CEN 214 Microprocessors Lab

Assignment 4

New Instruction Set Commands:

ADC [destination operand], [source operand]

Description:

Adds the destination operand (first operand), the source operand (second operand), and the carry (CF) flag and stores the result in the destination operand. The destination operand can be a register or a memory location; the source operand can be an immediate, a register, or a memory location. (However, two memory operands cannot be used in one instruction.) The state of the CF flag represents a carry from a previous addition. When an immediate value is used as an operand, it is sign-extended to the length of the destination operand format.

The ADC instruction does not distinguish between signed or unsigned operands. Instead, the processor evaluates the result for both data types and sets the OF and CF flags to indicate a carry in the signed or unsigned result, respectively. The SF flag indicates the sign of the signed result. The ADC instruction is usually executed as part of a multibyte or multiword addition in which an ADD instruction is followed by an ADC instruction. This instruction can be used with a LOCK prefix to allow the instruction to be executed atomically.

Operation

DEST ← DEST + SRC + CF;

Flags Affected

The OF, SF, ZF, AF, CF, and PF flags are set according to the result. [1]

SBB [destination operand], [source operand]

Description:

Adds the source operand (second operand) and the carry (CF) flag, and subtracts the result from the destination operand (first operand). The result of the subtraction is stored in the destination operand. The destination operand can be a register or a memory location; the source operand can be an immediate, a register, or a memory location. (However, two memory operands cannot be used in one instruction.) The state of the CF flag represents a borrow from a previous subtraction. When an immediate value is used as an operand, it is sign-extended to the length of the destination operand format. The SBB instruction does not distinguish between signed or unsigned operands. Instead, the processor evaluates the result for both data types and sets the OF and CF flags to indicate a borrow in the signed or unsigned result, respectively. The SF flag indicates the sign of the signed result. The SBB instruction is usually executed as part of a multibyte or multiword subtraction in which a SUB instruction is followed by a SBB instruction. This instruction can be used with a LOCK prefix to allow the instruction to be executed atomically.[2]

Operation

DEST ← DEST – (SRC + CF);

Flags Affected

The OF, SF, ZF, AF, PF, and CF flags are set according to the result.

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1 IA-32 Intel® Architecture Software Developer's Manual Volume 2: Instruction Set Reference, 2003, (ADC Command, pp. 3-20)

2 ...(SBB Command, pp. 3-708)

Examples

1. Write a program that adds two **4 byte** sized unsigned integers written on **0100:1000h** and **0100:1004h**. Then copy the result to **0100:1008h**. First integer is **3,000,000,000** and second integer is **1,000,000,000**.

2. Write a program that subtracts two **4 byte** sized unsigned integers written on **0100:1000h** and **0100:1004h**. Then copy the result to **0100:1008h**. First integer is **3,000,000,000** and second integer is **1,000,000,000**.

3. Write a program that compares two **4 byte** sized unsigned integers written on **0100:1000h** and **0100:1004h** and if integer that written on **0100:1000h** is bigger than integer written on **0100:1004h**, then subtract two numbers, if not, then add two numbers. Then copy the result to **0100:1008h.** First integer is **4,000,000,000** and second integer is **2,000,000,000**.