

1DT301 – Lab assignment 2

Goal for this lab:

- Getting started using the RPi Pico microcontroller and the development environment.
- Learn to program in the ARMv6-M Thumb instruction set.
- Learn to use the printf instruction to show output strings in a terminal.
- Learn to program the output pins and use them to control LEDs and a 7-segment display

Presentation of results:

After each task has been solved, contact a teacher for grading. To complete the lab, you also need to submit the code on Moodle, as a .pdf file. Each group must submit solutions to all lab tasks, and **the names of all group members must be in the header of every file**. Use the following header:

Course 1dt301: Computer Technology 1

Lab Assignment 2, 2024

Names of BOTH members in the lab group

Tasks

Task 1:

- Download the source code for the Hello World program presented on page 24 in Stephen Smith's book.
- Modify the program so that the counter starts at 100, decreases by one each time the loop is repeated. Print the text Hello World followed by the counter number. When the counter reaches 0, it shall be reset to 100 and start decreasing again, in an infinite loop.
- Compile and upload the program to the Pico. Open minicom, putty or a similar terminal to show the result. Example:

```
Hello World 5
Hello World 4
Hello World 3
Hello World 2
Hello World 1
Hello World 0
Hello World 100
Hello World 99
Hello World 98
Hello World 97
Hello World 96
Hello World 95
Hello World 94
Hello World 93
```

Task 2:

Connect one green, one yellow and one red light to three of the pins, in the same order as a traffic light. Then, write a program to make them flash like a traffic light.

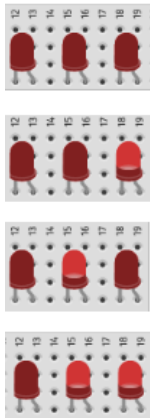
Use pins GP0 for green, GP1 for yellow and GP2 for green LED! Also, make sure you understand how to connect an LED and remember to ALWAYS connect it in series to a resistor!

You can use the code in Listing 8-1 (page 150). Copy everything from folder Chapter 8/1/ and edit the .S file to write your own code!

Note: The functions `link_gpio_put` and `link_gpio_set_dir` are C functions, not assembly, but you don't need to care much about this, just **remember to copy the file `sdklink.c`**!

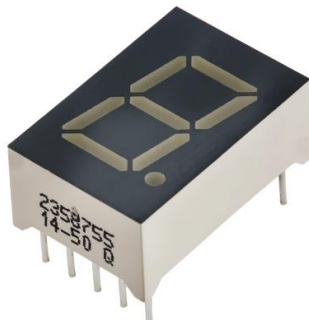
Task 3:

Use the same setup as in Task 2 and create a binary counter that counts from 000 up to 111. The picture below shows the first 4 steps. When the counter reaches its final value 111, count back to 000 one step at a time, repeat infinitely. Make one second delay between the counter values.



Task 4:

Connect a 7-segment display to the Pico. Implement a counter that counts from 0 up to 9, then count back to 0, and repeats infinitely. Make a delay of 1 second between the increments/decrements of the counter!



Use pins GP0, GP1, ..., GP6 for segments A, B, ..., G, respectively!