



University of Central Punjab

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FACULTY OF INFORMATION TECHNOLOGY

Computer Organization and Assembly Language

Lab 9	
Topic	1. Video memory

Note: Ascii table is provided at the end.

PART 1

VIDEO MEMORY

Console Display:

Note : Each cell represents a word (2 byte).

Row 1,Col 1	Row 1,Col 2	....	Row 1,Col 80
Row 2,Col 1	Row 2,Col 2	...	Row 2,Col 80
...
...
...
...
...
...
Row 25,Col 1	Row 25,Col 2	...	Row 25,Col 80

; if you change the second byte, you can change the color of the character.

; character attribute is 8 bit value,

; high 4 bits set background color and low 4 bits set foreground color.

LET AX have 16 bits with character 'A' as a value byte and Brown background with white foreground color.

Blinking of the foreground color	Attribute byte							Value byte							
	Background				Foreground										
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	1	1	0	1	1	1	1	0	1	0	0	0	0	0	1



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; hex	bin	color
; 0	0000	black
; 1	0001	blue
; 2	0010	green
; 3	0011	cyan
; 4	0100	red
; 5	0101	magenta
; 6	0110	brown
; 7	0111	light gray
; 8	1000	dark gray
; 9	1001	light blue
; a	1010	light green
; b	1011	light cyan
; c	1100	light red
; d	1101	light magenta
; e	1110	yellow
; f	1111	white

possible background colors

possible foreground color

```
mov ax, 0xb800;
Mov es, ax;
mov di, 0;

mov ah, 0x6F;
mov al, 0x41

Mov [es:di], ax;

mov ax, 0x4c00
int 21h
```

```
DOS
BOX DOSBox 0.74, Cpu speed: 3000 cycles, Frameskip C
C:\>nasm test.asm -o test.com
C:\>test.com
C:\>
```



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Copy character array from one to another.

```
[org 0x100]
```

```
jmp start
```

```
data1 db 'Abcd,edfg,ijkl,mnopqr',0 ;this is zero means null.
```

```
data2: times 21 db 0
```

```
start:
```

```
mov si, data1
```

```
mov di, data2
```

```
l1:
```

```
mov al,[si]
```

```
mov [di],al
```

```
inc si
```

```
inc di
```

```
cmp al,0 ;comparing if the string is terminated or not.
```

```
jne l1
```

```
mov ax,0x4c00
```

```
int 21h
```



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“To run code without debugging simply type test.com instead of afd test.com”

Type cls then enter before running the following codes.

Display string on screen

```
[org 0x100]
```

```
jmp start
```

```
str1 db 'I am a student of University of Central Punjab',0
```

```
start:
```

```
mov ax, 0xb800; ;segment address from where video memory starts.
```

```
Mov es, ax;
```

```
mov di, 0; ;location on screen where we want to start displaying our string.
```

```
mov cx, 46; ; string length, 11 characters.
```

```
mov si, str1;
```

```
mov ah, 0x1A; ; Attribute byte for the characters to be displayed.
```

```
label:
```

```
Mov al, [si]; ;reading the characters in al.
```

```
Inc si ; pointing to next character in string
```

```
Mov [es:di],ax; ; printing message on the screen, whole register of size word is written at
```

```
Add di,2;
```

```
cmp cx,30
```

```
jne skip
```

```
change_blinking:
```

```
mov ah,0x9A
```

```
skip:
```

```
loop label
```

```
mov ax,0x4c00
```

```
int 21h
```



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For example:

- Different attribute values of each word
- Different locations can be accessed for the display.

```
[org 0x100]
mov ax,0xb800
mov es,ax

mov ah,0x7A
mov al,0x41

mov [es:0],ax

mov bh,0x2c
mov bl,0x42

mov [es:160],bx

mov ax,0x4c00
int 21h
```

A screenshot of a DOSBox 0.74 terminal window. The title bar reads 'DOSBox 0.74, Cpu speed'. The terminal shows a command prompt 'B:\>' followed by the command 'test.com'. Below this, the prompt changes to 'C:\>'. The terminal background is black, and the text is white.



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Display code which writes and clears the string from screen.

USE CTRL+F11 to reduce cycles / sec or CTRL+F12 to increase the speed of dosbox.

Slow down the speed of dosbox by press and hold ctrl and press F11 till 1 cycle

```
DOSBox 0.74, Cpu speed: 1 cycles, Frameskip 0, Program: DOSBOX
C:\>nasm test.asm -o test.com
C:\>afd test.com
AFD-Pro is done
C:\>_
```

```
[org 0x100]
```

```
jmp start
```

```
str1 db 'HELLO WORLD'
```

```
start:
```

```
mov ax, 0xb800;
```

```
Mov es, ax;
```

```
mov di, 500;
```

```
mov cx, 11; ; string length, 11 characters.
```

```
mov si, str1;
```

```
mov ah, 0x1A;; Attribute byte, use any number
```

```
11:
```

```
Mov al, [si];
```

```
Inc si; pointing to next character in string
```

```
Mov [es:di],ax; ; printing message on the screen;
```

```
Add di,2;
```

```
loop 11
```



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mov cx, 2000; ; total screen locations.

mov ax, 0x0720; Attribute byte (07) and (20h) ASCII for space character.

mov di, 0; ; start from top left

l2:

Mov [es:di],ax; ; writing blank spaces on whole screen

Add di,2;

loop l2

mov ax,0x4c00

int 21h



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ASCII CODES

HEX format

00: null	20: spa	40: @	60: `	80: ¸	A0: Á	C0: ª	E0: α
01: ©	21: !	41: A	61: a	81: ù	A1: Í	C1: º	E1: β
02: ¢	22: "	42: B	62: b	82: é	A2: Î	C2: »	E2: γ
03: £	23: #	43: C	63: c	83: â	A3: Ñ	C3: º	E3: δ
04: ¤	24: \$	44: D	64: d	84: ä	A4: Ñ	C4: º	E4: ε
05: ¥	25: %	45: E	65: e	85: å	A5: Ñ	C5: º	E5: σ
06: ¤	26: &	46: F	66: f	86: æ	A6: Ñ	C6: º	E6: μ
07: beep	27: '	47: G	67: g	87: ç	A7: º	C7: º	E7: τ
08: back	28: <	48: H	68: h	88: è	A8: º	C8: º	E8: ø
09: tab	29: >	49: I	69: i	89: é	A9: º	C9: º	E9: θ
0A: newl	2A: *	4A: J	6A: j	8A: è	AA: º	CA: º	EA: Ω
0B: ¤	2B: +	4B: K	6B: k	8B: ì	AB: º	CB: º	EB: δ
0C: ¤	2C: ,	4C: L	6C: l	8C: ï	AC: º	CC: º	EC: ∞
0D: cret	2D: -	4D: M	6D: m	8D: ï	AD: º	CD: º	ED: €
0E: ¤	2E: .	4E: N	6E: n	8E: ð	AE: º	CE: º	EE: ¤
0F: ¤	2F: /	4F: O	6F: o	8F: Å	AF: º	CF: º	EF: ¤
10: ¤	30: 0	50: P	70: p	90: é	B0: º	D0: º	F0: ±
11: ¤	31: 1	51: Q	71: q	91: æ	B1: º	D1: º	F1: ≡
12: ¤	32: 2	52: R	72: r	92: Æ	B2: º	D2: º	F2: ∠
13: ¤	33: 3	53: S	73: s	93: ö	B3: º	D3: º	F3: √
14: ¤	34: 4	54: T	74: t	94: Ø	B4: º	D4: º	F4: ∫
15: ¤	35: 5	55: U	75: u	95: ò	B5: º	D5: º	F5: ∞
16: ¤	36: 6	56: V	76: v	96: ô	B6: º	D6: º	F6: ∞
17: ¤	37: 7	57: W	77: w	97: ù	B7: º	D7: º	F7: ∞
18: ¤	38: 8	58: X	78: x	98: ü	B8: º	D8: º	F8: ∞
19: ¤	39: 9	59: Y	79: y	99: Û	B9: º	D9: º	F9: ∞
1A: ¤	3A: :	5A: Z	7A: z	9A: Ü	BA: º	DA: º	FA: ∞
1B: ¤	3B: ;	5B: [	7B: <	9B: Ç	BB: º	DB: º	FB: ∞
1C: ¤	3C: <	5C: \	7C: i	9C: £	BC: º	DC: º	FD: ∞
1D: ¤	3D: =	5D:]	7D: >	9D: ¥	BD: º	DD: º	FE: ∞
1E: ¤	3E: >	5E: ^	7E: ~	9E: ¤	BE: º	DE: º	FF: res
1F: ¤	3F: ?	5F: _	7F: ¤	9F: ¤	BF: º	DF: º	

ASCII CODES

Decimal format

000: null	032: spa	064: @	096: `	128: ¸	160: Á	192: ª	224: α
001: ©	033: !	065: A	097: a	129: ù	161: Í	193: º	225: β
002: ¢	034: "	066: B	098: b	130: é	162: Î	194: »	226: γ
003: £	035: #	067: C	099: c	131: â	163: Ñ	195: º	227: δ
004: ¤	036: \$	068: D	100: d	132: ä	164: Ñ	196: º	228: ε
005: ¥	037: %	069: E	101: e	133: å	165: Ñ	197: º	229: σ
006: ¤	038: &	070: F	102: f	134: æ	166: Ñ	198: º	230: μ
007: beep	039: '	071: G	103: g	135: ç	167: º	199: º	231: τ
008: back	040: <	072: H	104: h	136: è	168: º	200: º	232: ø
009: tab	041: >	073: I	105: i	137: é	169: º	201: º	233: θ
010: newl	042: *	074: J	106: j	138: è	170: º	202: º	234: Ω
011: ¤	043: +	075: K	107: k	139: ì	171: º	203: º	235: δ
012: ¤	044: ,	076: L	108: l	140: ï	172: º	204: º	236: ∞
013: cret	045: -	077: M	109: m	141: ï	173: º	205: º	237: €
014: ¤	046: .	078: N	110: n	142: ð	174: º	206: º	238: ¤
015: ¤	047: /	079: O	111: o	143: Å	175: º	207: º	239: ¤
016: ¤	048: 0	080: P	112: p	144: é	176: º	208: º	240: ±
017: ¤	049: 1	081: Q	113: q	145: æ	177: º	209: º	241: ≡
018: ¤	050: 2	082: R	114: r	146: Æ	178: º	210: º	242: ∠
019: ¤	051: 3	083: S	115: s	147: ö	179: º	211: º	243: √
020: ¤	052: 4	084: T	116: t	148: Ø	180: º	212: º	244: ∫
021: ¤	053: 5	085: U	117: u	149: ò	181: º	213: º	245: ∞
022: ¤	054: 6	086: V	118: v	150: ô	182: º	214: º	246: ∞
023: ¤	055: 7	087: W	119: w	151: ù	183: º	215: º	247: ∞
024: ¤	056: 8	088: X	120: x	152: ü	184: º	216: º	248: ∞
025: ¤	057: 9	089: Y	121: y	153: Û	185: º	217: º	249: ∞
026: ¤	058: :	090: Z	122: z	154: Ü	186: º	218: º	250: ∞
027: ¤	059: ;	091: [	123: <	155: Ç	187: º	219: º	251: ∞
028: ¤	060: <	092: \	124: i	156: £	188: º	220: º	252: ∞
029: ¤	061: =	093:]	125: >	157: ¥	189: º	221: º	253: ∞
030: ¤	062: >	094: ^	126: ~	158: ¤	190: º	222: º	254: ∞
031: ¤	063: ?	095: _	127: ¤	159: ¤	191: º	223: º	255: res