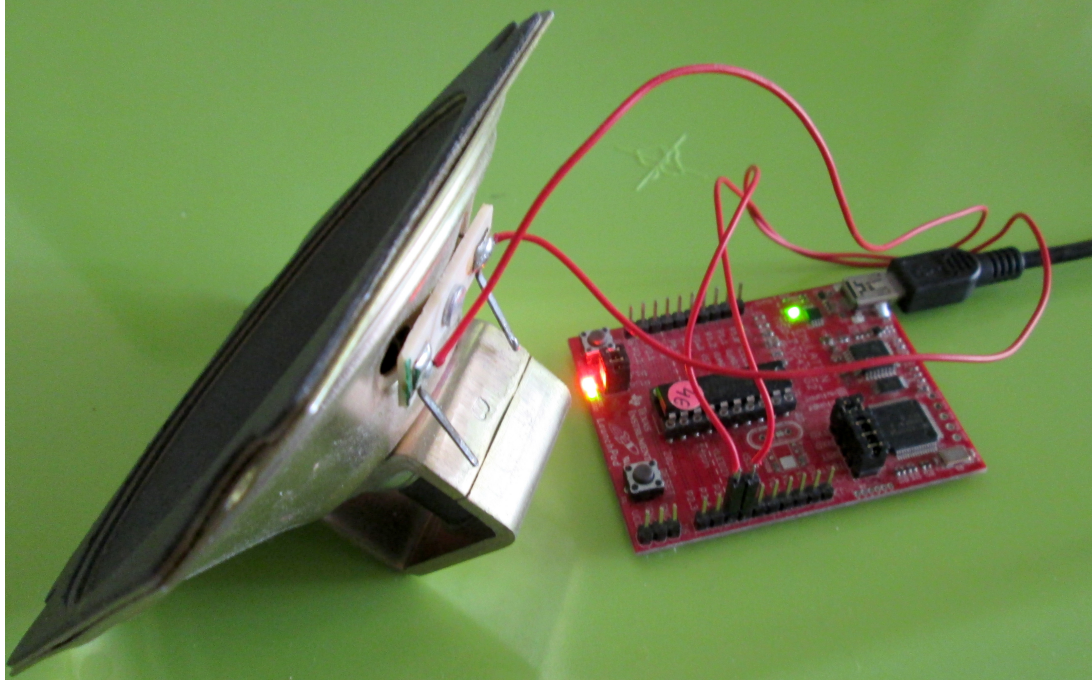


[To noForth website](#)

Beethoven430

Beethoven430 is software for the Launchpad MSP430 with noForth C or V on it. With the beethoven430 program you can play "tunes". How to do this?

- Connect a loudspeaker (high impedance) to p2.4 and p2.5



- Include (load) the beethoven430.f program
- Download one of the tunes from this web site, or write your own tune
- Include (load) the tune in noForth
- Type the name of the tune

About TUNE:

TUNE: is a defining word that compiles a named tune in ROM.
The name after **TUNE:** and the ; at the end must be separate words.

```
TUNE: C-SCALE 24T20''C10DE FGAB 20'C ;
```

The forth comment characters \ and (can be used:

```
TUNE: C-SCALE 24T20''C10DE \ this is comment  
FGAB 20'C ;
```

```
TUNE: C-SCALE 24T20''C10DE ( this is comment ) FGAB 20'C ;
```

A string without spaces that starts with (or \ is ignored.

```
TUNE: C-SCALE \comment 24T20''C10DE FGAB 20'C ;  
TUNE: C-SCALE 24T20''C10DE FGAB (comment 20'C ;
```

The elements of the musical language

All commands have the length of one character, the only exception is that consecutive digits are seen as one decimal number. Lower case characters are read as upper case.

1.	A B C D E F G R	note names and rest
2.	decimal number	duration
3.	T	tempo
4.	' , :	octave
5.	# @	sharp and flat
6.	- U V W . X Y Z	articulation
7.	< ^ >	repeat signs
8.	S \$	sound character

A B C D E F G R (note names and rest)

The note names and rests trigger the musical action. **This means that tone properties (duration, octave, flat, sharp and articulation) must precede the tone names. That's the nature of Forth.**

Numbers (duration)

Consecutive digits are seen as one decimal number (max=255).

Numbers are stored in **DURA** and **DURA** determines the relative tonelength, measured in TIQs.

These tones are each 24 TIQs: 24ABC

T (tempo)

T copies the last number (from DURA) into TIQ. TIQ is the time unit in ms.

The real duration of tones and rests is **DURA*TIQ** (in ms).



42T 12G 6#FG 12A 6'DC 12,B 3#FGAB 24C

In this example **TIQ** is 42 ms and the first **G** takes 12 TIQs ($12 \cdot 42 = 504$ ms).

' , : (octave)

The next tone will be chosen from the same octave [C .. B] as the previous tone.
 Use ' (tick) to go up 1 octave and , (comma) to go down 1 octave.
 : (colon) resets the octave to lowest. **PLAY** always starts in the lowest octave.
 Multiple , and ' are accepted (, , ' ' ' '). Ambitus: 7 octaves.





32T8 -C#CD#D ED .CG - 'C,@B@AG vAB'16C

< .. ^ .. > (repeat signs)

Music code between < and > will be played twice. When ^ (Prima Volta) is used the ^ .. > part is played only the first time, the second time it will be skipped.

< .. ^ .. > structures can be nested, similar to "IF ELSE THEN" in forth.



80T< <-4DE#FVD>

-<#FGAR>



<-2ABAG4#FVD>

<-4D,A8V'D>

>

S \$ (sound)

The last number (in DURA) is used to set the ratio busy-time / period for the duty cycle. For S the first digit(s) determine busy time. For \$ the last digit determines busy time:

19S 1/(1+9) = busy/cycle, 19\$ 9/(1+9) = busy/cycle
251S 25/(25+1) = busy/cycle, 251\$ 1/(25+1) = busy/cycle

By hand (interactively)

- Higher (transpose, a value)
n to HIGHER (the tune will be played n semitones higher)
- XF (blurr, a value)
n to XF (a higher n [0,15] causes a more unstable rhythm)
- PP (Parse and Play)
Play the immediately following music code. Nothing is compiled.
The character ; marks the end of the music code. The whole thing must be on one line, no name, no spaces, no comments! Examples:
PP 96T.4' '<DE#FD><4#FG8D>;
PP 96T.; PP 4' '<DE#FD><4#FG8D>;

(Albert Nijhof, may 2015)