

Example - Accumulator Fused-Multiply Add

The accumulator (Acc) is simply a special CPU register similar to Program Counter (PC). The accumulator is used mainly as intermediate storage or as calculations result holder for arithmetic and logic data in the CPU. For arithmetic operations, the accumulator is normally initialized to zero but it could be initialized to another value depending on the desired calculations. The initial value of the accumulator changes the final result of the arithmetic operation. Different types of arithmetic operations use the accumulator in different ways.

In multiplication, the accumulator is normally initialized to zero at the beginning. Then each bit of the multiplier is multiplied by the whole multiplicand and the result is ***incrementally added to the accumulator*** (ACC). In the example below, we see the result in the accumulator after each step. The final result of the accumulator shows the result of (a x b). What happens if the accumulator is not initialized to zero? How does the initial value of the accumulator change the final result?

101111	multiplicand (a)
<u> X 1101</u>	multiplier (b)
00000000	Acc(in Hex)=00
<u>+ 101111</u>	Multiply by Bit 0 of the multiplier
101111	Acc(in Hex)=2F
<u>+ 10111100</u>	Multiply by Bit 2 of the multiplier
11101011	Acc(in Hex)=EB
<u>+ 101111000</u>	Multiply by Bit 3 of the multiplier
1001100011	Acc(in Hex)=263