

# The helmholtz-ellis-ji-notation package\*

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## 1 Introduction

The Helmholtz-Ellis JI Pitch Notation (HEJI), devised in the early 2000s by Marc Sabat and Wolfgang von Schweinitz, explicitly notates the raising and lowering of the *untuned* diatonic Pythagorean notes by specific microtonal ratios defined for each prime. It provides visually distinctive “logos” distinguishing families of justly tuned intervals that relate to the harmonic series. These take the form of strings of additional accidental symbols based on historical precedents, extending the traditional sharps and flats. Since its 2020 update, HEJI ver. 2 (“HEJI2”) provides unique microtonal symbols through the 47-limit.

The `helmholtz-ellis-ji-notation` package is a simple L<sup>A</sup>T<sub>E</sub>X implementation of HEJI2 that allows for in-line typesetting of microtonal accidentals for use within theoretical texts, program notes, symbol legends, etc.

## 2 Compatibility

Documents must be compiled using the X<sub>Y</sub>L<sup>A</sup>T<sub>E</sub>X engine.

## 3 Installation

Install the package either through your T<sub>E</sub>X distribution (TeXLive, MiKTeX) or by manually installing the `helmholtz-ellis-ji-notation.ins` file (e.g. run `latex helmholtz-ellis-ji-notation.ins` in Command Prompt) and compiling `helmholtz-ellis-ji-notation.dtx` using X<sub>Y</sub>L<sup>A</sup>T<sub>E</sub>X to create the latest version of this documentation. Include the package

```
\usepackage[option]{helmholtz-ellis-ji-notation}
```

in your document preamble. You must also install the `HEJI2Text.otf` font file and verify that it appears in your system’s system font directory.

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\*This document corresponds to `helmholtz-ellis-ji-notation v1.1`, dated 2020-05-19.

## 4 Usage

`heji` The helmholtz-ellis-ji-notation package provides the general `\heji` macro for typesetting microtones. It takes two arguments.

`\heji{<note>}{<string>}`

`note` The first argument, `{<note>}`, corresponds to the desired diatonic pitch name (e.g. A–G, do–ti) and is typeset in the document’s default body font. The second argument, `{<string>}`, corresponds to the appropriate character mapping of the desired accidental (combination) within the `HEJI2Text.otf` file or the appropriate string of *accidental macros* (see table in section 5). For example, the pitch 7/4 above C♯ may be typeset by writing either `\heji{B}{<e>}` or `\heji{B}{\otonalseven\flat}` to produce B♭. By default, tones are displayed in note–accidental format. Including the option `accfirst` when loading the package reverses the order of elements to accidental–note format. To print an accidental on its own, use the macro `\acc{<string>}`.

`accfirst option`

`acc`

`otonal, utonal` The stand-alone macros `\otonal` and `\utonal` may be used when describing partials of harmonic and subharmonic series, e.g. `15\otonal\` for 15<sup>o</sup> and `\utonal 7` for u7. Note the extra backslash when the `\otonal` macro is used. This is required because L<sup>A</sup>T<sub>E</sub>X ignores spaces immediately following these macros (which is why a space *is*, confusingly, inserted after `\utonal` in order to *adjoin* it to the following digit). Including a backslash on the tail of `\otonal` forces a space after the symbol is printed. If no space is desired (e.g. if the symbol is followed by a period or a comma) then the trailing backslash may, of course, be omitted.

## 5 Accidental macros & font mappings

Notation	Accidental macro	Font mapping
♭♭	<code>\tempflatflat</code>	A
♭	<code>\tempflat</code>	a
♮	<code>\tempnat</code>	j
♯	<code>\tempsharp</code>	z
×	<code>\tempsharpsharp</code>	Z
♭♭	<code>\flatflat</code>	E
♭	<code>\flat</code>	e
♮	<code>\nat</code>	n
♯	<code>\sharp</code>	v
×	<code>\sharpsharp</code>	V
♭♭	<code>\otonalsixtwentyfiveflatflat</code>	I
♭	<code>\otonalsixtwentyfiveflat</code>	K
♮	<code>\otonalsixtwentyfivenat</code>	M
♯	<code>\otonalsixtwentyfivesharp</code>	O

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Accidental macros & font mappings – *cont'd from previous page*

Notation	Accidental macro	Font mapping
$\times$	<code>\otonalsixtwentyfivesharpsharp</code>	R
$\flat\flat$	<code>\otonalonetwentyfiveflatflat</code>	B
$\flat$	<code>\otonalonetwentyfiveflat</code>	b
$\natural$	<code>\otonalonetwentyfivenat</code>	k
$\sharp$	<code>\otonalonetwentyfivesharp</code>	s
$\times$	<code>\otonalonetwentyfivesharpsharp</code>	S
$\flat\flat$	<code>\otonaltwentyfiveflatflat</code>	C
$\flat$	<code>\otonaltwentyfiveflat</code>	c
$\natural$	<code>\otonaltwentyfivenat</code>	l
$\sharp$	<code>\otonaltwentyfivesharp</code>	t
$\times$	<code>\otonaltwentyfivesharpsharp</code>	T
$\flat\flat$	<code>\otonalfiveflatflat</code>	D
$\flat$	<code>\otonalfiveflat</code>	d
$\natural$	<code>\otonalfivenat</code>	m
$\sharp$	<code>\otonalfivesharp</code>	u
$\times$	<code>\otonalfivesharpsharp</code>	U
$\flat\flat$	<code>\utonalfiveflatflat</code>	F
$\flat$	<code>\utonalfiveflat</code>	f
$\natural$	<code>\utonalfivenat</code>	o
$\sharp$	<code>\utonalfivesharp</code>	w
$\times$	<code>\utonalfivesharpsharp</code>	W
$\flat\flat$	<code>\utonaltwentyfiveflatflat</code>	G
$\flat$	<code>\utonaltwentyfiveflat</code>	g
$\natural$	<code>\utonaltwentyfivenat</code>	p
$\sharp$	<code>\utonaltwentyfivesharp</code>	x
$\times$	<code>\utonaltwentyfivesharpsharp</code>	X
$\flat\flat$	<code>\utonalonetwentyfiveflatflat</code>	H
$\flat$	<code>\utonalonetwentyfiveflat</code>	h
$\natural$	<code>\utonalonetwentyfivenat</code>	q
$\sharp$	<code>\utonalonetwentyfivesharp</code>	y
$\times$	<code>\utonalonetwentyfivesharpsharp</code>	Y
$\flat\flat$	<code>\utonalsixtwentyfiveflatflat</code>	J
$\flat$	<code>\utonalsixtwentyfiveflat</code>	L

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Accidental macros & font mappings – *cont'd from previous page*

Notation	Accidental macro	Font mapping
Ɱ	<code>\utonalsixtyfivenat</code>	N
Ɱ	<code>\utonalsixtyfivesharp</code>	P
Ɱ	<code>\utonalsixtyfivesharpsharp</code>	Q
Ɱ	<code>\otonalfortynine</code>	,
Ɱ	<code>\otonalseven</code>	<
Ɱ	<code>\utonalseven</code>	>
Ɱ	<code>\utonalfortynine</code>	.
Ɱ	<code>\otonaleleven</code>	4
Ɱ	<code>\utonaleleven</code>	5
Ɱ	<code>\otonalthirteen</code>	0
Ɱ	<code>\utonalthirteen</code>	9
Ɱ	<code>\otonalseventeen</code>	:
Ɱ	<code>\utonalseventeen</code>	;
Ɱ	<code>\otonalnineteen</code>	/
Ɱ	<code>\utonalnineteen</code>	*
Ɱ	<code>\otonaltwentythree</code>	3
Ɱ	<code>\utonaltwentythree</code>	6
Ɱ	<code>\otonaltwenty-nine</code>	2
Ɱ	<code>\utonaltwenty-nine</code>	7
Ɱ	<code>\otonalthirtyone</code>	1
Ɱ	<code>\utonalthirtyone</code>	8
Ɱ	<code>\otonalthirtyseven</code>	á
Ɱ	<code>\utonalthirtyseven</code>	â
Ɱ	<code>\otonalfortyone</code>	+
Ɱ	<code>\utonalfortyone</code>	-
Ɱ	<code>\otonalfortythree</code>	é
Ɱ	<code>\utonalfortythree</code>	è
Ɱ	<code>\otonalfortyseven</code>	í
Ɱ	<code>\utonalfortyseven</code>	ì
<i>stand-alone macros for o- and utonal symbols</i>		
o	<code>\otonal</code>	ö
u	<code>\utonal</code>	ü
o	<code>\Otonal</code>	Ö
u	<code>\Utonal</code>	Ü

## 6 Implementation

`\heji` The package requires `fontspec` to access the required font files.

```
1 \RequirePackage{fontspec}[2018-07-30 vv2.6h]
2 \newfontfamily{\HEJIfont}{HEJI2Text}
3 \makeatletter
4 \newcommand*\fsize{\dimexpr\f@size pt\relax}
5 \makeatother
6 \newcommand*\tempflatflat{A}
7 \newcommand*\tempflat{a}
8 \newcommand*\tempnat{j}
9 \newcommand*\tempsharp{z}
10 \newcommand*\tempsharpsharp{Z}
11 \newcommand*\otonalsixtwentyfiveflatflat{I}
12 \newcommand*\otonalsixtwentyfiveflat{K}
13 \newcommand*\otonalsixtwentyfivenat{M}
14 \newcommand*\otonalsixtwentyfivesharp{O}
15 \newcommand*\otonalsixtwentyfivesharpsharp{R}
16 \newcommand*\otonalonetwentyfiveflatflat{B}
17 \newcommand*\otonalonetwentyfiveflat{b}
18 \newcommand*\otonalonetwentyfivenat{k}
19 \newcommand*\otonalonetwentyfivesharp{s}
20 \newcommand*\otonalonetwentyfivesharpsharp{S}
21 \newcommand*\otonaltwentyfiveflatflat{C}
22 \newcommand*\otonaltwentyfiveflat{c}
23 \newcommand*\otonaltwentyfivenat{l}
24 \newcommand*\otonaltwentyfivesharp{t}
25 \newcommand*\otonaltwentyfivesharpsharp{T}
26 \newcommand*\otonalfiveflatflat{D}
27 \newcommand*\otonalfiveflat{d}
28 \newcommand*\otonalfivenat{m}
29 \newcommand*\otonalfivesharp{u}
30 \newcommand*\otonalfivesharpsharp{U}
31 \newcommand*\flatflat{E}
32 \renewcommand*\flat{e}
33 \newcommand*\nat{n}
34 \renewcommand*\sharp{v}
35 \newcommand*\sharpsharp{V}
36 \newcommand*\utonalfiveflatflat{F}
37 \newcommand*\utonalfiveflat{f}
38 \newcommand*\utonalfivenat{o}
39 \newcommand*\utonalfivesharp{w}
40 \newcommand*\utonalfivesharpsharp{W}
41 \newcommand*\utonaltwentyfiveflatflat{G}
42 \newcommand*\utonaltwentyfiveflat{g}
43 \newcommand*\utonaltwentyfivenat{p}
44 \newcommand*\utonaltwentyfivesharp{x}
45 \newcommand*\utonaltwentyfivesharpsharp{X}
46 \newcommand*\utonalonetwentyfiveflatflat{H}
47 \newcommand*\utonalonetwentyfiveflat{h}
48 \newcommand*\utonalonetwentyfivenat{q}
49 \newcommand*\utonalonetwentyfivesharp{y}
50 \newcommand*\utonalonetwentyfivesharpsharp{Y}
51 \newcommand*\otonalsixtwentyfiveflatflat{J}
```

```

52 \newcommand*\utonalsixtwentyfiveflat}{L}
53 \newcommand*\utonalsixtwentyfivenat}{N}
54 \newcommand*\utonalsixtwentyfivesharp}{P}
55 \newcommand*\utonalsixtwentyfivesharpsharp}{Q}
56 \newcommand*\otonalfortynine}{,}
57 \newcommand*\otonalseven}{<}
58 \newcommand*\otonalseven}{>}
59 \newcommand*\otonalfortynine}{.}
60 \newcommand*\otonaleleven}{4}
61 \newcommand*\otonaleleven}{5}
62 \newcommand*\otonalthirteen}{0}
63 \newcommand*\otonalthirteen}{9}
64 \newcommand*\otonalseventeen}{:}
65 \newcommand*\otonalseventeen}{;}
66 \newcommand*\otonalnineteen}{/}
67 \newcommand*\otonalnineteen}{*}
68 \newcommand*\otonaltwentythree}{3}
69 \newcommand*\otonaltwentythree}{6}
70 \newcommand*\otonaltwentythree}{2}
71 \newcommand*\otonaltwentythree}{7}
72 \newcommand*\otonalthirtyone}{1}
73 \newcommand*\otonalthirtyone}{8}
74 \newcommand*\otonalthirtyseven}{á}
75 \newcommand*\otonalthirtyseven}{à}
76 \newcommand*\otonalfortyone}{+}
77 \newcommand*\otonalfortyone}{-}
78 \newcommand*\otonalfortythree}{é}
79 \newcommand*\otonalfortythree}{è}
80 \newcommand*\otonalfortyseven}{i}
81 \newcommand*\otonalfortyseven}{i}
82 \newcommand{\heji}[2]{\mbox{\#1\HEJIfont\large #2}}
83 \DeclareOption{accfirst}{
84 \renewcommand{\heji}[2]{\mbox{\#1\HEJIfont\large #2}\#1}}
85 }
86 \newcommand{\acc}[1]{\mbox{\HEJIfont\large #1}}
87 \newcommand*\otonal}{\mbox{\HEJIfont\large ö}}
88 \newcommand*\utonal}{\mbox{\HEJIfont\large ü}}
89 \newcommand*\Otonal}{\mbox{\HEJIfont\large Ö}}
90 \newcommand*\Utonal}{\mbox{\HEJIfont\large Ü}}
91 \ProcessOptions\relax

```