

Humdrum to MIDI

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Tempo

<http://extras.humdrum.org/man/hum2mid>

**kern
*M4/4
***MM60**
4c
4d
4e
4f
4g
4a
4b
2cc
*_



**kern
*M4/4
***MM120**
4c
4d
4e
4f
4g
4a
4b
2cc
*_



**kern
*M4/4
***MM240**
4c
4d
4e
4f
4g
4a
4b
2cc
*_



**kern
*M4/4
***MM480**
4c
4d
4e
4f
4g
4a
4b
2cc
*_



**kern
*M4/4
***MM960**
4c
4d
4e
4f
4g
4a
4b
2cc
*_



`hum2mid file.krn -o file.mid`

Tempo changes

**kern

*MM40

4c

4d

*MM60

4e

4f

*MM80

4g

4a

*MM112

4b

4cc

*MM144

4dd

4ee

2ff

*_



**tempo spine

- Useful for more frequent tempo changes

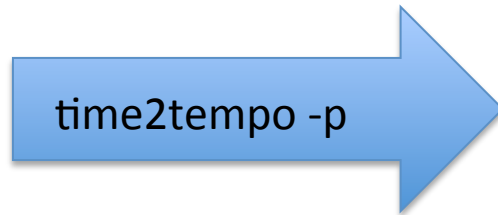
```
**kern    **tempo    hum2mid --tempo tempo.krn -o tempo.mid
4C        60
4D        65
4E        70
4F        75
4G        80
4A        85
4B        90
4c        95
4d        100
4e        105
4f        110
4g        115
4a        120
4b        125
2cc       130
*_        *_
```



time2tempo

<http://extras.humdrum.org/man/time2tempo>

```
**time  **kern
*u=sec  *
0       4c
1.0     4d
1.8     4e
2.6     4f
3.0     4g
3.25    4a
3.5     4b
5.0     4cc
*_      *_
```



```
**tempo **time  **kern
*       *u=sec  *
60      0       4c
75      1.0     4d
.       1.8     4e
150     2.6     4f
240     3.0     4g
.       3.25    4a
40      3.5     4b
.       5.0     4cc
*_      *_      *_
```

`hum2mid --tempo tempo.krn -o tempo.mid`

SMPTE timing

- Direct timing control from `**time` spine (`**tempo` not used)

<code>**time</code>	<code>**kern</code>
<code>*u=sec</code>	<code>*</code>
0	4c
1.0	4d
1.8	4e
2.6	4f
3.0	4g
3.25	4a
3.5	4b
5.0	4cc
<code>*_</code>	<code>*_</code>

`hum2mid time.krn --time -o time.mid`

- Direct translation into MIDI tick times
- Uses SMPTE time code: 25 frames/sec with 40 ticks per frame = 1000 ticks/second (1 tick = 1 millisecond)

MIDI performance simulations

<http://mazurka.org.uk/info/revcond/pid610003-17>

Beat timings: <http://mazurka.org.uk/info/revcond/pid610003-17/pid610003-17-01.tap>

Merged with score: <http://mazurka.org.uk/info/revcond/pid610003-17/pid610003-17.btime>

`gettime -i` (interpolate times for offbeats):

<http://mazurka.org.uk/info/revcond/pid610003-17/pid610003-17.time>

Converted to MIDI with `hum2mid --time` option:

<http://mazurka.org.uk/ana/midi/pid610003-17/contents.html>



Score's timings

Average tempo
*MM142



Performer's timings

Articulations

**kern

*M6/8

=-

8c

8c

8c

8c

8c

8c

=

8c'

8c'

8c'

8c'

8c'

8c'

=

8c^

8c

8c

8c^

8c

8c

=

8c^

8c

8c^

8c

8c^

8c

=

*_



Dynamics

hum2mid dynam.krn -o dynam.mid

**kern	**dynam
4c	pp
4d	<
4e	.
4f	.
4g	.
4a	.
4b	ff
4cc	>
4dd	.
4ee	.
4ff	.
2gg	pp
*_	*_



Timbre

**kern
*MM60
*Ipiano
8r
4C
8r
*Ituba
8r
4D
8r
*Icello
8r
4E
8r
*Ivibra
!vibraphone
8r
4F
8r
*Ixylo
!xylophone
8r
4G
8r
*IsxA
!Alto Saxophone
8r
4A
8r
*Icamba
!harpichord
8r
4B
8r

*Iguitr
!guitar
8r
4c
8r
*Iocari
!ocarina
8r
4d
8r
*Isteel
!steel drums
8r
4e
8r
*Isitar
8r
4f
8r
*Ivioln
!violin
8r
4g
8r
*Ivox
!voice
8r
4a
8r
*Itromp
!trumpet
8r
4b
8r
*Iorgan
8r
1cc
*_



Humdrum instrument codes to General MIDI mappings:

<http://extra.humdrum.org/man/hum2mid/humdrumidi.pdf>

Panning

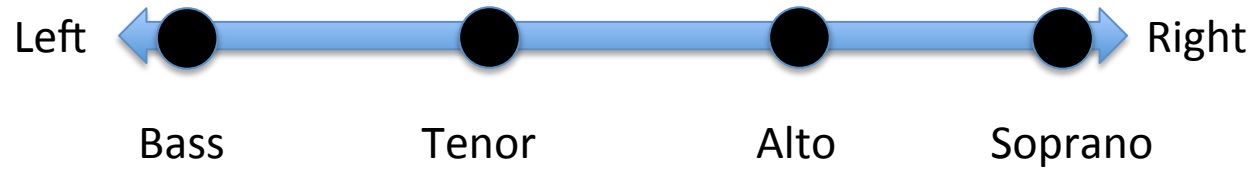
```
**kern  
*MM208  
*lvibra  
*pan=0.0  
4c  
*pan=0.1  
4c  
*pan=0.2  
4c  
*pan=0.3  
4c  
*pan=0.4  
4c  
*pan=0.5  
4c  
*pan=0.6  
4c  
*pan=0.7  
4c  
*pan=0.8  
4c  
*pan=0.9  
4c  
*pan=1.0  
4c  
*pan=0.9  
4c  
*pan=0.8  
4c  
*pan=0.7  
4c  
*pan=0.6  
4c  
*pan=0.5  
4c  
*pan=0.4  
4c  
*pan=0.3  
4c  
*pan=0.2  
4c  
*pan=0.1  
4c  
*pan=0.0  
4c  
*_
```

Stereo Left

Stereo Right



Auto-panning



```
hum2mid --autopan h://chorales/chor001.krn -o chor001-autopan.mid
```



MIDI Plus

hum2mid --plus

MIDI note
velocity bit



- 2 least-significant bits of MIDI note attack velocity byte store pitch's spelling

00 = No MIDI Plus spelling information assigned for note.

01 = Use the flattest possible diatonic spelling

10 = Use the middle possible diatonic spelling.

11 = Use the sharpest possible diatonic spelling.

Allegro

MIDI note 66
velocity bits: 00 = ?
01 = Gb
10 = F#
11 = Ex

Track 1

Track 2

```
!!!OMD: Allegro
**kern      **kern
*clefF4     *clefG2
*k[b-e-a-]  *k[b-e-a-]
*M6/8       *M6/8
==          ==
8CC^ 8CCC^ 4r
8r        .
8r        8r
!         !LO:S:a
4r        (4.f#/ 4.an/ [4.cc/
8r        .
=         =
2.r      4.fn/ 4.a-X/ 4.cc/]
.        4.e-/ 4.g/ 4.cc#/
=         =
4r        4.d/ 4.f#/ 4.dd/)
8r        .
=||       =||
*_        *_
```

Pitch Bend

Dictionary of Intervals:

<http://kern.ccarh.org/browse?l=intervals>

Pythagorean comma: 23.46 cents: $3^{12} / 2^{12} / 2^7$



100 cents = 1 equal-tempered semitone, 12th root of 2 ratio

1200 cents = 1 octave, 2/1 ratio

50 cents = quarter tone

25 cents = eighth tone

Just 3rd:



ET 3rd:



**Dcent

- Dcent = Deviation in cents
- Default range allowed by General MIDI instruments is +/- 200 cents

!!!OTL: Just major third (386.31 cents)

!!!ratio: 5:4

**kern	**Dcent	**kern	**Dcent
*Iclars	*Iclars	*Iclars	*Iclars
*MM60	*MM60	*MM60	*MM60
4cc	0	4r	.
8r	.	8r	.
4ee	-13.69	4r	.
8r	.	8r	.
4cc	0	4r	.
4r	.	4r	.
1cc	0	1ee	-13.69
*_	*_	*_	*_

`hum2mid --bend 200 file.krn -o file.mid`

- 200 is the synth's bend-depth (almost always 200 cents by default)

Temperaments

<http://kern.ccarh.org/browse?l=temperament>

!!!OTL: Pythagorean temperament (Wolf fifth between C-sharp and A-flat)

```
**kern    **Dcent
```

```
4c        0
```

```
4c#       13.685
```

```
4d        3.91
```

```
4e-       -5.865
```

```
4e        7.82
```

```
4f        -1.955
```

```
4f#       11.73
```

```
4g        1.955
```

```
4a-       -7.82
```

```
4a        5.865
```

```
4b-       -3.91
```

```
4b        9.775
```

```
*_        *_
```

[hum2mid -f 19 --temperament tune.krn file.krn -o file.mid](#)

Using online temperament files:

[hum2mid -f 19 --temperament h://tune/pythagorean](#)

Transposition

<http://kern.ccarh.org/browse?l=temperament/tests>

- If the **kern data has a key, then the transpose program can transpose automatically to another key.

```
transpose -k C# h://wtc/wtc1p01.krn | hum2mid -o wtc1p01-01.mid
transpose -k D- h://wtc/wtc1p01.krn | hum2mid -o wtc1p01-01.mid
transpose -k D h://wtc/wtc1p01.krn | hum2mid -o wtc1p01-02.mid
transpose -k E- h://wtc/wtc1p01.krn | hum2mid -o wtc1p01-03.mid
transpose -k E h://wtc/wtc1p01.krn | hum2mid -o wtc1p01-04.mid
transpose -k F h://wtc/wtc1p01.krn | hum2mid -o wtc1p01-05.mid
transpose -k F# h://wtc/wtc1p01.krn | hum2mid -o wtc1p01-06.mid
transpose -k G h://wtc/wtc1p01.krn | hum2mid -o wtc1p01-07.mid
transpose -k A- h://wtc/wtc1p01.krn | hum2mid -o wtc1p01-08.mid
transpose -k A h://wtc/wtc1p01.krn | hum2mid -o wtc1p01-09.mid
transpose -k A h://wtc/wtc1p01.krn | hum2mid -o wtc1p01-10.mid
transpose -k A h://wtc/wtc1p01.krn | hum2mid -o wtc1p01-11.mid
transpose -k A h://wtc/wtc1p01.krn | hum2mid -o wtc1p01-12.mid
```



C major



C#/D- major



D major



E- major

- -k transposition moves to the nearest tonic (+/- a 4th)

humplay

<http://extras.humdrum.org/man/humplay>