Key to Musical Symbols

# = sharp, ex: G#
♭ = flat, ex: B♭
♮ = natural, ex: F♮

° = diminished chord, ex: D°7
♭♭ = half-diminished chord, ex: F♭♭7
+= augmented chord, ex: A+7
dom = dominant chord, ex: Gdom7
maj = major chord, ex: Cmaj7

30-Day Limited Warranty

This product is warranted by Lotus Music against manufacturing defects in material and workmanship under normal use for thirty (30) days from the date of purchase. In the event of a product defect during the warranty period, return the product to the address below with a receipt or proof of purchase. Sender is responsible for shipping costs. Lotus Music will, at its option, repair or replace the product and deliver it at no charge (except for shipping). This warranty does not cover damage caused by liquids, heat, abuse, accident, misuse, alteration, or abnormal usage.

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Caring for your Harmonizer

To ensure enjoyment of your Lotus Music Harmonizer for a long time:

• Keep your Harmonizer dry.
• Keep your Harmonizer away from excessive heat.
• Handle your Harmonizer gently. Do not use force.
• Keep your Harmonizer away from dirt and dust.
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Welcome to Lotus Music™
Lotus Music is dedicated to your musical learning and believes in making products that will enlighten you to your own musical potential. The Harmonizer is designed to make understanding the underlying structure of music easy. The Harmonizer is a great tool, but you will not become a better musician unless you practice your instrument regularly.

Learning music is a wonderful journey and offers great personal rewards to those who are ready to take the first step and stick with it. The Harmonizer is a tool which will help you travel farther faster.

I wish you the best on your happy, musical journey and am grateful that you have chosen Lotus Music as one of your guides. If you have any questions or comments regarding the Harmonizer, I invite you to contact our company by fax, phone or email.

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Introduction

The Harmonizer shows you important musical concepts every musician should know. This guide will help you understand these concepts and how they are presented on the Harmonizer. This area of knowledge about musical concepts is called music theory. Understanding it allows you to make more expressive choices when composing or improvising, and provides you a language to communicate with other musicians.

The Harmonizer shows you major and minor keys, the chords that belong to those keys, the notes that make up those chords, chord progressions, and much more. The Harmonizer presents music theory in a visual way which reinforces the training your ear gets when you play your instrument. It also offers many technical answers to curious musicians.

The Harmonizer is appropriate for musicians of all skill levels in the same way a calculator is appropriate for math students. For the beginner, the Harmonizer offers a basic guide to scales and chords. For the more advanced musician, it is a reference tool that can help them compose and improvise.

The Harmonizer consists of several sections. Each section is listed in the table of contents of this guide.

Getting Started

The Harmonizer design consists of clear areas called windows arranged in a pattern that displays musical information.

To operate, turn the Harmonizer by holding the clear cylinder in your right hand and the black-banded end in your left. Then, twist your hands in opposite directions. You should see letters representing the scale notes appear and change in the windows of the clear cylinder.

Continue to twist the Harmonizer until the letter indicating the key, chord, or note you want to know about appears in one of the appropriate windows. The Harmonizer’s layout will then reveal information you need to know for composing and improvising.

This guide describes some common music theory concepts and demonstrates how to use each section of the Harmonizer. For a deeper understanding of music theory, you may elect to consult a music teacher or a textbook on the subject.

The Harmonizer is designed to demonstrate musical concepts without the use of traditional musical notation, though being able to read music is certainly helpful.
Major & Minor Scales

The most important scale used in pop, jazz, country, rock, and classical music today is a 7-note scale called the **diatonic major scale**. This section describes the diatonic scale and other musical concepts associated with it, including *modes, chords, and intervals*.

The second most important scale is the **natural minor scale**. This scale is derived from the diatonic major scale and shares the same notes and chords.

The diagram on the opposite page shows the Major and Natural Minor Scales section of the Harmonizer. The topics related to this section are indicated by number and are then described in the following pages of the guide.

1. **Key Designator**

When you turn the Harmonizer, you will notice different letters appear in the Key Designator window. These letters represent the names of the *major keys*.

In modern western music the diatonic scale pattern is the basis for fifteen major keys. Each of these keys begins on a different note. The note that begins a key becomes the name of that key.

The key of C major is an example of one such key. When we start playing a diatonic scale pattern beginning with C, the result is C, D, E, F, G, A, B and C. When we repeat the beginning note of the scale we have played an **octave**. An octave is the tonal distance between two notes with the frequency of the higher note being twice that of the lower.

**Diatonic Scale vs. Chromatic Scale**

In our western music culture there are twelve tones between each octave. This series of twelve tones is called a **chromatic scale**. The distance between each tone of a chromatic scale is called a half step. Two half steps make a whole step. There are, of course, six whole steps in an octave. Below is a chromatic scale beginning and ending on C.

<table>
<thead>
<tr>
<th>w = whole step</th>
<th>w</th>
<th>w</th>
<th>w</th>
<th>w</th>
<th>w</th>
<th>w</th>
<th>6 whole steps</th>
</tr>
</thead>
<tbody>
<tr>
<td>h = half step</td>
<td>h</td>
<td>h</td>
<td>h</td>
<td>h</td>
<td>h</td>
<td>h</td>
<td>12 half steps</td>
</tr>
</tbody>
</table>


In the above example the scale begins and ends on C. If we wanted, we could repeat the sequence of tones to higher or lower octaves. The tones that make up the octave have been given letter names (A, B, C, D, etc.). Sometimes a single tone is called by two different names, i.e., C# and D♭, D# and G♭.
A diatonic major scale, on the other hand, consists of seven notes spaced in a specific way consisting of whole steps and half steps between them. By the way, in a system called *solfeggio*, the diatonic major scale is sung “do, re, mi, fa, so, la, ti, do.” The diatonic major scale in the key of C looks like this:

```
C Major Diatonic Scale
C D E F G A B C
```

In the diatonic scale system, no matter what key is chosen, the spacing of the scale notes in steps is always: whole, whole, half, whole, whole, whole, half. The beginning note does not affect how the subsequent notes are spaced.

```
G major scale  G A B C D E F# G
F major scale  F G A B♭ C D E F
E major scale  E F# G# A B C# D# E
```
Although these modes share the same notes as the scale from which they are derived, when played they have subtly different sounds. Soloists often base their improvisations on modes, and change from one mode to another as the chords change in a song.

The different tonal qualities of the modes is a function of the relative spacing of the notes from the beginning note. The diagram below shows the names of the modes of major scales, the notes they begin on, and the spacing of notes in the mode. This example shows the modes of C major. However, the spacing between notes and the mode names are the same for all the major keys.
Chords are created when several notes of a scale are played simultaneously. A **triad chord** is made up of the 1st, 3rd, and 5th note of a scale or mode. There are seven triad chords that belong to each major and minor key. Because these chords are made up only of notes from one key, they are called diatonic to that key.

When you dial the Harmonizer to a particular key, you will see triad chords with their corresponding notes appear in the highlighted windows. Each chord begins with the first note of a mode. This note is called the **root** of the chord.

The tonal distances between 1st, 3rd, and 5th notes differ according to the mode. This gives the chords their different sounds.

A fourth note can be added to a triad to give it a more interesting sound. Often, this fourth note of the chord is the seventh note of the scale or mode. Chords that have this seventh note included are called **seventh chords**. Seventh chords are written like this: Cmaj7, Dm7, G7 (Gdom7).

Sometimes, the sixth note of the scale will be added instead of the seventh. As you might guess, this chord is called a **sixth chord**, i.e., C6, Fm6.
Chord Note Extensions

Sometimes notes above the first octave of the scale are added to chords to give them a larger sound. Chords with these notes are called extended chords. Chords with extensions are named according to their highest scale degree, e.g., Cmaj13 (as in the example below).

C Major Scale with Extensions to 13th degree

<table>
<thead>
<tr>
<th>1st</th>
<th>2nd</th>
<th>3rd</th>
<th>4th</th>
<th>5th</th>
<th>6th</th>
<th>7th</th>
<th>9th</th>
<th>10th</th>
<th>11th</th>
<th>12th</th>
<th>13th</th>
</tr>
</thead>
<tbody>
<tr>
<td>w</td>
<td>w</td>
<td>h</td>
<td>w</td>
<td>w</td>
<td>w</td>
<td>h</td>
<td>w</td>
<td>h</td>
<td>w</td>
<td>w</td>
<td>w</td>
</tr>
</tbody>
</table>

Cmaj13: C D E F G A B C D E F G A

Scale Degrees

Scale degree refers to a note’s position in a scale: 2nd, 4th, 5th, etc. When extended degrees are added to a chord, the chord takes on the name of the highest degree. For instance, Cmaj9 has a 9th in it. G13 (Gdom13) has a 13th in it, and so forth.

Scale degrees continue through the first octave and well into the second octave. Theoretically, we can count 15 notes through the second octave, but in practice the highest degree for a major chord is the 13th, 11th for minor chords.

Major Scale

1st 2nd 3rd 4th 5th 6th 7th 9th

Locrian Mode

3 steps = Diminished Fifth

The 9th degree of C major is D.
Scale degree also indicates the interval or tonal distance from the beginning note of that scale. For example, the tonal distance from C to G is 3½ steps. In the diagram at the bottom of page 10, we see that in the key of C major the fifth note is G. This interval is called a perfect 5th (often just called a fifth).

In the B Locrian mode, the distance between the first note and the fifth note (F) is 3 steps. The interval between B and F is a half step less than a perfect 5th. Using the scale degrees of the major scale to measure this distance, we call this shorter interval a diminished 5th. The scale degree and spacing of notes in the diatonic major scale is the “yardstick” by which intervals in other scales and modes are measured.

The Diatonic scale pattern is the musical equivalent of a yardstick.

**Altered Chords**

Occasionally, you may see a chord written G13♭9 or G11♯9. Chords like these have flatted or sharped one or more of the notes of the naturally occurring scale degree. Whenever a note of a chord is changed and the change results in a note that does not belong to the scale from which the chord is derived, the chord is said to be altered.

**C Major Scale**

Because altered chords use notes outside the diatonic scale they often produce a dissonant sound. These chords are used to create a feeling of tension in a song. The chord that follows an altered chord usually relieves the tension.
An interval is the tonal distance between two notes. This distance is measured in steps. Each interval has a name. For instance, in the key of C major the distance between C and E is two whole steps. This interval is called a major third because it ends on the third note of a major scale.

**2 steps = Major 3rd**

Major Scale

```
C  D  E  F  G  A  B  C
w  w  h  w  w  w  h
```

Conversely, the distance between D and F is one-and-a-half steps. This interval is called a minor third because it ends on the third note of a minor scale, or mode.

**1½ steps = Minor 3rd**

Dorian Mode

```
D  E  F  G  A  B  C  D
w  h  w  w  w  h  w
```

Intervals that create some confusion are the major 7th, dominant 7th, and minor 7th. This is because the chords that include them, like the Cmaj7, Cm7, and Cdom7 (C7), look very similar. However, Cmaj7 is a four-note chord derived from the C major scale with its major 7th interval. On the other hand, Cdom7 (C7) and Cmin7, with their minor 7th interval, are derived from the mixolydian mode and natural minor, respectively.

**5½ steps = Major 7th**

C Major Scale

```
C  D  E  F  G  A  B  C
w  w  h  w  w  w  h
```

C Mixolydian

```
C  D  E  F  G  A  B♭  C
w  w  h  w  w  h  w
```

C Natural Minor

```
C  D  E♭  F  G  A♭  B♭  C
w  h  w  w  h  w  w
```

5 steps = Minor 7th

```
C  D  E  F  G  A  B♭  C
w  w  h  w  w  h  w
```

```
C  D  E♭  F  G  A♭  B♭  C
w  h  w  w  h  w  w
```

Intervals

**Major & Minor Scales**

Intervals that create some confusion are the major 7th, dominant 7th, and minor 7th. This is because the chords that include them, like the Cmaj7, Cm7, and Cdom7 (C7), look very similar. However, Cmaj7 is a four-note chord derived from the C major scale with its major 7th interval. On the other hand, Cdom7 (C7) and Cmin7, with their minor 7th interval, are derived from the mixolydian mode and natural minor, respectively.
Modes and scales are classified as major and minor depending on the tonal distance between the first and third notes. When a scale or mode has a major interval between these notes, it is called major. When this interval is a minor, it is called minor.

The Diatonic Yardstick
The diatonic scale is what all other scales and modes are measured against to determine how we write the interval between the root and other notes. In the diagram below we see the diatonic scale in C major compared to the Aeolian mode derived from C major. As compared to the major scale, the 3rd, 6th, and 7th notes of the mode are flatted. You can see that it is the relative positioning of the notes that are flatted, not the actual notes themselves. The whole-step and half-step spacing between the notes remains unaltered.
Chords are named according to their root note and the intervals between the notes that make up the chord. Chords of a diatonic major scale fall into four types: major, minor, dominant, and diminished.

Chord names also depend on what notes are in them. To understand the names, we must first know how chords are constructed.

Chord construction
A chord is simply a group of notes sounded simultaneously. A group of three notes is called a triad. Commonly, triads are made of the first, third, and fifth notes of a scale or mode. Other notes can be added, but in the diatonic system any note added to a triad must belong to the key.

Major Chord
For example, the C major triad is made up of C, E, and G. Observe that the interval from C to E is a major third (2 steps) and the interval from E to G is a minor third (1½ steps). This arrangement of intervals produces a major chord.

When we add the seventh note of the major scale, we create a four-note chord known as a major 7th.

```
C D E F G A B C
1 2 3 4 5 6 7 8
```

Even though the notes of the Lydian mode (beginning on the fourth note of the major scale) are spaced differently than the major scale, its 1st, 3rd, 5th, and 7th notes produce a major 7th chord.

```
F G A B C D E F
1 2 3 4 5 6 7 8
```

```
C D E F# G A B C
```

```
C D E F G A B C
```

C Major Scale
The second note in the C major scale is D from which the Dorian mode is derived. When we choose the first, third, and fifth notes of this mode we get a different-sounding chord from the major. Here the interval from D to F is a minor third (1½ steps) and the interval from F to A is a major third (2 steps). This arrangement of intervals produces a minor chord.

When we add the seventh note of the mode, we create a four-note chord known as a minor 7th.

The other modes in the diatonic scale that produce a minor chord are Phrygian and Aeolian. In the key of C major they look like this:

The Aeolian mode is also known as the natural minor scale. The Aeolian mode is also refered to as the relative minor key of the major key from which it is derived.

In the example below, the A Aeolian mode is the natural minor scale relative to C major scale.
Dominant Chord
The fifth note of a diatonic scale begins the Mixolydian mode. When we choose the 1st, 3rd, 5th notes of this mode, it produces a dominant chord. A dominant chord, whether it has three, four, or five notes, creates harmonic tension when played as part of a chord progression.

The dominant triad is simply a major chord since the distance from its root and second note is a major 3rd. However, when the 7th note of the mode is added to the chord, it produces another minor 3rd interval between the third and fourth notes. These four notes combine to produce a chord which sounds slightly dissonant. This dissonance creates tension in a piece of music which is released by moving to another chord, usually the tonic chord. This phenomenon will be discussed further in the Chord Progression Map section of this guide.

When we choose the 1st, 3rd, 5th, and 7th notes of the Mixolydian mode to create a chord, we produce a chord known as a dominant 7th.

Diminished Chord
The last note of the diatonic scale begins the Locrian mode. When we choose the 1st, 3rd, and 5th notes of this mode we produce an interesting triad known as a diminished chord. In the key of C major the Locrian mode begins on B. Here the interval between the 1st and 3rd notes is a minor third and the interval from the 3rd to the 5th is also a minor third.

When we add the 7th note of the Locrian mode to the chord, the interval between the 5th and 7th notes is a major third (2 steps). This chord is sometimes called a half-diminished seventh. However, since the first interval is a minor third, it is also known as a minor seventh flat-five chord. When the chord has B in the root, it can be written Bm7<5. This chord is almost a regular minor seventh chord, except that the third note of the chord is a half-step lower than it would be normally.
Below is a comparison between a minor seventh chord (m7) and a minor seventh flat-five chord (m7<5).

**Locrian Mode**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>C</td>
<td>D</td>
<td>E</td>
<td>F</td>
<td>G</td>
<td>A</td>
<td>B</td>
</tr>
</tbody>
</table>

Bm7<5

3 steps

3½ steps

**Dorian Mode**

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>E</td>
<td>F</td>
<td>G</td>
<td>A</td>
<td>B</td>
<td>C</td>
<td>D</td>
</tr>
</tbody>
</table>

Dm7

### Chord Notation

There is no one set way to notate chords. This can cause some confusion. For instance, often a dominant seventh chord with G in the root is written G7. This is sometimes confused with Gmaj7. In order to avoid this possible confusion, the Harmonizer uses a less common but clearer way to note a dominant chord (Ex: Gdom7). The list below shows intervals, their names, and popular chord notations. Sometimes symbols are used to represent different types of chords.

#### Flats & Sharps with Intervals

A sharp (#) in front of an interval indicates that it is augmented a half step. A flat (♭) in front indicates that it is diminished a half step.

<table>
<thead>
<tr>
<th>Intervals</th>
<th>Chord Name</th>
<th>Notation (with C as the root)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 3 - 5</td>
<td>Major</td>
<td>C, Cmaj</td>
</tr>
<tr>
<td>1 - 3 - 5 - 6</td>
<td>Major Sixth</td>
<td>C6</td>
</tr>
<tr>
<td>1 - 3 - 5 - 7</td>
<td>Major Seventh</td>
<td>Cmaj7, Cmaj7</td>
</tr>
<tr>
<td>1 - ♭3 - 5</td>
<td>Minor</td>
<td>Cm, C♭</td>
</tr>
<tr>
<td>1 - ♭3 - 5 - 7</td>
<td>Minor Seventh</td>
<td>Cm7, C♭7</td>
</tr>
<tr>
<td>1 - 3 - 5 - ♭7</td>
<td>Dominant Seventh</td>
<td>C7, Cdom7</td>
</tr>
<tr>
<td>1 - ♭3 - ♭5</td>
<td>Diminished</td>
<td>Cdim, C♭</td>
</tr>
<tr>
<td>1 - ♭3 - ♭5 - ♭7*</td>
<td>Diminished Seventh</td>
<td>C♭7, Cdim7</td>
</tr>
<tr>
<td>1 - ♭3 - ♭5 - ♭7</td>
<td>Half-Diminished</td>
<td>Cm7♭5, C♭♭</td>
</tr>
</tbody>
</table>

* The diminished seventh is derived from a mode whose 7th note is a whole step lower than the 7th note of the major scale. This is called a double-flatted 7th interval. It is equal to a major 6th (4½ steps).
This section of the Harmonizer shows the comparison between the major scale and its parallel minor scale. When a natural minor scale has the same starting note as a major scale, it is said to be parallel to it.

**The Natural Minor Scale**
As mentioned earlier, the Aeolian mode that begins on the sixth note of the major scale is also known as the natural minor scale. When the natural minor scale shares the same notes as a major scale, it is called the relative minor to the major. On the other hand, when a minor scale starts on the same beginning note as a major scale, it is called the parallel minor to the major.

The diagram below shows how the intervals which create a natural minor scale are derived from the major scale beginning on the sixth note.

**C Major Scale**

```
R 2 3 4 5 6 7 R
w w h w w h w w h w
C D E F G A B C D E F G A
```

The sixth note of the major scale begins the natural minor scale, also known as the Aeolian mode. This scale is called the relative minor of the major scale from which it is derived.

**A Natural Minor Scale**
(Aeolian mode & relative minor to C major)
The Parallel Minor

A minor scale is said to be parallel to a major scale that begins on the same note. The diagram below shows the relationship between relative minor, parallel minor, and the major scale. Note that the relative minor scale has all the same notes as the major scale, but the parallel minor does not.

<table>
<thead>
<tr>
<th>Relative Minor to C major (Parallel Minor to A major)</th>
<th>Parallel Minor to C major</th>
<th>Major Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>D</td>
<td>E♭</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
<tr>
<td>A</td>
<td>B</td>
<td>C#</td>
</tr>
</tbody>
</table>

Special Note: The major keys of D♭, G♭, and C♭ do not have a parallel minor associated with them, at least in name. The Harmonizer will display what looks like a D♭ and G♭ minor scale, however they are not recognize according to accepted notation practice. Conversely, the minor keys of A#, D#, and G# have no parallel among the major keys.

The Blues Scale

The blues scale is so widely used that it bears mentioning even though its harmonic structure does not belong to the diatonic system. There are several scales that people call blues, but the most popular is a six-note scale that eliminates the second and sixth notes and adds a flatted fifth to the natural minor scale.

Below is a comparison between the natural minor scale and the blues scale.

<table>
<thead>
<tr>
<th>C Natural Minor</th>
<th>C Blues Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>C</td>
<td>E♭</td>
</tr>
</tbody>
</table>

The Harmonizer shows the blues scale with dots under the appropriate windows. To avoid confusion with the notes of the natural minor scale, the b5th of the blues scale does not display in a window.

Dots indicate the notes of the blues scale.
Common Chord Substitutions

Harmonizing the diatonic scale produces chords with different sounds. These chords have different qualities which produce different effects when played in a piece of music. Though these chords offer a wide range of expression, musicians often want to add variety and surprise to their music. This is accomplished by substituting existing chords with ones that sound different but accomplish the same harmonic function. When the new chord belongs to the same key as the original chord, it is called a *diatonic substitution*.

This section of the Harmonizer shows some of the more common chord substitutions and a few basic rules.

1. **Chord Degree**
2. **Name and Function**
3. **Substitute Chords**

**Common Chord Substitutions**

- **Tonic**
  - C (maj7)
  - E (m7)
  - A (m7)
- **Super Tonic**
  - D (m7)
  - F (6)
- **Mediant**
  - E (m7)
  - G (6)
  - C (maj7)
- **Sub-Dominant**
  - F (6m7)
  - D (m7)
- **Dominant**
  - G (dom7)
  - B (maj7)
  - D (dom7)
- **Submediant**
  - A (m7)
  - C (6maj7)
  - E (m7)
- **Leading Tone**
  - B (m7)
  - D (m6)
  - G (dom7)
1. **Chord Degrees**

Just as scale degrees are designated by Arabic numerals (1, 2, 3...), chords are similarly designated by Roman numerals (I, II, III). For example, in the key of C major the notes are C, D, E, F, G, A, B and we have designated them as 1, 2, 3, 4, 5, 6, 7. However, when we consider the triad chords in the key of C we have Cmaj, Dm, Em, Fmaj, Gmaj, Am, Bdim. These are designated I, II, III, IV, V, VI, VII. When speaking about these chords, for instance in the key of C major, we would call Gmaj the five chord, Dm the two chord, Fmaj the four chord and so on.

There is no single agreed-upon system for numbering chords. One system uses upper-case and lower-case Roman numerals to distinguish whether a chord is a major or a minor (Dm = ii, Fmaj = IV). The Harmonizer uses upper-case Roman numerals for all chords. However, if the chord happens to be minor, a lower-case “m” will appear next to the Roman numeral (ex: VIm). In the case of diminished chords such as the seven chord, the Roman numeral will be followed by a superscript circle (ex: VII°). A four-note dominant chord will be written V7.

**Major and Minor**

In the Common Chord Substitution section of the Harmonizer the one chord (I) of the major scale is found at the top of the column of chord roots. This chord is derived from the major key as appearing in the key designator of the Major and Natural Minor Scales section. Since the natural minor scale begins counting from the sixth note of the major scale, the chord that has this note as its root is the one chord (Im) of the minor scale relative to the major. Though they share the same chords, they perform different harmonic functions.

```
Major Scale
C | D | E | F | G | A | B | C | C Major

Chord Degree
I | IIIm | IIIm | IV | V | VIm | VII° | I

Relative Minor
A | B | C | D | E | F | G | A | A Minor

Parallel Minor
C | D | Eb | F | G | Ab | Bb | C | C Minor
```

2. **Name and Function**

This column indicates the root of the chord, its chord name, and the theoretical name which describes the chord’s harmonic function. Each of the seven chord degrees (I, II, III, etc.) performs a slightly different function in a piece of music. Knowing a chord’s function is important when making chord substitutions.

The root note in the window combines with the suffixes to the right to spell out the name of the chord which is to be replaced. The theoretical names as presented in this section apply only to the chords of the diatonic major scale.
A chord’s theoretical name indicates its relationship to the other chords of the key and gives musicians a way to talk about chords without being specific to a key.

A theoretical name is similar to the name given to a position on a baseball team, like pitcher, catcher, or outfielder, etc. The theoretical name describes what function the chord will play in a piece of music. Some chords create tension, some relaxation, while some create movement. While it is important to know all the positions a chord can play, the most popular chords in pop music are the tonic, subdominant, and dominant. In the key of C major these would be C, F, and G, respectively.

For the purpose of substitution, it is important to understand what position a chord plays so the proper substitution can be made. Musicians also refer to chord positions by their Roman numeral equivalents. The tonic is the one chord. The subdominant is the four chord. The dominant is the five chord.

### Summary of Scale & Degree Notation

<table>
<thead>
<tr>
<th>Alphabetical</th>
<th>Arabic</th>
<th>Roman</th>
<th>Solmization</th>
<th>Theoretical</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>1</td>
<td>I</td>
<td>do</td>
<td>Tonic</td>
<td>Perfect Prime</td>
</tr>
<tr>
<td>D</td>
<td>2</td>
<td>II</td>
<td>re</td>
<td>Super Tonic</td>
<td>Major Second</td>
</tr>
<tr>
<td>E</td>
<td>3</td>
<td>III</td>
<td>mi</td>
<td>Mediant</td>
<td>Major Third</td>
</tr>
<tr>
<td>F</td>
<td>4</td>
<td>IV</td>
<td>fa</td>
<td>Subdominant</td>
<td>Perfect Fourth</td>
</tr>
<tr>
<td>G</td>
<td>5</td>
<td>V</td>
<td>so</td>
<td>Dominant</td>
<td>Perfect Fifth</td>
</tr>
<tr>
<td>A</td>
<td>6</td>
<td>VI</td>
<td>la</td>
<td>Submediant</td>
<td>Major Sixth</td>
</tr>
<tr>
<td>B</td>
<td>7</td>
<td>VII</td>
<td>ti</td>
<td>Leading Tone</td>
<td>Major Seventh</td>
</tr>
<tr>
<td>C</td>
<td>8</td>
<td>VIII</td>
<td>do</td>
<td>Octave</td>
<td>Perfect Octave</td>
</tr>
</tbody>
</table>
The chords in the windows to the right of the original chord represent frequently used substitutions. Substitutions do not work in every case. There are some specific and even complicated rules for substitution, but the final arbiter of a successful chord substitution is how it sounds. We will look at three basic rules for substitution – chord family, inversion, and flat five.

### Chord Family Substitutions

It is helpful to know the functions of the chords in order to make successful chord substitutions. The diatonic structure consists of three families of chords: tonic, subdominant, and dominant.

The tonic family expresses the tonal foundation of a key. The subdominant family expresses movement away from the foundation. And finally, the dominant family expresses harmonic tension. This tension is released with chords that move the harmony back to the tonic. Chords belonging to the same family can often be substituted for each other.

#### Chord Families

<table>
<thead>
<tr>
<th>Chord Families</th>
<th>Chord Degree</th>
<th>Theoretical Name</th>
<th>Example (C Major)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tonic</td>
<td>I, Illm, VIIm</td>
<td>Tonic, Mediant, Submediant</td>
<td>C, Em, Am</td>
</tr>
<tr>
<td>Sub-dominant</td>
<td>IV, Illm</td>
<td>Subdominant, Super Tonic</td>
<td>F, Dm</td>
</tr>
<tr>
<td>Dominant</td>
<td>V, VIIo</td>
<td>Dominant, Leading Tone</td>
<td>G, B°</td>
</tr>
</tbody>
</table>
Another kind of chord substitution is accomplished by rearranging the notes of a chord to produce a new chord. Below is an example of some of the chords in the key of C major that are inversions of each other and can usually be used interchangeably.

Because of its construction, a diminished seventh chord ($\text{C}7$) offers several inverted combinations that work as chord substitutes. This chord is made up of four notes spaced a $3\text{rd}$ (minor third) apart. The notes of the diminished seventh repeat every $1\frac{1}{2}$ steps up or down the scale. The diminished seventh chord is not diatonic to the major scale; instead it is derived from the harmonic minor scale.
Flat-Five Substitution (Tri-tone)

Another kind of chord substitution which is often used in pop and jazz music is known as flat-five substitution. This substitution is made by replacing a dominant chord with a new dominant chord whose root is a diminished fifth interval above the original chord’s root. For example, in the key of C major, a Gdom7 (G7) could be replaced with a Dbdom7 (Db7). (G to Db is a diminished fifth interval.) This is not a diatonic substitution because Db does not belong to C major. However, the two chords do share a tritone interval.

A tritone interval is actually a diminished fifth (or augmented fourth) interval. This interval is made up of three whole steps, thus the name tritone. This substitution works because these two chords resolve to the tonic chord in similar ways.

In the key of C the dominant chord is Gdom7. The flatted fifth of Gdom7 is Dbdom7, which becomes the substitute chord. The example below shows that the second and fourth notes of these two dominant chords resolve to the first and second notes of the tonic chord by descending or ascending one half-step.

![Tritone Interval Diagram](image)

Another reason this substitution works, even though it is not diatonic, is that the root of the substitute chord which creates harmonic tension descends one half-step to the root of the tonic, creating a descending chromatic bass line. The tritone interval of the original dominant chord and its flatted-fifth substitute allow the tension created by these chords to be released by the tonic chord.

Another interesting characteristic about the tritone interval is that two tritone intervals added together produce an octave. As in the example shown above, when we go up the scale three whole steps from F (the second note of Dbdom7), we land on Cb (the fourth note of Dbdom7). When we go down three steps from F, we land on Cb an octave lower than the fourth note of the chord. Since Cb and B are enharmonic equivalent notes, you can see that Dbdom7 and Gdom7 share the same tritone interval from F to B and from B to F.
Chord Progression Map

The number of ways chords can go together to produce new and interesting sounds is nearly infinite. Musicians use their intuition and experience to arrange chords in ways that move the music along. This notion of movement is important to understanding how to compose and improvise a piece of music. The Chord Progression Map shows some often-used progressions which create harmonic movement.

Harmonic Movement

Usually the interplay between chords in a piece of music creates the feeling of movement and change. Some chord combinations sound uplifting, others sound somber, and some sound like ocean waves. While these harmonies and how we interpret them are nearly endless, there is a very simple principle at work.

Most pieces of music tend to first establish a feeling of stability, depart from it, create tension, then return to the feeling of stability. Though some pieces of music demonstrate this more dramatically than others, as you train your ear you will become increasingly aware of it.

Progression Formulas

The way chords are placed one after the other in a piece of music is called a chord progression. The Roman numerals indicating chord degree are used to designate the chords in a progression. For example, in the key of C major a I, IV, V7 (one, four, five) progression indicates the chords Cmaj, Fmaj, and Gdom7. In the key of F these chords would be Fmaj, B♭maj, and Cdom7.

This section of the Harmonizer shows the formulas of the more common chord progressions in major and minor keys. All of the major progression formulas presented here are based on the major scale. However, the minor progressions are based on the minor scale indicated within parentheses.
To find a chord progression in the key you want, turn the Harmonizer dial until the desired key appears in the window. This will be your beginning point from which the progressions begin and eventually end. Color-coded lines represent major and minor progressions. A third colored line shows major and minor progressions that share the same path.

Once the tonic chord has been established, the color-coded lines guide you through the progressions. Each window shows the root of the chord in the progression, and the chord degree indicates whether the chord is major, minor, dominant, or diminished. The letters in the window indicate the root of the chord in the progression.

Chord Substitutions
The Chord Progression Map provides the basics for harmonic movement. To add variety to the movement you can substitute chords, play dominant chords in place of minor chords, and vice versa. Play diminished chords instead of a dominant. Play chords with extensions. In other words, explore the different ways you can link chords together to create harmonic movement.

Example:
One of the most common progressions in music is the I, IV, V (one, four, five). Say we want to explore this progression in the key of C major. Turn the dial until a C appears in the tonic chord window. Now, by following the line that extends to the right of the selected tonic chord we encounter F. That is the IV chord. Next, along the line is the V chord, G. The line now returns to the tonic, C.

The V chord can act as a stronger dominant chord if we add the 7th note of the Mixolydian mode. In this case we produce a Gdom7 (G, B, D, F). Now we have a I, IV, V7 progression. We can spice up this progression even more. We know by looking at the Chord Substitution section of the Harmonizer that we can substitute a Dm7 (IIm7) for the F chord. Now we have a I, IIm, V7 progression. This is popular in jazz.

We also can put the D♭dom7 (♭II7) in place of the Gdom7, but let’s extend the D♭ dominant chord to the ninth degree to make it a D♭dom9. Finally, let’s make the tonic a major seventh chord. Okay, this gives us a Imaj7, IIm7, ♭II9 chord progression. Notice how this sounds compares to the original I, IV, V. This is just the beginning. Experiment and explore to create different harmonic movements.

When this window is dark, the root notes in the Chord Progression Map display enhamonic tones correctly. See page 39 for more information.
Melodic Minor Scale

The Melodic Minor scale is a scale form that evolved from the natural minor. It is a scale form that is particularly popular in jazz. It is often called the jazz minor scale.

Originally, it was used in classical music in tandem with the natural minor scale. The melodic minor was used on ascending passages, and the natural minor on descending ones. This was done because the melodic minor sounds more stable in ascending passages than does the natural minor. It is now use in jazz because of its slightly bluesy sound.

Below is a comparison of three scale forms:

\[
\begin{align*}
\text{C Major} & \quad \begin{array}{cccccccc}
C & D & E & F & G & A & B & C \\
1 & 2 & 3 & 4 & 5 & 6 & 7 & 8
\end{array} \\
\text{C Natural Minor} & \quad \begin{array}{cccccccc}
C & D & E_b & F & G & A_b & B_b & C \\
1 & 2 & b3 & 4 & 5 & b6 & b7 & 8
\end{array} \\
\text{C Melodic Minor} & \quad \begin{array}{cccccccc}
C & D & E_b & F & G & A & B & C \\
1 & 2 & b3 & 4 & 5 & 6 & 7 & 8
\end{array}
\end{align*}
\]

This section of the Harmonizer shows the harmonized melodic minor scale in a format similar to the Major and Natural Minor Scales section (see page 6). It shows the modes, chords, and notes that make up this scale.

1. **Mode Names**
   
   This column lists the names of the modes that are derived from the Melodic Minor scale. They are similar to those of the diatonic major except for a raised or lowered note somewhere in the mode.

2. **Triad Chords**
   
   Just as in the harmonized diatonic scale, triad chords can be created from the 1st, 3rd, and 5th notes of each of the melodic minor modes. The note that begins and ends each mode is the root of the triad.
3. **Chord Degree**

The Roman numerals to the left of the chord root indicate the chord degree.

4. **Fourth-tone Extensions**

The notes in this column provide a fourth note to add to the triad chords to create seventh chords.

5. **Chord Names**

This column shows the names of the four-note chords that are derived from each mode.

6. **Scale Degrees and Extensions**

This row indicates the scale degrees of the first octave and important extensions beyond. The number on top indicates the extension. For example, in the key of C melodic minor if we add the 9th to Fm7, we are adding a G. However, because of the dissonance that is created by the G being only one step away from the root, the extension is usually one of the higher notes of the chord. As a rule of thumb, extensions should be notes of the second octave above the root.

7. **Set Indicator**

When this window is dark, the Melodic Minor notes are enharmonically correct. See page 39 for more information.
Harmonic Minor Scale

The harmonic minor scale is another variation of the natural minor scale. By raising the seventh note of the natural minor to a major seventh interval, this scale resolves to the tonic with more movement. However, this leaves a minor third interval between the sixth and seventh note. This openness gives the scale an exotic character. This scale is sometimes called the snake-charmer scale.

The Layout

This harmonic minor section of the Harmonizer is presented similarly to the melodic minor. If you are not already familiar with the layout, please refer to the melodic minor section of this guide (see page 28).

The modes of the harmonic minor scale produce some interesting-sounding chords which can add originality to a piece of music.

Below is a comparison of the harmonic minor scale to the natural minor.

<table>
<thead>
<tr>
<th>Harmonic Minor</th>
<th>Natural Minor</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>C</td>
</tr>
<tr>
<td>D</td>
<td>D</td>
</tr>
<tr>
<td>Eb</td>
<td>Eb</td>
</tr>
<tr>
<td>F</td>
<td>F</td>
</tr>
<tr>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>Ab</td>
<td>Ab</td>
</tr>
<tr>
<td>Bb</td>
<td>Bb</td>
</tr>
<tr>
<td>C</td>
<td>C</td>
</tr>
</tbody>
</table>

C Natural Minor: 1 2 b3 4 5 b6 b7 8

C Harmonic Minor: 1 2 b3 4 5 b6 7 8

minor 3rd
Improvising

Improvising is one of the great creative outlets available to musicians. Often a musician will improvise a solo while another plays chords. The soloist chooses notes to play over the chords based on intuition, experience, and a few simple rules.

**Playing Arpeggios Over Chords**

A simple way to improvise is to play individual notes of a chord while the chord is sounding during a song. For instance, when a measure has Cmaj7 in it, you could play a riff of individual notes made up of C, E, G, B. As long as you stick to these notes while the chord is playing, your improvising will harmonize with the song.

| Major Scale | C | D | E | F | G | A | B | C | Cmaj7 |

**Playing Scales and Modes Over Chords**

Another way to improvise is to play individual notes of the scale or mode on which the chord is based. For instance, since Dm7 is based on the Dorian mode, you could play riffs using any notes from that mode.

| Dorian Mode | D | E | F | G | A | B | C | D | Dm7 |

**Playing Over Dominant and Altered Chords**

Sometimes it is appropriate to play scales or modes that are slightly different from the scale or mode the chord is based on. By doing this, you introduce notes that alter the harmony, usually making it more dissonant. Because altered chords usually sound dissonant, they often make good dominant chords.

The example below shows the notes of G myxolydian against the Gdom7 chord. Just below that is the G phrygian \( \flat3 \) mode (from the harmonic minor scale). Playing this mode over a Gdom7 will make it sound like a Gdom7\( \flat9 \) by adding the flatted 9 to the harmony.

G Myxolydian

| G | A | B | C | D | E | F | G | Gdom7 |

G Phrygian \( \flat3 \).

| G | Ab | B | C | D | Eb | F | G | G | Gdom7\( \flat9 \) |

Below is a table of chords with suggested scales and modes appearing on the Harmonizer that can be played over them. The root of the chord becomes the beginning note of the scale or mode. Ex: Play G myxolydian over a Gdom7 (G7) chord.

<table>
<thead>
<tr>
<th>Type of Chord</th>
<th>Maj7</th>
<th>Min6</th>
<th>Min7</th>
<th>Min7( \flat5 )</th>
<th>Dom7</th>
<th>Dom7( \flat9 )</th>
<th>Dim7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suggested scale or mode for playing over chord.</td>
<td>Ionian</td>
<td>Dorian</td>
<td>Aeolian</td>
<td>Locrian</td>
<td>Myxolydian</td>
<td>Super Locrian</td>
<td>Alt ( \flat7 )</td>
</tr>
<tr>
<td></td>
<td>Lydian</td>
<td>Phrygian</td>
<td>Harmonic Minor</td>
<td>Locrian ( #6 )</td>
<td>Phrygian ( \flat3 )</td>
<td>Blues Scale</td>
<td>Locrian</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Melodic Minor</td>
<td>Locrian ( #2 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Pivot Chord Modulation

Modulation refers to the changing of the tonal center in a piece of music. While modulation can be achieved by simply introducing chords and notes from another key, a subtler way is by pivot chord modulation. This type of modulation works by using a chord that is shared by two keys to “pivot” from one key to the other.

For example, in the key of C major the I, VIm, IIm, V7 chord progression (C, Am, Dm, and Gdom7) establishes the tonal center at C. However, since Am is also the IIm chord in the key of G, we could pivot into this key. Often the V chord of the new key follows the pivot chord to announce the new tonal center.

Below is a chord progression that modulates from the key of C major to G major using Am7 as a pivot chord.

1. Pivot Chord
   This window indicates the root of the chord which is used to pivot from one key to the other.

2. Chord Family
   This indicates whether the pivot chord is major, minor, or diminished. It also shows which branch to follow for information.
3. Key Indicator
This window indicates the keys to which the pivot chord belongs. Major and minor keys are differentiated by color.

4. Chord Degree
The Roman numerals indicate the chord degree of the pivot chord as it relates to the key that appears in the key indicator window. In other words, the chord degree tells what position the pivot chord plays in the key that is being displayed.

Example #1:
This shows C major as the pivot chord. While C major is the I (one) chord in the key of C major, in the key of G major it is the IV (four) chord.

Example #2:
This shows C minor as the pivot chord. While C minor is the Im (one) chord in the key of C minor, in the key of E< major it is the VIm (six) chord.
Example #3:
This shows C diminished as the pivot chord. While C diminished is the VII\(^{o}\) (seven) chord in the key of D\(\flat\) major, in the key of B\(\flat\) harmonic minor it is the II\(^{o}\) (two) chord.

In this example we actually pivoted into a harmonic minor scale form. We could have just as easily pivoted into B\(\flat\) natural minor but we would have ended up with an Fm (Vm of B\(\flat\) natural minor) acting as a dominant chord which does not create as much movement as the F7 (V7 of B\(\flat\) harmonic minor).

Circle of Fifths
This wheel reveals several important musical relationships and is one of the most important tools available to a musician. This wheel shows the relationship between major and natural minor keys as well as the most frequently used intervals for chordal harmonic movement.

The Layout
The letters on the black ring refer to major key names and chord roots. The letters on the inside ring refer to minor keys and chord roots. The rings are arranged so that the major keys are adjacent to their relative minor counterparts. For example, A minor (in the inner ring) is the relative minor of C major (on the outer ring).

At the bottom of the wheel are some key names arcing around the inner and outer ring. These are enharmonic keys sharing the identical tone. For instance, the key of C\(\flat\) has seven flats while the key of B has five sharps. Yet, since they refer to the same note, they are tonally equivalent.
When we think of the letters on the circle of fifths as representing chord roots, we see notes separated by intervals that create strong tonal movement. Moving clockwise on the wheel, we go from C to G to D, etc. This movement can be interpreted in two ways. First, if we are going up the scale, the interval from C to G is a fifth. Second, if we are going down the scale, the interval from C to G is a fourth.

On the other hand, if we move counter-clockwise on the wheel from C to F to B♭, this movement can be interpreted in two ways. First, if we are going up the scale, the interval from C to F is a fourth. Second, if we are going down the scale, the interval from C to F is a fifth.

The descending fifth and the ascending fourth intervals produce a strong resolving chordal movement. This movement is at the heart of many chord progressions. For instance, the I, IV, V, I chord progression in the key of C major produces C, F, G and C. As already shown, the movement going counter-clockwise resolves at F. Similarly, the V chord (G) resolves back to the tonic C.

In the circle of fifths diagram you might have noticed that the relative minor of F is D. In the chord substitution section of the Harmonizer, we can see that the chord of Dm can substitute for F major. When we make the change, our I, IV, V, I progression turns into a I, IIm, V, I progression: C, Dm, G and C.

You might now notice that on the outer ring of the circle of fifths diagram we can read (going counterclockwise) the same root notes of the IIm, V progression finishing with the I chord (G, D, C). In fact, it goes beyond that. You can see that the very popular IIm, VIm, IIm, V7, I progression is derived from the circle of fifths as well. In C major that progression would be Em, Am, Dm, Gdom7, C.
**The Turnaround**
The IIm-V7 (often called two-five) combination of chords is called a *turnaround* and is frequently used in jazz. Any two consecutive roots on the wheel moving counter-clockwise produce a IIm-V7 turnaround combination.

The combination is often played the end of a musical phrase because it “turns around” the chord progression and starts it over again. A turnaround usually leads to the tonic chord. In the key of C major, the turnaround would be Dm (IIm), Gdom7 (V7), C (I). You will notice that if we begin on the D on the outer ring of the circle and move counter-clockwise, we encounter the G and the C in the same order as played to create a turnaround.

Rotating counter-clockwise shows the roots for a IIm-V7-I turnaround. Ex: In the key of F that looks like: Gm, C7, F

---

**Finding the Tonal Center**
Another use for the wheel is analyzing tonal centers of a piece of music. Often a piece of music will change keys. (You can't always tell the tonal center just by looking at the *key signature.*) However, since the presence of a dominant chord often determines the tonal center, the wheel can suggest a possible center. To find the center, identify the root of the dominant chord on the outer ring and move along counter-clockwise one note. This note will probably be the center. For instance, if a Ddom7 appears in a piece of music, find the D, then move counter-clockwise one note. The result is G, the tonal center.
Key Transposer

Sometimes it is necessary to change a piece of music from one key to another. This process is called transposing. This section of the Harmonizer allows you to perform this rather tedious task quickly.

1. Original Key
   This row of key names represents the key you want to transpose from. Pick a key name that matches one of these.

2. New Key
   This row of key names represents the new key you wish to transpose to. Dial the Harmonizer until the key you want to transpose to lines up above the key you want to transpose from. For example, turn the Harmonizer dial until the C appears above the G. Now, anytime a note appears in the piece of music you are transposing, find it on the bottom row marked “From.” The letter above it will represent the new note.

Non-C Instruments
Wind instruments such as trumpet, sax, clarinet, etc., are tuned differently and will actually play a different note from a C instrument such as a guitar when reading from the same music. You can use the Harmonizer’s Key Transposer to show what note the C instrument should play when reading non-C music, and vice versa.

Example:
Let’s say you record yourself playing a piece of music in the key of C major on a guitar and you want to write it out so you can accompany yourself on a trumpet. First, you would identify the tuning note of the non-C instrument; for instance, a trumpet is tuned to B♭. Since you want to take a B♭ instrument to C, you would dial the Harmonizer until C appears in the “To” row above the tuning note of the non-C instrument in the “From” row. Now, when you read a note from your piece of music, find it on the “From” row. The note directly above it in the “To” row is the note you would write on your score for the trumpet.
3. Steps Between Notes
This window shows the number of steps between notes on the “From” line and the “To” line. Dial the Harmonizer until the note you wish to measure to appears above the note you wish to measure from. For instance, when B appears above D, 4½ appears in the window indicating the tonal distance between the two notes. This measurement assumes that the two notes are within the same octave and the note you’re going to is the higher note. Since twelve half steps make an octave, the highest number of whole steps is six.

4. Interval
This window shows the interval between the notes on the “From” line and the “To” line. The “from” line represents the lower of the two notes. The “To” line represents the higher note. Dial the Harmonizer until the note you wish to calculate the interval of appears above the note on the “From” line. For instance, when B appears above D, 6 appears in the window. This indicates that the interval from D to B is a perfect sixth.

Below is a list of the shorthand symbols to indicate the intervals.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Interval Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>♭2</td>
<td>Minor Second</td>
</tr>
<tr>
<td>2</td>
<td>Major Second</td>
</tr>
<tr>
<td>♭3</td>
<td>Minor Third</td>
</tr>
<tr>
<td>3</td>
<td>Major Third</td>
</tr>
<tr>
<td>4</td>
<td>Perfect Fourth</td>
</tr>
<tr>
<td>♭5</td>
<td>Augmented Fourth (or Diminished Fifth)</td>
</tr>
<tr>
<td>5</td>
<td>Perfect Fifth</td>
</tr>
<tr>
<td>♯5</td>
<td>Augmented Fifth (or Diminished Sixth)</td>
</tr>
<tr>
<td>6</td>
<td>Major Sixth</td>
</tr>
<tr>
<td>♭7</td>
<td>Minor Seventh</td>
</tr>
<tr>
<td>7</td>
<td>Major Seventh</td>
</tr>
<tr>
<td>0</td>
<td>Octave</td>
</tr>
</tbody>
</table>

Note: It may seem like a contradiction that the maximum number of steps in an octave scale is six. However, remember that the scale is made up of eight notes that span a total of six whole steps. Intervals basically are counting notes, while steps count the distance between the notes. (See p. 13 for a list of interval names and step distances.)
Enharmonics

*Enharmonics* are notes that are known by two different names, for instance C♯ and D♭. This can cause some confusion if you are not careful. Though C♯ and D♭ are the same note, accepted musical notation dictates that in the key of A major this note should be written C♯, and in the key of A♭ major it is written D♭.

As a rule, scales and modes in major and natural minor keys do not mix sharps and flats. So, if you see a scale or mode on the Harmonizer that mixes sharp and flats, or you see a scale that has fewer sharps or flats than it should, it probably indicates an enharmonic note is in the scale.

An indicator has been built into the Harmonizer to alert you when the scales and modes are displayed according to accepted musical notation principles.

The Harmonizer departs from accepted notation principles when it comes to the melodic minor and harmonic minor scales. In these scales it is common to show the raised seventh note as a sharp, even if the scale is based on a key consisting of flats. In order to preserve the integrity of notes in other locations on the dial, the Harmonizer shows these notes as flats. This anomaly applies to G melodic minor as well as D and G harmonic minors.

In exceptional cases, a window of the Harmonizer will show two notes. Choose the note that best matches context. Remember, sharps go with sharps. Flats go with flats.

<table>
<thead>
<tr>
<th>Flats</th>
<th>Keys</th>
<th>Sharps</th>
<th>Enharmonic Equivalent Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1♭</td>
<td>F, Dm</td>
<td>0</td>
<td>C# = D♭</td>
</tr>
<tr>
<td>2♭</td>
<td>B♭, Gm</td>
<td>1♭</td>
<td>D# = E♭</td>
</tr>
<tr>
<td>3♭</td>
<td>E♭, Cm</td>
<td>2♭</td>
<td>E# = F</td>
</tr>
<tr>
<td>4♭</td>
<td>A♭, Fm</td>
<td>2♭</td>
<td>F# = G♭</td>
</tr>
<tr>
<td>5♭</td>
<td>D♭, B♭m</td>
<td>3♭</td>
<td>G# = A♭</td>
</tr>
<tr>
<td>6♭</td>
<td>G♭, E♭m</td>
<td>4♭</td>
<td>A# = B♭</td>
</tr>
<tr>
<td>7♭</td>
<td>C♭*, A♭m</td>
<td>5♭</td>
<td>B# = C</td>
</tr>
<tr>
<td></td>
<td>C#, A♭m</td>
<td>6♭</td>
<td>B = C♭</td>
</tr>
</tbody>
</table>

This chart shows the number of sharp and flat notes that appear naturally in the corresponding keys.

* The Harmonizer does not show the key of C♭ major.
What does the Harmonizer do?

The Harmonizer helps new and seasoned musicians learn and apply music theory principles to composing and improvising.

The Harmonizer’s patented design shows musical concepts in a visual format, making learning easy and fun. The Harmonizer works for any instrument.

The Harmonizer aids musicians with:

- scales & modes
- chord construction
- chord progression
- chord substitution
- intervals
- modulation
- transposition

The Harmonizer is perfect for any musician who wishes to deepen their understanding of music theory and enhance their playing ability.

Its easy-to-use format works like a slide-rule. Simply dial the Harmonizer to any key and view all the information about that key instantly.