welcome to linotune

version 1.14 Oct 2018

strobe display
- divided into a number of horizontal bands, each tuned to a particular frequency (pitch)
- inital setup: fundamental ('1x' the →*base frequency*), octave ('2x'), and compound 5th ('3x', an octave and a perfect fifth)
- can be changed at will: →*strobe band editing*
- when frequencies near that pitch are detected in the input, a pattern of vertical bars appears
- bar contrast indicates strength of that signal
- bar movement indicates pitch deviation - pattern moves left: input is flat (pitch too low) pattern moves right: input is sharp (too high)
- bar sharpness indicates stability of pitch

pitch measurement: when a partial near a strobe band is detected, its mean deviation from the target pitch is shown on the right in Hz or cents, as chosen via the →*Hz* button

if that value is within the chosen →*tolerance* of the target, the strobe band will turn green

tip: clicking on the displayed deviation will zero it by adjusting the →cents offset

pitch pipe
- click on the left side of a band to hear its pitch as a continuous tone
- click again for *beep mode:* responds to sounds with a brief tone
- click a third time to turn the tone off
- click more bands to add/remove them

when **display performance** drops below 40 frames per second (fps) it is shown here. try reducing linotune's window size, and close other graphics-intensive applications.

a reminder that a non-standard **roll speed** has been set from the →*rear panel controls*

input level indicator lights up green when signal present; red when clipping (too loud).
tip: click here to pause the strobe display

the active **scale/temperament**; click to view or change →*scale/temperament files*

the **pitch dial** sets the current note, octave, and transpose. see next page for details

the **base frequency** that the '1x' strobe band is tuned to, in Hertz. determined by →*scale/temperament*, →*pitch dial*, →*cents offset*, and →*reference frequency* settings.
tip: click here for the →*rear panel controls*

cents offset shifts base frequency by cents (1/100^{ths} of an equal-tempered semitone)

reference frequency in Hz. in Western music this is typically the pitch of the "concert A" (A_4)

tip: the last two controls are "rocker switches" - click at top right to increment, bottom left to de-crement; press & hold to scroll through values at a speed controlled by the mouse position

control buttons

freeze: prevent changes in →cents offset, →*reference frequency, or* →*transposition*

peaks: display the →*peak spectrum*

auto pitch detection: on detecting a sound, set →*pitch dial* to the closest musical pitch (E_0 to E_9)

tip: press the above buttons once for single-shot detection (blinking), again for continuous mode

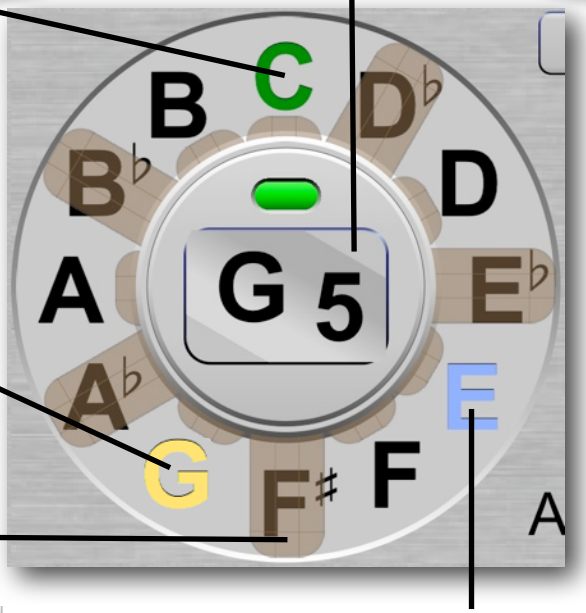
Hz: show strobe band offsets and pitch deviations as frequencies (in Hertz), rather than in cents, as note names, or just intonation frequency ratios.

map the frequency each strobe band is tuned to to the nearest note of the →*scale/temperament*

the pitch dial

transposition: the note that the tonic (first note) of the scale (here: C) is transposed to is lit dark green. press&hold any note on the dial to transpose to it (the first time you'll be asked to confirm this step)

octave click to change the current octave (0 to 9); also indicates the current note. an octave normally is a doubling of frequency, though this can be set differently in →*scale/temperament files*



the current **note** lights up bright yellow, and is also shown on the octave switch

- click on any note on the dial to change to it while remaining in the same octave
- drag the current note around the dial clockwise resp. counter-clockwise to increment or decrement it, possibly changing octave

mode wheel of retractable transparent blades allows selective disabling of notes to enforce tonal modes

- double-click on a note/blade to disable/re-enable it
- drag on a blade to transpose the modal pattern

disabled notes can't be clicked on, and are skipped by pitch detection and note up/down →*keyboard controls*

Example: mode wheel shown here supports *C major* mode; dragging it 90° clockwise would yield *E♭ major*

any **pitch detected** by linotune momentarily lights up in pale blue here. use →*auto pitch* to automatically change pitch

keyboard/mouse controls

keyboard control for front & rear panels:

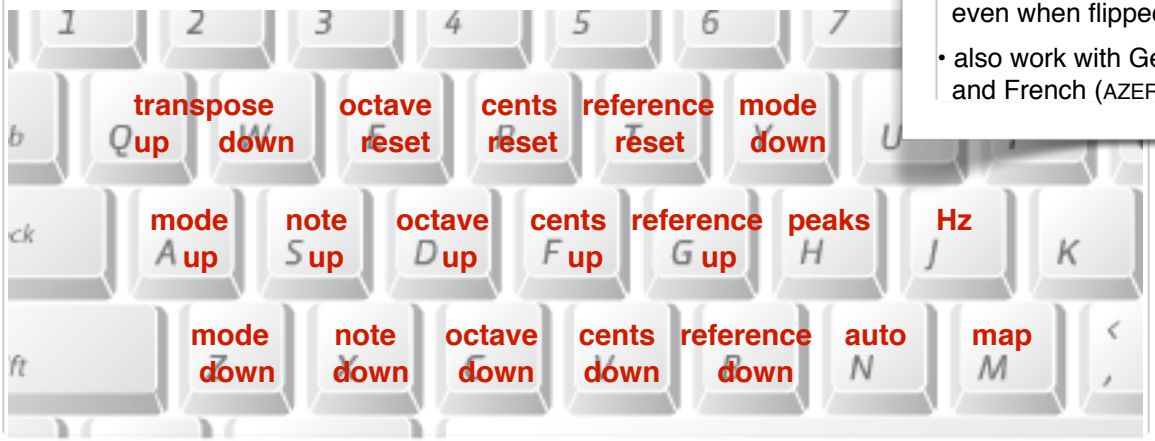
- use **escape/back** key to flip the panel over
- use **left/right** arrow keys to highlight a control
- use **up/down** arrow keys to adjust its value
- use **enter/return** key to set default value (where defined), or operate push buttons

mouse actions that linotune understands:

- **click**: press & release left mouse button
- **double click**: 2 clicks in quick succession
- **press&hold**: keep left button depressed
- **hover**: hold the mouse still over a control
- **drag**: move mouse with left button pressed
- **scroll**: rotate the scroll wheel (if present)

Center or right mouse buttons are not used.

direct keyboard shortcuts for front panel controls:



- these shortcuts are accessible even when flipped to rear panel
- also work with German (QWERTZ) and French (AZERTY) key layout

online activation

this screen appears whenever linotune doesn't know whether you are allowed to run; it can also be called up via the →*info button*.

if you have purchased or subscribed to linotune, make sure that you are online, enter your license key here, then click *activate*.

if you want to move linotune to another computer, you can de-activate your installation by entering the key 9999-9999-9999; this can be done at most twice a week.

tip: the key 0000-0000-0000 will activate a free trial period if available. linotune's operation is cpu-intensive - use the free trial to confirm performance on the target machine before purchase.

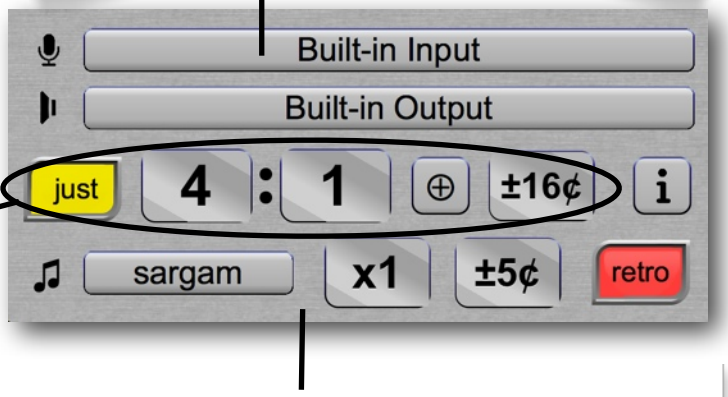
rear panel controls

press the escape/back key or click on the →*base frequency* to access these additional controls. press escape/back again or click the rear panel outside its controls to return to the front panel

tip: hover mouse over any control to receive a hint

audio i/o click to select from available audio inputs and outputs (for the →*pitch pipe*).

tip: on start-up linotune uses your computer's *default* audio input and output, which can be changed via your operating system's utilities



strobe band offset

- the two rocker switches specify an offset from the →*base frequency*, either in semitones and cents, or as a just intonation frequency ratio
- yellow button selects mode; click to convert the current value between the two modes
- conversion to just intonation gives simplest frequency ratio close enough to given offset
- rocker switch determines what's close enough

tip: repeatedly cycling to & from just intonation can yield a sequence of increasingly simple but distant (from the original offset) approximations

strobe band editing

- to **add** a strobe band, set the desired offset then click the ⊕ button
- to **select** a band for editing or deletion, click on it in the center; click again to deselect. a frame is drawn around the selected band; the peak spectrum (if shown) is zoomed onto it.
- to **edit** a band, select it then edit as desired
- to **delete** a band, select it & click the ⊗ button

tip: linotune inserts new bands according to their frequency, but this can be overridden by editing. to move an edited band to its proper (sorted) location, select it and click the ⊗ button twice.

notes click for English, German, solfège, sargam (Hindustani), Byzantine, Russian, Japanese, or numeric default note names for 12-tone scales.

note names specified in →*scale/temperament files* take precedence; scales with more or fewer than 12 pitches have numeric default note names.

roll speed set sensitivity of the strobe bands to pitch deviations, relative to a conventional strobe

tolerance pitch deviation (in cents) below which strobe band turns green (*any:* always, *off:* never)

retro mode shows the spinning disk of a conventional strobe; more cpu-intensive. temporarily disabled when a →*peak spectrum* is displayed.

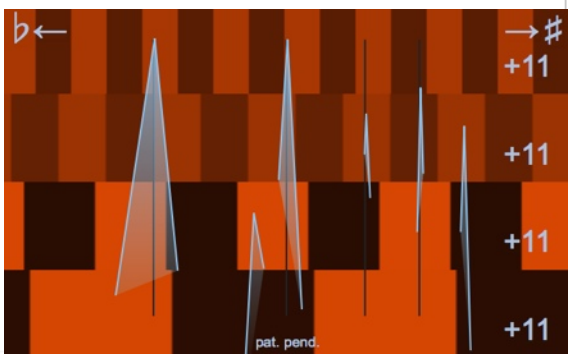
info button displays the program version, serial number, days left on subscription, plus (optionally) license agreement and →*online activation* screen

peak spectrum

calculates and shows the *exact* (not interpolated) location of all significant partials, overlaid on the strobe display. useful to find additional partials and problems such as doubled peaks

the noise floor is suppressed to improve clarity & efficiency; black vertical lines indicate strobe band frequencies.

- hover the mouse to see frequency (in multiples of the base) and amplitude (in dB relative to the maximum) at any point
- to reset the maximum amplitude, cycle the →*peaks* button
- click the middle of a strobe band to zoom spectrum onto it



scale/temperament files

linotune handles a wide variety of scales and temperaments via the *scala* open file format; the active scale/temperament can be viewed or changed by clicking on it in the front panel

tip: when changing scale/temperament, you have to *double*-click on a directory to open it

a collection of about 30 temperaments and a couple of alternative scales comes bundled with linotune. in addition, over 4000 (!) scales and temperaments in *scala* format are freely available at http://www.huygens-fokker.org/scala/downloads.html#scales

tip: use the included *scala* files as templates for your own additions. they are found in the *scala* folder, which on Windows resides in the linotune folder. on the Mac, right-click on the linotune application icon, pick *Show Package Contents*, then *Contents*, then *Resources*

***scala* file format**

defined at http://www.huygens-fokker.org/scala/scl_format.html; here is a brief summary:

- *scala* files are text files that can be edited with ordinary text editors; they have the suffix *.scl*
- lines starting with '!' are ignored as comments
- the first non-comment line describes the scale
- the next one non-comment line gives the total number of pitches to follow, one per line
- each pitch is given relative to the *tonic* (first pitch), either as a frequency ratio, or in cents
- the tonic with pitch 1/1 (or 0.0 cents) is not shown explicitly. instead it is listed last, one octave higher: its pitch thus determines the size of an octave - normally 2/1 or 1200.0¢
- the rest of the line following a pitch value is ignored (but used by →*linotune extensions*)

linotune extensions

linotune extends the *scala* format in two ways:

custom note names if the next word after a pitch value starts with ':', linotune interprets the remainder as a note name, which overrides the default name (→*rear panel controls*: *notes*).

suffixes can be used to specify *accidentals:*

suffix	^B	^b	^d	^+	^#	^x
yields	𝄫	♭	𝄳	♯	♯	𝄪
mea-ning	double flat	flat	semi flat	semi sharp	sharp	double sharp

(for any other character *c*, '^*c*' is rendered as ᶜ)

reference specification if a pitch value or name is followed by the keyword '!!reference', that pitch corresponds to to the →*reference frequency*

- at most one pitch may be marked in this way
- by default, linotune uses pitch 10 ('A') as the reference for 12-tone scales, the tonic otherwise
- '!!reference' is optionally followed by an integer specifying the reference's octave (default: 4)
- this in turn is optionally followed by a frequency in Hertz. if present, the →*reference frequency* is set to that value upon loading the scale

! scala file example

```
! Golden Gate (just).scl
hexatonic scale for Pantheon Steel's "Halo" handpan
6
! this is a comment
  9/8  :D      the first pitch specification
  5/4  :E      another one
45/32 :F^#   a note name with an accidental
701.955 :G   pitches can also be given in cents
 15/8  :B      next line fixes C3=131.2Hz as reference:
  2/1  :C !!reference 3 131.2 (corresponds to A4=440)
```

multi-strobe mode

optional add-on (available in the trial)

Lets you run several coupled linotune strobes simultaneously, limited only by the processing power of your computer. To use it, simply launch the linotune application multiple times. Each strobe adopts its configuration remembered from the previous session, according to the order in which it was launched.

The strobes communicate with each other through shared memory; they can but do not have to share the same audio input and/or output, as chosen by the user (→*audio i/o*).

The first strobe launched - the master - works as always. In all other strobes, the *auto* pitch recognition button is replaced by a *slave* button. When it is lit, any change in note, octave, transpose, cents offset, or reference frequency of the master will be mirrored in the slave, but *not* vice versa.

This facilitates very flexible multi-strobe arrangements. For instance, the dual strobe set-up favored by some pan tuners can be obtained by configuring both master and slave to show a “stack of octaves”, then setting the slave’s pitch a 5th above that of the master. The *slave* function maintains the interval between the two, even when *auto* pitch recognition is used.

tip: with this add-on multiple →laser projection attachments can be operated from a single computer; each strobe window will control one of the laser units. A powered USB hub for the lasers is advisable.

common just intonation ratios

					complement			
semi-tones	**interval name**	**freq. ratio**	**cents**	**comments**	**cents**	**freq. ratio**	**interval name**	**semi-tones**
0	unison	1/1	0.0		1200.0	2/1	octave	12
1	minor 2nd	16/15	111.7	semitone	1088.3	15/8	major 7th	11
2	major 2nd	10/9	182.4	lesser tone	1017.6	9/5	minor 7th	10
		9/8	203.9	greater tone	996.1	16/9		
		8/7	231.2	harmonic 7th	968.8	7/4		
3	minor 3rd	6/5	315.6		884.4	5/3	major 6th	9
4	major 3rd	5/4	386.3		813.7	8/5	minor 6th	8
5	perfect 4th	4/3	498.0		702.0	3/2	perfect 5th	7
6	augmented 4th	25/18	568.7		631.3	36/25	diminished 5th	6
		7/5	582.5	7-limit tuning	617.5	10/7		
		45/32	590.2		609.8	64/45		
		17/12	603.0	17-limit tuning	597.0	24/17		

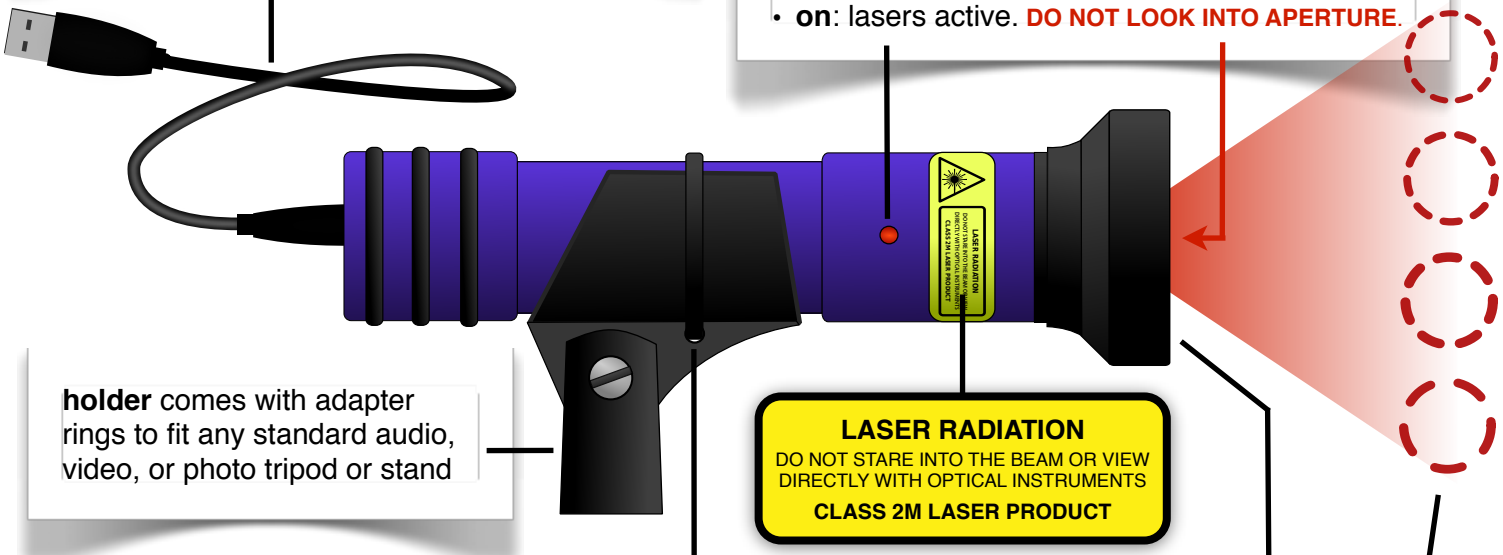
These frequency ratios are commonly used in just intonation. They are combined by multiplication: a compound fifth (an octave and a 5th) for instance is 2/1 × 3/2 = 3 times the base frequency.

linotune laser projection attachment

By projecting the first up to 4 strobe bands anywhere you want, linotune's unique laser attachment eliminates the distraction of constantly having to look up at a computer display, away from where the tuning actually takes place. This improves your concentrated focus on tuning, tightens the ear-eye-hand feedback loop, and prevents eye and neck aches after long tuning sessions.

powered and controlled via USB
to use, simply connect laser attachment to computer running linotune with supplied USB cable.

status indicator:
- **slow, brief flashes**: standby - powered but not operating; very low wear & power consumption.
- **rapid blinking**: spinning up - lasers may turn on any moment. **DO NOT LOOK INTO APERTURE.**
- **on**: lasers active. **DO NOT LOOK INTO APERTURE.**



holder comes with adapter rings to fit any standard audio, video, or photo tripod or stand

cable tie wrap prevents laser from being accidentally knocked out of its holder

lens hood guards against stray laser light

laser-drawn circles composed of 5, 7, 9, and 11 segments mirror linotune's →*strobe display*:
- counterclockwise rotation: input is flat
- clockwise rotation: input is sharp

in the box

The laser attachment comes well-cushioned in a sturdy, waterproof & impact resistant transport case, along with:

- a 6' (180cm) USB cable for connection to the computer;
- a clamp fitting US standard (⅝"-27 thread) mic stands;
- adapter rings for ⅜"-16 thread (European audio) and ¼"-20 thread (photo/video) stands, tripods, arms, etc.

laser driver installation

tip: the laser attachment is “plug & play” - the following instructions are only in case that fails.

Windows: should automatically detect it and download and install the appropriate drivers (“Linotune Laser Attachment”, then “USB Serial Port”). If this does not succeed, you can manually download and install the correct driver for your computer from http://www.ftdichip.com/Drivers/VCP.htm.

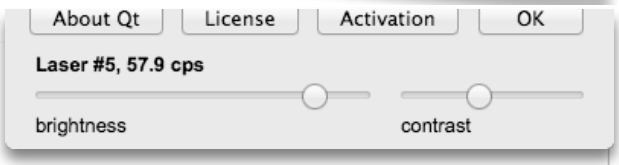
Mac: no driver required. However, if a VCP (“virtual COM port”) driver is installed on your Mac, it will *prevent* operation of the laser attachment by linotune. When this conflict is detected, linotune will pop up an alert and offer to disable the offending driver (Administrator password required). Your choices:

- **No**: leaves the VCP driver in place, but the laser attachment will not run.
- **Temporarily**: disables the driver temporarily; must be repeated each time the laser is plugged in.
- **Yes**: disables the VCP driver permanently; other software on your computer that relies on this driver (e.g., Arduino) may no longer work. Driver can be re-enabled again by (OS X 10.9+) rebooting the computer; (OS X 10.5-10.8) launching the Terminal application, entering the command

```
sudo kextload /System/Library/Extensions/FTDIUSBSerialDriver.kext
```

and an Administrator password.

brightness adjustment



Lasers are initially set to low brightness for safety reasons. Brightness & contrast can be adjusted in the window brought up by the →*info button* on the →*rear panel controls.* This also shows the device’s production number and current motor speed (which reflects USB power supply quality).

Maximum brightness is limited by safety regulations. If you find the circles not bright enough, try

- reducing the amount of incoming ambient light, especially bright daylight;
- reducing the projection distance to make the laser circles smaller and brighter;
- using a flat (matte) red, yellow, or white projection surface to improve visibility.

laser specification

class	wavelength	total power	accessible emission
2M	630-680nm	< 20mW	< 1mW (IEC 60825-1)

handling & care

please follow these instructions in order to preserve your warranty:

- always use the supplied transport case for protection when not in use.
- take special care while mounting, unmounting, or otherwise handling the device.
- contains sensitive mechanical, optical, and electronic components - do not subject to water, condensation, impact, vibrations, or temperatures over 50°C (120°F).
- gently clean the laser aperture with a lens cleaning cloth or brush when needed; the casing can be wiped clean with a damp, non-abrasive cloth and mild soap.
- do not open as that ruins the optical alignment. no user serviceable parts inside.

tip: avoid unplugging the USB cable while laser is operating - the sudden loss of power stresses the mechanical components. if possible, terminate linotune first, then wait a few seconds for the motor to spin down, then unplug the USB cable.

Lasers may briefly shut off when mechanically disturbed - this is a normal safety precaution when the motor has temporarily left its tightly controlled speed range.

Poor USB power supply, possibly due to an overly long cable, may lead to motor speeds less than 50 cycles per second (cps), or - in extreme cases - the device getting stuck in the spin-up phase, with the status indicator blinking rapidly. Try connecting the laser attachment through a good quality powered USB hub.

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