: Dominic D'Sylva

CE This device meets the requirements of the following standards: EN55032, EN55103-2, EN61000-3-2, EN61000-3-3, EN62311.