

Practical No. 4

Aim: Subtraction of Two 8-bit Numbers

Objective: To perform the subtraction of two 8-bit numbers and obtain an 8-bit result.

Theory:

Subtraction in an 8-bit system follows binary arithmetic principles. The operation is performed using the **2's complement method**, where:

- **Direct subtraction** is used when the minuend (first number) is greater than the subtrahend (second number).
- **2's complement method** is used when the subtrahend is larger, as microprocessors do not directly support subtraction; instead, they perform addition using the 2's complement of the subtrahend.

Steps for Subtraction Using 2's Complement:

1. **Take the 2's complement** of the subtrahend:
 - Find the **1's complement** (invert all bits).
 - Add **1** to the 1's complement to get the **2's complement**.
2. **Add** the 2's complement of the subtrahend to the minuend.
3. **Check the carry flag:** If a carry is generated, the result is positive; if no carry is generated, the result is negative (represented in 2's complement form).

Materials/Tools Required:

- Microprocessor/microcontroller (e.g., 8085/8051)
- Assembler/Simulator
- Computer system with programming software
- Binary calculator (optional)

Procedure:

1. **Initialize Registers:** Load the minuend (first number) into a register (e.g., A register in an 8085 microprocessor).
2. **Load the Subtrahend:** Store the second 8-bit number in another register (e.g., B register).
3. **Find the 2's Complement:** Take the 2's complement of the subtrahend.
4. **Perform Addition:** Add the minuend and the 2's complement of the subtrahend.
5. **Check Carry and Store Result:**
 - If carry = 1 → The result is positive.
 - If carry = 0 → The result is negative (stored in 2's complement form).
6. **Display the Result:** Store and display the final result in memory or on an output device.

Observations:

- If the minuend is larger, subtraction works directly.
- If the subtrahend is larger, the result is in 2's complement form, indicating a negative result.
- The carry flag helps determine whether the result is positive or negative.

Conclusion:

The subtraction of two 8-bit numbers is successfully performed using the 2's complement method. The microprocessor handles both positive and negative results using the carry flag.

Applications (Optional):

- Used in digital circuits for arithmetic computations.
- Essential operation in microprocessors and microcontrollers for logical and arithmetic decision-making.
- Applied in embedded systems and low-level programming for data processing.