

## Lab 3.1

### Conditional Statements and Jumps (Signed) - UPDATED

- Suppose that a certain country Y somewhere is so unique in such a way that the temperature can vary very extremely at any point in time. Sometimes, the temperature shoots up to 80°C and there are times when it becomes as low as 0K (-273°C). Now, you are tasked to create a computer system that will check the temperature level T of country Y and generate certain alerts in order to notify certain people.

Alert A ( $T \geq 80^{\circ}\text{C}$ ) : Too hot! Give yourself a shower.  
 Alert B ( $30^{\circ}\text{C} < T < 80^{\circ}\text{C}$ ) : You're good. Stay alert.  
 Alert C ( $T \leq 30^{\circ}\text{C}$ ) : Oh no! You're freezing.

Assume that the computer system utilizes the DMA (or direct memory access) architecture in which any I/O device is capable of accessing (reading/writing) directly from/to the memory bypassing the CPU to speed up operation<sup>1</sup>. Here, the temperature sensor will send temperature reading directly to the memory, hence the name direct memory access. Assume that the temperature reading will be stored in the memory location with a label 'TEMP\_READING'. TEMP\_READING must be able to hold data ranging from -273°C to 100°C. (Values outside this range will not be checked.) Note that the unit of measure to use for temperature will be °C or centigrade.

Here, negative numbers are represented using 2's complement notation. For example, -273 is FEEFH (65, 263 in decimal). Values for TEMP\_READING could be in decimal or hex format (for hex, note that you need to append extra 0 as the assembler will not allow leading characters, e.g. valid values are 1234H, 0FEEFH, 0ABCDH; invalid are FEEFH, ABCDH.)

Sample display: (Note that the value of TEMP\_READING need not be displayed since it's complicated to display such values for now. Just display the alert directly.)

(if TEMP\_READING = 100)  
Too hot! Give yourself a shower.

(if TEMP\_READING = 50)  
You're good. Stay alert.

(if TEMP\_READING = 65263)  
Oh no! You're freezing.

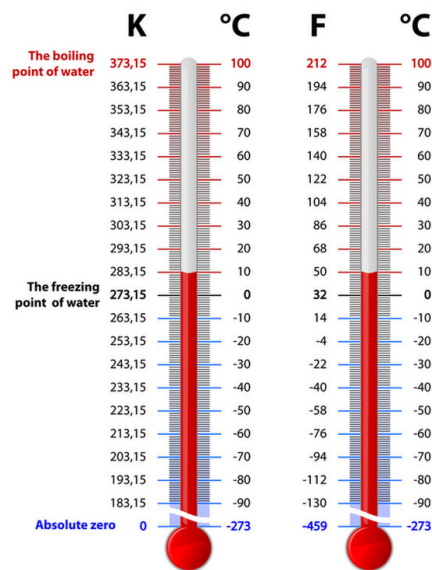


Figure 1 The Temperature Scale

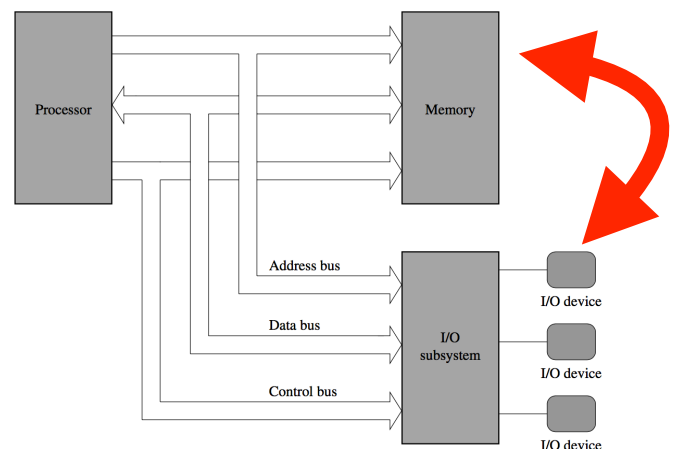


Figure 2 DMA

(if TEMP\_READING = FEEFH)  
Oh no! You're freezing.

<sup>1</sup><https://www.techopedia.com/definition/2767/direct-memory-access-dma>