

CT Lab: Control Structures - Calculator

1 Introduction

In this lab you will implement a simple calculator on the target hardware. The operands can be entered through the dip switches and the operation can be selected through the rotary switch.

2 Learning Objectives

- You can implement a switch-case statement with a jump table in assembly.
- You strengthen your skills in the application of arithmetic and logic instructions.

3 Task 1

Implement a program, which reads 8-bit values from the DIP-switches and performs different operations on them. The result shall be displayed on the LEDs. Use the given project frame.

- Read the comments in the given program frame. They will show you where to enter your code.
- Implement the switch-case statement based on the lecture slides.

The program shall meet the following requirements (See **Table 1**, **Figure 1**):

- The first operand (op1) shall be entered through the DIP-switches S15 to S8.
- The second operand (op2) shall be entered through the DIP-switches S7 to S0.
- The 8 bit operands shall be zero-extended to 32 bit.
- The operation shall be selected through the rotary switch, according to Table 1.
- The position of the rotary switch shall be displayed on the 7-segment display. The operands 1 and 2 shall be displayed on LED15 to LED0 (above the corresponding DIP-switches).
- The 16 bit result shall be displayed on LED31 to LED16.
- A logical “1” shall mean that the corresponding LED is on.
- The program shall use a jump table.

Hex-Switch	Operation	Hex-Switch	Operation
0x00	all 16 dark	0x08	!(op1 & op2) → NAND
0x01	op1 + op2	0x09	!(op1 # op2) → NOR
0x02	op1 – op2	0x0a	!(op1 \$ op2) → XNOR
0x03	op1 * op2 (unsigned)	0x0b	all 16 bright
0x04	op1 & op2 → AND	0x0c	all 16 bright
0x05	op1 # op2 → OR	0x0d	all 16 bright
0x06	op1 \$ op2 → XOR	0x0e	all 16 bright
0x07	!op1 → NOT	0x0f	all 16 bright

Table 1: Operations overview

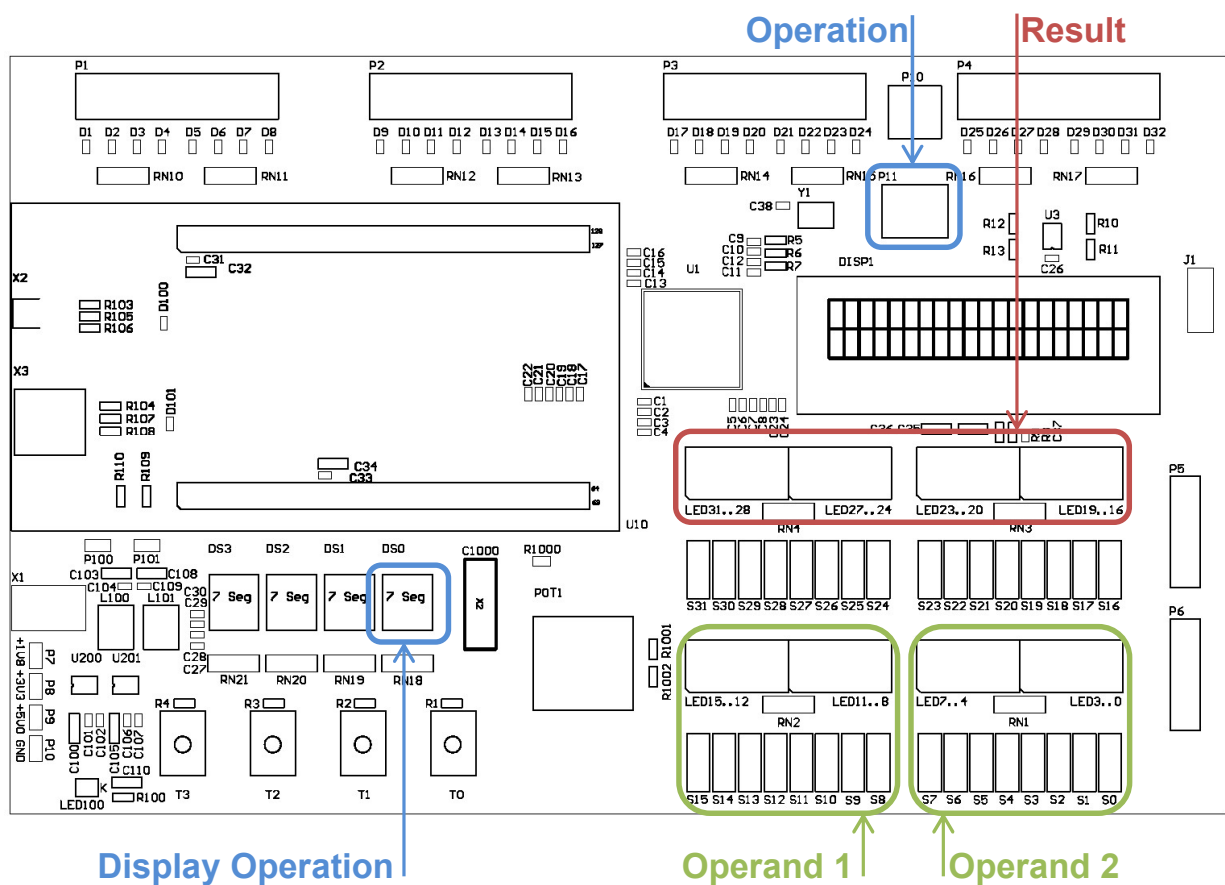


Figure 1: In- and output of operands, operation and result

4 Grading

The working program has to be presented to the lecturer. The student has to understand the solution / source code and has to be able to explain it to the lecturer.

Task	Criteria	Weight
1	The program meets the required functionality.	4/4