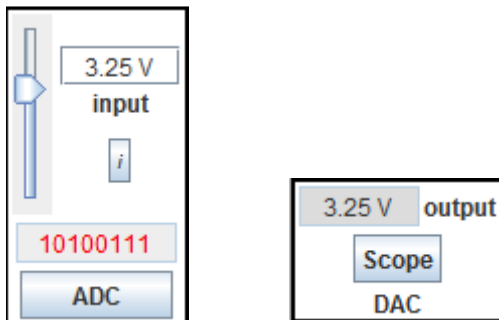


Tasks 1 – 5

1. a) The EdSim51 Assembler example „9a_ADC_ASM“ reads a voltage by ADC and outputs that voltage again by DAC to a display. To accomplish this T0 and INTO Interrupts are used:



Write a new EdSim51 Assembler program, which similarly reads a voltage by ADC and outputs that voltage again by DAC to a display, however **not using Interrupts** for this.

Hint: Polling of Pin **ADC_INTR**

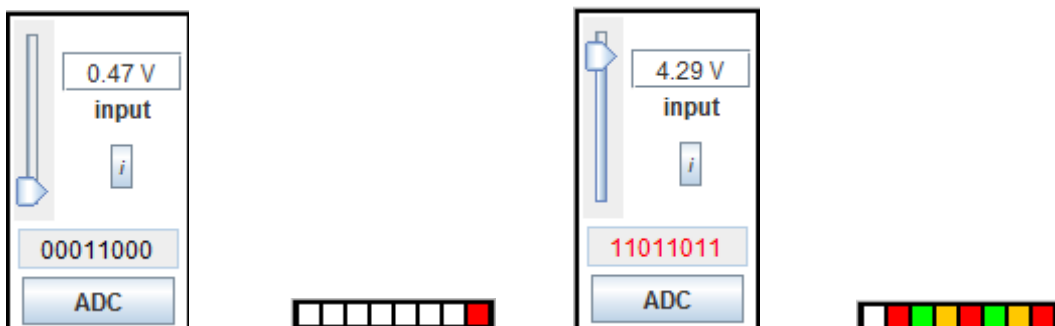
Submit a workable and commented solution named: „1a_ADC_POLL_ASM.asm“

1. b) Now write a similar EdSim51 C program, which reads a voltage by ADC and outputs that voltage again by DAC to a display, **not using Interrupts** for this.

Submit a workable and commented solution named: „1b_ADC_POLL_C.c“

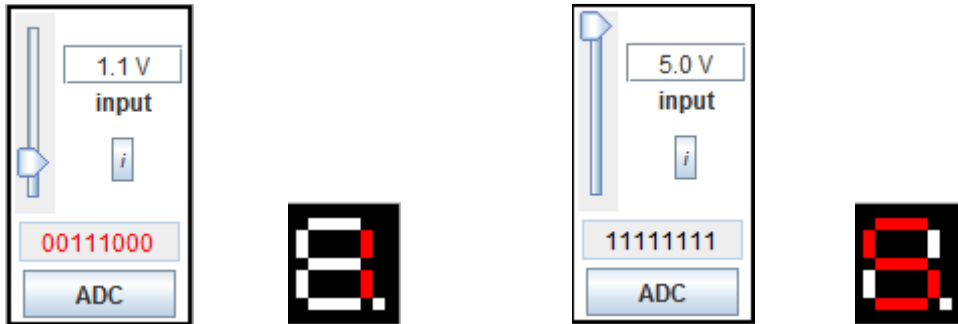
2. a) The EdSim51 C example „9b_ADC_C“ reads a voltage by ADC and outputs that voltage again by DAC to a display.

Modify this EdSim51 C example so the voltage is instead displayed by using the 8 LEDs as a bar indicator:



Submit a workable and commented solution named: „2a_ADC_LED_C.c“

2. b) Now modify the EdSim51 C example once more so the voltage is instead displayed using a single 7-digit display:



Hint: How to use a 7-digit display is found in EdSim51 C example „4b_SEG_C“ and may be copied from there.

Submit a workable and commented solution named: „2b_ADC_SEG_C.c“

3. a) In RPCEmu Assembler example „5b_asm_key_led.txt“ the arrow keys $\leftarrow \rightarrow$ are used as “buttons” for switching the simulated LED on and off:



Modify this RPCEmu Assembler example so the LED is now blinking, and the blinking frequency can be increased and decreased using the $\leftarrow \rightarrow$ arrow keys.

Hint: LED blinking is found in RPCEmu Assembler example „4a_asm_blinky.txt“ and may be copied from there.

Submit a workable and commented solution named: „3a_asm_key_blinky.txt“

3. b) In RPCEmu C example „5_key_led“ the arrow keys $\leftarrow \rightarrow$ are used as “buttons” for switching the simulated LED on and off.

Modify this RPCEmu C example so the LED is now blinking, and the blinking frequency can be increased and decreased using the $\leftarrow \rightarrow$ arrow keys.

Hint: LED blinking is found in RPCEmu C example „4a_blinky“ and may be copied from there.

Submit a workable and commented solution named: „3b_key_blinky.c“

4. As an example for „Advanced Programming“ the Euclidean Algorithm was implemented in RPCEmu C example „2_euclid“

Now you should implement a simple sorting algorithm: the Bubblesort

<https://de.wikipedia.org/wiki/Bubblesort>

https://en.wikipedia.org/wiki/Bubble_sort

Write a new RPCEmu C program which sorts and outputs the given Array:

```
int sample[] = {55, 7, 78, 12, 42};  
int size = 5;  
gcc compiling ...  
55 7 78 12 42  
7 12 42 55 78
```

Submit a workable and commented solution named: „4_sort.c“

5. For mass-production of PCBs connecting sensors to PLCs you should choose a suitable low-cost microcontroller with built-in ADC

In the shortlist are EFM8BB1 and EFM8LB1

Explain in an essay of about one page the important differences between EFM8BB1 ADC and EFM8LB1 ADC, and why EFM8LB1 may be more suitable.

To accomplish this, read through the respective Reference Manuals chapters:

12. Analog-to-Digital Converter (ADC0)

<https://www.silabs.com/documents/public/reference-manuals/efm8bb1-rm.pdf>

12. Analog to Digital Converter (ADC0)

<https://www.silabs.com/documents/public/reference-manuals/efm8lb1-rm.pdf>

Hint: Copying off text from the Reference Manuals **is not considered** as writing an essay. Use your **own** wording.