XCHG Instruction

The **XCHG (Exchange)** instruction is used to exchange the contents of two operands. There are three variants of the XCHG instruction:

1. **XCHG reg, reg:** Exchanges the contents of two registers.
2. **XCHG reg, mem:** Exchanges the contents of a register with the contents of a memory location.
3. **XCHG mem, reg:** Exchanges the contents of a memory location with the contents of a register.

Here's a brief explanation and examples of each variant:

XCHG reg, reg: This variant exchanges the contents of two registers. Example:

```
xchg ax, bx ; Exchange the contents of AX and BX
```

After this instruction, the values in AX and BX will be swapped.

XCHG reg, mem: This variant exchanges the contents of a register with the contents of a memory location. Example:

```
xchg var1, bx ; Exchange the contents of memory location 'var1' with BX
```

This instruction will exchange the value in memory location 'var1' with the value in BX.

XCHG mem, reg: This variant exchanges the contents of a memory location with the contents of a register. Example:

```
mov ax, val1  ; Load the value from 'val1' into AX
xchg ax, val2 ; Exchange the contents of 'val2' with AX
```

Here, we use a temporary register (AX in this case) to exchange the contents of two memory locations, val1 and val2.

The XCHG instruction is particularly useful in various situations, such as swapping values, implementing synchronization mechanisms, and array sorting algorithms, as mentioned in the provided example. It provides a simple way to exchange data between registers and memory locations.