

# VDDP

## VESA Display Definition Protocol

Proposal  
Draft 5.05

July 24, 1992

For VESA internal review only

VESA Confidential

**IMPORTANT NOTICE:** This document is a preliminary draft only. Many sections are still being actively revised. All VESA members are invited to submit comments and participate in the creation of the final standards proposal.

VESA Confidential  
7/24/92 VDDP Proposal Draft 5.05 VDDP505.SAM

VESA008005

## VDDP Document Content

### 1. Purpose and General Description

Anders Frisk, ICL

### 2. Display Capability File Information and Definitions

Richard Atanus,, NEC

### 3. File Format

Andre Vachon, Microsoft

Mark Snitily, SGCS

### 4. Storage Location

Ed Anwyl, IBM

### 5. Configuration Process

Jeff Zalewski, Diamond

### 6. Display / Controller Compatibility Specification

Anders Frisk, ICL

### 7. Initial Display Mode

Ed Anwyl, IBM

Anders Frisk, ICL

#### Section coordinators telephone list

Anders Frisk, ICL,

Tel (408) 982 9836, Fax (408) 982 9945, AOL: AndersF

Ed Anwyl, IBM,

Tel (407) 982 3510, Fax (407) 443 5074 AOL: IBM EdA

Richard Atanus, NEC,

Tel (708)860 9500 ext 6324, Fax (708) 860 5481, AOL: NEC RA

Jeff Zalewski, Diamond,

Tel (408) 736 2000, Fax (408) 730 5750, AOL: DMND JeffZ

Andre Vachon, Microsoft

Internet: andrev@microsoft.com

Mark Snitily, SGCS

Tel (408)255 9665, Internet: mark@sgcs.com

## 1, Purpose and General Description

VDDP provides a way for a display to communicate its specification in machine readable format to the display controller system. This will enable the creation of display controller systems that can adapt dynamically to a wide range of displays without having prior detailed knowledge about the specification of the attached display.

Properly implemented VDDP will eliminate the need for future "discrete monitor timing standards". Hence any display manufacturer can move forward with incremental improvements in monitor timings without having to agree with every controller manufacturer in order to get support for a new timing.

In the same way controller manufacturers will be allowed to implement new resolutions without having to agree in advance on the details with the monitor manufacturer.

This will benefit end users as well since they can invest in leading edge technology without fear that the display and or the controller becomes out dated as soon as a new monitor timing standard is released.

VDDP will allow for greater market diversification, essentially users can select a controller based on controller qualities (e.g. drawing speed, number of colors, .....). In the same way users will be able to select the display based on display qualities (e.g. refresh rate, screen utilization, overscan, size.....).

VDDP will specify how the information is structured and how it shall be communicated to the host system. VDDP will not specify how the information about the display is to be used.

The information is provided by the Display manufacturer in the form of a disk file or through a communication channel from the display to the controller..

In order to ensure that error messages and other information can be displayed before the controller can be configured for a particular display, VDDP defines an "Initial Display Mode" to be used before the information in the VDDP information is available to the system.

## 2, Display Capability File Information and Definitions

The information in the file is intended to fully describe a display unit. The current revision is primarily addressing information pertinent to CRT based displays. It is the ambition of the work group to expand this to also cover other types of displays. All input is welcome!

The Display information is grouped in tree sections

1, Description

2, Operational Limits

3, Pre-Adjusted Timings

The Operational Limits and the Pre-Adjusted Timings sections may occur several times depending on the type of monitor. Each occurrence describes the limits for one of the operational ranges the monitor is capable of operation within

The Pre-Adjusted Timings section describes sets of frequencies that have been adjusted and verified by the manufacturer. Each occurrence describes one possible mode of operation. The monitor may also be able to operate in modes not described in the Pre-Adjusted Timings section. In such case the configuration SW has to verify that the intended mode does not violate the Operational Limits specification.

Tolerances for Pre-Adjusted timing values are +/- 0.5%!

## Display Capability File

### File Information

Date	=	YYYY/MM/DD
VDDP Version	=	xxx
File Revision	=	xxx

### Description

Manufacturer	=	xxxx
Model Number	=	xxxxx
Resolution / Minimum VDDP Index	=	Hor. x Ver. / Min. VDDP Index
Version	=	x.xx
Serial Number	=	xxxxx
Date Mfg.	=	YYYY/MM/DD
Start-up Compatibility	=	xxx
Number Of Operational Limits	=	xx
Number O Pre-Adjusted Timings	=	xx
Monitor Type	=	Color/Monochrome
CRT Size	=	xx inches
Red Phosphor Decay	=	xxx mSec
Green Phosphor Decay	=	xxx mSec
Blue Phosphor Decay	=	xxx mSec
Border Color	=	%R, %G, %B
White Chromaticity	=	xxx X, xxx Y, xxx Z cd/m <sup>2</sup>
Red Chromaticity	=	xxx X, xxx Y cd/m <sup>2</sup>
Green Chromaticity	=	xxx X, xxx Y cd/m <sup>2</sup>
Blue Chromaticity	=	xxx X, xxx Y cd/m <sup>2</sup>
White Gamma	=	x.xx
Red Gamma	=	x.xx
Green Gamma	=	x.xx
Blue Gamma	=	x.xx

### Operational Limits

Min. Hor. Freq	=	xx.xxx kHz
Max. Hor. Freq.	=	xx.xxx kHz
Min. Ver. Freq.	=	xx.xxx Hz
Max. Ver. Freq.	=	xx.xxx Hz
Max. Pixel Clock	=	xxx.xxx MHz
Max. Hor. Dots	=	xxxx
Max. Ver. Lines	=	xxxx
Min. Hor. Retrace	=	x.xxx uSec
Min. Ver. Retrace	=	x.xxx mSec
Hor. Line Dimension	=	xxx mm
Ver. Height Dimension	=	xxx mm

Page 4

## Pre-Adjusted Timings

Pre-Adjusted Timing Name	=	xxxxxxxxxx
Hor. Resolution	=	xxxx Dots
Ver. Resolution	=	xxxx Lines
Hor. Freq.	=	xx.xxx kHz
Ver. Freq.	=	xx.xxx Hz
Pixel Aspect Ratio (H:V)	=	x : x
Hor. Active Line Length	=	xxx mm
Ver. Active Height	=	xxx mm
Video Type	=	TTL/Analog/ECL
Video Level	=	0.7/1.0 Vp-p
Sync. Type	=	Analog/TTL/ECL
Sync. Configuration	=	Sep./Comp./Sync. on greenS
Scan Type	=	Inter./Non-Inter.
Hor. Sync. Polarity	=	Neg./Pos.
Ver. Sync. Polarity	=	Neg./Pos.
Hor. Active	=	xx.xxx uSec
Hor. Right Border	=	x.xxx uSec
Hor. Front Porch	=	x.xxx uSec
Hor. Pulse Width	=	x.xxx uSec
Hor. Back Porch	=	x.xxx uSec
Hor. Left Border	=	x.xxx uSec
Ver. Active	=	xx.xxx mSec
Ver. Bottom Border	=	x.xxx mSec
Ver. Front Porch	=	x.xxx mSec
Ver. Pulse Width	=	x.xxx mSec
Ver. Back Porch	=	x.xxx mSec
Ver. Top Border	=	x.xxx mSec

## PARAMETER DEFINITIONS

### DESCRIPTION SECTION:

Compatibility:	The minimum standard initial display mode that the monitor is capable of displaying.
CRT Size:	This is the actual CRT size measured diagonally and not the CRT display area.
Phosphor Decay:	The Phosphor Decay information will be used by some vendors to calculate the minimum flicker frequency. For a color CRT, all three phosphor (Red, Green and Blue) decays are provided. For a Monochrome CRT, the single phosphor decay is only listed under Green Phosphor Decay no matter what the color of the Monochrome CRT is.
Border Color:	This is the percentages of the Red, Green and Blue border colors that are recommended by the manufacturer of the display. This is a linear number. 100% for all the three guns would represent white and 0% for all three guns would represent black.
Chromaticity	This is the X and Y values of the White, Red, Green and Blue fields based on the CIE 1931 Chromaticity Chart. The Luminance value in Candela per square meter (cd/m <sup>2</sup> ) is stated for the White Chromaticity. For a Monochrome CRT, the single X and Y coordinates are listed under the White Chromaticity no matter what the color of the color of the Monochrome CRT is.
Gamma	The exponent function of the non-linear characteristic of the video input versus the output image on the CRT used for the purpose of correcting the system input output transfer characteristics.

### PRE-ADJUSTED TIMINGS SECTION:

Pre-Adjusted Timing Name:	Used by the manufacturer and end users to easily identify the Pre Adjusted Timing. Can be either special names derived by the manufacturer or standard names such as VESA 800 x 600 at 60 Hz.
Hor. Resolution:	The Horizontal Resolution measured in Dots. For Standard 800 x 600, this number will be 800 Dots. This number divided into the Horizontal Active Period and the result divided into 1 will produce the Dot Clock Frequency.

Ver. Resolution:	<p>The Vertical Resolution measured in Lines. For Standard 800 x 600, this number will be 600 Lines.</p> <p>This number multiplied by the inverse of the Horizontal Frequency will produce the Vertical Active Period.</p>
Hor. Freq.:	<p>The Horizontal scanning Frequency measured in kilohertz (kHz). For VESA Standard 800 x 600, this number will be 37.879 kHz.</p> <p>The inverse of this number subtracted by the Horizontal Active Period and Horizontal Right and Left Borders will produce the Horizontal Blanking period. The Horizontal Blanking period can be obtained by the addition of the Horizontal Front Porch, Horizontal Pulse Width and Horizontal Back Porch.</p>
Ver. Freq.:	<p>The Vertical scanning Frequency measured in Hertz (Hz). For VESA Standard 800 x 600, this number will be 60 Hz.</p> <p>The inverse of this number subtracted by the Vertical Active Period and Vertical Top and Bottom Borders will produce the Vertical Blanking period. The Vertical Blanking Period can be obtained by the addition of the Vertical Front Porch, Vertical Pulse Width and vertical Back Porch.</p>
Pixel Aspect Ratio:	<p>The Aspect Ratio of a single Pixel. The first number is the pixel width and the second number is the pixel height.</p>
Hor. Active Line Length:	<p>The Horizontal Active Line Length measured in millimeters (mm). This is the actual length of the image during the Horizontal Active period (excluding the right and left borders).</p>
Ver. Active Height	<p>The Vertical Active Height measured in millimeters (mm). This is the actual height of the image during the Vertical Active period (excluding top and bottom borders).</p>
Video Type:	<p>The type of Video Signal applied to the display unit. Either Analog (e.g. PGC, VGA, XGA or Macintosh), TTL (e.g. CGA, MDA and EGA) or ECL.</p>
Video Level:	<p>The Level of the Analog Video applied to the display unit. For most PCs, this will be 0.7 Vp-p and for Macintosh, this will be 1.0 Vp-p.</p>
Sync. Type:	<p>The type of Sync. Signal applied to the display unit. Either Analog, TTL (e.g. CGA, MDA, EGA, VGA, XGA and Macintosh) or ECL.</p>



Sync. Configuration:	The type of Sync. Configuration applied to the display unit. Either Separate (e.g. CGA, MDA, EGA, VGA and XGA), Composite (e.g. PGC and Macintosh) or Sync. on Green (e.g. Macintosh).
Scan Type:	The type of Scan Type applied to the display unit. Either Interlaced (e.g. 8514/A and XGA) or Non-Interlaced (CGA, MDA, EGA, VGA, and Macintosh).
Hor. Sync. Polarity:	The Polarity of the Horizontal Sync applied to the display unit. Either negative or positive.
Ver. Sync. Polarity:	The Polarity of the Vertical Sync applied to the display unit. Either negative or positive.
Hor. Active:	The time period of the Horizontal Active Period measured in microseconds (uSec). This is the period of time that the active data is displayed. Also, this is the period of time starting at the end of the horizontal left border and ending at the beginning of the horizontal right border (if the borders are not present, then it is measured from the end of the back porch to the beginning of the front porch).
Hor. Right Border	The time period of the Right Border measured in microseconds (uSec). This is the period of time starting at the end of the active time and ending at the beginning of the front porch.
Hor. Front Porch:	The time period of the Horizontal Front Porch measured in microseconds (uSec). This is the period of time starting at the end of the right border (if present or end of active period if not present) and ending at the beginning of the horizontal pulse width.
Hor. Pulse Width:	The time period of the Horizontal Pulse Width measured in microseconds (uSec). This is the period of time starting at the end of the front porch and ending at the beginning of the back porch.
Hor. Back Porch:	The time period of the Horizontal Back Porch measured in microseconds (uSec). This is the period of time starting at the end of the pulse width and ending at the beginning of the left border (if present or at the beginning of the active period if not present).
Hor. Left Border:	The time period of the Horizontal Left Border measured in microseconds (uSec). This is the period of time starting at the end of the pulse width and ending at the beginning of the active period.

Ver. Active:	The time period of the Vertical Active Period measured in milliseconds (mSec). This is the period of time that the active data is displayed. This is the period of time starting at the end of the top border and ending at the beginning of the bottom border (if the borders are not present, then it is measured from the end of the back porch to the beginning of the front porch).
Ver. Bottom Border:	The time period of the Vertical Bottom border measured in microseconds (mSec). This is the period of time starting at the end of the active period and ending at the beginning of the front porch.
Ver. Front Porch:	The time period of the Vertical Front Porch measured in milliseconds (mSec). This is the period of time starting at the end of the bottom border (if present or end of the active period if not present) and ending at the beginning of the pulse width.
Ver. Pulse Width:	The time period of the Vertical Pulse Width measured in milliseconds (mSec). This is the period of time starting at the end of the front porch and ending at the beginning of the back porch.
Ver. Back Porch:	The time period of the Vertical Back Porch measured in milliseconds (mSec). This is the period of time starting at the end of the pulse width and ending at the beginning of the left border (if present or at the beginning of the active period if not present).
Ver. Top Border:	The time period of the Vertical Top Border measured in milliseconds (mSec). This is the period of time starting at the end of the pulse width and ending at the beginning of the active period.

### 3, FILE FORMAT

The VDDP file information can be distributed in two different formats, ASCII and Binary. It is anticipated that each format will appeal to different markets. Controller manufacturers are encouraged to provide software that can convert between the formats, since it is not mandatory to distribute both formats.

#### Binary format

The binary format is specified in appendix \_\_\_\_.

#### ASCII format

The ASCII format is specified in appendix \_\_\_\_.

## 4, STORAGE LOCATION

It is expected that the VDDP file will not be used in its 'as supplied' form but will be compiled on a one-time basis at system installation to a controller-specific format. Although the VDDP file might therefore reside on the system, it is not a requirement, however in order to provide for this situation both a naming and storage convention have been established.

### DEFINITION

The definition file will be stored in a \VDDP directory off the root directory appropriate to the installed operating system. The ASCII format file will have a file extension of .VDP and should be named in accordance with the following.

### MANUFACTURER CODE

The first three characters in the file name are defined as appropriate for the manufacturer of the display from the agreed list of display manufacturer identifiers. The suggested provisional list is:-

IBM	International Business Machines Corporation
NEC	NEC Technologies, Inc
SAM	Samsung Information Systems
TAX	Taxan America, Inc

The next four characters are made up of the hexadecimal equivalent of the display identification bits ('DIB'). The current hexadecimal equivalent for a '1' is 'F'x and for a '0' is '0'x. The last character is available as an extension to accommodate the existing current multiple uses of the same display identification bits for different displays.

### EXAMPLES

#### FILE NAMING

IBM PS/2 8512 Color Display, IBMFFF0A.VDP

IBM PS/2 8513 Color Display, IBMFFF0B.VDP

IBM PS/2 8515 Color Display, IBMF0FFA.VDP

#### STORAGE LOCATION

##### DOS

File stored in \DOS\VDDP directory

##### Microsoft WINDOWS

File stored in \WINDOWS\SYSTEM\VDDP

##### OS/2

File stored in \OS2\SYSTEM\VDDP

##### UNIX

\etc\VESA\VDDP

##### Apple

TO BE DETERMINED

#### DISKETTE LABELLING

If the VDDP file is supplied on a diskette, the labelling should contain the following information.

VDDP File(s), Use this diskette for configuration of the display system.

## 5, CONFIGURATION PROCESS

The VDDP Configuration Process allows user to select and store the best match between a monitor and a Video Graphics Controller (Controller) installed on a user's system. A VDDP file that is provided by a display manufacturer contains the monitor information and Pre-Adjusted Timing "tables" in a fixed format. This file is used by a Video Graphics Controller (Controller) installation or a setup program supplied by the Controller manufacturer. It is not intention of VESA to suggest a method of installation procedure but rather to provide a detailed guide for that process.

The configuration process takes place after initial start up procedure has been completed and control is transferred to the operating system. For sake of simplicity of this chapter all references are made to the ISA/EISA/MC platform. The VDDP installation process can be broken down into four steps:

### Step 1 Read and Display VDDP file information

VDDP file is read from the floppy drive A(B)

Monitor information is presented to the user

Manufacture

Compatibility

Model

Monitor type

Serial #

CRT size

VDDP index

List of pre-adjusted timings matched and supported by the monitor and the Controller is displayed.

640x480 60Hz

800x600 75Hz

1024x768 60Hz

1024x768 75Hz

etc.

Backward compatibility timing supported is displayed.

All IBM VGA modes

800x600 72Hz VESA

VDDP index for each resolution may also be displayed.

Page 13

## Step 2 Resolution selection

User can select one or more resolutions from the list presented in the step 1

## Step 3 Convert and Save

Before selected resolutions are saved the installation program converts .VDP text file into a binary file. A format of the binary file must be the same as the corresponding .VDP file. This file can be stored either in a non-volatile memory located on the

Controller or in the system as a TSR file for MSDOS operating system or as a .BIN file for OS/2 or Windows NT operating systems. For example an IBM monitor with IBMFFF0B.VDP file will have a corresponding IBMFFF0B.BIN file.

Unlike DOS system that uses video BIOS calls, Windows NT and OS/2 operating systems program Controller directly through a video driver. The CRTC programming parameters are read by the video driver from the .BIN file (in our example IBMFFF0B.BIN) or from a non-destructive memory (if accessible). The .BIN file(s) stored in the same subdirectory as VDP files (look Step 4)

## Step 4 Monitor select

This is an optional step that is required only when more than one VDP files are installed. For every .VDP file installation steps 1 and 2 are the same but step 3 would require an extra procedure.

Every new .VDP-.BIN file installation overrides a current one. Only one .BIN file can be stored in a /XXX /VDDP subdirectory (where XXX is DOS or Windows/Systems or ....). The replaced .BIN files should not be destroyed but renamed to .BVP (Binary VESA Protocol) files for future use. This allows a user to have several .VDP files installed but only one .BIN file active.

## Backward Compatibility

Display Compatibility File should have one more section where standard timings (if any) supported by a monitor are listed.

These are:

IBM VGA standard timings

VESA 640x480 72Hz

VESA 800x600 56Hz

VESA 800x600 60Hz

VESA 800x600 72HZ

VESA 1024X768 70Hz

Other platforms may or may not need to include this section



## 6, Display / Controller Compatibility Specification

To ensure that a non technical end user can select matching Controller and Display, it is imperative that both Displays and Controllers are specified in the same way.

The VDDP specification calls for a parameter "VDDP Index".

Definition for displays:

VDDP Index = Horizontal active time (us)

Definition for controllers:

VDDP Index = Horizontal pixels / Pixel clock frequency (MHz)

To be VDDP compliant, data sheets and "on the box" specifications for supported resolutions and timings shall contain the statements:

### SUPPORTED RESOLUTIONS

Horizontal x Vertical pixels, VDDP Index (2), Vertical Refresh Rate (1)

The above line shall be repeated for each supported resolution and index.

### NOTES

(1) Vertical refresh rate can and shall only be stated for displays.

VDDP compliant controllers can not state support for any specific refresh rate, since this is a parameter defined by the display. Interlaced display modes shall specify both frame rate and vertical frequency.

For backwards compatibility, references regarding support for existing industry standard timings can be specified as they have been in the past (resolution and refresh rate). However it is important that the VDDP Index be listed for all supported resolutions and that controller manufacturers refrain from specifying refresh rate for "new resolutions".

(2) The VDDP index can be stated as a range.

## Examples showing how VDDP compliant specifications can look

### Example of controller specification

This controller supports the VESA Display Definition Protocol

To select a suitable monitor for this controller, follow this procedure:

1. Determine which is the highest resolution that you are planning to use
2. Note the VDDP Index range that this controller support for that particular resolution
3. Look for a monitor that has a VDDP Index that falls within this range for the selected resolution. Generally a lower index indicates a higher quality monitor with better ergonomics

In case you are planning to use several different resolutions, you should verify that the selected monitor support those resolutions and that it has a VDDP Index that falls within the range of this controller (same procedure as above).

### SUPPORTED RESOLUTIONS

H x V Pixels	Colors	RAM	VDDP Index	Monitor type
1280x1024	16	1MB	10.67 - 20.00	VDDP Comp
1024x768	256 (16)	1MB (512KB)	8.53 - 21.00	VDDP Comp VESA 70Hz
800x600	256	512KBor1MB	6.67 - 22.22	VDDP Comp VESA 56Hz VESA 60Hz VESA 72Hz

## Example of display specification

This display supports the VESA Display Definition Protocol

To select a suitable controller for this display follow this procedure:

1. Determine which is the highest resolution that you are planning to use
2. Note the VDDP Index or Index range that this display support for that particular resolution
3. Look for a controller that has a VDDP Index that falls within this range for the selected resolution. A controller that supports the lowest VDDP Index specified for this display will allow you to run this display at its highest refresh rate.

In case you are planning to use several different resolutions, you should verify that the selected controller support those resolutions and that it has a VDDP Index that falls within the range of this display (same procedure as above).

## SUPPORTED RESOLUTIONS

H x V pixels	VDDP Index	Refresh rate	DPI (dots/inch)
1280x1024	11.64	##Hz	##
1150x900	11.64	##Hz	##
1024x768	11.64 - 16.11	## - ##Hz	##
1024x768	13.65	##Hz	##
1024x768	15.75	##Hz	##
800x600	11.64 - 16.11	## - ##Hz	##
640x480	11.64 - 25.11	## - ##Hz	##

\*

Resolutions that are displayed as interlaced shall be followed by the word "Interlaced" or an "I\*" and a statement below the table "I\* = Interlaced".

Examples "1024x768 I\*" or "1024x768 Interlaced"

Refresh rates for interlaced modes shall state both the frame rate and the vertical frequency.

Example "43.5/87 Hz"

## 7, Initial Display Mode

It is assumed that the majority of systems that initially adopt the VDDP standard will not be able to automatically determine the optimized monitor/display driver configuration until after the basic system diagnostic tests have completed. However there is a requirement that during this initial diagnostic period the system be able to use the visual subsystem to output system status and/or error messages as required.

This requirement is addressed by the definition of the initial display mode.

This standard is not intended to restrict the means by which the initial display mode is defined or detected.

Compatible displays and controllers must both be able to work with at least one common set of timing parameters during the initial boot and configuration phase. This parameter set defines a boot mode. This standard specifies 6 different alternative boot modes. These modes can be used to ensure compatibility between displays and controllers from different vendors.

Any given monitor need only support one boot mode.

Any given controller should support as many boot modes as possible within its frequency range

The boot mode to be used shall be determined by the controller by going through and testing the methods listed below.

(P), Any proprietary method

(DCC), Display Communication Channel Level I

(PIN). Monitor ID pin

(31). IBM 31.5 kHz VGA timing

Any given monitor is only required to support one of the following combinations of methods, but can support additional methods.

(31) or

(PIN) or

(PIN) and (DCC)

Any given controller must support at least methods

(31) and (PIN) or

(31) and (PIN) and (DCC).

By supporting method (DCC) in addition to method (31) or (PIN), a higher degree of automatic configuration (user friendliness) can be achieved).

If some proprietary method for determining appropriate boot mode is used, such method should be applied before verifying support for any of the standard methods.

The standard methods shall be tested in the order: (DCC), (PIN), (31).

Once the monitor responds correctly to a method no further methods need to be tested.

#### **Initial Display mode selection methods**

The different identification methods all refer to the boot modes specified in appendix \_\_\_\_\_.

#### **Method 31, IBM 31.5 kHz timing**

This method is a special case of the PIN method described below.

In case all ID pins are left open, ID = 1111, the monitor supports mode "Boot 31"

#### **Method PIN, Monitor ID pin based**

The appropriate boot mode is defined by signals on the 4 ID pins in the monitor connector. (An IBM VGA type connector is assumed)

Pin 15 - ID 3

Pin 4 - ID 2

Pin 12 - ID 1

Pin 11 - ID 0

Each pin can be tied to:

Ground - 0

Vertical sync signal - V

Left open or + 5 volt - 1

x = any value

The following combinations are defined, all other combinations are available for proprietary identification methods or any other use.

ID				Mode
3	2	1	0	
x	0	x	x	Boot 31
x	1	x	x	Boot 31
x	V	0	0	Boot 38
x	V	0	1	Boot 48
x	V	1	0	Boot 57
x	V	1	1	Boot 64
x	V	0	V	Boot 74

#### Method DCC, Display Communication Channel Level 1

This method is described in appendix \_\_\_\_.

IN ADDITION TO THE ABOVE METHODS THE FOLLOWING METHOD HAS BEEN DISCUSSED. UNLESS THE VDDP WORK GROUP RECEIVES A STRONG INDICATION FROM THE INDUSTRY THAT THIS IS A DESIRED METHOD FOR IDENTIFICATION OF AN ACCEPTABLE BOOT MODE THIS METHOD WILL NOT BE PART OF THE STANDARD AND THE DESCRIPTION WILL BE DELETED FROM THIS DOCUMENT.

#### **Incremented Refresh Rate Based Method**

This method requires that the initial display mode be determined by a manual inspection technique.

It assumes that either the display adapter or monitor do not support any of the above techniques.

The method is to set up the base display mode to the same parameters as used in the 720x400 resolution. The video clock is set to 28MHz. The video clock is then incremented by 0.25MHz increments until a satisfactory displayed image is perceived. It is recommended that the up/down cursor control keys are also enabled to provide fine control once a course lock has been achieved.

Once the video clock value has been stored it is reused on each subsequent power-up. Since a change of monitor, for example, cannot be automatically detected, it will be necessary to run a routine to change the video clock from a manually loaded boot programme.

## ASCII File Format

**THIS TEXT WILL BE UPDATED TO REFLECT RECENT CHANGES IN THE FILE INFORMATION SECTION (MINOR CHANGES).**

**PLEASE SEND COMMENTS TO MARK SNITLY, SGCS, PHONE (408)255 9665,  
INTERNET: mark@sgcs.com**

The purpose of this section is to formally specify the layout and the form of a VDDP ASCII file. The basic syntax is taken VFGP (Vesa File Grammar Proposal).

### 1. Overall Structure

A VDDP file consists of four major parts: revision information about the VDDP file [VERSION]; basic information about the monitor [MONITOR\_DESCRIPTION]; operational limits of the monitor [OPERATIONAL\_LIMITS]; and pre-adjusted timings for the monitor [PREADJUSTED\_TIMINGS].

Note that the last two sections can be repeated multiple times. The operational limits [OPERATIONAL\_LIMITS] section is optional due to the case of fixed frequency monitors. For the case of a multisync monitor the file would normally have one or more operational limits [OPERATIONAL\_LIMITS] sections and then one or more pre-adjusted timings [PRE-ADJUSTED\_TIMINGS] associated with each [OPERATIONAL\_LIMITS]. The overall structure is as follows.

```
[VERSION]
[MONITOR_DESCRIPTION] (the following two sections are repeated one or more
times)
[OPERATIONAL_LIMITS] (optional, not needed for fixed frequency monitors)
[PREADJUSTED_TIMINGS] (repeated one or more times)
```

### 2. Contents of each Section

In what follows, all keywords are shown in uppercase. Note that keywords are actually case insensitive; it doesn't matter if uppercase or lowercase characters are used. For example "DATE", "Date" and "date" are all parsed the same.

#### 2.1. [VERSION]

```
"DATE"           "=" String "; "
"VDDPVERSION"    "=" String "; "
"FILEREV"        "=" String "; "
```

#### 2.2. [MONITOR\_DESCRIPTION]



	"MANUFACTURER"	"=" String ";"
	"MODELNUMBER"	"=" String ";"
	"VERSION"	"=" String ";"
	"SERIALNUMBER"	"=" String ";"
	"COMPATIBILITY"	"=" String ";"
	"MONITORTYPE"	"=" "MONOCHROME"   "COLOR" ";"
(in)	"CRTSIZE"	"=" Integer ";"
(mSec)	"PHOSPHORDECAY"	"=" Float ";"
	"REDGAMMA"	"=" Float ";"
	"GREENGAMMA"	"=" Float ";"
	"BLUEGAMMA"	"=" Float ";"
	"BORDERCOLOR"	"=" Float Float Float ";"
	"REDCHROMATICITY"	"=" Float ";"
	"GREENCHROMATICITY"	"=" Float ";"
	"BLUECHROMATICITY"	"=" Float ";"

### 2.3. [OPERATIONAL\_LIMITS]

(kHz)	"MINHORFREQ"	"=" Float ";"
(kHz)	"MAXHORFREQ"	"=" Float ";"
(Hz)	"MINVERFREQ"	"=" Float ";"
(Hz)	"MAXVERFREQ"	"=" Float ";"
(MHz)	"MAXPIXELCLOCK"	"=" Float ";"
(dots)	"MAXHORDOTS"	"=" Integer ";"
(dots)	"MAXVERLINES"	"=" Integer ";"
(uSec)	"MINHORRETRACE"	"=" Float ";"
(uSec)	"MINVERRETRACE"	"=" Float ";"
(mm)	"HORDIMENSION"	"=" Integer ";"
(mm)	"VERDIMENSION"	"=" Integer ";"

### 2.4. [PREADJUSTED\_TIMINGS]

	"MODEID"	"=" Integer ";"
(dots)	"HORRESOLUTION"	"=" Integer ";"
(dots)	"VERRESOLUTION"	"=" Integer ";"
(mm)	"HORDIMENSION"	"=" Integer ";"
(mm)	"VERDIMENSION"	"=" Integer ";"
	"VIDEOTYPE"	"=" "ANALOG"   "TTL"   "ECL" ";"
(Vp-p)	"VIDEOLEVEL"	"=" Float ";"
	"SYNCTYPE"	"=" "ANALOG"   "TTL"   "ECL" ";"
	"SYNCONFIGURATION"	"=" "SEPARATE"   "COMPOSITE"   "GREEN" ";"
	"SCANTYPE"	"=" "INTERLACED"   "NONINTERLACED" ";"
	"HORSYNCPOLARITY"	"=" "POSITIVE"   "NEGATIVE" ";"
	"VERSYNCPOLARITY"	"=" "POSITIVE"   "NEGATIVE" ";"
(kHz)	"HORFREQ"	"=" Float ";"
(uSec)	"HORACTIVE"	"=" Float ";"
(uSec)	"HORRIGHTBORDER"	"=" Float ";"
(uSec)	"HORFRONTPORCH"	"=" Float ";"
(uSec)	"HORPULSEWIDTH"	"=" Float ";"
(uSec)	"HORLEFTBORDER"	"=" Float ";"
(uSec)	"HORBACKPORCH"	"=" Float ";"
(Hz)	"VERFREQ"	"=" Float ";"
(mSec)	"VERACTIVE"	"=" Float ";"
(mSec)	"VERBOTTOMBORDER"	"=" Float ";"
(mSec)	"VERFRONTPORCH"	"=" Float ";"
(mSec)	"VERPULSEWIDTH"	"=" Float ";"
(mSec)	"VERTOPBORDER"	"=" Float ";"
(mSec)	"VERBACKPORCH"	"=" Float ";"

## Appendix \_\_\_\_\_

### Binary File Format

Please send comments to [andreva@microsoft.com](mailto:andreva@microsoft.com) (Andre Vachon, Microsoft)

```
//
// This structure is in little endian format i.e. compatible with the
// 386 byte addressing method.

//
// The device data record for the Monitor peripheral.
//

typedef struct _CM_MONITOR_DESCRIPTION {

    UCHAR VDDPVersion;           // Structure version
    UCHAR FileRevision;          // Structure revision
    USHORT Date[3];              // Structure date
                                // [0]=Year / [1]=month / [2]=day
    ULONG Checksum;              // Total Number of bytes in the file
// This should be checked against:
// Checksum = sizeof(CM_MONITOR_DESCRIPTION) +
//      NumberOperationalLimits * sizeof(CM_MONITOR_OPERATIONAL_LIMITS) +
//      NumberPreadjustedTimings * sizeof(CM_MONITOR_PREADJUSTED_TIMING);

    UCHAR Manufacturer[12];      // ASCII ID of the manufacturer
    UCHAR ModelNumber[12];       // ASCII ID of the model
    UCHAR Version[12];           // ASCII ID of the model version
    UCHAR SerialNumber[12];      // ASCII ID
    USHORT DateManufactured[3];  // [0]=Year / [1]=month / [2]=day
    USHORT RedPhosphoreDecay;    // milliseconds
    USHORT GreenPhosphoreDecay;  // milliseconds
    USHORT BluePhosphoreDecay;   // milliseconds
    UCHAR StartUpCompatibility[3]; // name of device compatible with
    UCHAR MonitorType;           // monochrome=0 / Color=1
    UCHAR CRTSize;               // inches
    UCHAR BorderColorRed;        // percentage of Red in border color
    UCHAR BorderColorGreen;      // percentage of Green in border color
    UCHAR BorderColorBlue;       // percentage of Blue in border color
    USHORT WhiteChromaticityX;    //
    USHORT WhiteChromaticityY;    //
    USHORT WhiteChromaticityZ;    //
    USHORT RedChromaticityX;      //
    USHORT RedChromaticityY;      //
    USHORT GreenChromaticityX;    //
    USHORT GreenChromaticityY;    //
    USHORT BlueChromaticityX;     //
    USHORT BlueChromaticityY;     //
    USHORT WhiteGamma;           //
    USHORT RedGamma;             //
    USHORT GreenGamma;           //
    USHORT BlueGamma;            //
    USHORT NumberOperationalLimits; // number of operational limits
    USHORT NumberPreadjustedTimings; // number of timings structures
    USHORT Unused;

} CM_MONITOR_DESCRIPTION, *PCM_MONITOR_DESCRIPTION;
```

```

typedef struct _CM_MONITOR_OPERATIONAL_LIMITS {

    ULONG MinimumHorizontalFrequency;    // Hertz
    ULONG MaximumHorizontalFrequency;    // Hertz
    ULONG MinimumVerticalFrequency;      // milliHertz
    ULONG MaximumVerticalFrequency;      // milliHertz
    ULONG MaximumPixelClock;             // Hertz
    USHORT MaximumHorizontalDots;         // dots
    USHORT MaximumVerticalLines;         // lines
    USHORT MinimumHorizontalRetrace;      // nanoseconds
    USHORT MinimumVerticalRetrace;        // microseconds
    USHORT HorizontalLineDimension;       // millimeters
    USHORT VerticalHeightDimension;       // millimeters

} CM_MONITOR_OPERATIONAL_LIMITS, *PCM_MONITOR_OPERATIONAL_LIMITS;

typedef struct _CM_MONITOR_PREADJUSTED_TIMING {
    UCHAR Version;                       // Should match the monitor
description
    UCHAR Revision;                      // version and revision values
    UCHAR PreadjustedTimingName[12];     // ASCII ID of the Preadjusted timing
    USHORT HorizontalResolution;          // dots

    USHORT VerticalResolution;            // lines
    UCHAR PixelWidthRatio;                // used with PixelHeight to form ratio
    UCHAR PixelHeightRatio;               // gives H:V

    ULONG HorizontalFrequency;            // Hertz
    ULONG VerticalFrequency;              // millihertz

    USHORT VerticalActiveHeight;          // millimeters
    USHORT HorizontalActiveLineLength;    // millimeters

    UCHAR VideoType;                     // TTL=0 / analog=1 / ECL=2
    UCHAR VideoLevel;                    // 0.7 Vp-p=0 / 1.0 Vp-p=1
    UCHAR SyncType;                      // TTL=0 / analog=1 / ECL=2
    UCHAR Unused;

    UCHAR SyncConfiguration;              // separate=0 / composite=1 / green=2
    UCHAR ScanType;                       // noninterlaced=0 / interlaced=1
    UCHAR HorizontalSyncPolarity;         // negative=0 / positive=1
    UCHAR VerticalSyncPolarity;           // negative=0 / positive=1

    ULONG HorizontalActive;               // nanoseconds
    ULONG VerticalActive;                 // microseconds

    USHORT HorizontalRightBorder;         // nanoseconds
    USHORT HorizontalFrontPorch;          // nanoseconds
    USHORT HorizontalPulseWidth;          // nanoseconds
    USHORT HorizontalBackPorch;           // nanoseconds
    USHORT HorizontalLeftBorder;          // nanoseconds
    USHORT VerticalBottomBorder;          // microseconds
    USHORT VerticalFrontPorch;            // microseconds
    USHORT VerticalPulseWidth;            // microseconds
    USHORT VerticalBackPorch;             // microseconds
    USHORT VerticalTopBorder;             // microseconds
} CM_MONITOR_PREADJUSTED_TIMING, *PCM_MONITOR_PREADJUSTED_TIMING;

```

Appendix \_\_\_\_\_

## Boot mode specifications

Pre-Adjusted Timing Name	=	Boot 31
Hor. Resolution	=	720
Ver. Resolution	=	400
Hor. Freq.	=	31.469 KHz
Ver. Freq.	=	70.087 Hz
Pixel Aspect Ratio	=	1 : 1
Hor. Active Line Length	=	
Video Type	=	Analog
Video Level	=	0.7 Vp-p
Sync. Type	=	TTL
Sync. Configuration	=	Separate
Scan Type	=	Non-Inter.
Hor. Sync. Polarity	=	Negative
Ver. Sync. Polarity	=	Negative
Hor. Active	=	25.422 uSec
Hor. Right Border	=	0.318 uSec
Hor. Front Porch	=	0.318 uSec
Hor. Pulse Width	=	3.813 uSec
Hor. Back Porch	=	1.589 uSec
Hor. Left Border	=	0.318 uSec
Ver. Active	=	12.711 mSec
Ver. Bottom Border	=	0.222 mSec
Ver. Front Porch	=	0.191 mSec
Ver. Pulse Width	=	0.064 mSec
Ver. Back Porch	=	0.858 mSec
Ver. Top Border	=	0.222 mSec

Pre-Adjusted Timing Name=	Boot 38
Hor. Resolution	= 720
Ver. Resolution	= 400
Hor. Freq.	= 37.778 kHz
Ver. Freq.	= 84.138 Hz
Pixel Aspect Ratio	= 1 : 1
Hor. Active Line Length	=
Video Type	= Analog
Video Level	=
Sync. Type	= TTL
Sync. Configuration	=
Scan Type	= Non-Inter.
Hor. Sync. Polarity	= Negative
Ver. Sync. Polarity	= Negative
Hor. Active	= 21.176 uSec
Hor. Right Border	= 0.265 uSec
Hor. Front Porch	= 0.265 uSec
Hor. Pulse Width	= 3.176 uSec
Hor. Back Porch	= 1.324 uSec
Hor. Left Border	= 0.265 uSec
Ver. Active	= 10.588 mSec
Ver. Bottom Border	= 0.185 mSec
Ver. Front Porch	= 0.159 mSec
Ver. Pulse Width	= 0.053 mSec
Ver. Back Porch	= 0.715 mSec
Ver. Top Border	= 0.185 mSec

Pre-Adjusted Timing Name=	Boot 48
Hor. Resolution	= 720
Ver. Resolution	= 400
Hor. Freq.	= 48.333 kHz
Ver. Freq.	= 53.823 Hz
Pixel Aspect Ratio	= 1 : 1
Hor. Active Line Length	=
Video Type	=
Video Level	=
Sync. Type	=
Sync. Configuration	=
Scan Type	= Non-Inter.
Hor. Sync. Polarity	=
Ver. Sync. Polarity	=
Hor. Active	= 16.552 uSec
Hor. Right Border	= 0.207 uSec
Hor. Front Porch	= 0.207 uSec
Hor. Pulse Width	= 2.483 uSec
Hor. Back Porch	= 1.034 uSec
Hor. Left Border	= 0.207 uSec
Ver. Active	= 16.552 mSec
Ver. Bottom Border	= 0.290 mSec
Ver. Front Porch	= 0.248 mSec
Ver. Pulse Width	= 0.083 mSec
Ver. Back Porch	= 1.117 mSec
Ver. Top Border	= 0.290 mSec

Page 28

Pre-Adjusted Timing Name=	Boot 57
Hor. Resolution	= 720
Ver. Resolution	= 400
Hor. Freq.	= 56.667 kHz
Ver. Freq.	= 63.103 Hz
Pixel Aspect Ratio	= 1 : 1
Hor. Active Line Length	=
Video Type	=
Video Level	=
Sync. Type	=
Sync. Configuration	=
Scan Type	= Non-Inter.
Hor. Sync. Polarity	=
Ver. Sync. Polarity	=
Hor. Active	= 14.118 uSec
Hor. Right Border	= 0.176 uSec
Hor. Front Porch	= 0.176 uSec
Hor. Pulse Width	= 2.118 uSec
Hor. Back Porch	= 0.882 uSec
Hor. Left Border	= 0.176 uSec
Ver. Active	= 14.118 mSec
Ver. Bottom Border	= 0.247 mSec
Ver. Front Porch	= 0.212 mSec
Ver. Pulse Width	= 0.071 mSec
Ver. Back Porch	= 0.953 mSec
Ver. Top Border	= 0.247 mSec

Pre-Adjusted Timing Name=	Boot 64
Hor. Resolution	= 720
Ver. Resolution	= 400
Hor. Freq.	= 64.444 kHz
Ver. Freq.	= 71.764 Hz
Pixel Aspect Ratio	= 1 : 1
Hor. Active Line Length	=
Video Type	=
Video Level	=
Sync. Type	=
Sync. Configuration	=
Scan Type	= Non-Inter.
Hor. Sync. Polarity	=
Ver. Sync. Polarity	=
Hor. Active	= 12.414 uSec
Hor. Right Border	= 0.155 uSec
Hor. Front Porch	= 0.155 uSec
Hor. Pulse Width	= 1.862 uSec
Hor. Back Porch	= 0.776 uSec
Hor. Left Border	= 0.155 uSec
Ver. Active	= 12.414 mSec
Ver. Bottom Border	= 0.217 mSec
Ver. Front Porch	= 0.186 mSec
Ver. Pulse Width	= 0.062 mSec
Ver. Back Porch	= 0.838 mSec
Ver. Top Border	= 0.217 mSec

Pre-Adjusted Timing Name	=	Boot 74
Hor. Resolution	=	720
Ver. Resolution	=	400
Hor. Freq.	=	74.444 kHz
Ver. Freq.	=	82.900 Hz
Pixel Aspect Ratio	=	1 : 1
Hor. Active Line Length	=	
Video Type	=	
Video Level	=	
Sync. Type	=	
Sync. Configuration	=	
Scan Type	=	Non-Inter.
Hor. Sync. Polarity	=	
Ver. Sync. Polarity	=	
Hor. Active	=	10.746 uSec
Hor. Right Border	=	0.134 uSec
Hor. Front Porch	=	0.134 uSec
Hor. Pulse Width	=	1.612 uSec
Hor. Back Porch	=	0.672 uSec
Hor. Left Border	=	0.134 uSec
Ver. Active	=	10.746 mSec
Ver. Bottom Border	=	0.188 mSec
Ver. Back Porch	=	0.725 m Sec
Ver. Top Border	=	0.188 mSec

## Display Communication Channel Level 1

### Objectives

To identify the "Boot mode" supported by the monitor.

To identify if the monitor has been replaced since last time the system was configured.

To transmit the VDDP file from the monitor to the system via the video signal cable.

### Method for communication

The basic idea is to use standard VGA compatible circuitry that is normally used to recognize the display unit (monochrome/colour detection), but now used for data transfer. This method does not require any circuitry changes to standard VGA and it can be easily implemented to other display controllers that do not support this standard feature yet.

On the display unit side an additional driver circuit is needed to drive current to the "Green" signal line. The current will cause a potential rise in the signal line due to the impedance (double terminated line with usually  $150\parallel 75$  ohm or  $75\parallel 75$  ohm terminators). The potential caused by current drive is same as used for display detection. DAC circuits are current drive circuits and should tolerate parallel drive if voltages are within maximum ratings.

This potential can be read using standard comparator circuitry on VGA boards and finally read from VGA register bit.

Communication data is transferred through analog video signal (G colour signal) and is synchronized to VSYNC. Data is driven from starting edge of sync pulse and can be read during VSYNC pulse period. VSYNC status (sync appearance time) can be read from VGA status registers.



DCC consists of two transfer timing modes: one for transferring monitor ID information (Monitor ID Transfer Mode) and the other is a high speed mode for transferring the VDDP file (VDDP Transfer Mode).

During communication normal video is disabled (DAC not driving analog signals).

#### Block Diagram

##### **VGA Display system**

This block diagram describes VGA display system (video connection to display) which is the dominant display system in PCs at the moment.

Most display controller boards have equivalent circuitry within the chips and boards.

DIAGRAM 1.

##### **Display unit drive circuitry (principle)**

This block diagram describes the principle how data can be driven to signal line with correct timing. The diagram shows the logical connection to the driver circuit and it can be designed in several ways.

DIAGRAM 2.

## Monitor Timing During Data Communication

### Monitor ID Transfer Mode

This mode uses a timing very close to standard 31 kHz boot up mode, only VSYNC period is longer. The data speed for Monitor ID transfer is 70 bps.

### Monitor ID Transfer timing

Pre-Adjusted Timing Name	=	DCC ID
Hor. Resolution	=	720
Ver. Resolution	=	400
Hor. Freq.	=	31.469 kHz
Ver. Freq.	=	70.087 Hz
Pixel Aspect Ratio	=	
Hor. Active Line Length	=	
Video Type	=	Analog
Video Level	=	
Sync. Type	=	
Sync. Configuration	=	
Scan Type	=	Non-Inter.
Hor. Sync. Polarity	=	Negative
Ver. Sync. Polarity	=	Positive
Hor. Active	=	25.422 uSec
Hor. Right Border	=	0.318 uSec
Hor. Front Porch	=	0.318 uSec
Hor. Pulse Width	=	3.813 uSec
Hor. Back Porch	=	1.589 uSec
Hor. Left Border	=	0.318 uSec
Ver. Active	=	12.711 mSec
Ver. Bottom Border	=	0.222 mSec
Ver. Front Porch	=	0.159 mSec
Ver. Pulse Width	=	0.638 mSec
Ver. Back Porch	=	0.318 mSec
Ver. Top Border	=	0.222 mSec

### VDDP Transfer Mode

In VDDP Transfer Mode the vertical frequency is increased to a much higher level relative to standard VGA 640x480 31.5 kHz timing. This is done by programming the display controller CRTC registers to use standard VGA horizontal frequency (31 kHz), but decreasing vertical period to 10 lines (3.1 kHz = 3100 bps data rate).

The display have to be turned blank during the communication to avoid flicker on screen.

The basic display timing mode for the high speed transfer is BIOS mode 12 (640x480/16 graphics mode). The only changes to the mode 12 timings are in vertical timing section.

### VDDP Transfer mode timing

Pre-Adjusted Timing Name	=	DCC xfer
Hor. Resolution	=	640
Ver. Resolution	=	
Hor. Freq.	=	31.469 kHz
Ver. Freq.	=	3147 Hz
Pixel Aspect Ratio	=	
Hor. Active Line Length	=	
Video Type	=	Analog
Video Level	=	
Sync. Type	=	
Sync. Configuration	=	
Scan Type	=	Non-Inter.
Hor. Sync. Polarity	=	Negative
Ver. Sync. Polarity	=	Negative
Hor. Active	=	25.422 uSec
Hor. Right Border	=	0.318 uSec
Hor. Front Porch	=	0.636 uSec
Hor. Pulse Width	=	3.813 uSec
Hor. Back Porch	=	1.907 uSec
Hor. Left Border	=	0.318 uSec
Ver. Active	=	0.064 mSec
Ver. Bottom Border	=	0 mSec
Ver. Front Porch	=	0.032 mSec
Ver. Pulse Width	=	0.127 mSec
Ver. Back Porch	=	0.095 mSec
Ver. Top Border	=	0 mSec

## Data Transfer Process

### Monitor ID Transfer

The information transferred during the Monitor ID Transfer phase is intended to be sufficient to select boot mode and to verify that the monitor has not been replaced since last configuration.

The Monitor ID Transfer should be attempted at each boot up time.

If Monitor ID Transfer fails, the monitor apparently doesn't support data communication and the VDDP File Transfer should not be attempted. This will prevent the possibility to go beyond the maximum limits of the monitor.

### VDDP File Transfer

The data transferred during the VDDP File Transfer phase should normally be stored in the system at configuration time. The stored copy can be used at subsequent sessions without the need to transfer the file from the monitor again until the Monitor ID phase indicates that the monitor has been replaced. Since it is not necessary to download the VDDP information more than once during video system setup phase, the time needed for transferring is not critical. For example a 5 KB VDDP file will take about 15 seconds to transfer.

### Time out

Since not all monitors will meet DCC requirement and are not capable to communicate (also if display unit is not turned on), the first boot up DCC check process should be aborted if the monitor is not responding within one second after the Monitor ID Transfer timing is applied.

### Retransmission

In case the data transmission fails, parity or check sum error, the following sequence should be followed:

Error in transmission => normal timing => communication timing => data transfer.

It is recommended that the system signal an error condition if transmission fails more than 5 times in a row. The system may then fall back to Monitor ID pin identification..

#### **Valid Data Time**

Communication data is placed on the G signal at the beginning of the vertical sync pulse and is available for reading during the sync pulse. The current drive is removed when the sync pulse ends. (MARGINS?)

#### **Data Stream**

Header consisting of 18 ones followed by 9 zeros.

Data block where each byte is represented using 8 data bits and 1 even parity bit. Bytes are sent least significant bit first.

The two first bytes in the data block indicate the total number of data bytes in the data block.

Transmission integrity check block consisting of 2 bytes (8 bits + even parity) The first byte is the result of XOR operation on all data bytes in the data block. The second byte is the result of 8 bit ADD operation (ignore overflow) on all data bytes in the data block.

## Data Formats

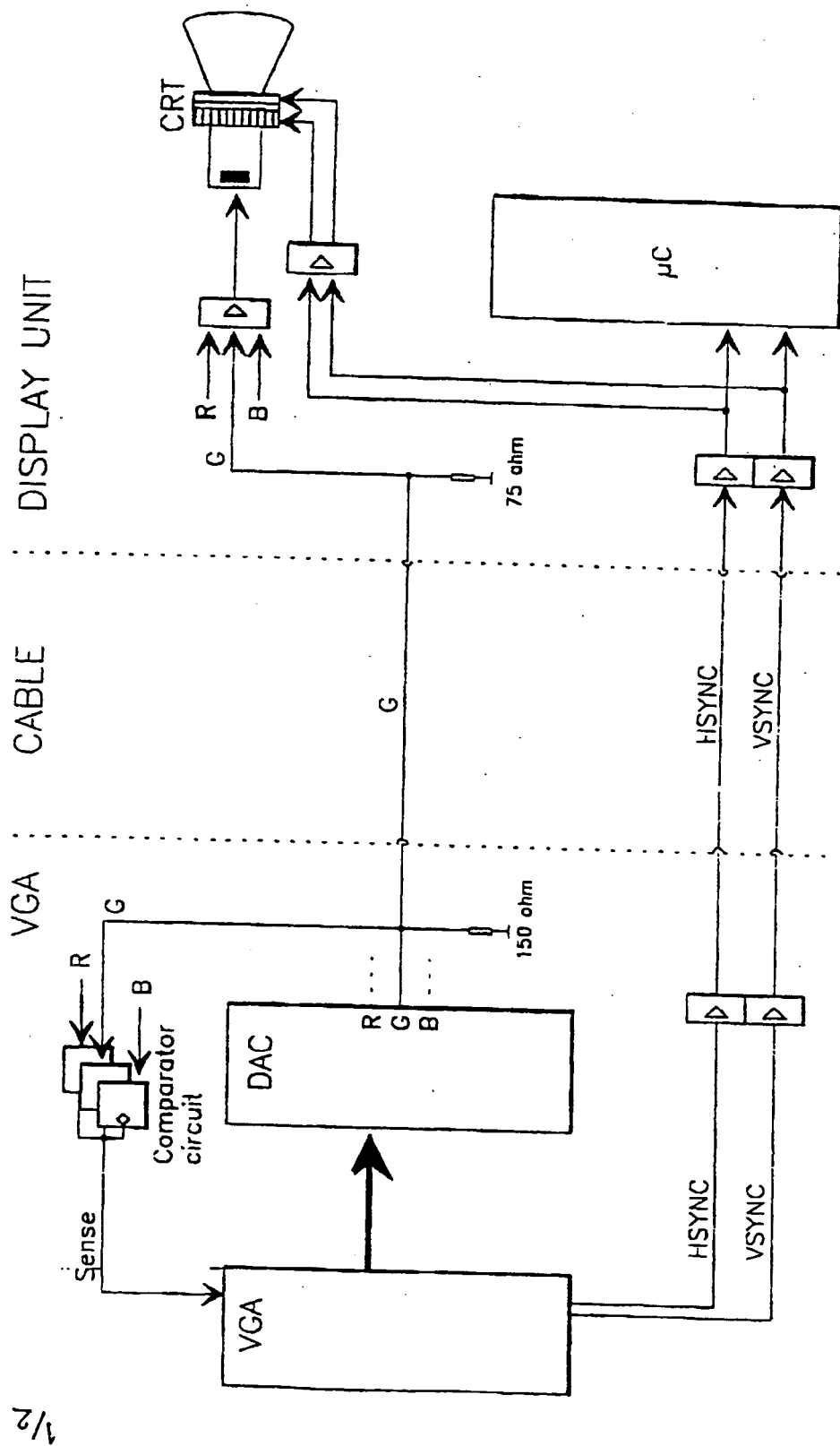
### Monitor ID Transfer data block

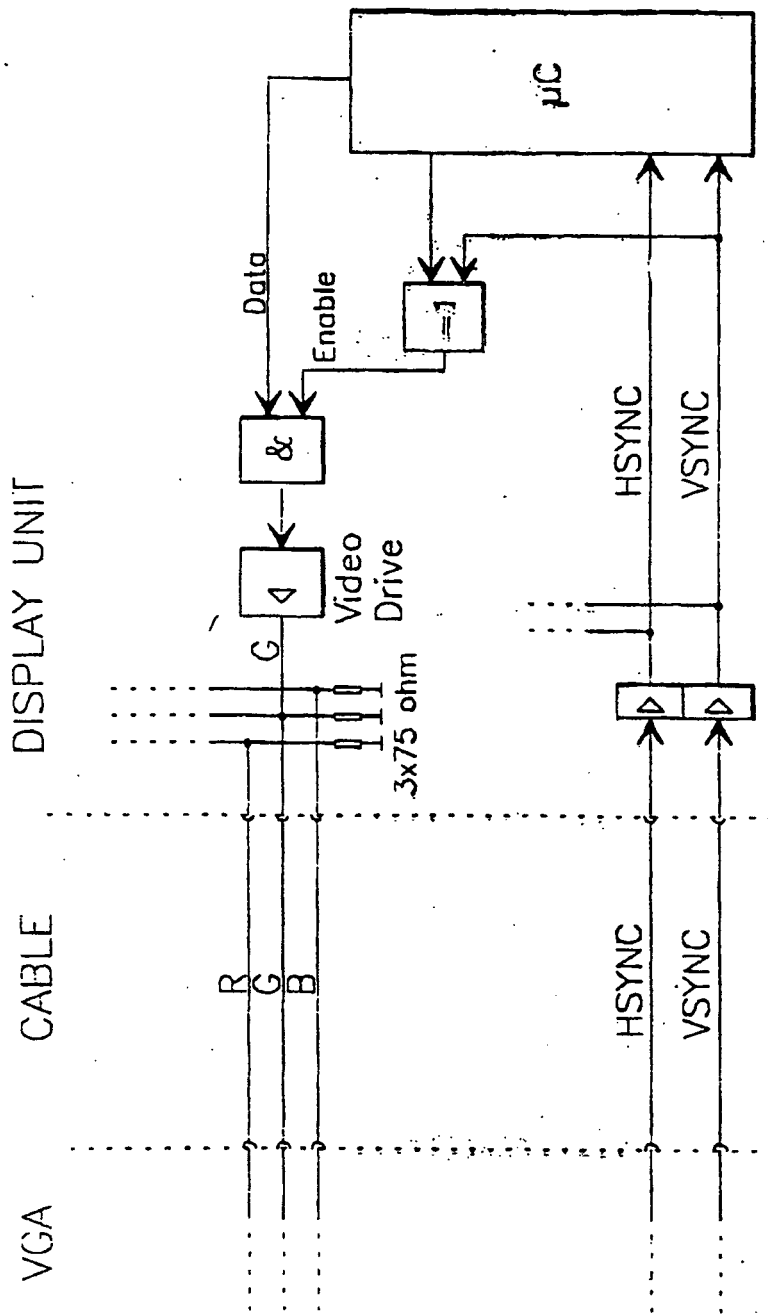
byte

- |       |   |
|-------|---|
| 0     | 0B h, number of bytes in data block (lsb)                   |
| 1     | 00 h, number of bytes in data block (msb)                   |
|       |   |
| 2 - 4 | Manufacturer code (see "Storage Location" section in VDDP)  |
|       |   |
| 5 - 7 | Manufacturer model (see "Storage Location" section in VDDP) |
|       |   |
| 8     | bit   |
|       | 0 = 0, Read boot mode from byte 9                           |
|       | 0 = 1, Reserved for future boot mode method                 |
|       | 1 = 0, VDDP file transfer not supported                     |
|       | 1 = 1, VDDP file can be read from monitor                   |
|       | bit 2 - 7 reserved  |
|       |   |
| 9     | Boot mode (if byte 8 bit 0 = 0)                             |
|       | 00 h = Boot 31  |
|       | 01 h = Boot 38  |
|       | 02 h = Boot 48  |
|       | 03 h = Boot 57  |
|       | 04 h = Boot 64  |
|       | 05 h = Boot 74  |
|       | 06 - ff h = reserved for future boot modes                  |

### VDDP File Transfer data block

The data in the block is identical to the Binary File format specified in appendix \_\_\_\_\_, with the byte count added in the beginning and the check bytes at the end.





2/2

VESA008044