

1. Record Nr.	UNINA9910508433703321
Autore	Smith Stephen
Titolo	RP2040 Assembly Language Programming : ARM Cortex-M0+ on the Raspberry Pi Pico
Pubbl/distr/stampa	Berkeley, CA : , : Apress L. P., , 2021 ©2022
ISBN	1-4842-7753-8
Descrizione fisica	1 online resource (330 pages)
Soggetti	Electronic books.
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	<p>Intro -- Table of Contents -- About the Author -- About the Technical Reviewer -- Acknowledgments -- Introduction -- Chapter 1: How to Set Up the Development Environment -- About the Raspberry Pi Pico -- About the Host Computer -- How to Solder and Wire -- How to Install Software -- A Simple Program to Ensure Things Are Working -- Create Some Helper Script Files -- Summary -- Chapter 2: Our First Assembly Language Program -- 10 Reasons to Use Assembly Language -- Computers and Numbers -- ARM Assembly Instructions -- CPU Registers -- ARM Instruction Format -- RP2040 Memory -- About the GCC Assembler -- Hello World -- Our First Assembly Language File -- About the Starting Comment -- Where to Start -- Assembly Instructions -- Data -- Program Logic -- Reverse Engineering Our Program -- Summary -- Exercises -- Chapter 3: How to Build and Debug Programs -- CMake -- GNU Make -- Print Statements -- GDB -- Preparing to Debug -- Beginning GDB -- Summary -- Exercises -- Chapter 4: How to Load and Add -- About Negative Numbers -- About Two's Complement -- About Raspberry Pi OS Calculator -- About One's Complement -- Big- vs. Little-Endian -- About Bi-Endian -- Pros of Little-Endian -- Cons of Little-Endian -- How to Shift and Rotate Registers -- About Carry Flag -- Basics of Shifting and Rotating -- Logical Shift Left -- Logical Shift Right -- Arithmetic Shift Right -- Rotate Right -- Rotate Right Extend -- How to Use MOV -- Move Immediate -- Moving Data from One Register to Another Using Register</p>

MOV -- ADD/ADC -- Add with Carry -- SUB/SBC -- Shifting and Rotating -- Loading All 32 Bits of a Register -- MOV/ADD/Shift Example -- Summary -- Exercises -- Chapter 5: How to Control Program Flow -- Unconditional Branch -- About the CPSR -- Branch on Condition -- About the CMP Instruction -- Loops -- FOR Loops -- While Loops -- If/Then/Else -- Logical Operators.

AND -- EOR -- ORR -- BIC -- MVN -- TST -- Design Patterns -- Converting Integers to ASCII -- Using Expressions in Immediate Constants -- Storing a Register to Memory -- Why Not Print in Decimal? -- Performance of Branch Instructions -- Summary -- Exercises -- Chapter 6: Thanks for the Memories -- How to Define Memory Contents -- How to Align Data -- How to Load a Register -- How to Load a Register with an Address -- How to Build the Address Directly -- PC Relative Addressing -- How to Load Data from Memory -- Optimizing Small Read-Only Data Access -- Indexing Through Memory -- How to Store a Register -- How to Convert to Uppercase -- How to Load and Store Multiple Registers -- Summary -- Exercises -- Chapter 7: How to Call Functions and Use the Stack -- About Stacks on the RP2040 -- How to Branch with Link -- About Nesting Function Calls -- About Function Parameters and Return Values -- How to Manage the Registers -- Summary of the Function Call Algorithm -- More on the Branch Instructions -- About the X Factor -- Uppercase Revisited -- About Stack Frames -- Stack Frame Example -- How to Define Symbols -- How to Create Macros -- About Include Directive -- How to Define a Macro -- About Labels -- Why Macros? -- Summary -- Exercises -- Chapter 8: Interacting with C and the SDK -- How to Wire Flashing LEDs -- How to Flash LEDs with the SDK -- How to Call Assembly Routines from C -- How to Embed Assembly Code Inside C Code -- Summary -- Exercises -- Chapter 9: How to Program the Built-in Hardware -- About the RP2040 Memory Map -- About C Header Files -- About the Raspberry Pi Pico Pins -- How to Set a Pin Function -- About Hardware Registers and Concurrency -- About Programming the Pads -- How to Initialize SIO -- How to Turn a Pin On/Off -- The Complete Program -- Summary -- Exercises -- Chapter 10: How to Initialize and Interact with Programmable I/O.

About PIO Architecture -- About the PIO Instructions -- Flashing the LEDs with PIO -- PIO Instruction Details and Examples -- JMP -- WAIT -- IN -- OUT -- PUSH -- PULL -- MOV -- IRQ -- SET -- About Controlling Timing -- About the Clock Divider -- About the Delay Operand -- About Side-Set -- More Configurable Options -- Summary -- Exercises -- Chapter 11: How to Set and Catch Interrupts -- Overview of the RP2040's Interrupts -- About the RP2040's Interrupts -- About the Interrupt Vector Table -- About Saving Processor State -- About Interrupt Priorities -- Flashing LEDs with Timer Interrupts -- About the RP2040 Alarm Timer -- Setting the Interrupt Handler and Enabling IRQ0 -- The Complete Program -- About the SVCall Interrupt -- Using the SDK -- Summary -- Exercises -- Chapter 12: Multiplication, Division, and Floating Point -- Multiplication -- Division -- About Division and Interrupts -- Interpolation -- Adding an Array of Integers -- Interpolating Between Numbers -- Floating Point -- About the Structure of the Boot ROM -- Sample Floating-Point Program -- Some Notes on C and printf -- Summary -- Exercises -- Chapter 13: Multiprocessing -- About Saving Power -- About Interprocessor Mailboxes -- How to Run Code on the Second CPU -- A Multiprocessing Example -- About Fibonacci Numbers -- About Factorials -- The Complete Program -- About Spinlocks -- Regulating Access to a Memory Table -- A Word on the SDK -- Summary -- Exercises -- Chapter 14: How to Connect Pico to IoT -- About

[the RP2040's Built-in Temperature Sensor](#) -- [About Home-Brewed Communication Protocol](#) -- [About the Server Side of the Protocol](#) -- [About the RP2040's UART](#) -- [Mastering Math Routines](#) -- [Viewing the Main Program](#) -- [About IoT, Wi-Fi, Bluetooth, and Serial Communications](#) -- [Summary](#) -- [Exercises](#) -- [Appendix A: ASCII Character Set](#) -- [Appendix B: Assembler Directives](#).  
[Appendix C: Binary Formats](#) -- [Integers](#) -- [Floating Point](#) -- [Addresses](#) -- [Appendix D: The ARM Instruction Set](#) -- [Answers to Exercises](#) -- [Chapter 2](#) -- [Chapter 4](#) -- [Chapter 6](#) -- [Chapter 9](#) -- [Chapter 10](#) -- [Index](#).

---