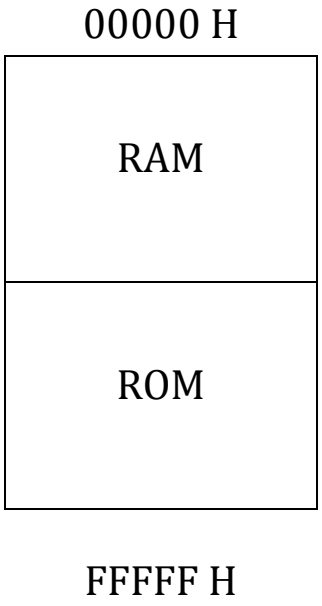
8086 Memory Interfacing

8086 has 20 bits address line.

So, 2^20 = 1MB Memory.



- **Interface two 4KX8 EPROM and two 4KX8 RAM chips with 8086.**

Solution:

Capacity of 2 Chips = 4K X 8 X 2 = 8K X 8 = 8KB

Consider, EA of ROM = FFFFF H

Size = 8KB = 8 X 1KB = 2^3 X 2^10 = 2^13

0000 0001 1111 1111 1111 = 01FFF H

So, SA of ROM = FFFFF H – 01FFF H = FE000 H

Consider, SA of RAM = 00000 H

Now, 4KB = 2^2X2^10 = 2^12

So, Address Lines = A1 – A12

Ao = Bank Selection (Even/Odd)

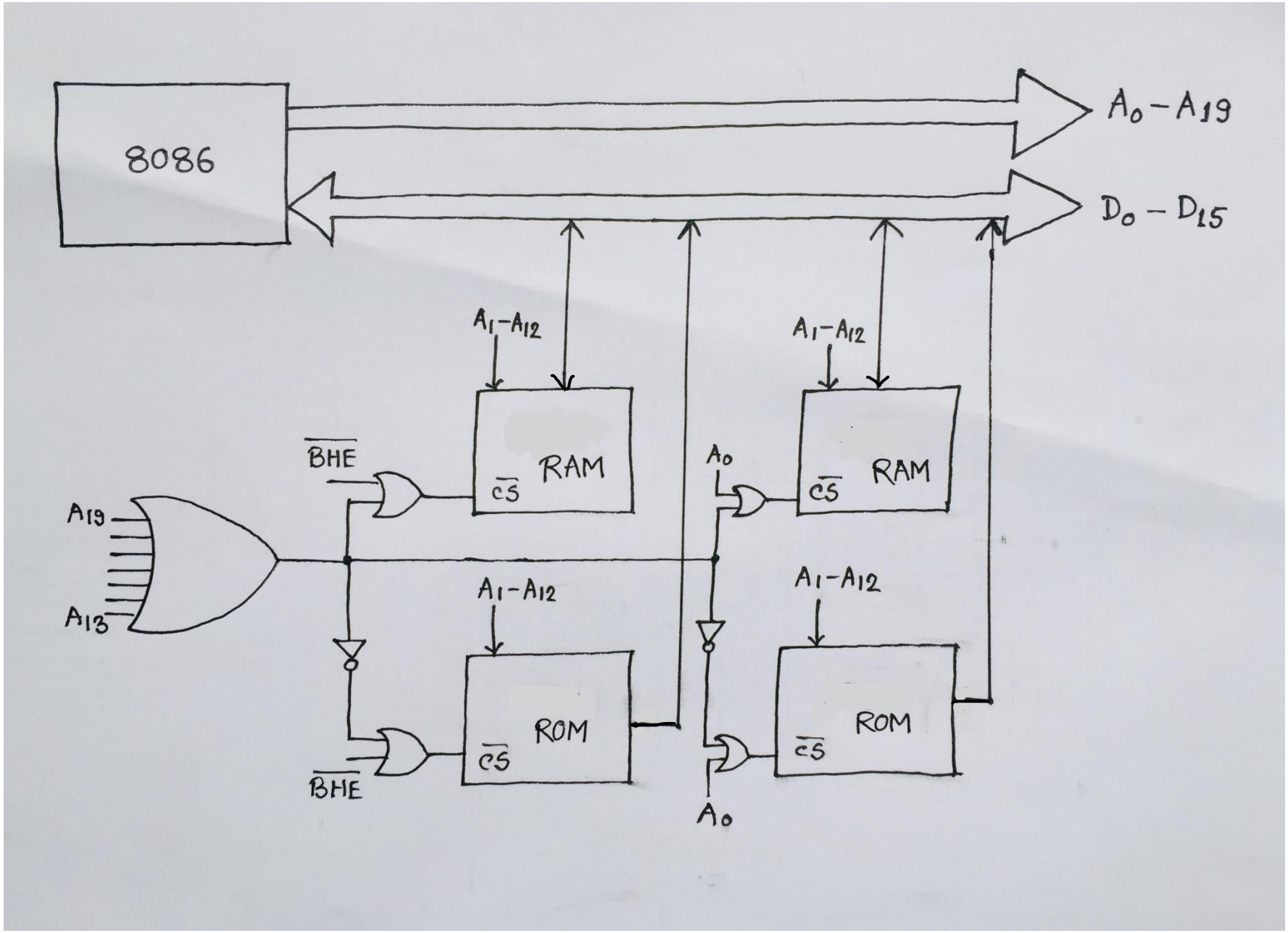
The 8086 microprocessor uses a 20-bit address to access memory. With 20-bit address the processor can generate $2^{20} = 1$ Mega address. The basic memory word size of the memories used in the 8086 system is 8-bit or 1-byte (i.e., in one memory location an 8-bit binary information can be stored). Hence, the physical memory space of the 8086 is 1Mb (1 Mega-byte).

For the programmer, the 8086 memory address space is a sequence of one mega-byte in which one location stores an 8-bit binary code/data and two consecutive locations store 16-bit binary code/data. But physically (i.e., in the hardware), the 1Mb memory space is divided into two banks of 512kb (512kb + 512kb = 1Mb). The two memory banks are called Even (or Lower) bank and Odd (or Upper) bank.

The 8086-based system will have two sets of memory IC's. One set for even bank and another set for odd bank. The data lines D_0-D_7 are connected to even bank and the data lines D_8 -D_{15} are connected to odd bank. The even memory bank is selected by the address line Ao and the odd memory bank is selected by the control signal BHE. The memory banks are selected when these signals are low(active low). Any memory location in the memory bank is selected by the address line A_1 to A_{19}.

		A19	A18	A17	A16	A15	A14	A13	A12	A11	A10	A9	A8	A7	A6	A5	A4	A3	A2	A1	A0
RAM1	SA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	EA	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	0
RAM2	SA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	EA	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1
ROM1	SA	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0
	EA	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
ROM2	SA	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1
	EA	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Memory		SA	EA
RAM1	Even (Lower) Bank	00000 H	01FFE H
RAM2	Odd (Higher) Bank	00001 H	01FFF H
ROM1	Even (Lower) Bank	FE000 H	FFFFE H
ROM2	Odd (Higher) Bank	FE001 H	FFFFF H


8086
$A_0 - A_{19}$
$D_0 - D_{15}$
$A_1 - A_{12}$
$A_1 - A_{12}$
$\overline{BHE}$
RAM
$\overline{CS}$
A_0
RAM
$\overline{CS}$
A_{19}
A_{13}
$A_1 - A_{12}$
$A_1 - A_{12}$
ROM
$\overline{CS}$
ROM
$\overline{CS}$
$\overline{BHE}$
A_0