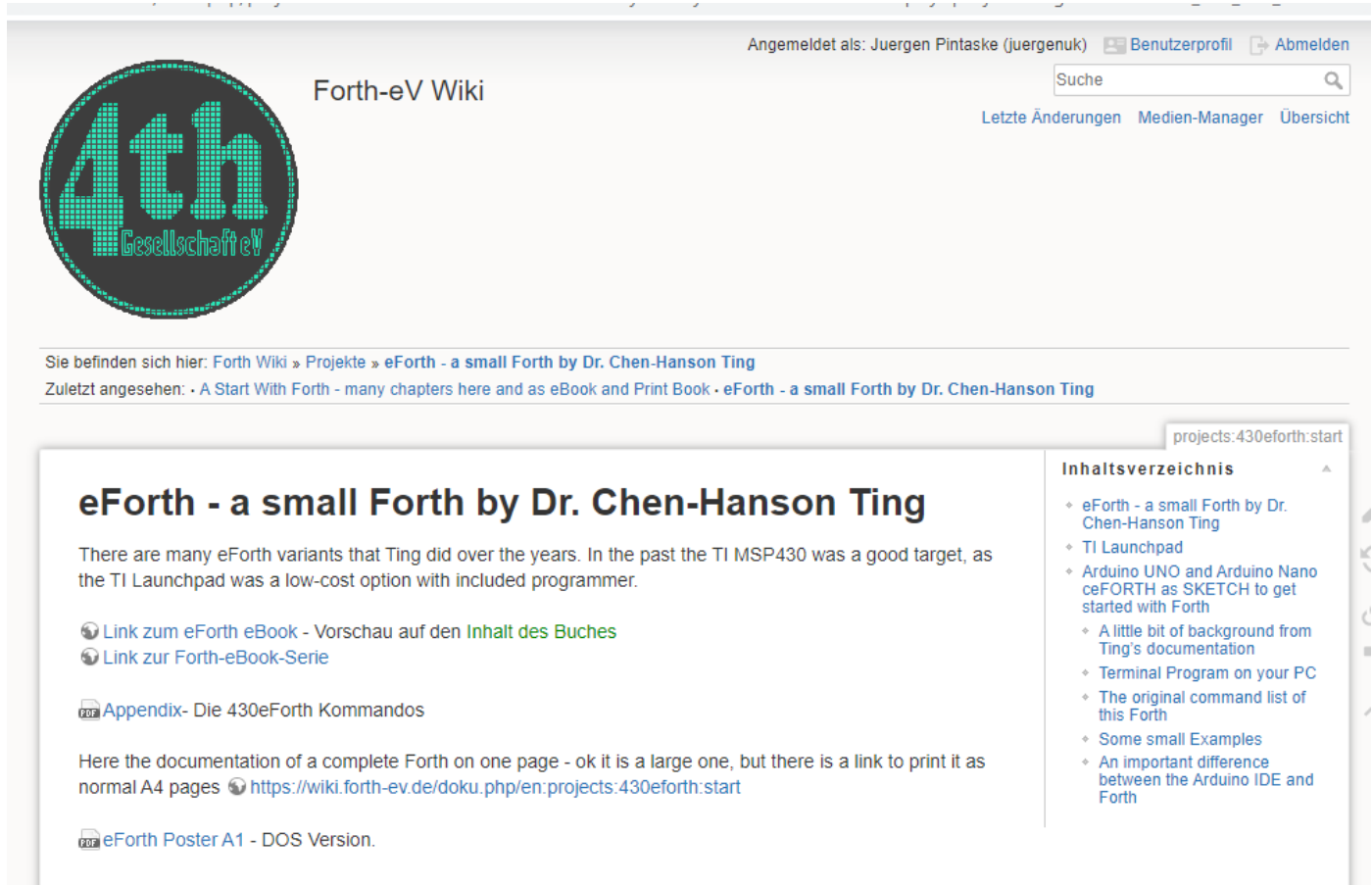


## 39 Steps - no, not Hitchcock, but

### How to get started with eFoprth as Arduino Sketch and control LEDs in Forth and more.

The procedure described here is not optimized, but works as I have worked my way through it exactly as is with the shown results. And then asked others to replicate it in the same way.

1. Click on the picture with the nano, and you end up here



The screenshot shows the Forth-eV Wiki page for 'eForth - a small Forth by Dr. Chen-Hanson Ting'. The page header includes the logo for '4th Gesellschaft eV' and the text 'Forth-eV Wiki'. The user is logged in as 'Juergen Pintaske (juergenuk)'. The page content includes a breadcrumb trail: 'Forth Wiki » Projekte » eForth - a small Forth by Dr. Chen-Hanson Ting'. The main heading is 'eForth - a small Forth by Dr. Chen-Hanson Ting'. Below the heading, there is a paragraph: 'There are many eForth variants that Ting did over the years. In the past the TI MSP430 was a good target, as the TI Launchpad was a low-cost option with included programmer.' There are two links: 'Link zum eForth eBook - Vorschau auf den Inhalt des Buches' and 'Link zur Forth-eBook-Serie'. There is also a PDF icon and the text 'Appendix- Die 430eForth Kommandos'. Below that, there is a paragraph: 'Here the documentation of a complete Forth on one page - ok it is a large one, but there is a link to print it as normal A4 pages' followed by the URL 'https://wiki.forth-ev.de/doku.php/en:projects:430eforth:start'. There is also a PDF icon and the text 'eForth Poster A1 - DOS Version.'. On the right side, there is a table of contents titled 'Inhaltsverzeichnis' with a list of items: 'eForth - a small Forth by Dr. Chen-Hanson Ting', 'TI Launchpad', 'Arduino UNO and Arduino Nano ceFORTH as SKETCH to get started with Forth', 'A little bit of background from Ting's documentation', 'Terminal Program on your PC', 'The original command list of this Forth', 'Some small Examples', and 'An important difference between the Arduino IDE and Forth'.

2. Scroll down to Arduino

## Arduino UNO and Arduino Nano ceFORTH as SKETCH to get started with Forth

for example using an ATmega328P Nano V3 Development Board (Geekcreit).

 [eForth as Arduino Sketch \(C Sourcecode\)](#), and in [txt](#).

( This part is in English, as the link to this location is shared )

How can you simply carry out a few Forth instructions?

And understand how Forth works?

OK, the execution of commands online without additional hardware has already been shown elsewhere in this Wiki, in the **A Start With Forth** documentation, especially in chapters 4, 5, 6 and 7:

: <https://wiki.forth-ev.de/doku.php/projects:a-start-with-forth:start0>

and in English

[https://wiki.forth-ev.de/doku.php/en:projects:a-start-with-forth:start0#a\\_start\\_with\\_forth\\_-\\_many\\_c\\_hapters\\_here\\_and\\_as\\_ebook\\_and\\_print\\_book](https://wiki.forth-ev.de/doku.php/en:projects:a-start-with-forth:start0#a_start_with_forth_-_many_c_hapters_here_and_as_ebook_and_print_book)

But it is something else to test this locally in your own (or borrowed) controller board. <sup>4)</sup>




3. There you find the line with the link to download the Sketch

**for example using an ATmega328P Nano V3 Development Board (Geekcreit).**  
[eForth as Arduino Sketch \(C Sourcecode\), and in txt.](#)

4. Click on the link to download the sketch as zip


5. Create folder, for example call it ArduinoForth\_test

6. Go to the folder where you downloaded the zip ( I downloaded it 3x as you can see)

 eforth328 (1)	05/06/2020 16:05	ZIP File	28 KB
 eforth328 (2)	05/06/2020 16:05	ZIP File	28 KB
 eforth328	05/06/2020 16:05	ZIP File	28 KB

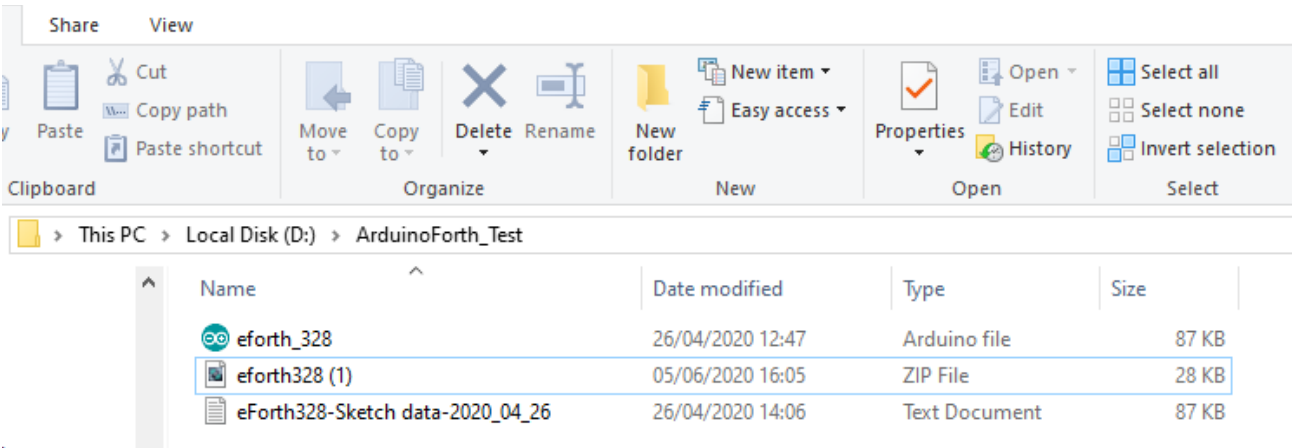
7. Copy it from there and paste it into the ArduinoForth\_test folder

> Local Disk (D:) > ArduinoForth\_Test >

Name	Date modified	Type	Size
 eforth328 (1)	05/06/2020 16:05	ZIP File	28 KB

8. Unzip thezip- file and 2 additional files have been added.

One of them is the sketch, the other one the same as ASCII file






Share View

Paste Copy path Paste shortcut Move to Copy to Delete Rename New folder New item Easy access Properties Open History Select all Select none Invert selection





Clipboard Organize New Open Select

> This PC > Local Disk (D:) > ArduinoForth\_Test

Name	Date modified	Type	Size
 eforth_328	26/04/2020 12:47	Arduino file	87 KB
 eforth328 (1)	05/06/2020 16:05	ZIP File	28 KB
 eForth328-Sketch data-2020_04_26	26/04/2020 14:06	Text Document	87 KB

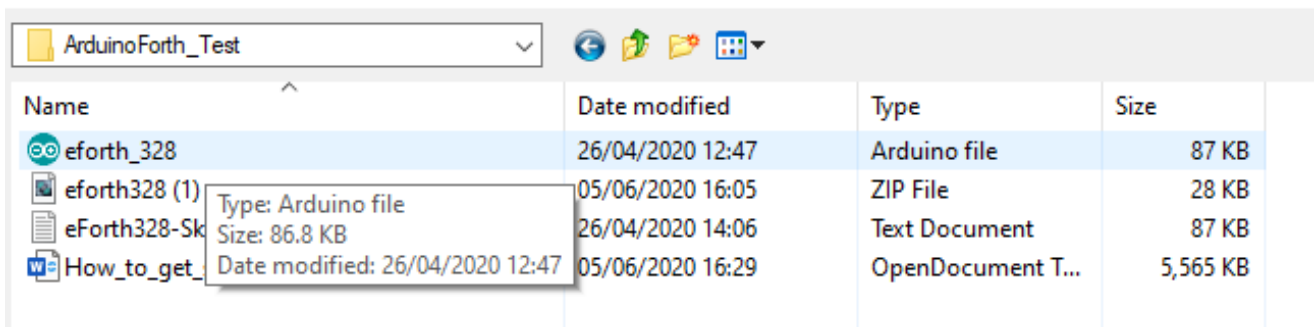
9. This file we use now, describing the set-up procedure I have added now as well as you can see.

> This PC > Local Disk (D:) > ArduinoForth\_Test

Name	Date modified	Type	Size
 eforth_328	26/04/2020 12:47	Arduino file	87 KB
 eforth328 (1)	05/06/2020 16:05	ZIP File	28 KB
 eForth328-Sketch data-2020_04_26	26/04/2020 14:06	Text Document	87 KB
 How_to_get_started_and_control_some_L...	05/06/2020 16:25	OpenDocument T...	4,658 KB

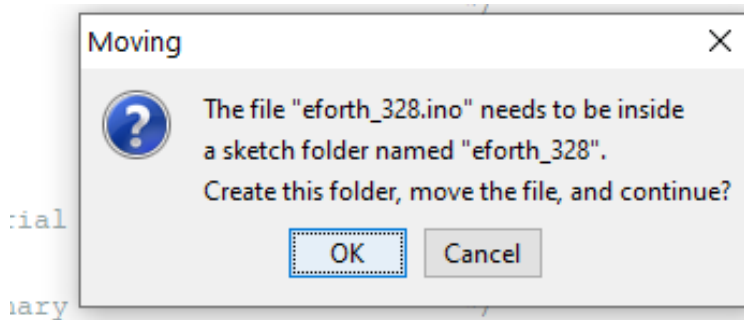
10. Now grab your Arduino, I used the nano, and start the IDE

11. Point to the file you want to upload

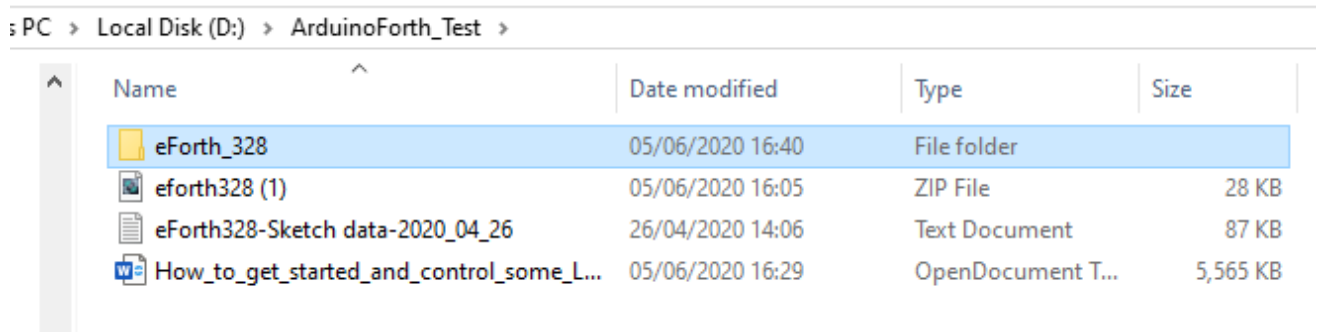


Name	Date modified	Type	Size
eforth_328	26/04/2020 12:47	Arduino file	87 KB
eforth328 (1)	05/06/2020 16:05	ZIP File	28 KB
eForth328-Sk	26/04/2020 14:06	Text Document	87 KB
How_to_get_	05/06/2020 16:29	OpenDocument T...	5,565 KB

12. You get a message that you had probably expected:



13. Folder created and sketch moved



Name	Date modified	Type	Size
eForth_328	05/06/2020 16:40	File folder	
eforth328 (1)	05/06/2020 16:05	ZIP File	28 KB
eForth328-Sketch data-2020_04_26	26/04/2020 14:06	Text Document	87 KB
How_to_get_started_and_control_some_L...	05/06/2020 16:29	OpenDocument T...	5,565 KB

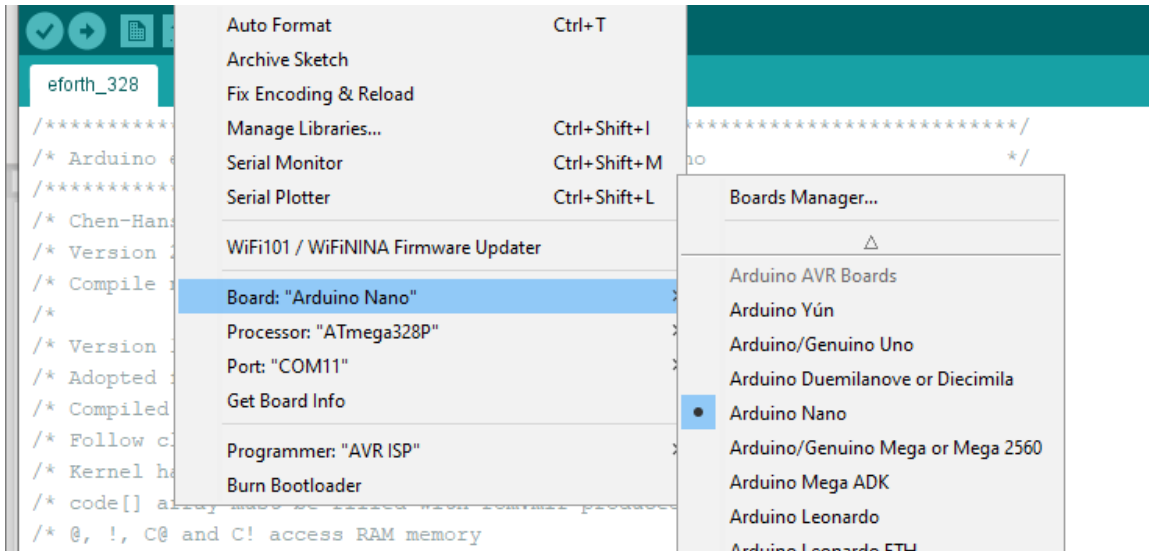
14. Select the sketch and open file - and there it is

```

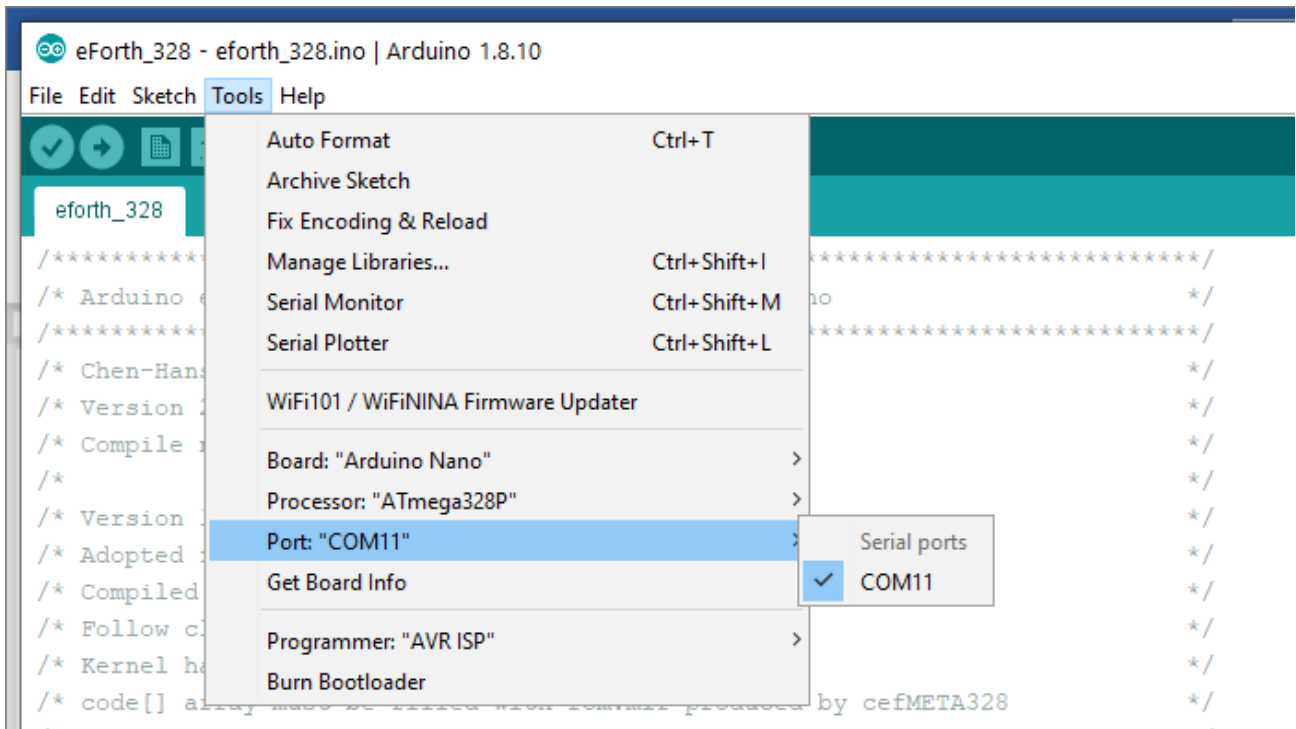
/*****/
/* Arduino eForth.C, 1.0: For Atmega328 on arduino Uno */
/*****/
/* Chen-Hanson Ting */
/* Version 2.0, 06novllcht */
/* Compile new commands in RAM */
/* */
/* Version 1.0, 21sep11cht */

```

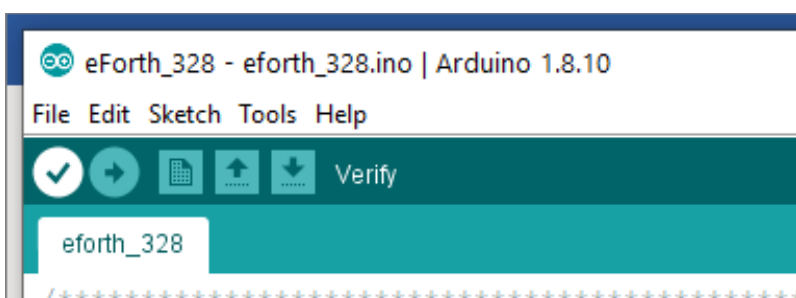
15. Make sure you select the correct board – I use the nano



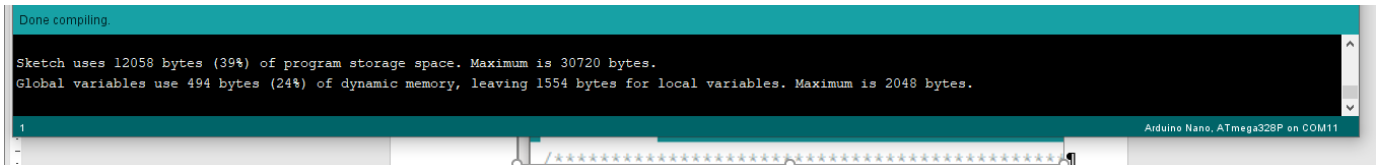
16. And the serial connection, here COMM11



17. Compile the sketch



## 18. No problems seen



```
Done compiling.
Sketch uses 12058 bytes (39%) of program storage space. Maximum is 30720 bytes.
Global variables use 494 bytes (24%) of dynamic memory, leaving 1554 bytes for local variables. Maximum is 2048 bytes.
```

## 19. So, let's upload



eForth\_328 - eforth\_328.ino | Arduino 1.8.10

File Edit Sketch Tools Help

eforth\_328

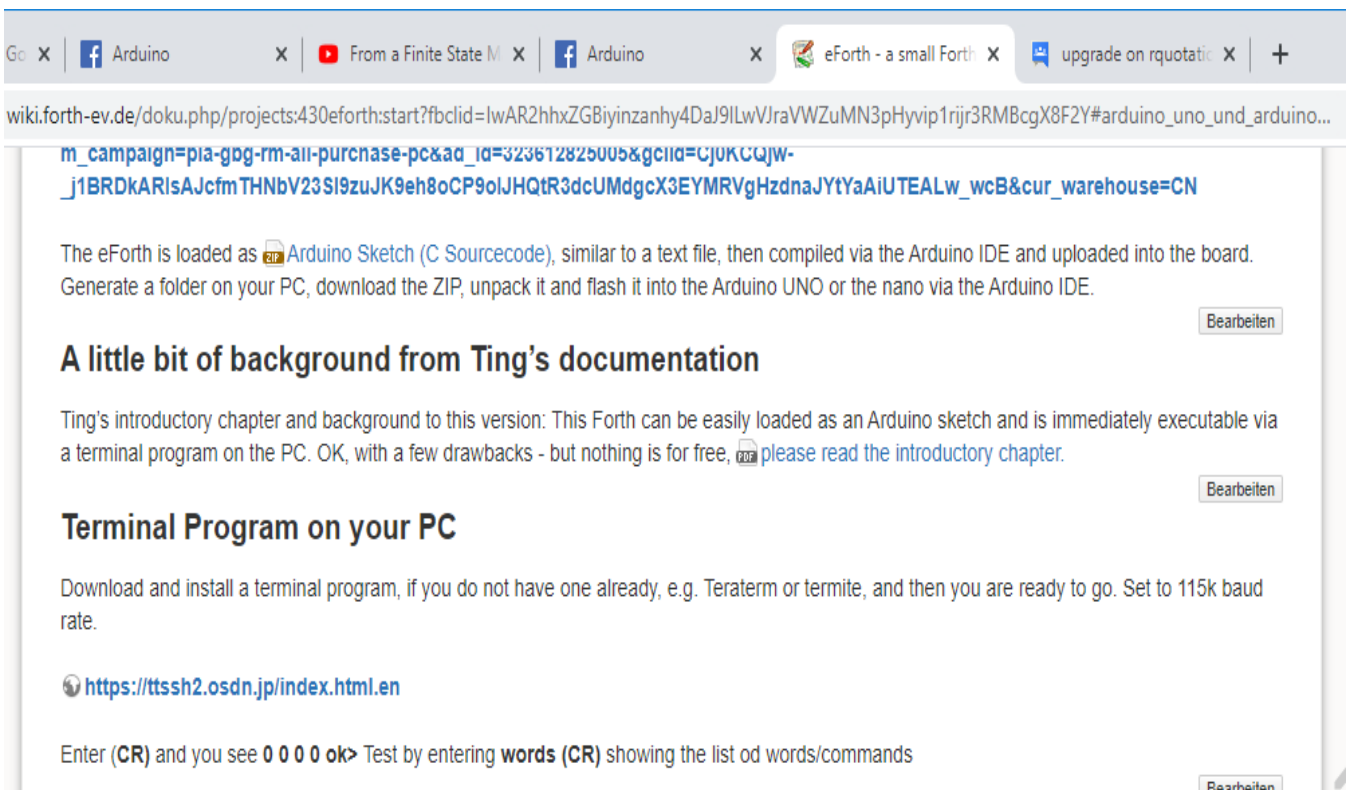
```
#include <avr/pgmspace.h>
```

```
Done uploading.
Sketch uses 12058 bytes (39%) of program storage space. Maximum is 30720 bytes.
Global variables use 494 bytes (24%) of dynamic memory, leaving 1554 bytes for local variables. Maximum is 2048 bytes.
```

## 20. Done uploading, so the nano is prepared.


Unfortunately, this sketch needs an external Terminal program on the PC to to run. This is easily done.

Let us use Teraterm. The link is on the website:




wiki.forth-ev.de/doku.php/projects:430eforth:start?fbclid=IwAR2hhxZGBiyinzhny4DaJ9lLwVJraVWZuMN3pHyvip1rj3RMBcgX8F2Y#arduino\_uno\_und\_arduino...

[m\\_campaign=pla-gog-rm-all-purchase-pc&ad\\_id=323612825005&gclid=CJ0KCCQJW-j1BRDKARIsAJcfmTHNbV23SI9zuJK9eh8oCP9oIJHQtr3dcUMdgcX3EYMRVgHzdnaJYtYaAiUTEALw\\_wcB&cur\\_warehouse=CN](#)

The eForth is loaded as  **Arduino Sketch (C Sourcecode)**, similar to a text file, then compiled via the Arduino IDE and uploaded into the board. Generate a folder on your PC, download the ZIP, unpack it and flash it into the Arduino UNO or the nano via the Arduino IDE.

**A little bit of background from Ting's documentation**

Ting's introductory chapter and background to this version: This Forth can be easily loaded as an Arduino sketch and is immediately executable via a terminal program on the PC. OK, with a few drawbacks - but nothing is for free,  please read the introductory chapter.

**Terminal Program on your PC**

Download and install a terminal program, if you do not have one already, e.g. Teraterm or termite, and then you are ready to go. Set to 115k baud rate.

<https://ttssh2.osdn.jp/index.html.en>

Enter (CR) and you see 0 0 0 0 ok> Test by entering **words** (CR) showing the list od words/commands

21. The link for download there: <https://ttssh2.osdn.jp/index.html.en>

22. Download it, as you downloaded the sketch, add it to our folder

The screenshot shows a web browser window with the URL `ttssh2.osdn.jp/index.html.en`. The page title is "Tera Term Home Page". Below the title, there are several navigation links: [\[Project page\]](#), [\[License\]](#), [\[Download\]](#), [\[Document\]](#), [\[Snapshot\]](#), [\[SourceCode\]](#), [\[Users ML\]](#), [\[Commit ML\]](#), and [\[Development\]](#). A large digital counter displays "7933588" with sub-counters for "Today: 117" and "Yesterday: 2405". The main heading is "TeraTerm Project", followed by a paragraph explaining the project's history and its status as open source software. A "Download" section provides information about the latest version (4.105) and where to find source code and snapshots. A "Manual" section lists available manuals, including the "Tera Term Help Index" and "MACRO for Tera Term".

23. Click on the link Go to the download page

The screenshot shows the OSDN project page for Tera Term. The browser address bar displays `osdn.net/projects/ttssh2/releases/`. The page has a navigation bar with icons for "Download", "Magazine", "Develop", and "Contribute". The breadcrumb trail is "OSDN > Find Software > Terminals > Serial > Tera Term > Download File List". The main heading is "Tera Term". Below the heading, there are several tabs: "Description", "Downloads", "Source Code", "Ticket", "Documents", and "C". The "Downloads" tab is currently selected, and the page content shows a "Download List" section and a "Project Description" section.

## 24. Scroll down to



osdn.net/projects/ttssh2/releases/

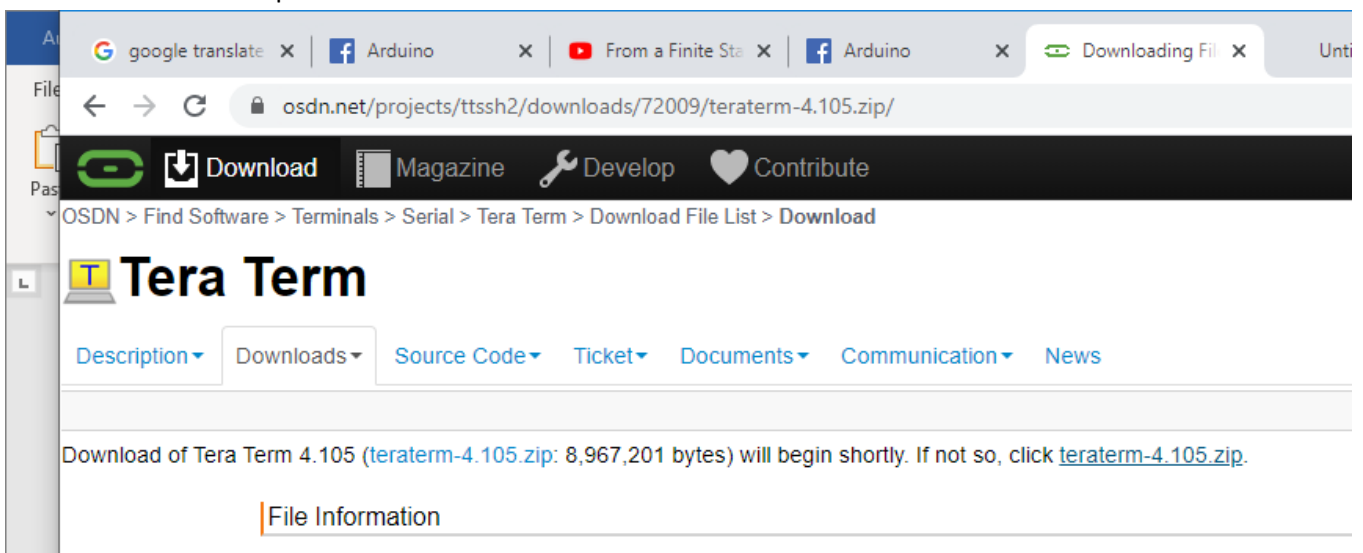
**Download Package list**

**Tera Term** (37 items)

**4.105** (2 files)

Name ^	Size ↓	Hash
<a href="#">teraterm-4.105.exe</a> <input type="button" value="Share"/>	12.12 MB	<input type="button" value="Show"/>
<a href="#">teraterm-4.105.zip</a> <input type="button" value="Share"/>	8.55 MB	<input type="button" value="Show"/>

## 25. Download the zip as before



osdn.net/projects/ttssh2/downloads/72009/teraterm-4.105.zip/

Download Magazine Develop Contribute

OSDN > Find Software > Terminals > Serial > Tera Term > Download File List > Download

## Tera Term

Description Downloads Source Code Ticket Documents Communication News

Download of Tera Term 4.105 ([teraterm-4.105.zip](#): 8,967,201 bytes) will begin shortly. If not so, click [teraterm-4.105.zip](#).

[File Information](#)

## 26. Copy the downloaded zip into the same folder

Downloads

Name	Date modified	Type	Size
Today (4)			
teraterm-4.105	05/06/2020 17:14	ZIP File	8,758 KB
eforth328 (1)	05/06/2020 16:05	ZIP File	28 KB
eforth328 (2)	05/06/2020 16:05	ZIP File	28 KB
eforth328	05/06/2020 16:05	ZIP File	28 KB



Local Disk (D:) > ArduinoForth\_Test >

Name	Date modified	Type	Size
eForth_328	05/06/2020 16:40	File folder	
eforth328 (1)	05/06/2020 16:05	ZIP File	28 KB
eForth328-Sketch data-2020_04_26	26/04/2020 14:06	Text Document	87 KB
How_to_get_started_and_control_some_L...	05/06/2020 17:05	OpenDocument T...	15,267 KB
teraterm-4.105	05/06/2020 17:14	ZIP File	8,758 KB

27. Unzip Teraterm.zip, and the view is

Local Disk (D:) > ArduinoForth\_Test >

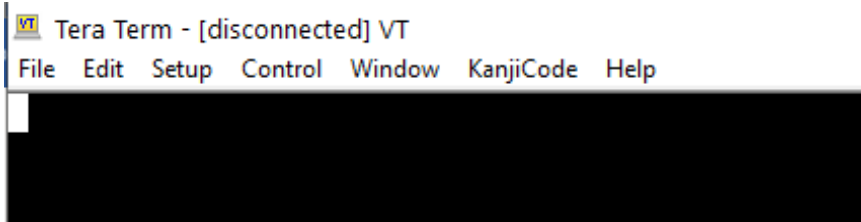
Name	Date modified	Type	Size
eForth_328	05/06/2020 16:40	File folder	
teraterm-4.105	05/06/2020 17:21	File folder	
eforth328 (1)	05/06/2020 16:05	ZIP File	28 KB
eForth328-Sketch data-2020_04_26	26/04/2020 14:06	Text Document	87 KB
How_to_get_started_and_control_some_L...	05/06/2020 17:05	OpenDocument T...	15,267 KB
teraterm-4.105	05/06/2020 17:14	ZIP File	8,758 KB

28. Click on

The image shows a Microsoft Word ribbon with the 'File' tab selected, and a File Explorer window open to the 'teraterm-4.105' folder. The File Explorer window displays a list of files and folders:

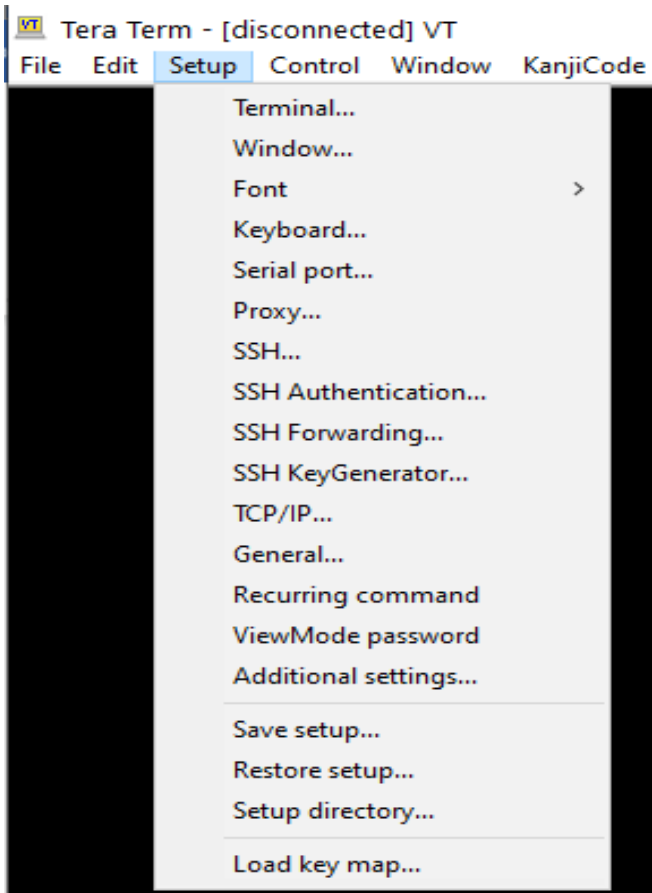
Name	Date modified	Type	Size
74181			
990000_PASSWORDS			
Adventures in Publishi			
AI ARM eBook			
Alan Winfield_ The Cc			
Altium			
AOL Downloads			
APM_Project			
ArcSoft ToGo			
ARDUINO 2020			
ssh2login.ttl	07/12/2019 13:16	TTL File	1 KB
teraterm	07/12/2019 13:40	Compiled HTML ...	2,233 KB
TERATERM	07/12/2019 13:40	Configuration sett...	25 KB
teratermj	07/12/2019 13:40	Compiled HTML ...	2,163 KB
TSPECIAL1	07/12/2019 13:16	TrueType font file	8 KB
ttermpro	07/12/2019 13:39	Application	1,752 KB
ttermenu_readme-j	07/12/2019 13:16	Text Document	13 KB
ttpcmn.dll	07/12/2019 13:39	Application exten...	272 KB
ttpfile.dll	07/12/2019 13:39	Application exten...	252 KB
ttmacro	07/12/2019 13:39	Application	1,416 KB

29. And you see

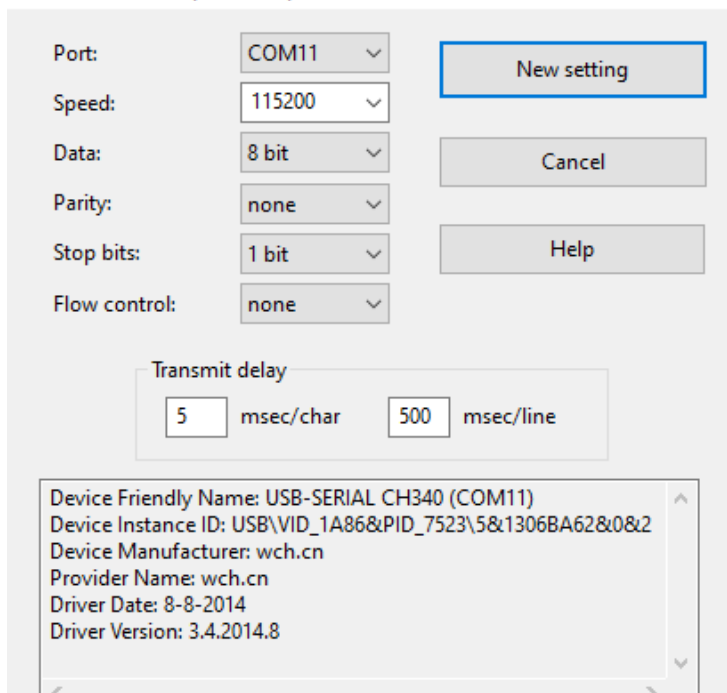




30. Click onto setup, then serial port



31. Select PORT, if not given, here 11, select 115k baud, add in the delays 5 and 500 and hit **New setting**



## 32. AND YOU SEE SUCCESS

```
Start Arduino
Arduino eForth 2.0, 2011
```

33. Push the ENTER key ( I pushed 2x ) and you see and are in control, displayed is 0 0 0 0 ok>

```
Arduino eForth 2.0, 2011
0 0 0 0 ok>
0 0 0 0 ok>
```

34. As a first test type in **words** and **Enter key** and you see the “commands”, ready to be used. Some wrap around.

```
File Edit Setup Control Window KanjiCode Help
0 0 0 0 ok>
Start Arduino
Arduino eForth 2.0, 2011
0 0 0 0 ok>
0 0 0 0 ok>words
IMMEDIATE ( ¥ .( ." $" ABORT" WHILE ELSE AFT THEN REPEAT AHEAD IF
AGAIN UNTIL NEXT BEGIN FOR >RESOLVE >MARK <RESOLVE <MARK COLD DIAGNOS
E FORGET WORDS SEE .ID >NAME DUMP dm+ CONSTANT VARIABLE CREATE CODE
: ] ; OVERT $COMPILE $,n ?UNIQUE $," LITERAL COMPILE [COMPILE] , ALL
OT ' QUIT EVAL .OK [ $INTERPRET ERROR abort" ABORT QUERY EXPECT acce
pt kTAP TAP ^H NAME? find SAME? NAME> WORD TOKEN PACK$ CHAR PARSE (
parse) ? . U. U.R .R ."| $"| do$ CR TYPE SPACES CHARS SPACE NUMBER
? DIGIT? >UPPER UPPER DECIMAL HEX str #> SIGN #S # HOLD <# EXTRACT
DIGIT ERASE FILL CMOVE @EXECUTE TIB PAD HERE COUNT 2@ 2! +! ALIGNED
>CHAR BL 2/ 2* 2+ 2- 1+ 1- */ */MOD M* * UM* / MOD /MOD M/MOD
UM/MOD WITHIN MIN MAX < U< = 0= ABS - DNEGATE NEGATE NOT + 2DUP
2DROP ROT ?DUP EMIT KEY ?KEY doVAR doCON doLIST UM+ XOR OR AND 0<
OVER SWAP DUP DROP >R R@ R> PEEK POKE C@ C! @ ! doNEXT BRANCH QBR
ANCH EXECUTE EXIT doLIT !IO TX! ?RX 'ABORT LAST CP CONTEXT HLD 'EVAL
BASE 'TIB #TIB >IN SPAN tmp
0 0 0 0 ok>
```

35. Now we have finished the installation and can have a rest.

36. We will add to this, but most of the relevant information is on the website.

37. Then the fun bit starts with switching the on-board LED on/off first, and more.

38. This will be for later, as the 39<sup>th</sup> step is the usual HELLO WORLD

39. Just as a little example: the usual **hello world** as two options using the Interactive Programming

– **NO upload, NO Compile.:**

```
0 0 0 0 ok>: hello ." Hello Arduino People, welcome to Forth " ;
0 0 0 0 ok>helloHello Arduino People, welcome to Forth
0 0 0 0 ok>: hello2 CR ." Hello World / Arduino People, welcome to Forth " CR C
R ;
0 0 0 0 ok>hello2
Hello World / Arduino People, welcome to Forth

0 0 0 0 ok>|
```

Yes, this is how easy it is to define and display text interactively.

Controlling the on-board LED and other 328 internal functions is similar:

Define the relevant WORDS, Stick them together like LEGO,  
and hen all has been stuck together , the “house” is ready – meaning the application is ready.

Juergen Pintaske 05/06/2020