Microprocessor & Interfacing
Lecture 19
8086 Data Transfer Instructions

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- Introduction
- Data transfer instructions
- Examples

Introduction

- Data transfer instruction are those which are used to movement of the data from one location to another location such as memory to microprocessor, microprocessor to port or memory or vice versa. Data transfer includes instructions such as move, exchange etc.

Types of Instruction

1 Data-Transfer Instructions

2 Arithmetic Instructions

3 Logic Instructions

4 Shift Instructions

5 Rotate Instructions

Data-Transfer Instructions

- The data-transfer functions provide the ability to move data either between its internal registers or between an internal register and a storage location in memory
- The data-transfer functions include

– MOV (Move byte or word)

– XCHG (Exchange byte or word)

– XLAT (Translate byte)

– LEA (Load effective address)

– LDS (Load data segment)

– LES (Load extra segment)

Cont..

- The MOVE Instruction
- The move (MOV) instruction is used to transfer a byte or a word of data from a source operand to a destination operand
- e.g. MOV DX, CS

  MOV [SUM], AX
- The MOV instruction cannot transfer data directly between external memory

Cont..

Mnemonic	Meaning	Format	Operation	Flags affected
MOV	Move	MOV D,S	(S) → (D)	None

(a)

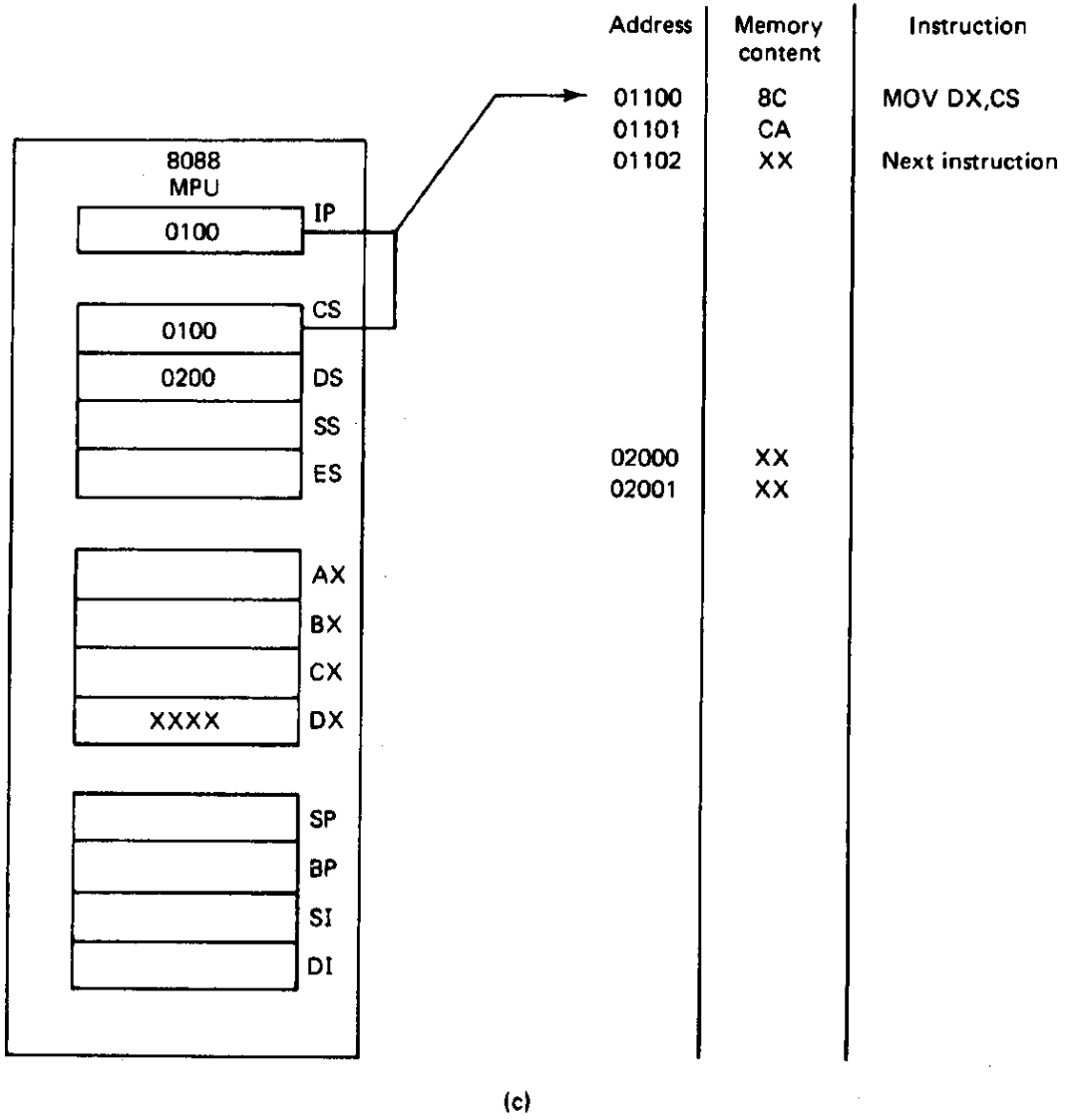
Destination	Source
Memory	Accumulator
Accumulator	Memory
Register	Register
Register	Memory
Memory	Register
Register	Immediate
Memory	Immediate
Seg-reg	Reg16
Seg-reg	Mem16
Reg16	Seg-reg
Memory	Seg-reg

(b)

Cont..

The MOVE Instruction

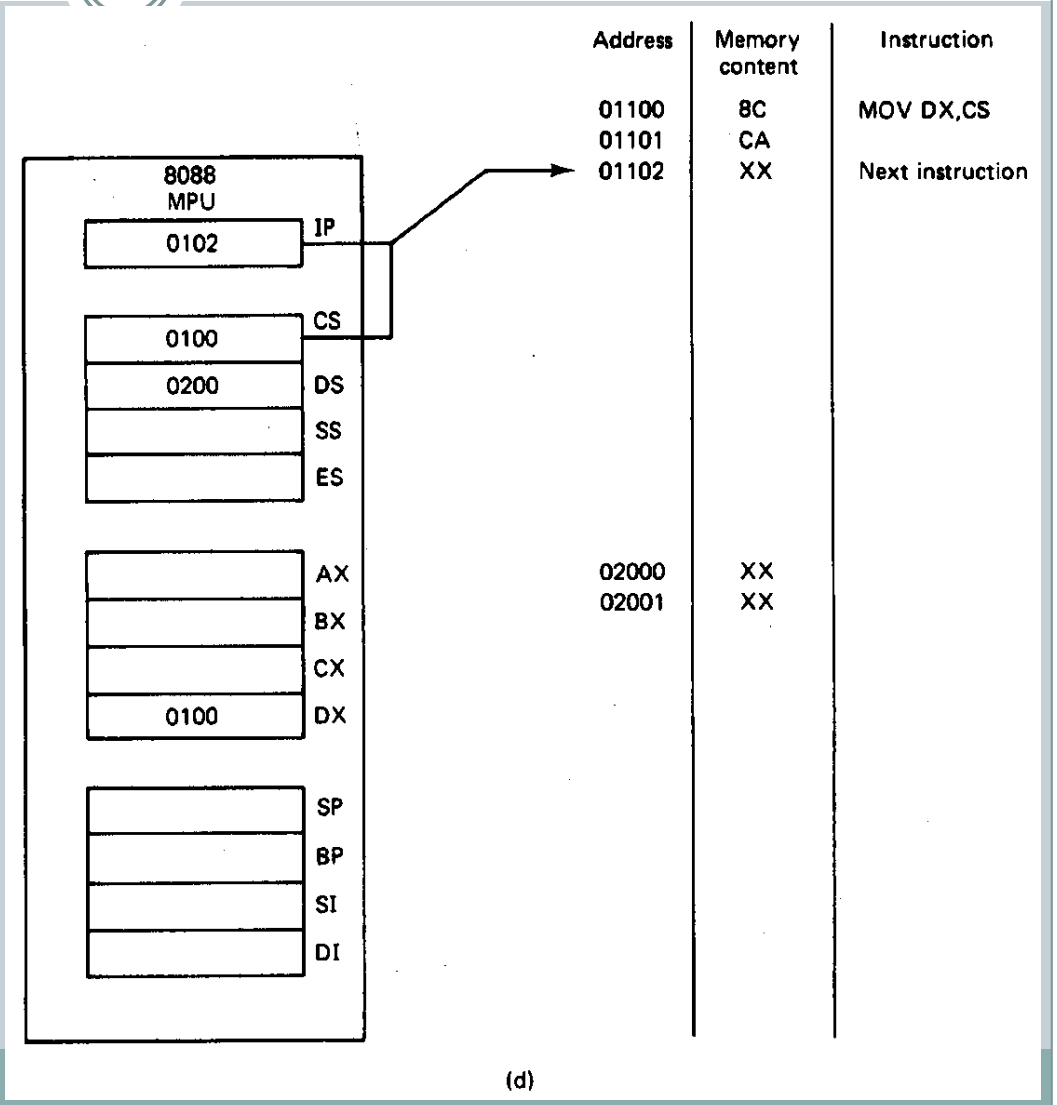
MOV DX, CS



Cont..

The MOVE Instruction

MOV DX, CS



EXAMPLE

- What is the effect of executing the instruction?

  MOV CX, [SOURCE_MEM],

  where SOURCE_MEM equal to 2016 is a memory location offset relative to the current data segment starting at 1A00016

Solution:

$((DS)0+20_{16}) \longrightarrow (CL)$

$((DS)0+20_{16}+1_{16}) \longrightarrow (CH)$

Therefore CL is loaded with the contents held at memory address

$$1A000_{16} + 20_{16} = 1A020_{16}$$

and CH is loaded with the contents of memory address

$$1A000_{16} + 20_{16} + 1_{16} = 1A021_{16}$$

XCHG

The XCHG Instruction

- This instruction can be used to swap data between two general-purpose registers or between a general purpose register and a storage location in memory
- e.g. XCHG AX, DX

Mnemonic	Meaning	Format	Operation	Flags affected
XCHG	Exchange	XCHG D,S	(D) ↔ (S)	None

(a)

Destination	Source
Accumulator	Reg16
Memory	Register
Register	Register
Register	Memory

(b)

EXAMPLE

- What is the result of executing the following instruction?

XCHG [SUM], BX

where SUM = 1234_{16}, (DS)=1200_{16}

- *Solution:*

((DS)0+SUM) $\longrightarrow$ (BX)

PA = 12000_{16} + 1234_{16}=13234_{16}

Execution of the instruction performs the following 16-bit swap:

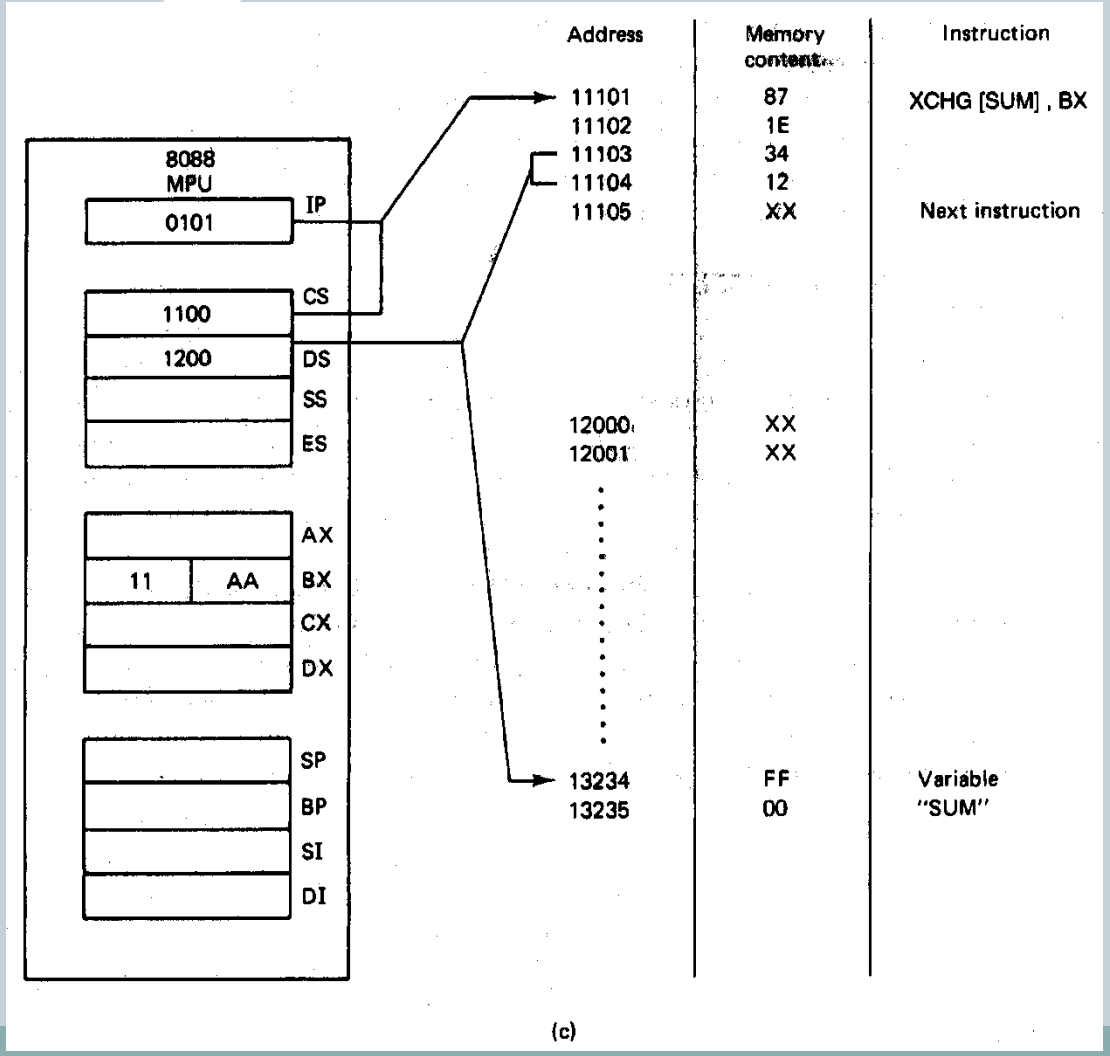
(13234_{16}) $\longrightarrow$ (BL)

(13235_{16}) $\longrightarrow$ (BH)

So we get (BX) = $00FF_{16}$, (SUM) = $11AA_{16}$

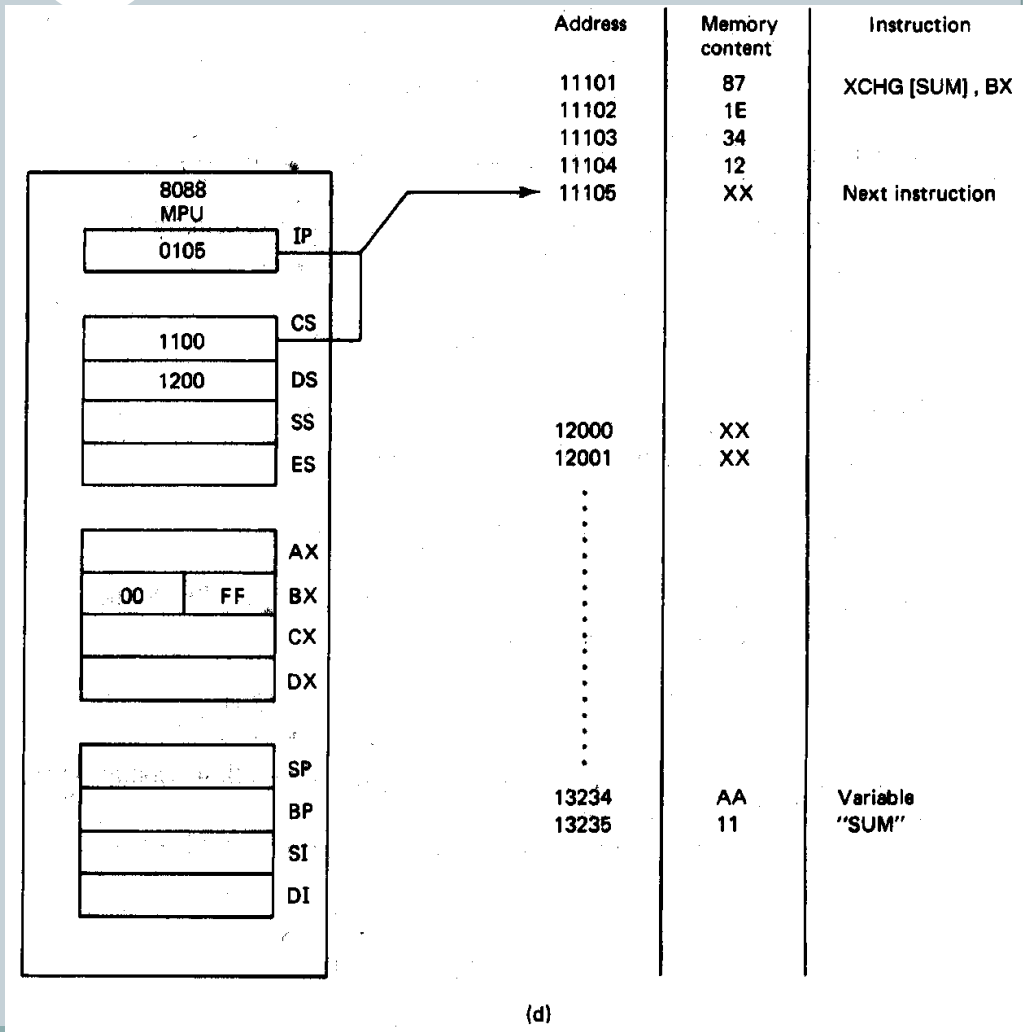
Cont..

The XCHG Instruction – XCHG [SUM], BX



Cont..

The XCHG Instruction – XCHG [SUM], BX



XLAT Instruction

- The translate (XLAT) instruction is used to simplify implementation of the lookup-table operation.
- Execution of the XLAT replaces the contents of AL by the contents of the accessed lookup-table location
- e.g. PA = (DS)0 + (BX) + (AL)

  $= 03000_{16} + 0100_{16} + 0D_{16} = 0310D_{16}$
- $(0310D_{16}) \longrightarrow (AL)$

Mnemonic	Meaning	Format	Operation	Flags affected
XLAT	Translate	XLAT	((AL)+(BX)+(DS)0) → (AL)	None

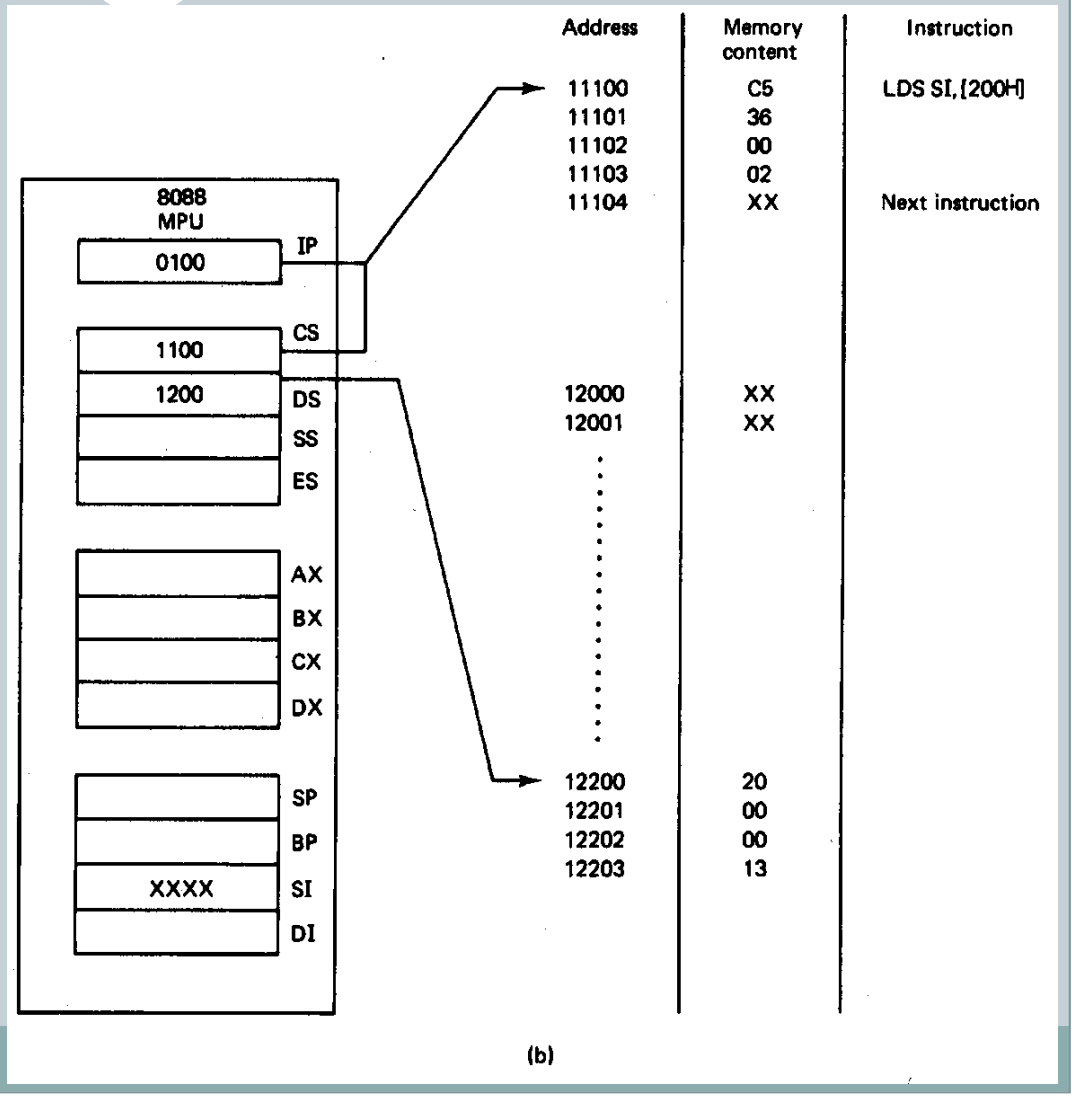
LEA, LDS, and LES Instructions

- The LEA, LDS, LES instructions provide the ability to manipulate memory addresses by loading either a 16-bit offset address into a general-purpose register or a register together with a segment address into either DS or ES
- e.g. LEA SI, [DI+BX+5H]

Mnemonic	Meaning	Format	Operation	Flags affected
LEA	Load effective address	LEA Reg16,EA	EA → (Reg16)	None
LDS	Load register and DS	LDS Reg16,EA	EA → (Reg16) EA+2 → (DS)	None
LES	Load register and ES	LES Reg16,EA	EA → (Reg16) EA+2 → (ES)	None

Cont..

The LEA, LDS, and LES Instructions – LDS SI, [200H]



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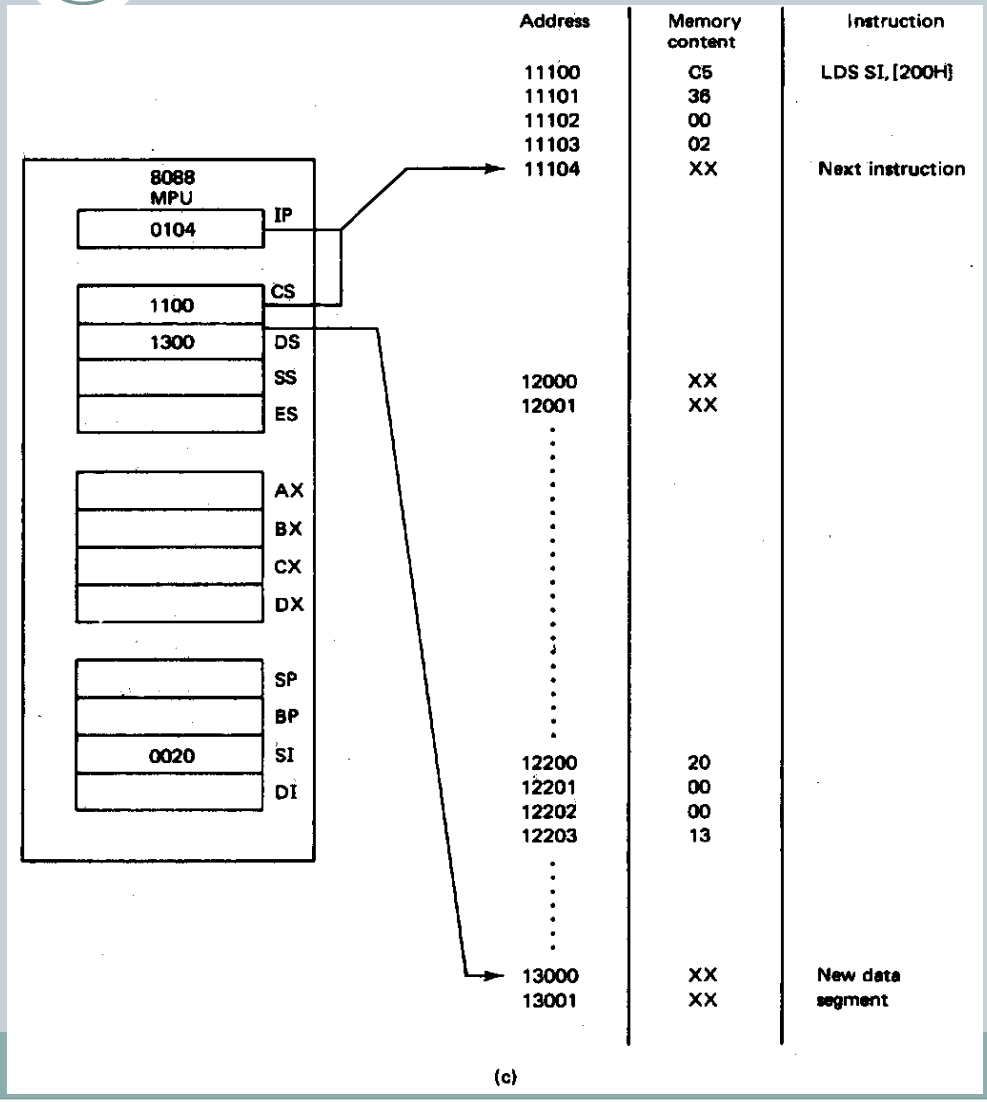
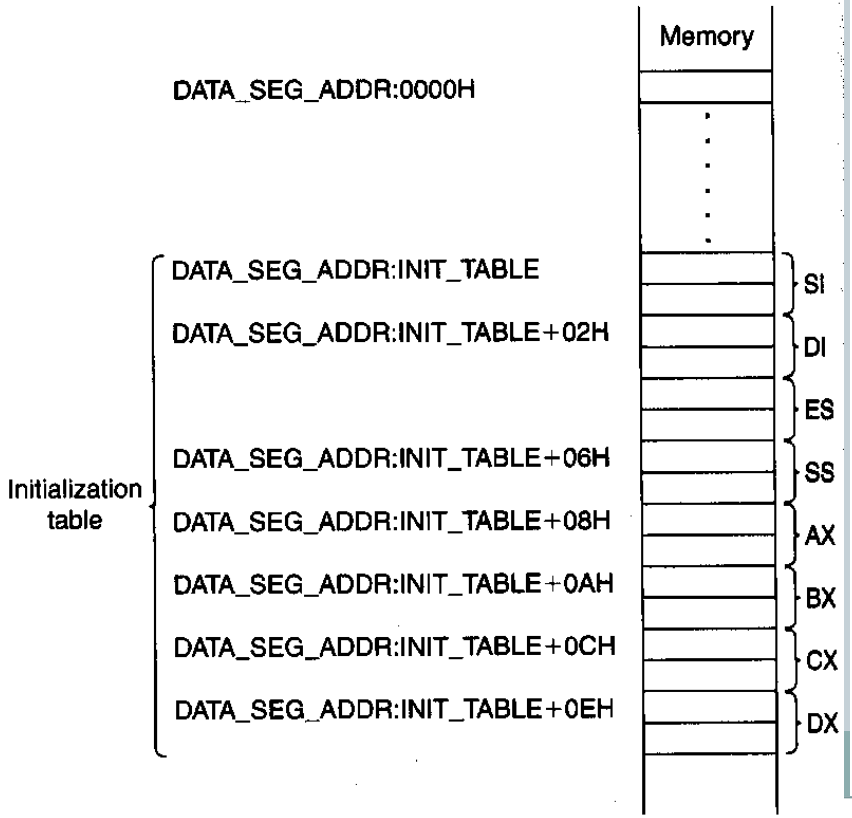
The LEA, LDS, and LES Instructions – LDS SI, [200H]



Example

- Initializing the internal registers of the 8088 from a table in memory
- Solution




```
MOV  AX, DATA_SEG_ADDR
MOV  DS,AX
MOV  SI,[INIT_TABLE]
LES  DI,[INIT_TABLE+02H]
MOV  AX,[INIT_TABLE+06H]
MOV  SS,AX
MOV  AX,[INIT_TABLE+08H]
MOV  BX,[INIT_TABLE+0AH]
MOV  CX,[INIT_TABLE+0CH]
MOV  DX,[INIT_TABLE+0EH]
```

Scope of research

- We can develop new data transfer instruction which will be more suitable than the current instructions. or an instruction which is more easily understandable by user and the microprocessor. and has capability of fast execution speed with large data and less time.