Laboratory 07
Programming the Screen

CO 2103 Assembly Language

Objective

AL programming for Screen

-programming screen in text and graphics modes

-INT 10h for setting video mode

-manipulating video memory and registers

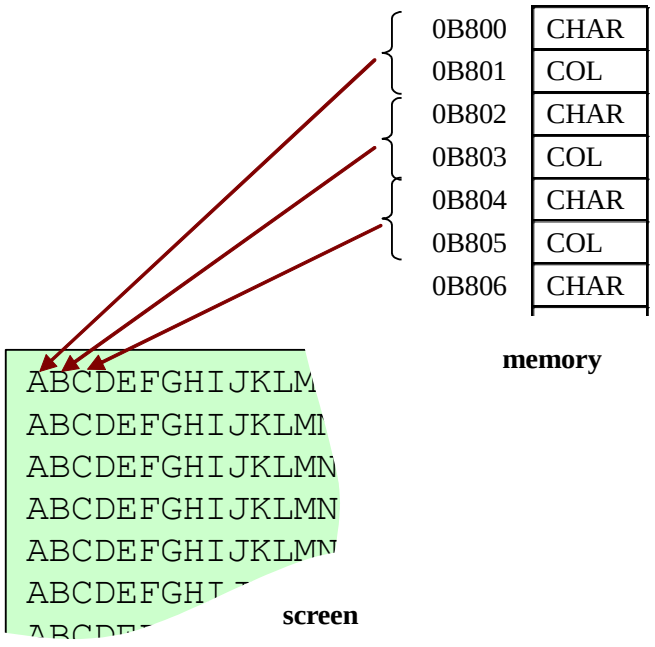
About the screen

Two modes

- Depending on program requirement, the PC screen can be set to one of the two modes:
  - text – color, b/w
  - graphics – color, b/w, different size
- Function AH=00h of INT 10h is used to set the video mode, commonly used modes are:
  - AL=03 80x25 16 color text
  - AL=12 640x480 16 color graphics
  - AL=13 320x200 256 color graphics
- Refer
  http://www.htl-steyr.ac.at/~morg/pcinfo/hardware/interrupts/inte6l9s.htm

Text mode

- Video buffer starts at 0B800h
- For screen size of 80 columns x 25 rows of text
  - think of the screen as a grid of 80 x 25 cells, each cell contain a character
  - two pieces of information for each character: color and character
  - 2 bytes are needed to store each character information – total of 80x25x2 = 4000 bytes in the buffer
  - 2 consecutive bytes (starts at 0B800h) represent a character on screen

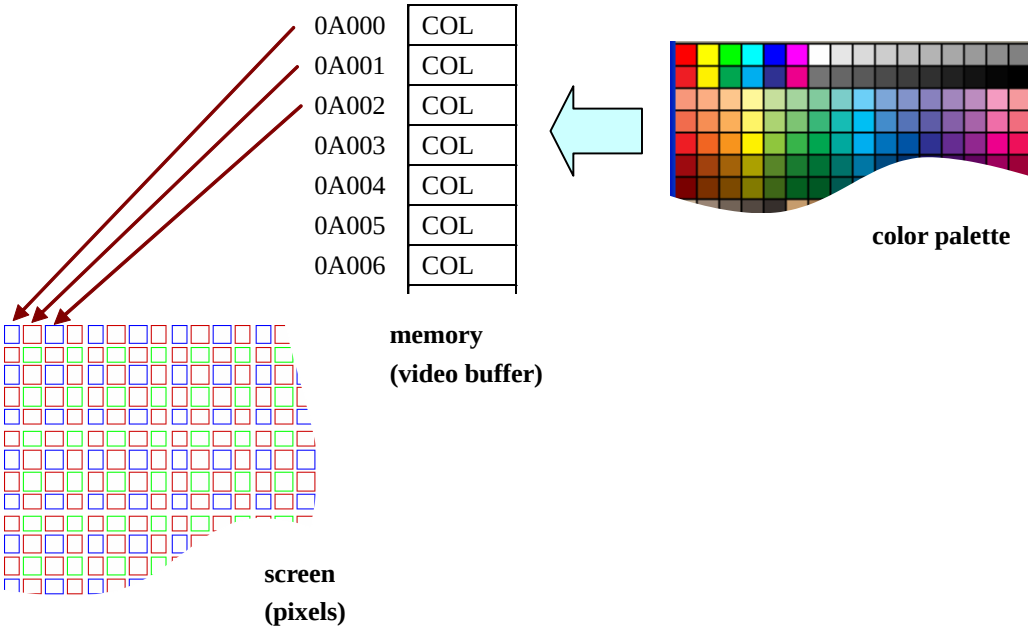


Graphic mode - 1

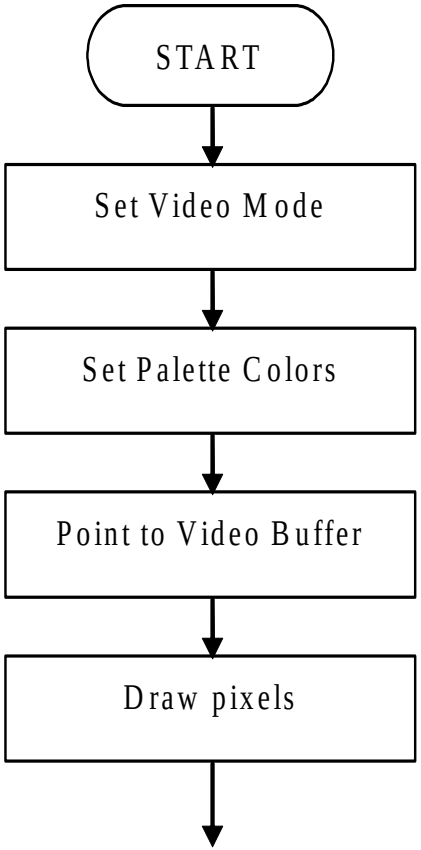
- Video buffer starts at 0A000h
- For screen size of 320 x 200 pixels, 256 colors (mode 13h)
  - think of the screen made up of 200 rows of 320 dots (pixels)
  - to draw on the screen, we simply change the color of relevant dots/pixels
  - the color for the pixels can be chosen from a palette containing 256 colors – each color (position 0-255) is stored with 3 information: red, green, blue intensities (0-63 each)
    - theoretically, there are 64*64*64=262144 possible colors
    - however, only 256 colors can be stored on the palette and be used on the screen at any one time
    - programmer can set the palette colors by writing to relevant hardware port registers

Graphic mode - 2

- the video buffer has 320 x 200=64000 bytes, starting from 0A000h
  - each byte corresponding to 1 dot/pixel on the screen
  - the byte store the color (0-255 from the palette) for the particular dot/pixel on screen



Steps – programming the screen (graphic mode)



Task 5 will elaborates on these steps

Exercises - 1

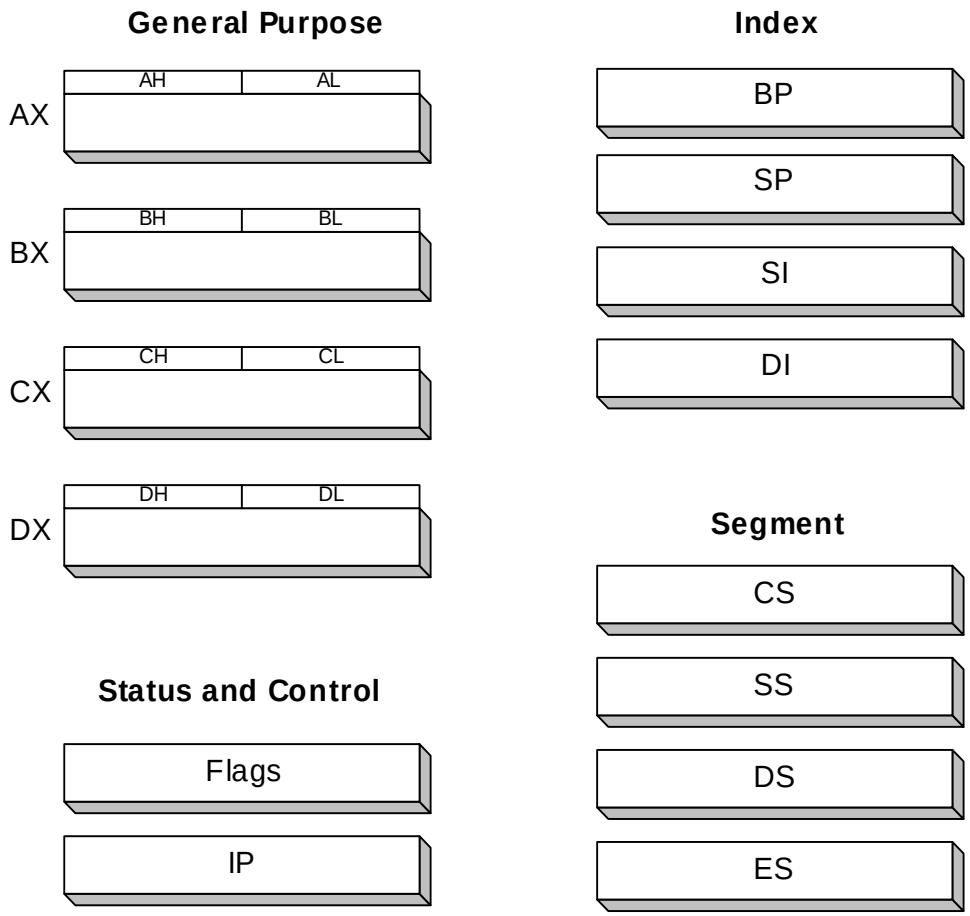
- **Task 5:** Read the article "VGA Programming" (from moodle)
- **Task 6:** Write and test the following programs (from moodle) to deal with colored text:
  - text.asm
  - looptext.asm
  - coltext.asm

Exercises - 2

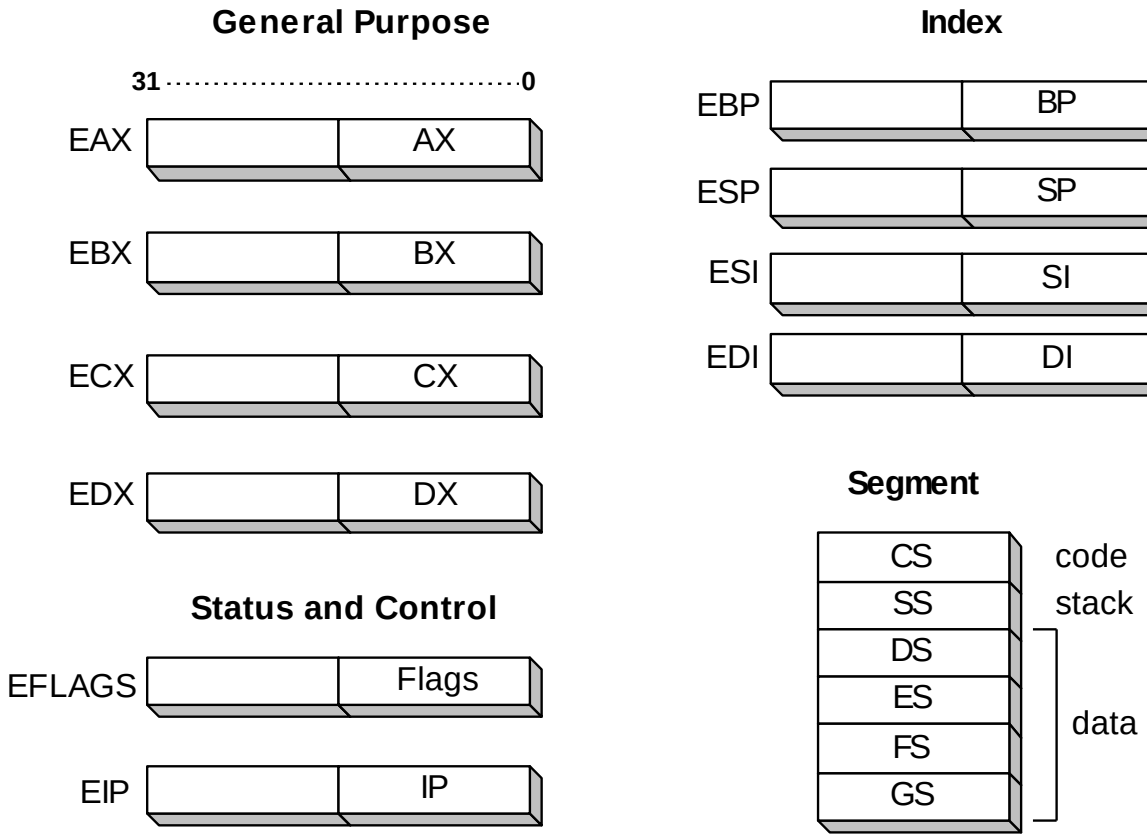
- **Task 7:** Write and test pallete.asm (from moodle) to change color palette
- **Task 8:** Write and test the following programs (from moodle) to deal with pixels:
  - pix.asm
  - drawpix.asm
- Refer to article in Task 5, resources in moodle and lecture slides for above tasks

Useful Information

Intel 16-bit registers



32-bit registers (Intel 386+)



Map of the first Megabyte of PC memory

- Note how system data are organized in the memory
- You will be accessing the video graphics buffer and color text buffer in the exercises