Using MIDI Pitchbend and MIDI Tuning Dump to LucyTune your music.

Pitchbend

It is possible to LucyTuned your sequences to the nearest 64th of a semitone using MIDI pitchbend.
Check that your MIDI equipment can recognise and respond to pitchbend data
The current pitchbend range operating on your equipment may be adjustable (see the operating manual), if this is not clear or you wish to test the current range test it as follows:

1. Make a simple MIDI sequence of two adjacent notes (one semitone apart) Eg. G#4 and A4. Play the sequence and you should hear two notes a semitone apart.

2. Now add a pitchbend value to the lower of the two notes, at a value of +4096 and a value of 0 to the higher note. Listen to the two notes again. If the notes are now the same pitch your pitchbend range is set at 4096 units per semitone.

Experiment by changing the values until you get it right, and discover how many pitchbend units are required to bend your equipment by one semitone. This will tell you which column (*d, or e*) of the table below to use.

Pitchbend usually effects only the assigned channel, and all notes played on that channel will be "bent" until another pitchbend command is received. Therefore to LucyTune your sequence you may have to move notes to other channels, so that there is only ever one note per channel at any time.

(Remember to reset all the A's to zero)

3. Each note will need to be pitchbent by the appropriate amount. This is a tedious procedure, yet the results can be quite satisfying. You can make the conversion easier by using copy and paste in your sequencer's edit program.

Using the table below and the appropriate pitchbend ranges (columns *d, or e)* you can set the pitchbend of each note (column **a**) which you wish to use by adjusting the value for the MIDI note named in column *b*.

The cent values are also included for users of Ensoniq, Korg M series, and other cent programmable equipment (column c*).*

Lucy Note Name **a**	**Bend** 12tET Note *b*	**cents** from A4=440Hz c	**Bend** +/- 64ths *d*	**Bend** 4096 ths *e*	**Ratio from A=1.0000** (Octave=2.0) *f*	**Dump** 64ths (Proteus) **g**	**Dump** xx (hex) semitone **h**	**Dump** yy (hex) MSB **i**	**Dump** zz (hex) LSB **j**	**Nearest Semitone** to pitch **k**	**Cents Change** (to nearest 1/10th cent) **l**
C	C	0313.521	+9	+554	1.198531	0009	00	11	27	C	+13.5
Dbb	C	0367.605	+43	+2769	1.236564	0043	00	56	45	C#	-32.4
C#	C#	0381.972	-12	-738	1.246869	0052	00	68	75	C#	-18.0
Db	C#	0436.056	+23	+1477	1.286437	0087	01	2E	14	C#	+36.1
Cx	D	0450.424	-32	-2031	1.297156	0096	01	40	45	D	-49.6
D	D	0504.507	+3	+185	1.338320	0131	02	05	62	D	+04.5
Ebb	D	0558.591	+37	+2400	1.380789	0166	02	4B	00	D#	-41.4
D#	D#	0572.958	-17	-1108	1.392295	0175	02	5D	31	D#	-27.0
Eb	D#	0627.042	+17	+1108	1.436478	0209	03	22	4F	D#	+27.0
Dx	E	0641.410	-37	-2400	1.448445	0218	03	33	00	D#	+41.4
E	E	0695.493	-3	-185	1.494412	0253	03	7A	1E	E	-04.5
Fb	E	0749.577	+32	+2031	1.541834	0288	04	3F	3B	E	+49.6
E#	F	0763.944	-23	-1477	1.554682	0297	04	51	6C	F	-36.1
F	F	0818.028	+12	+738	1.604018	0332	05	17	0A	F	+18.0
Gbb	F	0872.112	+46	+2954	1.654918	0366	05	5C	27	F#	-27.9
F#	F#	0886.479	-9	-554	1.668709	0375	05	6E	59	F#	-13.5
Gb	F#	0940.563	+26	+1661	1.721663	0410	06	33	76	F#	+40.6
Fx	G	0954.931	-29	-1846	1.736018	0419	06	46	28	G	-45.1
G	G	1009.014	+6	+369	1.791099	0454	07	0B	45	G	+09.0
Abb	G	1063.098	+40	+2584	1.847936	0488	07	50	62	G#	-36.9
G#	G#	1077.465	-14	-923	1.863336	0498	07	63	14	G#	-22.5
Ab	G#	1131.549	+20	+1292	1.922466	0532	08	28	31	G#	+31.5
Gx	A	1145.917	-35	-2215	1.938491	0542	08	3A	63	G#	+45.9
A	A	00000.000	0	0	1.000000	0576	09	00	00	A	00.0
Bbb	A	0054.083	+35	+2215	1.031734	0611	09	45	1D	A#	-45.9
A#	A#	0068.451	-20	-1292	1.040331	0620	09	57	4F	A#	-31.5
Bb	A#	0122.535	+14	+923	1.073344	0654	0A	1C	6C	A#	+22.5

Ax	B	0136.903	-40	-2584	1.082291	0664	0A	2F	1E	A#	+36.9
B	B	0190.986	-6	-369	1.116633	0698	0A	74	3B	B	-09.0
Cb	B	0245.070	+29	+1846	1.152068	0733	0B	39	58	B	+45.1
B#	C	0259.438	-26	-1661	1.161667	0742	0B	4C	0A	C	-40.6

Programs to microtune your MIDI files using pitchbend

Oct 1999 A recent trio of PC programs called Midi Tempering Utilities by Fred Nachbaur (free midi pitchbend software) can be used to midi microtune existing midi files.

Download lucy**.dat files for use with Nachbaur miditemp program.**

Lucy0f5s 0 flats - 5 sharps (i.e. black notes are C#-D#-F#-G#-A#)
Lucy1f4s 1 flat - 4 sharps (i.e. black notes are C#-D#-F#-G#-Bb)
Lucy2f3s 2 flats - 3 sharps (i.e. black notes are C#-Eb-F#-G#-Bb)
Lucy3f2s 3 flats - 2 sharps (i.e. black notes are C#-Eb-F#-Ab-Bb)
Lucy4f1s 4 flats - 1 sharp (i.e. black notes are Db-Eb-F#-Ab-Bb)
Lucy5f0s 5 flats - 0 sharps (i.e. black notes are Db-Eb-Gb-Ab-Bb)

To LucyTune your files with these programs use the ratios from A = 1.000000 in *g* column above

Tuning samples, in cent values.

Some sample programs, such as EMagic's EXS24, and tuners, such as Peterson VS-1, show microtuning values in cents and tenths of a cent respectively, yet only within +/- 50 cents for each semitone. Therefore to set these values the columns k and l have been provided to simplify calculations. When using EXS, a separate zone will be needed for each note in each group. For example to set up an 88 note sample mapping with three groups requires 264 zones to be individually adjusted. I hope now that Apple have taken over EMagic, they will consider introducing a more user friendly interface with more accurate tuning resolution.

MIDI Tuning Dump

In 1992, a new MIDI tuning dump standard was introduced. This is intended to transmit tuning data to a resolution of 16,384 units per semitone, (196,608 per octave). As many of the psychological effects of LucyTuning depend upon subsonic beating: the more accurate the tuning; the greater the effect. Unfortunately I have yet to find a manufacturer who has fully implemented this standard, although it should eventually happen. (Please encourage manufacturers to introduce it in their new products). A number of tuning programs (eg. Tuning Wrench) and some hardware (eg. Proteus 3) already use these values to transfer tuning data.

By using the table above in the Dump columns (**g, h, i, and j**), you can tune to the LucyTuned notes listed in column **a.** The tuning resolution which is played will depend upon your hardware. The 64th of a semitone (Proteus) and xx (hex) values shown in the table are for the lowest octave. For higher octaves add 768 units per octave to the 64th of a semitone (Proteus) column (**g**), or 12 (0C in hex) per octave to the xx column (**h**).

[Frequency data format (all bytes in hex)]

xx semitone = 100 cent units; yy MSB (Most Significant Byte) of fraction (1/128 semitone) = 0.78125 cent units; LSB (Least Significant Byte) of fraction (1/16384 semitone) = 0.0061 cent units

LucyTuning table of 52 arrangements for microtunable synths and samplers

Brian Pugley's EMagic Logic **Tuning** Environments include LucyTuning features - download from here.
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