
NAME

kern — translate pitch-related representations to ****kern**

SYNOPSIS

kern [-x] [*inputfile ...*] [> *outputfile.krn*]

DESCRIPTION

The **kern** command transforms various pitch-related inputs to corresponding ****kern** representations. For example, the ****pitch** token 'Ab2' will be output as the ****kern** token 'AA-'. Continuous pitch-related representations, such as frequency (****freq**) and cents (****cents**) are rounded-off to the nearest equally-tempered pitch. Hence, ****freq** values between 254.178 and 269.291 will be output as the ****kern** token for middle C — 'c'.

Pitches in ****kern** are encoded as equally-tempered values at concert pitch. Kern is not able to represent pitch deviations from equal temperament. Diatonic pitch names are encoded using the letters A to G. Octaves are indicated by a system of upper- and lower-case letters, and by letter repetition. Middle C is represented by the single lower-case letter 'c'. The C an octave above is represented by two lower-case letters: 'cc' — with each successive octave adding another letter. The C an octave below middle C is represented by a single upper-case 'C'. The C an octave lower yet is represented by two upper-case letters: 'CC' — and so forth. Changes of octave are deemed to occur between the pitches B and C. Thus the B below middle 'c' is rendered as a single upper-case 'B'; the B below 'cc' is 'b' and so forth. Sharps are indicated by the octothorpe sign (#) whereas flats are indicated by the minus sign (-).

The **kern** command is able to translate any of the pitch-related representations listed below. In each case, a tuning standard of A4 equals 440 hertz is assumed. For descriptions of the various input representations (including ****kern**) refer to Section 2 (*Representation Reference*) of this reference manual.

**cents	hundredths of a semitone with respect to middle C=0
**degree	scale degree including octave designation
**freq	frequency in hertz (abbreviated Hz.)
**fret	fretted-instrument pitch tablature
**MIDI	Music Instrument Digital Interface key-press tablature
**pitch	American National Standards Institute pitch notation (e.g. "A#4")
**semit	equal-tempered semitones with respect to middle C=0
**solfg	French solfège system (fixed 'doh')
**specC	spectral centroid (in hertz)
**Tonh	German pitch system

Input representations processed by kern.

For numerically-oriented inputs, such as ****cents**, ****freq**, ****MIDI**, ****semit**, and ****specC**, variant enharmonic spellings are selected for output according to the prevailing key signature or explicit key indication. (Refer to **key** and **key signatures** in Section 3 (*Humdrum Tandem Interpretations*). Hence, in the key of G minor, F-sharp and E-flat spellings will be output rather than G-flat and D-sharp. Kern recognizes the presence of key, or key signature tandem interpretations. If no key or key signature is encountered in the input, a default key of C major is assumed. Kern is sensitive to both *pitch-class* and *pitch-height* key signatures. In the case of pitch-height key signatures, the user can specify complex spelling preferences, such as F#2 rather than Gb2, but Gb3 rather than F#3, etc. See SAMPLE OUTPUT below.

It is recommended that output files produced using the **kern** command should be given names with the distinguishing '.krm' extension.

OPTIONS

The **kern** command provides the following options:

- h** displays a help screen summarizing the command syntax
- x** suppresses printing of non-pitch-related signifiers

Options are specified in the command line.

In the default operation, **kern** outputs any non-pitch-related signifiers in addition to the kern value. For example, the ****pitch** token "A6zzz" will result in the output "aaazzz" — that is, after translating A6 to "aaa", the "zzz" signifiers are retained in the output. For some applications, echoing non-pitch-related signifiers in the output is useful. However, in other situations, the result can prove confusing — especially, when the non-pitch-related signifiers are upper- or lower-case letters from A-G. Consider the case of the ****freq** token "aA#5"; after translating "A#5" to "aa", the leading non-pitch-related signifier "a" will be prepended to the output, hence the value "aaa" — which will undoubtedly cause confusion. The **-x** option is useful for eliminating non-pitch-related signifiers from the output. For most inputs, the **-x** option is recommended.

SAMPLE OUTPUTS

The following example illustrates the use of **kern**. The input contains six pitch-related spines — two of which (****deg** and ****cocho**) cannot be processed by **kern**. In addition, there are two non-pitch-related spines (****embell** and ****metpos**).

```
!! 'kern' example #1
**specC  **pitch  **MIDI  **deg  **metpos  **cocho  **Tonh  **embell
*M2/4    *M2/4    *M2/4    *M2/4  *M2/4    *M2/4    *M2/4    *M2/4
*        *        *        *      *tb8      *        *        *
=1       =1       =1       =1     =1        =1       =1       =1
foo2000  G#4foo    /60/bar  1foo  1        r        Gis2    ct
.        .        /-60/    .      .        .        .        .
2321     A3+20     /62/     2      3        9.89     H2       upt
.        .        48/-62/   .      .        .        .        .
1807     Ab3       0/70/64  1      2        7.07     B2       ct
.        .        48/-70/   .      .        .        .        .
2487     C#4       /61/     6      3        7.135    Cis4    sus
.        .        /-61/     .      .        .        .        .
=2       =2       =2       =2     =2        =2       =2       =2
3323     r         .        5      1        r        r        .
.        .        .        7      3        5.5      Heses2   ct
3471     D4-8      /48/ /52/  1      2        8.11     C3       ct
.        .        /-48/     .      .        .        .        .
.        D4 F4     /-52/     2      3        7.33 6.4  C3 Es3   ct
=3       =3       =3       =3     =3        =3       =3       =3
r        G4        .        r      1        r        H2 D3    .
=====
*-       *-       *-       *-     *-        *-       *-       *-
```

Executing the command

```
kern -x input > output.krn
```

produces the following result:


```

!! 'kern' example #1
**kern    **kern    **kern    **deg    **metpos    **cocho    **kern    **embell
*M2/4     *M2/4     *M2/4     *M2/4     *M2/4     *M2/4     *M2/4     *M2/4
*         *         *         *         *tb8        *         *         *
=1        =1        =1        =1        =1        =1        =1        =1
bbb       g#        c         1foo      1          r         GG#       ct
.         .         .         .         .          .         .         .
dddd      A         d         2          3          9.89      BB        upt
.         .         .         .         .          .         .         .
aaa       A-        b-        1          2          7.07      BB-       ct
.         .         .         .         .          .         .         .
eeee-     c#        d-        6          3          7.135     c#        sus
.         .         .         .         .          .         .         .
=2        =2        =2        =2        =2        =2        =2        =2
aaaa-     r         .         5          1          r         r         .
.         .         .         7          3          5.5       BB--      ct
aaaa      d         C E      1          2          8.11      C         ct
.         .         .         .         .          .         .         .
.         d f       .         2          3          7.33 6.4   C E-     ct
=3        =3        =3        =3        =3        =3        =3        =3
r         g         .         r         1          r         BB D      .
====      ====      ====      ====      ====      ====      ====      ====
*-        *-        *-        *-        *-        *-        *-        *-

```

Both processed and unprocessed spines are output. Also notice that the non-pitch-related signifiers (e.g. foo) in the first notes of the ****specC**, ****pitch**, and ****MIDI** spines have been stripped away (due to the **-x** option).

Key signature sensitivity is illustrated in the following example. The input contains a “pitch-height key signature” — where flats and sharps pertain to only a specific absolute pitch. For example, Bb3 is preferred to A#3, although A#4 is preferred to Bb4. Similarly, C#4 is preferred to Db4, although Db5 is preferred to C#5.

```

!! 'kern' example #2
**semitS
*K[B3-C4#F4#A4#D5-]
-2
10
1
6
13
*-

```

Notice in the corresponding output given below, that all pitches are rendered with the correct enharmonic spelling.

```
!! 'kern' example #2
**kern
*K[B3-C4#F4#A4#D5-]
B-
a#
c#
f#
dd-
*-
```

FILES

The file `x_option.awk` is used by this program when the `-x` option is invoked.

PORTABILITY

DOS 2.0 and up, with the MKS Toolkit. OS/2 with the MKS Toolkit. UNIX systems supporting the *Korn* shell or *Bourne* shell command interpreters, and revised *awk* (1985).

SEE ALSO

****cents** (2), **cents** (4), ****degree** (2), **degree** (4), ****freq** (2), **freq** (4), ****fret** (2), **hint** (4), ****kern** (2), **mint** (4), ****MIDI** (2), **midi** (4), ****pitch** (2), **pitch** (4), **proof** (4), ****semits** (2), **semits** (4), ****solfg** (2), **solfg** (4), ****specC** (2), **specc** (4), ****Tonh** (2), **tonh** (4)

BUGS

When translating ****pitch**, ****solfg**, or ****Tonh**, inputs, **kern** ignores cents deviation. Hence `C#6+80` is rendered as `'ccc#'` rather than the nearest pitch `'ddd'`.

WARNINGS

Humdrum representations are expected to avoid context dependency insofar as possible. This can lead to unexpected results. For example, the letter 'x' in ****pitch** is intended to signify the presence of a double sharp. Thus the ****pitch** input token `'xyzC4'` is correctly translated by **kern** as `'yzc##'`. Similarly, the ****pitch** input token `'lyzC4'` becomes `'yzCCC4'`. (The first numerical value is interpreted as the octave number and the trailing number 4 is interpreted as a non-pitch-related signifier.)