

FAST FORTH V2.0 RESUMED

Words in braces {} are [MARKER](#) words.

FORTH vocabulary

Words with hyperlink are ANSI compliant. The others are detailed below.

COLD	WARM	WIPE	RST_HERE	PWR_HERE	RST_STATE	PWR_STATE	MOVE
LEAVE	+LOOP	LOOP	DO	REPEAT	WHILE	AGAIN	UNTIL
BEGIN	THEN	ELSE	IF	>BODY	DEFER	DOES>	CREATE
CONSTANT	VARIABLE	.	.	POSTPONE	RECURSE	IMMEDIATE	IS
[']]]	\	_EXECUTE	ABORT!	ABORT	QUIT
EVALUATE	COUNT	LITERAL	.	SPACE	>NUMBER	FIND	WORD
"	S"	TYPE	SPACES	C,	CR	NOECHO	ECHO
.	ACCEPT	KEY	C,	ALLOT	HERE	.	D.
U.	HOLD	#>	#S	#	UM/MOD	<#	BL
SIGN	BASE	CIB	J	I	UNLOOP	U<	>
STATE	=	0<	0=	DABS	1-	1+	ABS
<	-	+	C!	C@	!	@	DEPTH
NEGATE	R>	>R	ROT	OVER	SWAP	NIP	DROP
R@	DUP	LIT	EXIT				
?DUP							

COLD	Software reset
WARM	primary DEFERred word, performs a hot start
WIPE	resets the program memory to its original state.
RST_HERE	defines the boundary of the program memory protected against COLD or hardware reset.
PWR_HERE	defines the boundary of the program memory protected against ON/OFF and against any error occurring.
RST_STATE	remove all words defined after RST_HERE
PWR_STATE	remove all words defined after PWR_HERE
NOECHO	stop display on output
ECHO	start display on output
CIB	leave addr of Current Input Buffer
LIT	execution part of LITERAL

ASSEMBLER vocabulary

?GOTO	GOTO	FW3	FW2	FW1	BW3	BW2	BW1
?JMP	JMP	REPEAT	WHILE	AGAIN	UNTIL	ELSE	THEN
IF	0=	0<	U>=	U<	0<	0>=	S<
S>=	RRUM	RLAM	RRAM	RRCM	POPM	PUSHM	CALL
PUSH.B	PUSH	SXT	RRA.B	RRA	SWPB	RRC.B	RRC
AND.B	AND	XOR.B	XOR	BIS.B	BIS	BIC.B	BIC
BIT.B	BIT	DADD.B	DADD	CMP.B	CMP	SUB.B	SUB
SUBC.B	SUBC	ADDC.B	ADDC	ADD.B	ADD	MOV.B	MOV
RETI	LO2HI	COLON	ENDASM	ENDCODE	SLEEP		

[ASM](#) [CODE](#) [HI2LO](#) <-- added to FORTH vocabulary

[ASM <word>](#) creates an assembler word as [CODE](#) but which is not interpretable by FORTH (because use of [CALL ... RET](#)). this defined <word> must be ended with [ENDASM](#).

[CODE <word>](#) creates a FORTH words, ready to be writtent in assembly. This word must be terminated with [ENDCODE](#) unless using [COLON](#) or [LO2HI](#).

[HI2LO](#) used to switch from a high level (FORTH) to low level (assembler) modes.

[?GOTO](#) used after a conditionnal (0=,0<,U>=,U<,0<,S<,S>=) to branch to a label FWx or BWx

[GOTO](#) used as unconditional branch to a label FWx or BWx

[FW3](#) FORWARD branch destination n*3

[FW2](#) FORWARD branch destination n*2

[FW1](#) FORWARD branch destination n*1

[BW3](#) BACKWARD branch destination n*3

[BW2](#) BACKWARD branch destination n*2

[BW1](#) BACKWARD branch destination n*1

[?JMP](#) used after a conditionnal (0=,0<,U>=,U<,0<,S<,S>=) to jump to a defined word

[JMP](#) unconditional jump to a defined word

[REPEAT](#) assembler version of the FORTH word [REPEAT](#) (unconditionnal branch)

[WHILE](#) assembler version of the FORTH word [WHILE](#) (conditionnal branch preceded by 0=,0<,U>=,U<,0>=,S<,S>=)

[AGAIN](#) assembler version of the FORTH word [AGAIN](#) (unconditionnal branch)

[UNTIL](#) assembler version of the FORTH word [UNTIL](#) (conditionnal branch preceded by 0=,0<,U>=,U<,0>=,S<,S>=)

[ELSE](#) assembler version of the FORTH word [ELSE](#) (unconditionnal branch)

[THEN](#) assembler version of the FORTH word [THEN](#) ends IF or IF ELSE statements

[IF](#) assembler version of the FORTH word [IF](#) (conditionnal branch preceded by 0=,0<,U>=,U<,0>=,S<,S>=)

[LO2HI](#) switches between low level and high level interpretation mode (counterpart of [HI2LO](#)), without saving IP.

[COLON](#) pushes IP then performs [LO2HI](#), used as: [CODE <word> ... assembly code ... COLON ... FORTH words ... ;](#)

[ENDASM](#) to end an ASM definition

[ENDCODE](#) to end a CODE definition

[SLEEP](#) DEFERred word, initially executes the default background task, It enables you to create your own background task.

To better understand the use of the assembler I refer you to `\MSP430-FORTH\ANS_COMP.f`.

Here are adds-on to be compiled

CONDCOMP

[\[DEFINED\]](#) [\[UNDEFINED\]](#) [\[IF\]](#) [\[ELSE\]](#) [\[THEN\]](#) COMPARE MARKER

VOCABULARY

[DEFINITIONS](#) ONLY PREVIOUS ALSO ASSEMBLER FORTH VOCABULARY

FORTH replace first words set in CONTEXT by the words set FORTH
ASSEMBLER replace first words set in CONTEXT by the words set ASSEMBLER
VOCABULARY VOCABULARY TRUC creates a new words set called TRUC

SD_CARD_LOADER

LOAD" CIB

LOAD" LOAD" SD_TEST.4TH" loads file SD_TEST.4TH to FASTFORTH.
CIB leave on stack address of CIB (Current Input Terminal), by default: TIB.

BOOTLOADER

BOOT

QUIT becomes a primary DEFERED word

BOOT the input: ' BOOT IS QUIT allow downloading BOOT.4th from SD CARD during the process RESET.
to cancel the bootstrap: ' QUIT >BODY IS QUIT

SD_CARD_READ_WRITE

TERM2SD" SD_EMIT WRITE READ CLOSE DEL" WRITE" READ"

TERM2SD" TERM2SD" SD_TEST.4TH" copy input file to SD_CARD (use CopySourceFileToTarget_SD_Card.bat to do)
SD_EMIT sends output stream at the end of last opened as write file.
WRITE write sequentially BUFFER content to a sector
READ read sequentially a sector to BUFFER
CLOSE close last opened file.
DEL" DEL" SD_TEST.4TH" remove this file from SD_CARD.
WRITE" WRITE" TRUC" open or create TRUC file ready to write to the end of this file
READ" READ" TRUC" open TRUC and load its first sector in BUFFER

see SD_TEST.f

NONAME_ADD-ON

[:NONAME](#) CODENNM
CODENNM assembly counterpart of :NONAME

Below, adds-on that can be compiled in kernel or loaded later

[FIXPOINT](#) you must uncomment the FIXPOINT_INPUT switch before use this add-on.

[2CONSTANT](#) S>F F. F* F#S F/ F- F+

[HOLDS](#) {FIXPOINT}

S>F u/n -- Qlo Qhi convert u/n in a s15.16 value
F. display a s15.16 value
F* s15.16 multiplication
F#S Qlo Qhi u -- Qhi 0 convert fractionnal part of a s15.16 value displaying u digits
F/ s15.16 division
F- s15.16 soustraction
F+ s15.16 addition
{FIXPOINT} do nothing if compiled in core, else remove all FIXPOINT add-on.

ANS_COMPLEMENT

[PAD](#) >IN SOURCE -C C DECIMAL HEX FILL

[\[CHAR\]](#) CHAR +1 2/ 2* MIN MAX RSHIFT

[LSHIFT](#) INVERT 2OVER 2SWAP 2DROP 2DUP 2!

[S>D](#) CELL+ CELLS CHAR+ CHARS ALIGN ALIGNED

[*/MOD](#) MOD / /MOD * FM/MOD SM/REM

[UM*](#) XOR OR AND {ANS_COMP}

UTILITY

[DUMP](#) U.R WORDS ? .RS .S {UTILITY}

U.R u z -- display unsigned number u with size z
.RS Return Stack content
{UTILITY} if you type {UTILITY} all subsequent loaded words are removed

SD_TOOLS

DIR FAT CLUSTER SECTOR {SD_TOOLS}

DIR dump first sector of current directory
FAT dump first sector of FAT1
CLUSTER .123 CLUSTER displays first sector of cluster 123
SECTOR .123456789 SECTOR displays sector 123456789
{SD_TOOLS} if you type {SD_TOOLS} all subsequent loaded words are removed

build your FastForth local copy

download <https://github.com/jean-michel/FAST-FORTH/archive/master.zip>

once you have unzipped it into your folder, share it (with you) and notice its network path. Then right clic on the root of your notepad to create a network drive by recopying this network path (change backslashes \ to slashes /); then set drive letter as you want.

In explorer you should obtain that:

```
drive:\prog\                TERATERM.ini
drive:\prog\gema\
drive:\prog\MacroAssemblerAS\bin\
drive:\prog\MSP430Flasher\
drive:\prog\Srecord\
drive:\prog\wscite\        ScITEGlobal.properties

drive:\
drive:\ADD-ON\            source files to build FASTFORTH, including files for KERNEL ADD-ON switches
drive:\MSP430-FORTH\    FASTFORTH build ADD-ON files for OPTIONAL KERNEL ADD-ON switches (not erasable version)
drive:\config\gema\     FORTH source files
drive:\config\msp430\   GEMA pattern files
drive:\config\scite\    bat files
                        others.properties
                        hex.properties
drive:\config\scite\AS_MSP430\ SCITE configuration files
```

source files to build FASTFORTH, including files for KERNEL ADD-ON switches:

```
drive:\ForthMSP430FRxxxx.asm      main FASTFORTH program
\ForthMSP430FRxxxx_ASM.asm       assembler
\ForthMSP430FRxxxx_SD_ACCEPT.asm  ACCEPT from SD_CARD
\ForthMSP430FRxxxx_SD_INIT.asm    to init SD_CARD (FAT16/32)
\ForthMSP430FRxxxx_SD_LOAD.asm    to load source files from SD_CARD
\ForthMSP430FRxxxx_SD_LowLevel.asm SPI routines + Read / write sector
\ForthMSP430FRxxxx_SD_RW.asm      to read create write del SD_CARD files + file copy from terminal to SD_CARD
\prog.bat                          'drag and drop' programing bat file (hard link)
*.inc files                         targets configuration files
*.asm files                         targets (minimalist) init files
*.mac files                         macros files for AS assembler
*.txt files                         program files ready to 'drag and drop' onto prog.bat
\ScITEDirectories.properties       copy of \config\scite\AS_MSP430\ScITEDirectories.properties
```

FASTFORTH build ADD-ON files for OPTIONAL KERNEL ADD-ON switches (not erasable option version): drive:\ADD-ON\

```
ALIGNMENT.asm
ANS_COMPLEMENT.asm
ARITHMETIC.asm
CONDCOMP.asm
DOUBLE.asm
PORTABILITY.asm
SD_TOOLS.asm
UTILITY.asm
```

FORTH source files:

```
drive:\MSP430-FORTH\*.4th      pure FORTH generic source files ready to download without preprocessing
*.f                             source files with use of assembler, must be preprocessed before downloading
*.bat                           to download source file to target, to SD_CARD target, and to debug (hard links)
ANS_COMP.f                      same as ANS_COMP.asm, (erasable)
SD_TOOLS.f                      same as SD_TOOLS.asm, (erasable)
UTILITY.f                       same as UTILITY.asm, (erasable)
RTC.f                           to set time and date with embedded RTC
BOOT.f                          performs bootstrap
RC5toLCD.f                      multitasking example:
SD_test.f                       tests for SD_CARD option: contains the explanations
```

drive:\MSP430-FORTH\MISC\ empty directory. See use in SD_TEST.f

GEMA pattern files

```
drive:\config\gema\FastForthREGtoTI.pat  converts FORTH symbolic registers names to TI Rx registers
\config\gema\MSP430FR2x4x.pat           declarations for MSP430FR2 MSP430FR4 families, assembly part
\config\gema\MSP430FR2x4x_FastForth.pat  declarations for MSP430FR2 MSP430FR4 families, FORTH part
\config\gema\MSP430FR5x6x.pat           declarations for MSP430FR6 MSP430FR6 families, assembly part
\config\gema\MSP430FR5x6x_FastForth.pat  declarations for MSP430FR5 MSP430FR6 families, FORTH part
\config\gema\MSP430FR57xx.pat           declarations for MSP430FR57 family, assembly part
\config\gema\MSP430FR57xx_FastForth.pat  declarations for MSP430FR57 family, FORTH part
\config\gema\MSP430FRxxxx.pat          assembly declarations for device MSP430FRxxxx
\config\gema\RemoveComments.pat
\config\gema\ScITEDirectory.properties  copy of \config\scite\AS_MSP430\ScITEDirectories.properties
\config\gema\tiREGtoFastForth.pat       converts TI RX registers to FORTH symbolic registers names
\config\gema\target.pat                 declarations for target
\config\gema\launchpad_x.pat           assembly declarations for specific target
```

SCITE configuration files:

```
drive:\config\scite\AS_MSP430\ScITEDirectories.properties  scite directory config file
asm.properties       configuration for *.inc,*.mac,*.asm files
forth.properties    configuration for *.f,*.4th files
fortran.properties  configuration for *.pat files
```

```
drive:\config\msp430\SendFile.tt1      TERATERM macro file to send source file to FASTFORTH
SendToSD.tt1                          TERATERM macro file to send source file to embedded SD_CARD
build(.bat)                            called by scite to build target.txt program
prog(.bat)                              to flash target with target.txt file
CopyTo_SD_Card(.bat)                   to copy in your MSP430-FORTH
SendSource(.bat)                       to send file to FASTFORTH
Preprocess(.bat)                       to convert generic .f file to specific .4th file
CopySourceFileToTarget_SD_Card.bat     to copy in any user folder for drag'n drop use
SendSourceFileToTarget.bat             to copy in any user folder for drag'n drop use
PreprocessSourceFile.bat               to copy in any user folder for drag'n drop use
SelectTarget.bat                       called by them three to select target
```

Note: all actions made from ScITE editor are processed via bat/bash files. So you can easily use your preferred editor by reuse them.

Note: all actions (flashing target, downloading files) can be made by using bat files directly, i.e. without use of ScITE editor.

The next is to download IDE (WINDOWS):

First get TI's programs

go here: <http://www.ti.com/> and registers you to enable MSP430Flasher downloading:

<http://www.ti.com/tool/msp430-flasher?DCMP=MSP430&HQS=Other+OT+msp430flasher>
and
http://software-dl.ti.com/msp430/msp430_public_sw/mcu/msp430/MSP430_FET_Drivers/latest/index_FDS.html

install in the suggested directory,
then copy MSP430Flasher.exe and MSP430.dll to **drive:\prog\MSP430Flasher**

download and install teraterm: <http://logmett.com/tera-term-the-latest-version>

<https://sourceforge.net/projects/gema/files/latest/download>
unzip in **drive:\prog\gema**

download <http://www.scintilla.org/Sc400.exe> to **drive:\prog\wscite**
then rename Sc400.exe to scite.exe

<http://john.ccac.rwth-aachen.de:8000/ftp/as/precompiled/i386-unknown-win32/aswcurr.zip>
unzip in **drive:\prog\MacroAssemblerAS**

<https://sourceforge.net/projects/srecord/files/latest/download>
unzip in **drive:\prog\Srecord**

In explorer you should obtain that (minimum requested programs):

drive:\prog\	TERATERM.ini	
drive:\prog\gema\	gema.exe	syntactic preprocessor
drive:\prog\MacroAssemblerAS\bin\	asw.exe P2hex.exe as.msg cmdarg.msg ioerrs.msg P2hex.msg tools.msg	macro assembler linker
drive:\prog\MSP430Flasher\	MSP430Flasher.exe MSP430.dll	flasher
drive:\prog\Srecord\	srec_cat.exe	TI.hex to TI.txt files converter
drive:\prog\wscite\	scITE.exe scITEGlobal.properties	text editor

Next we need to change the drive letter in hard links below:

drive:\prog.bat

drive:\MSP430-FORTH\SendSourceFileToTarget.bat
CopySourceFileToTarget_SD_Card.bat
PreprocessSourceFile.bat

to do, right clic on them
select "properties"
set your drive letter in "target"

The last step is ask windows to associate scite editor with file types:

right clic on a **.asm** file,
select "open with",
select "other application" then select: **drive:\prog\wscite\scite.exe**

repeat for **.inc**, **.mac**, **.lst**, **.f**, **.4th**, **.pat**, **.properties**, **.TTL** files.

IT's done ! See **forthMSP430FRxxxx.asm** to configure TeraTerm

IDE for linux UBUNTU / MINT

First search from ti.com:

http://software-dl.ti.com/msp430/msp430_public_sw/mcu/msp430/MSP430Flasher/latest/index_FDS.html

untar in a home folder then:

```
open MSPFlasher-1.3.16-linux-x64-installer.run
install in MSP430Flasher (under home)
```

open a terminal in MSP430Flasher/Drivers:

```
sudo ./msp430uif_install.sh
```

```
copy MSP430Flasher/MSP430Flasher to /usr/local/bin/MSP430Flasher
```

```
copy MSP430Flasher/libmsp430.so to /usr/local/lib/MSP430Flasher/libmsp430.so
```

open an editor as superuser in /etc/ld.so.conf.d/

```
write on first line (of new file): /usr/local/lib/msp430flasher/
```

```
save this new file as libmsp430.conf
```

then in a terminal: sudo /sbin/ldconfig

install the package srecord

install the package scite

as super user, edit /etc/scite/SciteGlobal.properties

```
uncomment (line 18): position.maximize=1
```

```
uncomment (line 257): properties.directory.enable=1
```

```
add line 7: PLAT_WIN=0
```

```
add line 8: PLAT_GTK=1
```

```
save file
```

at the end of your ~/.profile file, add these two lines:

```
FF="/the_root_of_your_FastForth_local_copy"
```

```
export FF
```

<https://sourceforge.net/projects/gema/files/gema/gema-1.4-RC/gema-1.4RC-src.tgz/download>

untar in a home folder then:

```
make (ignore warnings)
```

```
sudo make install (ignore warnings)
```

```
make clean
```

```
result: /usr/local/bin/gema
```

http://john.ccac.rwth-aachen.de:8000/ftp/as/source/c_version/as1-current.tar.gz

untar in a home folder then:

```
copy /Makefile.def-samples/Makefile.def-i386-unknown-linux2.x,x to ../Makefile.def
```

```
edit this Makefile.def to remove "-march=i586" option from line 7
```

```
make
```

```
make test
```

```
sudo make install
```

```
make clean
```

```
result: as1 files are in /usr/local
```

Here, you can compile FastForth from scite editor, so to generate file.4th

install minicom package

```
sudo gpasswd --add ${USER} dialout
```