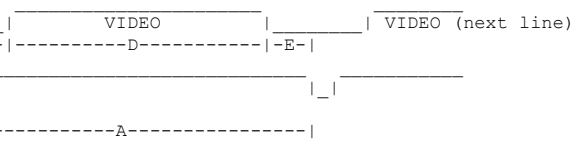
VGA timing information

This documents tries to collect together information about standard VGA card timing details.

Information form HP monitor manual

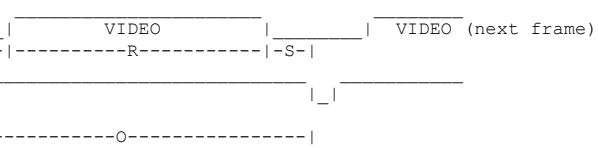
Horizonal Timing

```
Horizonal Dots          640     640     640
Vertical Scan Lines     350     400     480
Horiz. Sync Polarity    POS     NEG     NEG
A (us)                  31.77   31.77   31.77     Scanline time
B (us)                  3.77    3.77    3.77      Sync pulse lenght
C (us)                  1.89    1.89    1.89      Back porch
D (us)                  25.17   25.17   25.17     Active video time
E (us)                  0.94    0.94    0.94      Front porch
```



Vertical Timing

```
Horizonal Dots          640     640     640
Vertical Scan Lines     350     400     480
Vert. Sync Polarity     NEG     POS     NEG
Vertical Frequency      70Hz    70Hz    60Hz
O (ms)                  14.27   14.27   16.68     Total frame time
P (ms)                  0.06    0.06    0.06      Sync length
Q (ms)                  1.88    1.08    1.02      Back porch
R (ms)                  11.13   12.72   15.25     Active video time
S (ms)                  1.2     0.41    0.35      Front porch
```



Informations source

- HP D1194A Super VGA Display & HP D1195A Erognomic Super VGA Display Installation Guide, Hewlett Packard

---

"VGA industry standard" 640x480 pixel mode

General characteristics

```
Clock frequency 25.175 MHz
Line  frequency 31469 Hz
Field frequency 59.94 Hz
```

One line

```
  8 pixels front porch
 96 pixels horizontal sync
 40 pixels back porch
  8 pixels left border
640 pixels video
```

```
  8 pixels right border
---
800 pixels total per line
```

One field

```
  2 lines front porch
  2 lines vertical sync
 25 lines back porch
  8 lines top border
480 lines video
  8 lines bottom border
---
525 lines total per field
```

Other details

```
Sync polarity: H negative, V negative
Scan type: non interlaced.
```

Information source

- Article "Re: VGA specifications ,where ?" posted 19 Nov 1997 to sci.electronics.design newsgroup by Jeroen Stessen

More VGA mode information

There are the 3 "standard" VGA modes that each VGA card is supposed to be able to do:

- 640 x 350 x 70 is compatible with the old EGA mode, but on a VGA display.
- 640 x 400 x 70 is the MS-DOS text mode (when the computer is booting !).
- 640 x 480 x 60 is the default Windows(tm) graphics mode (16 colours !).

Their line frequency is exactly twice that of the NTSC television system, or almost twice that of the PAL television system. This makes it fairly easy to implement a VGA input on a television set that uses line doubling for the television signals so the line deflection already runs on 31 kHz.

The following timings come from a list of 82 different computer timings, and by now there will be even more. Some video cards even have variable timing (allowing the user to set width, height and shift...). **The only standard is that there is no standard !**

```
"640 x 350 (EGA on VGA)"    "640 x 400 VGA text"        "VGA industry standard"
Clock frequency 25.175 MHz  Clock frequency 25.175 MHz  Clock frequency 25.175 MHz
Line  frequency 31469 Hz    Line  frequency 31469 Hz    Line  frequency 31469 Hz
Field frequency 70.086 Hz   Field frequency 70.086 Hz   Field frequency 59.94 Hz

One line:                   One line:                   One line:
  8 pixels front porch        8 pixels front porch        8 pixels front porch
 96 pixels horizontal sync   96 pixels horizontal sync   96 pixels horizontal sync
 40 pixels back porch        40 pixels back porch        40 pixels back porch
  8 pixels left border        8 pixels left border        8 pixels left border
640 pixels video            640 pixels video            640 pixels video
  8 pixels right border       8 pixels right border       8 pixels right border
---                         ---                         ---
800 pixels total per line   800 pixels total per line   800 pixels total per line

One field:                  One field:                  One field:
 31 lines front porch        5 lines front porch         2 lines front porch
  2 lines vertical sync      2 lines vertical sync       2 lines vertical sync
 54 lines back porch        28 lines back porch         25 lines back porch
  6 lines top border         7 lines top border          8 lines top border
350 lines video            400 lines video             480 lines video
  6 lines bottom border      7 lines bottom border       8 lines bottom border
---                         ---                         ---
449 lines total per field   449 lines total per field   525 lines total
per field

Sync polarity: H positive,  Sync polarity: H negative,  Sync polarity: H negative,
               V negative                  V positive                  V negative
Scan type: non interlaced.  Scan type: non interlaced.  Scan type: non interlaced.
```

Information source

Jeroen H. Stessen kindly mailed this information for me to be added to this document at November 1997.

SuperVGA timing from NEC monitor manual

```
Horizontal :

                ______________                ______________
               |              |              |
_______________|  VIDEO       |______________|  VIDEO (next line)

___________  ____________________  ____________________
           |_|                    |_|
            B C <------D-----><-E->
            <----------A---------->
```

```
Vertical :

                 _______________                 _____________
                |               |               |
________________|  VIDEO        |_______________|  VIDEO (next frame)

___________  ____________________  ____________________
           |_|                    |_|
            P Q <------R-----><-S->
            <----------O---------->
```

For VESA 800*600 @ 60Hz:

```
Fh (kHz) :37.88
A  (us)  :26.4
B  (us)  :3.2
C  (us)  :2.2
D  (us)  :20.0
E  (us)  :1.0

Fv (Hz)  :60.32
O  (ms)  :16.579
P  (ms)  :0.106
Q  (ms)  :0.607
R  (ms)  :15.84
S  (ms)  :0.026
```

Information source

- NEC Multisync manual

Necessary timing information about VGA modes

Vertical timing information

Mode name	Lines Total	line width (us)	sync pulse (us)	(lin)	back porch (us)	(lin)	active time (us)	(lin)	front porch (us)	(lin)	whole frame period (us)	(lin)
VGA 640x480 60Hz	525	31.78	63	2	953	30	15382	484	285	9	16683	525
VGA 640x480 72Hz	520	26.41	79	3	686	26	12782	484	184	7	13735	520
VGA 720x400 70Hz	449	31.78	63	2	1016	32	12839	404	349	11	14268	449
VGA 720x350 70Hz	449	31.78	63	2	1811	57	11250	354	1144	36	14268	449
VGA 800x600 56Hz	625	28.44	56	1	568	20	17177	604		-1*	17775	625
VGA 800x600 60Hz	628	26.40	106	4	554	21	15945	604		-1*	16579	628
VGA 800x600 72Hz	666	20.80	125	6	436	21	12563	604	728	35	13853	666
IBM 640x480 75Hz	525	25.397	51	2	761	30	12292	484	228	9	13333	525
MAC 640x480 66Hz	525	28.57	86	3	1057	37	13827	484	28	1	14999	525

Notes:

- Active area is actually an active area added with 4 overscan border lines (in some other VGA timing tables those border lines are included in back and front porch)
- Note than when the active part of VGA page is widened, it passes by the rising edge of the vertical sync signal in some modes (marked with *)

Horizonal timing information

Mode name	Pixel clock (MHz)	sync pulse (us)	(pix)	back porch (pix)	active time (pix)	front porch (pix)	whole line period (pix)
VGA 640x480 60Hz	25.175	3.81	96	45	646	13	800
VGA 640x480 72Hz	31.5	1.27	40	125	646	21	832
VGA 720x400 70Hz	28.322	3.81	108	51	726	15	900
VGA 720x350 70Hz	28.322	3.81	108	51	726	15	900
VGA 800x600 56Hz	36	2	72	125	806	21	1024
VGA 800x600 60Hz	40	3.2	128	85	806	37	1056
VGA 800x600 72Hz	50	2.4	120	61	806	53	1040
IBM 640x480 75Hz	31.5	3.05	96	45	646	13	800
MAC 640x480 66Hz	30.24	2.11	64	93	646	61	864

Notes:

- Active area is actually an active area added with 6 overscan border pixels (in some other VGA timing tables those border pixels are included in back and front porch)

Information source

- Jere M  kel, Software design for a video conversion equipment, Master's Thesis, Helsinki University of Technology,23. August 1994, Appendix B.1

Timing used in one VGA monitor tester product

The following timings are used in VTG-KIT VGA monitor tester kit sold my Data Sync Engineering.

Mode	Horiz Dots	Vertical Lines	Horiz KHz	Vert Hz	Horiz Sync	HSYNC Pol	Vertical Sync	VSYNC Pol
VGA-480	640	480	31.5	60	3.8 us	-	64 us	-
VGA-400	640	400	31.5	70	3.8 us	-	64 us	+
SVGA I	800	600	35.2	56	2.0 us	-	57 us	-
SVGA II	800	600	37.8	60	3.2 us	+	106 us	+
SVGA III	800	600	48.0	72	2.4 us	+	125 us	+
XGA	1024	768	48.5	60	2.0 us	-	124 us	-

Information source:

- VGT-KIT information web page

Tomi Engdahl <*Tomi.Engdahl@iki.fi*>