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## REPRESENTATION

**\*\*fret** — generalized fretted tablature representation

## DESCRIPTION

The **\*\*fret** representation provides a comprehensive system for representing performance aspects for fretted instruments. The **\*\*fret** scheme is suitable for representing tablature information for most fretted instruments, including: common 6-string and 12-string guitars, the 4-string bass guitar, lute, mandore, theorbo, chitarrone, mandoline, banjo, dulcimer, and viols. The **\*\*fret** interpretation is not limited to equal-temperament tuning, and so can be used to represent non-Western fretted instruments, such as the oud and the sitar.

The **\*\*fret** representation is performance-oriented rather than notationally-oriented. Thus **\*\*fret** is not suitable for distinguishing different visual renderings — such as traditional French or German lute tablatures. Special-purpose Humdrum representations should be used if the user's goal is to distinguish different forms of visual signifiers.

The **\*\*fret** representation distinguishes three types of data tokens: tablature-tokens, rests, and barlines. In addition, **\*\*fret** provides three special-purpose tandem interpretations to specify more precisely the instrument's layout and tuning.

The basic pitches produced by fretted instruments depend on three factors: (1) the relative tuning of the strings with respect to each other, (2) the absolute overall tuning of the instrument, and (3) the position of the frets. Three tandem interpretations allow the user to specify each of these aspects: **\*AT:** (absolute tuning), **\*RT:** (relative tuning), and **\*FT:** (fret tuning). The absolute tuning and fret tuning have default settings,<sup>†</sup> however, the relative tuning of the open strings (**\*RT:**) must be explicitly encoded in a **\*\*fret** spine.

The absolute tuning of an instrument is indicated by encoding the pitch of the lowest string using the **\*AT:** tandem interpretation. For the common six-string guitar, the lowest pitch is normally tuned to E2, and so would be encoded with the tandem interpretation:

**\*AT:E2**

The **\*AT:** interpretation makes use of **\*\*pitch**-type pitch designations and may also include cents deviation. For example, an instrument tuned 45 cents sharp might be represented as **\*AT:E2+45**. Encoding the absolute tuning of an instrument is optional in the **\*\*fret** representation.

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<sup>†</sup> The default absolute tuning is E2; the default fret tuning is one semitone for each successive fret.

The tandem interpretation (\*RT:) specifies the relative tuning, number, and arrangement of strings. Some instruments pair strings together in close physical proximity so that two strings are treated by the performer as a single virtual “string.” Such paired strings are referred to as *courses*. For example, the 12-string guitar is constructed using 6 courses, and is played much like a 6-string guitar — except that two strings sound together, rather than a single string.

The \*RT: tandem interpretation encodes the relative tuning of each string by specifying the number of semitones above the lowest string — where each course is delineated by a colon (:). In the following encoding, the relative tuning of successive strings is 0, 5, 10, 15, 19, and 24 semitones above the lowest string. This tuning defines the most common relative tuning for the six-string guitar — where successive strings are tuned above the lowest string by a perfect fourth (5 semitones), a minor seventh (10 semitones), a minor tenth (15 semitones), a perfect fifteenth (19 semitones), and a double octave (24 semitones).

```
*RT:0:5:10:15:19:24
```

For non-Western and other instruments, it is possible to encode non-integer semitone values for various strings, such as a string tuned 9.91 semitones above the lowest string.

When courses consist of more than one string, the relative tuning of each string in the course may differ. When encoding the relative tuning, each string within a course is separated by a comma (,) in the relative tuning interpretation. For example, a 12-string guitar is typically tuned as follows:

```
*AT:E2
*RT:0,12:5,17:10,22:15,27:19,19:24,24
```

In this case, the lower four courses consists of two strings tuned an octave apart, whereas the upper two courses consist of paired unison strings.

Historically, the 6-course *lute* was tuned in a variety of ways — the most common being the so-called *vieil accord* tuning: G2, C3, F3, A3, D4, and G4. From low-to-high, the courses are named bass, tenor, counter-tenor, great mean, small mean, and treble. During the first half of the 16th century, it was common to tune the lower three courses (bass, tenor, counter-tenor) in octaves. Hence, the relative tuning may be represented as follows:

```
*AT:G2
*RT:0,12:5,17:10,22:14,14:19,19:24,24
```

Of course the absolute tuning of the lute was highly variable, so the lowest pitch would not necessarily be G2.

In addition to the absolute and relative tunings, **\*\*fret** also allows the user to specify the tuning of successive frets. In Western instruments, frets are normally placed in semitone increments. For a 12-fret instrument, this semitone arrangement may be explicitly represented using the following tandem interpretation:



\*FT:1,2,3,4,5,6,7,8,9,10,11,12

Each successive numerical value indicates the number of semitones above the open string for successive fret positions. The interpretation begins with the tuning of the first fret rather than the tuning of the open string. The above interpretation is similar to the *default fret tuning* — which is an increase of precisely one semitone for each successive fret. However, the above interpretation specifies only 12 frets, and so fret positions higher than 12 would be considered errors in the above encoding. An instrument constructed with 1/4-tone fret positions can be encoded as follows:

\*FT:.5,1,1.5,2,2.5,3,3.5,4,4.5

The only restriction imposed by \*FT: is that all strings must have identical fret distances. That is, if the first fret is positioned 1 semitone above the open string, then this relative pitch arrangement must be true of all strings.

*Tablature-tokens* encode information regarding the fret/finger positions, the manner by which individual strings are plucked (or bowed), pitch-bending, vibrato, damping, harmonics, and other effects. The actions of individual fingers can also be represented. Each tablature-token consists of a several subtokens in the form of Humdrum multiple-stops. Subtokens are delimited by spaces and represent individual courses/strings. A six-string (or six-course) instrument will require six subtokens in each tablature-token.

Subtokens consist of up to five component elements: (1) the string/course status, (2) fret position, (3) bowing/strumming, (4) finger action, and (5) percussive effects. In addition, the tablature-token can encode bowing and strumming information.

In the **\*\*fret** representation, the status of a string/course can occupy one of sixteen states: (1) inactive, (2) plucked, (3) plucked ponticello, (4) plucked sul tasto, (5) plucked tremolo, (6) pizzicato, (7) bowed, (8) bowed ponticello, (9) bowed sul tasto, (10) spiccato, (11) col legno, (12) bowed tremolo, (13) natural harmonic, (14) artificial harmonic, (15) ringing, or (16) damped.

An *inactive* string is signified by the minus sign (-). An ordinary *plucked* string is represented by the vertical line (|). Plucking near the bridge (*plucked ponticello*) is represented by the slash character (/). Plucking near the tone-hole (*plucked sul tasto*) is represented by the back-slash character (\). The repeated *plucked-tremolo* (commonly used on the mandoline) is represented using the octothorpe or hash character (#). *Pizzicato* is represented by the small letter 'z'. Normal bowing of a string is represented by the plus sign (+); *ponticello* bowing is represented by the open parenthesis '(' whereas *sul tasto* bowing is represented by the closed parenthesis ')'. *Spiccato* (bouncing the bow) is represented by the open curly brace '{'. *Col legno* (using the wood of the bow) is represented by the closed curly brace '}'. *Tremolo bowing* is represented by the ampersand (&). *Natural harmonics* and *artificial harmonics* are represented by the lower-case 'o' and upper-case 'O' respectively. String *ringing* is denoted by the colon (:), and the *damping* of a string is denoted by the small letter 'x'.

By way of illustration, the following tablature-token represents a six-string/course



instrument, where the first through sixth strings are respectively (1 and 2) plucked, (3) damped, (4) bowed, (5) plucked *sul tasto*, (6) inactive.

| | x + \ -

Note that the layout of the strings in a tablature-token always corresponds to the tuning specified in the relative-tuning interpretation. In most representations, the lower-pitched strings will be toward the left side of the tablature token.

*Bowing-direction* and *strumming* information is prepended to the beginning of the tablature-token. The direction of bowing/strumming is encoded using the left and right angle brackets: > means to bow/strum from the strings on the left side of the representation toward the strings on the right side of the representation. On most instruments this means strumming “downward” — from the lowest- to the highest-pitched strings. The left angle bracket: < means to strum in the opposite direction. A rough indication of the speed of bowing/strumming can be represented by duplicating these signifiers. For example, >> means a slower “downward” bow/strum, and <<< means an especially slow “upward” bow/strum. The percent sign (%) is used to signify the so-called *rasgeado* — or flamboyant Spanish strum. Once again these signifiers appear at the beginning of a tablature-token — whenever they are encoded. Strumming all 6 open strings downward on a commonly-tuned guitar is represented as:

```
*AT:E2
*RT:0:5:10:15:19:24
>| | | | | |
```

Notice that there is no space between the right angle bracket and the first vertical bar.

*Fret-position* information is indicated through the use of numbers, with the first fret signified by the number ‘1’. Fret-position numbers are encoded immediately to the right of their respective string/course. For example, the following tablature-token encodes a six-string/course instrument in which the second and third strings are both stopped at the second fret.

>| |2 |2 | | |

The **\*\*fret** representation also permits the optional encoding of *fingering* information. For the plucking-hand (normally right hand), traditional musical abbreviations are used: *P* (pollex) for the thumb, *I* (index) for the index finger, *M* (medius) for the middle finger, *A* (annularis) for the ring finger, and *Q* (quintus) for the little finger. In addition, the lower-case letter *p* is used to signify the palm of the hand. Note that these letters are applied only to the ‘plucking’ hand. In the case of the ‘fret-board’ hand, the lower-case letters *a-e* are used to denote the thumb, index finger, middle finger, ring finger, and little fingers, respectively. Like the fret information, fingering information is encoded immediately to the right of the string to which the information applies. By way of illustration, the finger actions used in the above example may be made explicit as follows:

>|P |2bP |2cP |P |P |P

The strum is carried out by the thumb, while the index and middle fingers of the fret-hand stop the second and third courses/strings at the second fret. In the following continuation of this representation, the first course/string is replucked by the thumb. With the exception of the second and third courses/strings, the other strings are allowed to ring.

```
>|P |2bP |2cP |P |P |P
>|P xIM xIM : : :
```

Notice that in damping the vibrations of the second and third strings, both the index and middle fingers of the ‘pluck’ hand are used on both strings.

On rare occasions, guitarists will substitute fingers on the fret-board while a string remains sounding. The following example illustrates such a finger-substitution where the middle finger is replaced by the ring finger:

```
| |2b |2c | | |
: :2b :2d : : :
```

Note that in the **\*\*fret** representation, no special signifiers are provided for so-called ‘hammer-on’ or (ascending-slur), nor for the so-called ‘pull-off’ or (descending-slur). During the ascending-slur, the sound is produced simply by engaging the next fret. This can be represented in **\*\*fret** by using the “let ring” signifier (:) in conjunction with the appropriate fret notation. The descending-slur can be similarly notated.

The **\*\*fret** representation also provides several short-hand abbreviations for common ornaments and effects. Trills are indicated by the letters ‘t’ (one semitone) and ‘T’ (two semitones). Mordents are indicated by the letters ‘m’ (one semitone) and ‘D’ (two semitones). Inverted mordents are indicated by the letters ‘w’ (one semitone) and ‘W’ (two semitones). Turns are indicated by the letters ‘S’ and ‘\$’ (for the inverted “Wagnerian” turn). Two types of vibrato are distinguished: ‘v’ for transverse vibrato and ‘V’ for lateral vibrato. Pitch bending is signified by the tilde (~).

Four types of *percussion effects* can be represented using **\*\*fret**. The two most common *tambours* involve tapping on the bridge (represented by the lower-case letter ‘u’) and tapping on the strings near the bridge (represented by the upper-case letter ‘U’). A simple ‘tap’ on the top-plate is represented by the lower-case letter ‘y’, whereas a lower-pitched ‘thump’ on the top-plate is represented by the upper-case letter ‘Y’. When sounded alone, these signifiers appear on a record by themselves. When sounded in conjunction with a plucked or (uncommonly) bowed string, these signifiers appear at the beginning of the tablature-token.

Apart from tablature-tokens, **\*\*fret** also permits the encoding of rests and barlines. Rests tokens are denoted simply by the lower-case letter ‘r’.

Barlines are represented using the “common system” for barlines — see **barlines (2)**.



## FILE TYPE

It is recommended that files containing predominantly **\*\*fret** data should be given names with the distinguishing '.fret' extension.

## SIGNIFIERS

The complete system of signifiers used by **\*\*fret** is summarized in the following table.

<b>Fret-board (left) Hand</b>	
1	first fret position
2	second fret position, ...
11	eleventh fret position, etc.
0	open string (not necessarily sounded)
~	bend up in pitch
v	vibrato (transverse)
V	vibrato (lateral)
t	trill (1 fret distance)
T	trill (2 frets distance)
m	mordent (1 fret distance)
D	mordent (2 frets distance)
w	inverted mordent (1 fret distance)
W	inverted mordent (2 frets distance)
S	turn
\$	inverted (Wagnerian) turn
a	thumb (of fret hand)
b	index finger (of fret hand)
c	middle finger (of fret hand)
d	ring finger (of fret hand)
e	little finger (of fret hand)
n	no finger (of fret hand)
<b>Pluck (right) Hand</b>	
-	unplucked or unactivated string
	plucked string (normal)
/	plucked string — near bridge (ponticello)
\	plucked string — near tone-hole (sul tasto)
#	tremolo (plucked, ala mandoline)
z	pizzicato
:	let string ring
x	damp string
o	natural harmonic
O	artificial harmonic
+	bow (normal)
(	bow — near bridge (ponticello)

)	bow — toward fret-board (sul tasto)
{	spiccato
}	col legno (with wood of the bow)
&	tremolo (bowed)
>	strum from low notes to high notes (= down-bow)
<	strum from high notes to low notes (= up-bow)
>>	slower down-strum; slower down-bow
>>	slower up-strum; slower up-bow
>>>	very slow down-strum; very slow down-bow
<<<	very slow up-strum; very slow up-bow
%	rasgado (Spanish strum)
P	pollex: thumb (of pluck hand)
I	index: index finger (of pluck hand)
M	medius: middle finger (of pluck hand)
A	annularis: ring finger (of pluck hand)
Q	quintus: little finger (of pluck hand)
p	palm (of pluck hand)
N	no finger (of pluck hand)
u	tambour (tap on bridge)
U	tambour (tap on strings near bridge)
y	'tap' on top-plate
Y	'thump' on top-plate

*Summary of \*\*fret Signifiers*

## EXAMPLES

A sample document is given below. The **\*\*kern** representation echoes the pitches in the **\*\*fret** representation.

<b>**recip</b>	<b>**kern</b>	<b>**fret</b>
*	*	*AT:G2 ~
*	*	*RT:0,12:5,17:10,22:14,14:19,19:24,24
*M3/4	*	*M3/4
=1	=1	=1
4	E e g	:  4 : : :  0
8	c	: : :  3 : :
8	d	: : : :  0 x
8	D d e	:  2 : :  2 :
8	f	: : : :  3 :
=2	=2	=2
4	E e g	:  4 : : :  0
4	c	: : :  3 : :
4	c	: : :  3 : x
=3	=3	=3
4	F f a	:  5 : : :  2W
8	f	: : : :  3 :
8	g	: : : : :  0
8	a	: : : : :  2
8	b	: : : : :  4
=4	=4	=4
2	E e cc	:  4 : : :  5v
*_	*_	*_

## PERTINENT COMMANDS

The following Humdrum commands accept **\*\*fret** encoded data as inputs:

<b>cents</b>	translates <b>**fret</b> to <b>**cents</b>
<b>freq</b>	translates <b>**fret</b> to <b>**freq</b>
<b>kern</b>	translates <b>**fret</b> to <b>**kern</b>
<b>pitch</b>	translates <b>**fret</b> to <b>**pitch</b>
<b>semit</b>	translates <b>**fret</b> pitch to numerical <b>**semit</b>
<b>solfg</b>	translates <b>**fret</b> pitch to numerical <b>**solfg</b>
<b>tonh</b>	translates <b>**fret</b> pitch to numerical <b>**Tonh</b>

## TANDEM INTERPRETATIONS

The following tandem interpretations can be used in conjunction with **\*\*fret**:



ensemble	*a2
absolute tuning	*AT:
relative tuning	*RT:
fret tuning	*FT:
meter signatures	*M6/8
key signatures	*k[f#c#]
key	*c#:

*Tandem interpretations for \*\*fret*

**SEE ALSO**

**barlines (2), \*\*cents (2), \*\*freq (2), \*\*kern (2), \*\*pitch (2), \*\*semit (2), \*\*solfg (2),  
\*\*Tonh (2)**