String Manipulation Instructions

A series of data byte or word available in memory at consecutive locations, to be referred as Byte String or Word String. A String of characters may be located in consecutive memory locations, where each character may be represented by its ASCII equivalent.

The 8086 supports a set of more powerful instructions for string manipulations for referring to a string, two parameters are required.

I. Starting and End Address of the String.
II. Length of the String.

The length of the string is usually stored as count in the CX register. The incrementing or decrementing of the pointer, in string instructions, depends upon the Direction Flag (DF) Status. If it is a Byte string operation, the index registers are updated by one. On the other hand, if it is a word string operation, the index registers are updated by two.

REP : Repeat Instruction Prefix

This instruction is used as a prefix to other instructions, the instruction to which the REP prefix is provided, is executed repeatedly until the CX register becomes zero (at each iteration CX is automatically decremented by one).

i. REPE / REPZ - repeat operation while equal / zero.
ii. REPNE / REPNZ - repeat operation while not equal / not zero.

These are used for CMPS, SCAS instructions only, as instruction prefixes.

MOVSB / MOVSW : Move String Byte or String Word

Suppose a string of bytes stored in a set of consecutive memory locations is to be moved to another set of destination locations. The starting byte of source string is located in the memory location whose address may be computed using SI (Source Index) and DS (Data Segment) contents.

The starting address of the destination locations where this string has to be relocated is given by DI (Destination Index) and ES (Extra Segment) contents.

CMPS : Compare String Byte or String Word

The CMPS instruction can be used to compare two strings of byte or words. The length of the string must be stored in the register CX. If both the byte or word strings are equal, zero Flag is set.
The REP instruction Prefix is used to repeat the operation till CX (counter) becomes zero or the condition specified by the REP Prefix is False.

**SCAN : Scan String Byte or String Word**

This instruction scans a string of bytes or words for an operand byte or word specified in the register AL or AX. The String is pointed to by ES:DI register pair. The length of the string stored in CX. The DF controls the mode for scanning of the string. Whenever a match to the specified operand, is found in the string, execution stops and the zero Flag is set. If no match is found, the zero flag is reset.

**LODS : Load String Byte or String Word**

The LODS instruction loads the AL / AX register by the content of a string pointed to by DS : SI register pair. The SI is modified automatically depending upon DF, If it is a byte transfer (LODSB), the SI is modified by one and if it is a word transfer (LODSW), the SI is modified by two. No other Flags are affected by this instruction.

**STOS : Store String Byte or String Word**

The STOS instruction Stores the AL / AX register contents to a location in the string pointer by ES : DI register pair. The DI is modified accordingly, No Flags are affected by this instruction.

The direction Flag controls the String instruction execution, The source index SI and Destination Index DI are modified after each iteration automatically. If DF=1, then the execution follows autodecrement mode, SI and DI are decremented automatically after each iteration. If DF=0, then the execution follows autoincrement mode. In this mode, SI and DI are incremented automatically after each iteration.

**Flag Manipulation and a Processor Control Instructions**

These instructions control the functioning of the available hardware inside the processor chip. These instructions are categorized into two types:

1. Flag Manipulation instructions.
Flag Manipulation instructions

The Flag manipulation instructions directly modify some of the Flags of 8086.

i. CLC – Clear Carry Flag.
ii. CMC – Complement Carry Flag.
iii. STC – Set Carry Flag.
iv. CLD – Clear Direction Flag.
v. STD – Set Direction Flag.
vi. CLI – Clear Interrupt Flag.
vii. STI – Set Interrupt Flag.

Machine Control instructions

The Machine control instructions control the bus usage and execution
i. WAIT – Wait for Test input pin to go low.
ii. HLT – Halt the process.
iii. NOP – No operation.
iv. ESC – Escape to external device like NDP
v. LOCK – Bus lock instruction prefix.