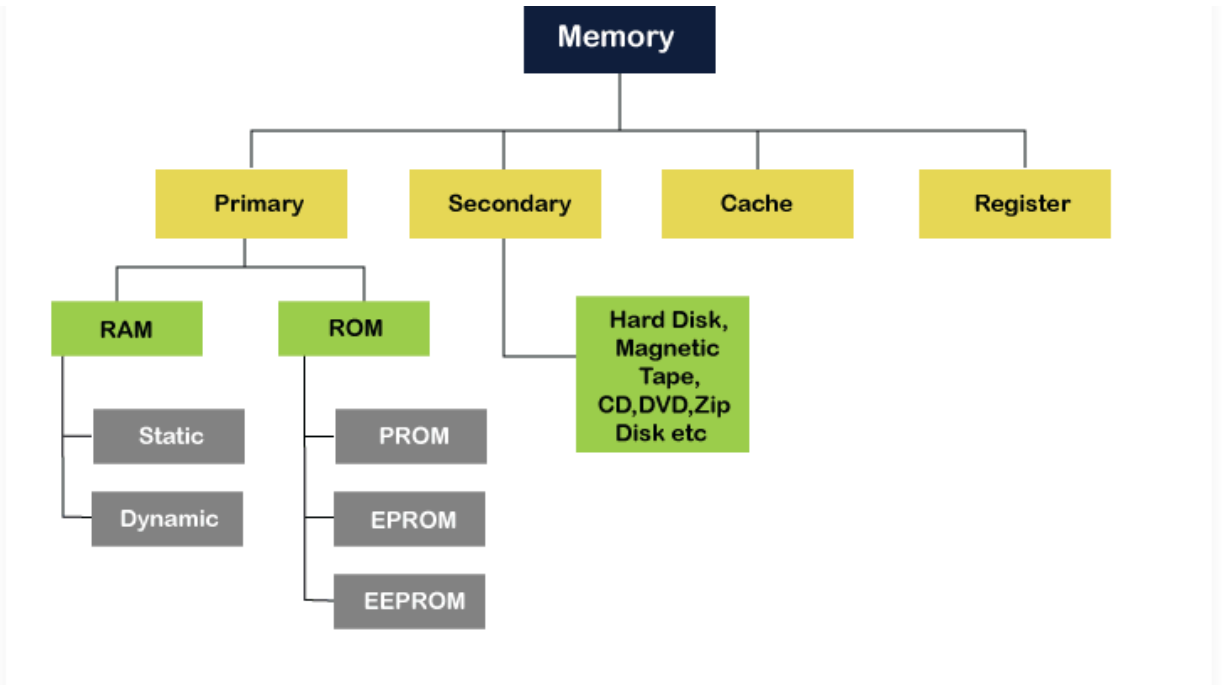
Memory Classification

[Classification of Memory - javatpoint]



RAM Vs. ROM

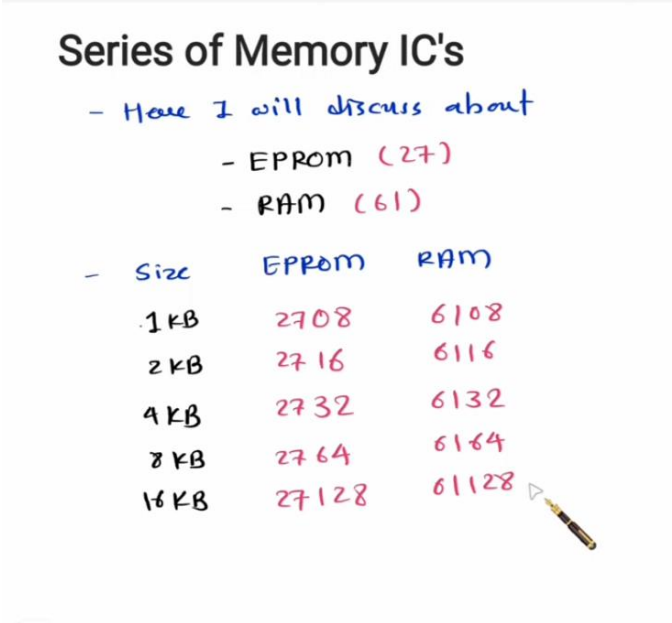
RAM	ROM
It is a Random-Access Memory.	It is a Read Only Memory.
Read and write operations can be performed.	Only Read operation can be performed.
Data can be lost in volatile memory when the power supply is turned off.	Data cannot be lost in non-volatile memory when the power supply is turned off.
It is a faster and expensive memory.	It is a slower and less expensive memory.

Types of ROM

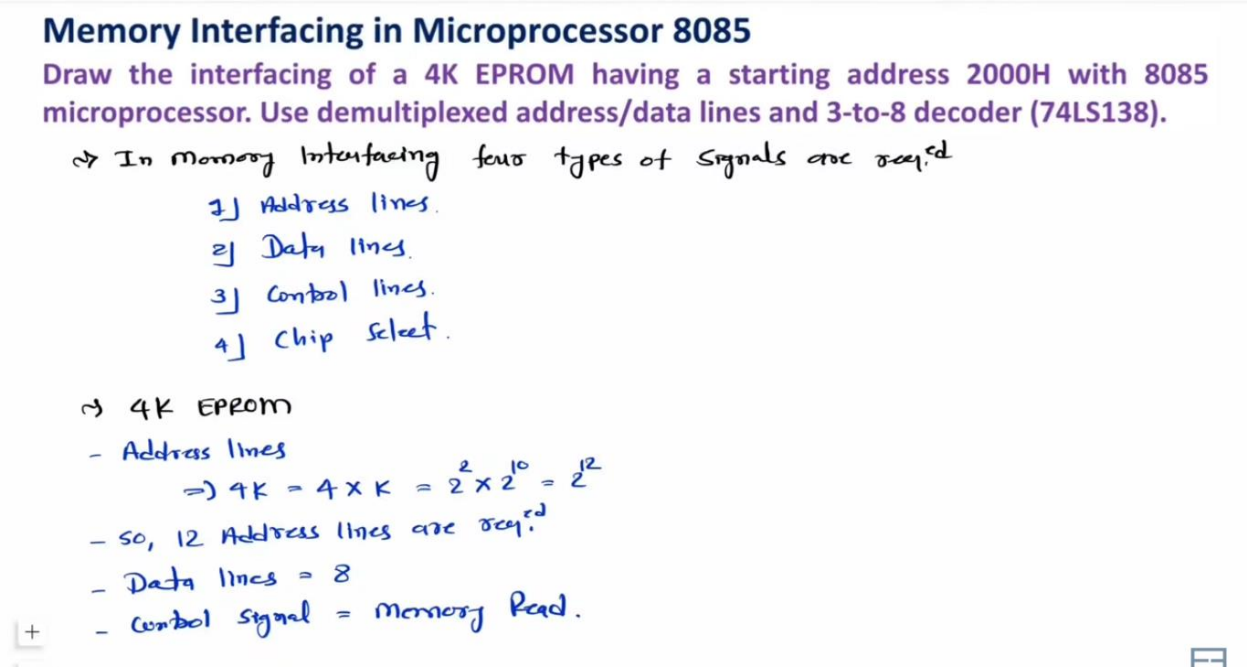
There are five types of Read Only Memory:

1. **MROM (Masked Read Only Memory):**
   MROM is the oldest type of read-only memory whose program or data is pre-configured by the integrated circuit manufacture at the time of manufacturing. Therefore, a program or instruction stored within the MROM chip cannot be changed by the user.
2. **PROM (Programmable Read Only Memory):**
   It is a type of digital read-only memory, in which the user can write any type of information or program only once. It means it is the empty PROM chip in which the user can write the desired content or program only once using the special PROM programmer or PROM burner device; after that, the data or instruction cannot be changed or erased.
3. **EPROM (Erasable and Programmable Read Only Memory):**
   It is the type of read only memory in which stored data can be erased and re-programmed only once in the EPROM memory. It is a non-volatile memory chip that holds data when there is no power supply and can also store data for a minimum of 10 to 20 years. In EPROM, if we want to erase any stored data and re-programmed it, first, we need to pass the ultraviolet light for 40 minutes to erase the data; after that, the data is re-created in EPROM.
4. **EEPROM (Electrically Erasable and Programmable Read Only Memory):**
   The EEROM is an electrically erasable and programmable read only memory used to erase stored data using a high voltage electrical charge and re-programmed it. It is also a non-volatile memory whose data cannot be erased or lost; even the power is turned off. In EEPROM, the stored data can be erased and reprogrammed up to 10 thousand times, and the data erase one byte at a time.

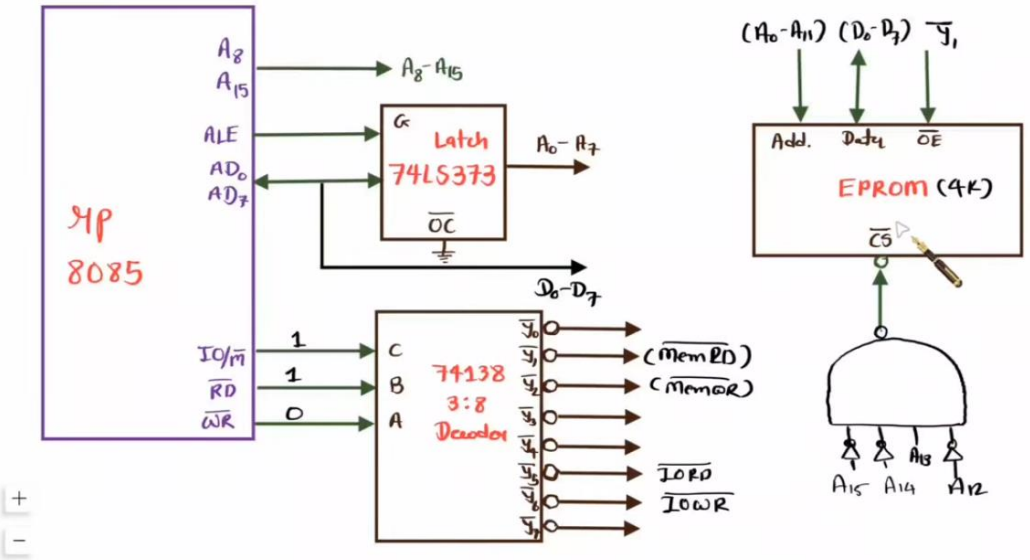
Series of Memory ICs: EPROM and RAM IC Series



Memory Interfacing with 8085 Microprocessor: Solved problems – 1



EPROM 4K	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2000 H
	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	2FFF H



Memory Interfacing with 8085 Microprocessor: Solved problems – 2

Memory Interfacing in Microprocessor 8085

Interface 4K EPROM and 16K RAM with 8085 processor. Write address range for both the memory chips and also show the address decoding logic.

↳ In memory interfacing four types of signals are req'd

1] Address lines.
2] Data lines.
3] Control lines.
4] Chip select.

↳ For 4K EPROM

- Address lines
  ⇒ $4K = 4 \times K = 2^2 \times 2^{10} = 2^{12}$
- So total 12 Address lines are req'd $(A_0$-$A_{11})$
- Data lines = 8 $(D_0$-$D_7)$
- Control lines = Memory Read.

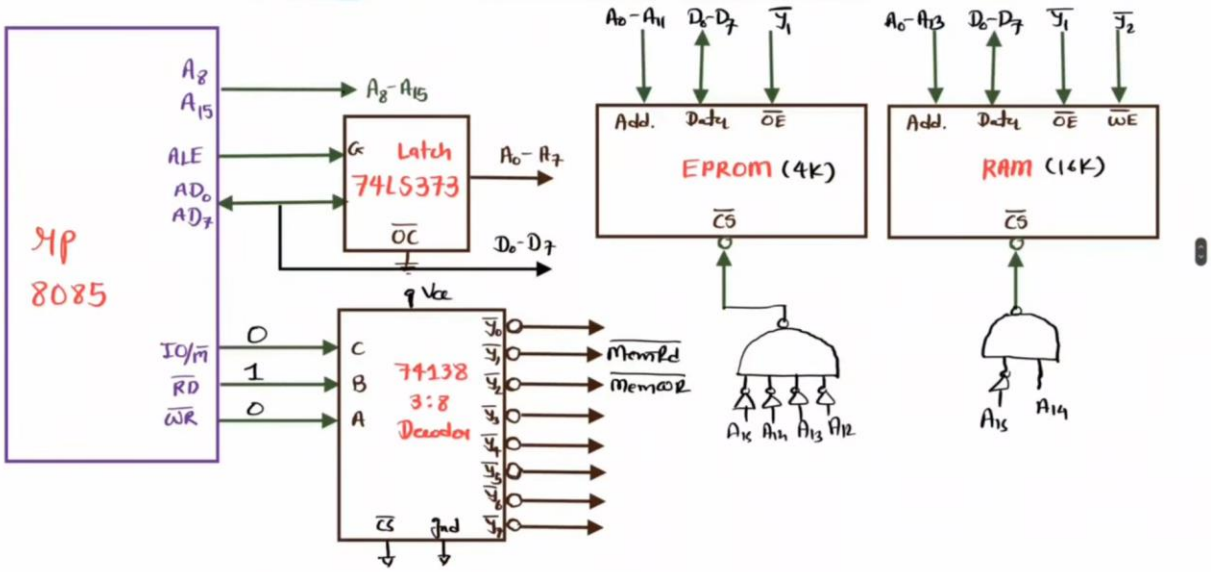
↳ 16K RAM

- Address lines
  ⇒ $16K = 2^4 \times 2^{10} = 2^{14}$
- Address lines = 14 $(A_0$-$A_{13})$
- Data lines = 8 $(D_0$-$D_7)$
- Control Lines- Memory read and write

Memory Mapping

Chip Select

Memory Chip	A_{15}	A_{14}	A_{13}	A_{12}	A_{11}	A_{10}	A_9	A_8	A_7	A_6	A_5	A_4	A_3	A_2	A_1	A_0	Memory Address
EPROM 4K	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0000 H
	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0FFF H
RAM 16K	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4000 H
	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	7FFF H



Memory Interfacing in 8086

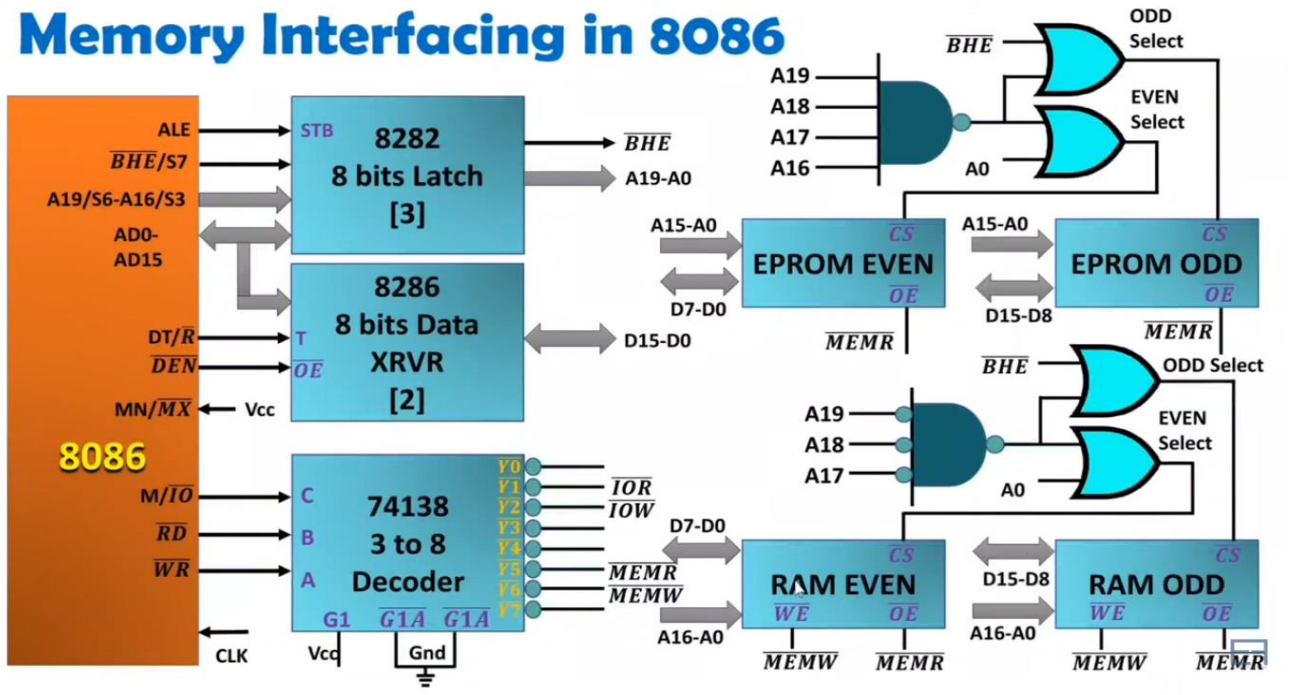
- Design following system with 8086 microprocessor.
  1. 8086 working in minimum mode with 8MHz.
  2. 64KB EPROM using 32KB EPROM
  3. 128KB RAM using 64KB RAM

- In Memory interfacing, we need to interface four categories of lines:
- Address Lines
- Data Lines
- Control Lines
- Chip Select

- 64KB EPROM using 32KB EPROM
- Numbers of Chips = 2 chips of 32KB EPROM [one chip for even address and another for odd address]
- Address lines for 64KB Address = $2^{10} \times 2^6 = 2^{16}$
- So it needs 16 address lines.
- Data Lines for 64KB = 8 [For Byte, it is 8 bits]
- Control Lines for 64KB EPROM = Memory Read

- 128KB RAM using 64KB RAM
- Numbers of Chips = 2 chips of 64KB RAM [one chip for even address and another for odd address]
- Address lines for 128KB Address = $2^{10} \times 2^7 = 2^{17}$
- So it needs 17 address lines.
- Data Lines for 128KB = 8 [For Byte, it is 8 bits]
- Control Lines for 128KB RAM = Memory Read & Memory Write.

Memory IC	A19	A18	A17	A16	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0	Address
EPROM 1 [Lower Byte]	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	F0000H
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	FFFFEH
EPROM 2 [Higher Byte]	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	F0001H
	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	FFFFFH
RAM 1 [Lower Byte]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	00000H
	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1FFFEH
RAM 2 [Higher Byte]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	00001H
	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1FFFFH



8279 Keyboard controller Interfacing