

1. Introduction

In 1991, Glen Haydon described six "levels" of Forth implementation¹. This is a reflection and discussion of how they might apply to a Forth written as a command processor in another language.

I also want to try out the org-mode->Typst gateway, but that's a different thing.

2. Level 0

This describes the most basic words in a Forth. However, some of these are strongly tied to a particular kind of implementation and are less immediately useful to us.

2.1. Math Words

word(s)	Stack	Description	Commentary
+ - *	(a b -- c)	Basic math ops.	Integer operations. Where's divide? For early mini/microcomputers, division was an expensive operation.
/MOD	(a b -- rem quot)	Modulo operator.	Returns remainder and quotient. Could be easily implemented with repeated subtractions.
*/	(a b c -- quot)	Precison math op.	
MIN	(a b -- min)	Minimum	
MAX	(a b -- max)	Maximum	
NEGATE	(a -- -a)	Logic operation.	
ABS	(a -- A)	Remove sign.	
AND OR XOR	(a b -- f)	Logic operation.	Historically, Forths use 0 for false, and -1 (all bits set) for true, which means these operators are both logical and bitwise. This also has performance implications at assembly level. ²
NOT	(a -- !a)	Logic operation.	
=	(a b -- f)	Equality test.	

2.2. Stack Manipulation Words

word(s)	Stack	Description	Commentary
DUP	(a -- a a)	Duplicate TOS.	
DROP	(a --)	Remove TOS.	
SWAP	(a b -- b a)	Swap top two values.	
OVER	(a b -- a b a)	Copy second value to top.	

¹<https://www.forth.org/literature/forthlev.html>

²See <https://stackoverflow.com/questions/23832703/why-does-forth-return-1-as-a-flag-for-true>.

2.3. I/O Words

word(s)	Stack	Description	Commentary
DECIMAL	(--)	Change to decimal format.	
HEX	(--)	Change to hexadecimal.	Most modern usage confined to core dumps and web colour specifications.
OCTAL	(--)	Change to Octal (base 8).	Super-duper obsolete (except for IBM weenies and Unix chmodders).
.	(n --)	Print number at TOS.	
.R	(R:n --)	Print number at top of return stack.	
CR	(--)	Carriage return (newline).	
EMIT	(c --)	Prints TOS as single character.	In the age of Unicode, not so useful.
KEY	(-- c)	Get keyboard character.	

word(s)	Stack	Description	Commentary
:	(name \vert --)	Define new word.	
;	(--)	End definition.	
CREATE	(--)		
,			
ALLOT			
IF			
ELSE			
THEN			
FOR			
NEXT			
I			
BEGIN			
UNTIL			

These words are not in Mr. Haydon's document, but can be reasonably be expected to be included in a minimal Forth³.

word(s)	Stack	Description	Commentary
WORD			
NUMBER			
INTERPRET			
ABORT			
EXPECT			

³See https://www.1strec.org/downloads/Forth_Resources/CM_Invention_of_Forth.pdf

3. Level 1

According to Mr. Haydon, this is based on the fig-Forth Installation Manual⁴. It defined a subset of Forth that a hobbyist could easily get running on the micros of the time. It was an early open-source multi-platform reimplementation effort, since Moore's Forth was not available.

4. Level 2

5. Level 4

6. Level 5

⁴https://archive.org/details/h42_fig-Forth_Installation_Manual