8-bit Multiplier using Assembly Language

Microprocessor and Computer Structure Lab Project

Manoosh Samiei

In this project, I constructed an 8-bit multiplier using aggregate operations, dividing the result into two parts; 8 bits with greater value stored in port D, and 8 bits with lower value stored in port C.

First, ports A and B are defined as inputs and ports C and D are output. Then in the main loop the initial values of the registers R17, R18, and R22 are set to zero. In the multiply loop, the value of pin B is assigned to register R19, and then is added to register R18, which its initial value is zero. In the next runs of the loop, this algorithm causes the pin B to accumulate several times with itself. Our goal is to sum up B with itself for A times. In order to make 8-bit multiplication, according to the 16-bit response and 8-bit registers, only the first 8 first bits of the answer are poured into the registry R18, and for storing the other 8bits of higher value, we should consider the carry flag of each summation separately by using the command BRCS. Whenever the value of carry flag is 1, this command jumps to a loop named “carry”. In the carry loop, register R22 is incremented by 1 unit in order store the summation of all generated carry bits, which is equal the 8 bits of higher value in multiplication. Then, to continue from the same previous point in the “multiply” loop after the “carry” loop is ended, I defined another loop named “continue” to jump from “carry” loop to continue the program from the previous point in the “multiply” loop.

Then, the register R17 is incremented by one unit. This register counts the number of iteration of the “multiply” loop, which is equal to the number of times that pin B is added to itself. Whenever, the value of register R17 is equal to A, the command branch equal (BREQ) becomes true and the program enters the “loop” loop. In this loop the value of register R18, which contains the 8 less significant bits of multiplication, is assigned to port C, and register R22, containing the summation of all generated carry bits and therefore the 8 bits with greater value of multiplication, is assigned to the port D.