Video Electronics Standards Association

DI-EXT™ Standard

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VESA Display Information Extension Block Standard

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Purpose

This standard defines an extension block data format to carry configuration information to allow for optimum use of analog and digital interfaced displays. DI-EXT provides more detailed information than is available in the base 128 Bytes (EDID Data Structure 1.3 or higher) as defined in the E-EDID Standard (Release A or later).

Summary

This document describes a 128-byte extension block data structure "DI-EXT" (Data Structure Version 1) as well as the overall layout of the data that make up the Display Information Extension Block. DI-EXT is to be used with EDID 1.3 Data Structure (or later) as defined in the VESA Enhanced Extended Display Identification Data Standard (E-EDID). DI-EXT contains additional information related to the digital interface and feature set of the display. This information is needed to support "Plug & Play" for digital and analog interfaced displays. Use of the DI-EXT extension block described in this document requires that the addressing method described in the Enhanced Display Data Channel (E-DDC) Standard be used.

Note

This issue of the DI-EXT document contains specifications for the content of the Display Information Extension Block. Refer to VESA E-EDID Standard for the mandatory core elements of Enhanced EDID and to VESA E-DDC Standard for the addressing method.

Preface

Scope
This document defines the initial version (Data Structure Version 1) of the DI-EXT standard. It contains information related to the digital interface, the display device, capabilities and feature support contained in the display and display transfer characteristics.

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1. OVERVIEW

1.1 Summary

The Display Information Extension (DI-EXT) Block, described in this document, is a data structure, with optional variants, that allow the display to inform the host about its capabilities and features. The DI-EXT Block, defined in this document is an E-EDID Release A-compliant extension block. It allows a display device to signal features and capabilities that are not handled in the base 128-byte EDID data structure. The DI-EXT data structure is independent of the video interface communications protocol (analog or digital) used between the monitor and the host.

The DI-EXT Block requires the use of EDID 1.3 data structure (or later) as defined in the VESA Enhanced Extended Display Identification Data (E-EDID) Standard. In addition, the use of the DI-EXT block described in this document requires the use of the addressing method described in the Enhanced Display Data Channel (E-DDC) Standard.

DI-EXT contains the following:
1. Information related to the digital video interface (if present);
2. Information related to the display device;
3. Display Capabilities & Feature Support Set;
4. Display Transfer Characteristics.

DI-EXT can be used in an analog or digital video interfaced system. In an analog video interfaced system, the digital content of DI-EXT must be ignored by the host system. In the event that there is a conflict between DI-EXT content and content in the lower 128 bytes (EDID data structure 1.3 or later), then the DI-EXT content has priority.

The "Primary Video Interface Connector" as used in this document is the connector, which is currently connected (active) to the host, and the connector that contains the Display Data Channel (DDC), which transmits the EDID and DI-EXT data structures from the monitor/display to the host.

1.2 Background

The E-EDID Standard was created to clarify how EDID extension blocks shall be used in order to handle identification of future monitor capabilities, while maintaining a basic level of compatibility that can be used to uniquely identify the monitor. DI-EXT is one of these extension blocks.

1.3 Standard Objectives

DI-EXT was developed by VESA to meet, exceed and/or complement certain criteria. These criteria are set forth as standard objectives as follows:

- Support Microsoft® Plug and Play definition for displays.
- Support the Digital Visual Interface Specification (Version 1.0) and other recognized digital interface standards.
- Provide information in a compact format to allow the graphic subsystem to be configured based on the capabilities of the attached display.

1.4 Reference Documents

Note: Versions identified here are current (at the release of this standard), but users of this standard are advised to ensure they have the latest versions of referenced standards and documents.

- Digital Display Working Group (DDWG) - Digital Visual Interface (DVI) Specifications, Version 1.0, April 2, 1999
- Digital Content Protection, LLC - High-bandwidth Digital Content Protection (HDCP) System, Revision 1.0, February 17, 2000
- EIA/CEA-861, "A DTV Profile for Uncompressed High Speed Digital Interfaces", December 1, 2000
- EIA/CEA-861-A, "A DTV Profile for Uncompressed High Speed Digital Interfaces", April 25, 2001 (Draft) or later
- IBM Personal System/2 Hardware Interface Technical Reference- Common Interfaces Video Subsystem
- ISO 8859 Document (ASCII Definitions) - "Information Processing - 8 Bit Single-Byte Coded Graphic Character Sets"
- ITU-R BT .470, Rev 6, Dated 1998, Conventional Television Systems
- Microsoft / Intel Plug and Play ISA Specification, Version 1.0, May 28, 1993
- Microsoft / Intel Plug and Play Errata and Clarification Document, December 10, 1993
- National Semiconductor - Open LVDS Display Interface (OpenLDI) Specification, Version 0.95, May 13, 1999
- SMPTE-170M, Rev 99M, Dated April 21, 1999, Television – Composite Analog Video Signal NTSC For Studio Applications
- SMPTE-240M, Rev 99M, Dated 1999, Television – 1125-Line High Definition Production System – Signal Parameters
- SMPTE-260M, Rev 99M, Dated 1999, Television – 1125-Line High Definition Production System – Digital Representation and Bit-Parallel Interface
- SMPTE-274M, Rev 98M, Dated Oct. 1, 1998, Television – 1920 X 1080 Scanning And Analog And Digital Interfaces For Multiple Picture Rates
- SMPTE-293M, Rev 99M, Dated April 21, 1999, Television – 720 X 483 Active Line At 59.94-Hz Progressive Scan Production – Digital Representation
- SMPTE-294M, Rev 97M, Dated Jan. 24, 1997, Television – 720 X 483 Active Line At 59.94-Hz Progressive Scan Production Bit-Serial Interfaces
- TIA/EIA-644, "ELECTRICAL CHARACTERISTICS OF LOW VOLTAGE DIFFERENTIAL SIGNALING (LVDS) INTERFACE CIRCUITS"
- VESA - Digital Flat Panel (DFP) Standard, Version 1, February 14, 1999
- VESA - Display Data Channel, Command Interface (DDC/CI) Standard, Version 1, August 14, 1998
- VESA - Enhanced Display Data Channel (E-DDC) Standard, Version 1, September 2, 1999
- VESA - Enhanced Extended Display Identification Data (E-EDID) Standard, Release A, Rev. 1, February 9, 2000
- VESA - Flat Panel Display Measurements (FPDM2) Standard, Version 2.0, June 1, 2001
- VESA - Monitor Control Command Set (MCCS) Standard, Version 1.0, September 11, 1998
- VESA - Plug and Display (P&D) Standard, Version 1, June 11, 1997

2. Display Information Extension (DI-EXT) Block

2.1 DI-EXT Format Overview

Table 2-1 gives an overview of the DI-EXT block contents.

Address /Offset	No. Bytes	Byte #	Description	Format / Location
00h	**1**		**Block Header**	See Section 3.1.1
00h		1	40h	Hexadecimal
01h	**1**		**Version Number**	See Section 3.1.2
01h		2	1 to 255	Hexadecimal
02h	**12**		**Digital Interface (Monitors with a digital video interface)**	See Section 3.2
02h		3	Digital Interface Standard/Specification Supported	See Section 3.2.1
03h		4	Digital Interface Standard/Specification Version Number and Revision Number	See Section 3.2.2
04h		5		
05h		6		
06h		7		
07h		8	<u>*Digital Interface Data Format Description:*</u> Data Enable, Shift Clock Edge, HDCP, Double Clocking of Input Data & Packetized Digital Video Support	See Section 3.2.3
08h		9	Digital Interface --- Standard Data Formats	
09h		10	Minimum Pixel Clock Frequency Per Link	See Section 3.2.4
0Ah		11	Maximum Pixel Clock Frequency per Link	
0Bh		12	...	
0Ch		13	Crossover Frequency	
0Dh		14	...	
0Eh	**6**		**Display Device (Monitors with analog &/or a digital video interface/s)**	See Section 3.3
0Eh		15	Sub-Pixel Layout	See Section 3.3.1
0Fh		16	Sub-Pixel Configuration	
10h		17	Sub-Pixel Shape	
11h		18	Horizontal Dot/Pixel Pitch	See Section 3.3.2
12h		19	Vertical Dot/Pixel Pitch	
13h		20	<u>*Major Display Device Characteristics:*</u> Fixed Pixel Format, View Direction, Display Background, Physical Implementation & DDC/CI	See Section 3.3.3
14h	**35**		**Display Capabilities & Feature Support Set (Monitors with analog &/or a digital video interface/s)**	See Section 3.4
14h		21	<u>*Miscellaneous Display Capabilities:*</u> Legacy Modes, Stereo Video, Scaler On Board, Image Centering, Conditional Update & Interlaced Video	See Section 3.4.1
15h		22	<u>*Frame Rate Conversion:*</u> Frame Lock, Frame Rate Conversion	See Section 3.4.2
16h		23	Vertical Frequency	
17h		24	...	
18h		25	Horizontal Frequency	
19h		26	...	

Table 2-1 --- DI-EXT Version 1 Overview

Address /Offset	No. Bytes	Byte #	Description	Format / Location
1Ah		27	*<u>Display/Scan Orientation:</u>* Definition Type, Screen Orientation, Zero Pixel Location, Scan Direction & Standalone Projector	See Section 3.4.3
1Bh		28	Default Color/Luminance Decoding Description	See Section 3.4.4
1Ch		29	Preferred Color/Luminance Decoding Description	
1Dh		30	Color/Luminance Decoding Capabilities Description	
1Eh		31	...	
1Fh		32	Dithering,	See Section 3.4.5
20h		33	Monitor Color Depth for BGR Input	
21h		34	...	
22h		35	...	
23h		36	Monitor Color Depth for YCrCb or YPbPr Input	
24h		37	...	
25h		38	...	
26h		39	Aspect Ratio Conversion Modes	See Section 3.4.6
27h ... 36h		40 ... 55	Packetized Digital Video Support Information (16 Bytes Reserved) - will be defined in a future revision to the DI-EXT Standard.	See Section 3.4.7
37h	**17**		**Unused Bytes (Reserved)**	See Section 3.5
37h ... 47h		56 ... 72	Reserved for additional information in future revisions	
48h	**9**		**Audio Support Bytes (Reserved)**	See Section 3.6
48h ... 50h		73 ... 81	Audio Support will be defined in a future revision to the DI-EXT Standard. ...	
51h	**46**		**Display Transfer Characteristic – Gamma (Monitors with analog &/or a digital video interface/s)**	See Section 3.7
51h		82	Gamma Control	
52h ... 60h		83 ... 97	White or Blue Color Sub-Channel 0, (15 Data Points)	
61h ... 6Fh		98 ... 112	White or Green Color Sub-Channel 1, (15 Data Points)	
70h ... 7Eh		113 ... 127	White or Red Color Sub-Channel 2, (15 Data Points)	
7Fh	**1**		**Miscellaneous Items (Both Analog & Digital Input Monitors)**	See Section 3.8
7Fh		128	Checksum	Hexadecimal

Table 2-1 --- DI-EXT Version 1 Overview (Continued)

Section 3 provides details on each byte of the DI-EXT Version 1 Data Structure.

2.2 Data Format Conventions

The DI-EXT data structures are designed to be compact in their representation of data in order to fit the most information into a limited space. To accommodate this, many data lengths have been used according to the needs of the particular data. These include fields from single bit up to two bytes in length. In all cases, except where explicitly stated, the following conventions are used:

Data length	Convention used	Example
1 to 7 bits	Stored in order stated	
8 bits (1 byte)	Stored in order stated	
9 to 15 bits	Stored in order stated	
16 bits (2 bytes)	Bytes are a binary format (not BCD) stored in locations specified with least significant byte (LSB) stored in first location	1280 decimal = 0500h Stored 05 at first location 00 next location
Character string (More than 2 bytes)	Bytes are ASCII stored in order they are appearing in the string See NOTE 5:	"ACED" Stored 41h at first location, 43h at the next location, 45h at the next location, and 44h at the next location

Table 2-2 --- Data Format Conventions

NOTES:

All unused bytes in the DI-EXT Data Table must be set to "00h".

2. "xxxxh", "xxh" or "xh" (where "x" is a value between "0" and "F") indicates a hexadecimal data number.
3. 'y' to 'yyyyyyyy' (where 'y' is '0' or '1') is a binary data number.
4. **xxh** (bold) indicates a hexadecimal address (or offset) in the DI-EXT Data Table.
5. Refer to ISO 8859 Document (ASCII Definitions) Page 437- "Information Processing - 8 Bit Single-Byte Coded Graphic Character Sets"

3. CONTENTS OF THE DI-EXT BLOCK

This section defines the parameters that are contained in the DI-EXT Block. The “CONTENTS OF THE DI-EXT BLOCK” (Section 3) has been partitioned into sub-sections (categories). The order, titles, sizes and locations of these sub-sections are shown below in Table 3-1.

128	Bytes	Sub-Section (Category)	Location
	2	General Information	See Section 3.1
	12	Digital Interface	See Section 3.2
	6	Display Device	See Section 3.3
	35	Display Capabilities & Feature Support Set	See Section 3.4
	17	Unused Bytes (Reserved)	See Section 3.5
	9	Audio Support (Reserved)	See Section 3.6
	46	Display Transfer Characteristic –Gamma	See Section 3.7
	1	Miscellaneous Items	See Section 3.8

Table 3-1 --- Sub-Sections of “Contents of the DI-EXT Block”

3.1 General Information – 2 Bytes – Byte #00h to #01h

The “General Information” section defines the parameters related to Block Header, Version Number. Section 3.1 has been partitioned into sub-sections. The order, titles, sizes and locations of these sub-sections are shown below in Table 3-2.

2	Bytes	Sub-Section	Location
	1	Block Header	See Section 3.1.1
	1	Version Number	See Section 3.1.2

Table 3-2 --- Contents of the “General Information” Section

3.1.1 Block Header – 1 Byte – Byte #00h

The Block Header is an extension tag for the block. The Block Header for the DI-EXT Block has been assigned the number “40h”. See Table 3-3.

Address/Offset Within the extension block	**No. of Bytes**	**Byte No.**	**Description**	**Format**
00h	**1**	1	**DI-EXT Block Header**	
			Tag identifying DI-EXT Block	“40h”

Table 3-3 --- Block Header

3.1.2 Version Number – 1 Byte – Byte #01h

The Version Number for the DI-EXT Block Data Structure is shown in Table 3-4.

Address/Offset Within the extension block	**No. of Bytes**	**Byte No.**	**Description**	**Format**
01h	**1**	1	**DI-EXT Version Number**	
			Version Number	“00h” --- is an invalid number. “01h” ⇒ “FFh” --- Hexadecimal (Range 1 to 255)

Table 3-4 --- DI-EXT Version Number

3.2 Digital Interface – 12 Bytes – Bytes #02h to #0Dh – (Monitors with a digital video interface)

The "Digital Interface" section defines the parameters related to the digital video interface hardware and software that are contained in the display. **Section 3.2 is for Digitally Interfaced Displays Only.** For monitors with analog inputs, all data in this section should be set to "00h". The "Digital Interface" (section 3.2) section has been partitioned into sub-sections. The order, titles, sizes and locations of these sub-sections are shown below in Table 3-5.

12	Bytes	Sub-Section	Location
	1	Digital Interface Standard/Specification Supported	See Section 3.2.1
	4	Digital Interface Version/Revision Number	See Section 3.2.2
	2	Digital Interface Data Format Description	See Section 3.2.3
	5	Min, Max & Cross-Over Pixel Clock Frequency	See Section 3.2.4

Table 3-5 --- Contents of the "Digital Interface" Section

3.2.1 Digital Interface Standard/Specification Supported – 1 Byte – Byte #02h

This section indicates if the display is compatible with a Digital Interface Standard/Specification. For each Digital Video Interface Standard/Specification listed in Table 3-6, the display/monitor must be compliant to the standard/specification. However, the display/monitor may or may not be mechanically (video connector) compliant to the standard/specification, depending upon the individual standard/specification requirements. Available selections are listed below in Table 3-6.

Address/Offset Within the extension block	**No. of Bytes**	**Byte No.**	**Description**	**Format**
02h	**1**	1	**Digital Interface Standard/Specification** {Bits 7 ⇒ 0}	“00h” --- Display has an Analog Video Input (See NOTE 1) “01h” --- Display has a Digital Video Input but the Standard/Specification cannot be defined “02h” --- Digital Visual Interface (DVI) -- Single Link “03h” --- Digital Visual Interface (DVI) -- Dual Link – High Resolution (See NOTE 2) “04h” --- Digital Visual Interface (DVI) -- Dual Link – High Color (See NOTE 3) “05h” --- Digital Visual Interface (DVI) -- For Consumer Electronics (See NOTE 5) “06h” --- Plug & Display (P&D) “07h” --- Digital Flat Panel (DFP) “08h” --- Open LDI (National Semiconductor) -- Single Link (See NOTE 4) “09h” --- Open LDI (National Semiconductor) -- Dual Link (See NOTE 4) “0Ah” --- Open LDI (National Semiconductor) -- For Consumer Electronics (See NOTES 4 & 5) “0Bh” ⇒ “FFh” --- Reserved (Do Not Use)

Table 3-6 --- Digital Interface Standard/Specification Supported

NOTES:
1. For monitors/displays with Analog Video Inputs, all Bytes at addresses/offsets **“02h”** through **“0Bh”** shall be set to **“**00h**”**.
2. In Table 3-6, if you select ”03h”, then the second link is being used for higher resolutions and you are limited to 24-bit color depth. Therefore, in Table 3-8, you must select ”48h” (“Digital Interface Data Format”) for 24-bit color.
3. In Table 3-6, if you select ”04h”, then the second link is being used for higher color depth and your monitor can display up to 48-bit color depth. Therefore, in Table 3-8, you must select ”49h” (“Digital Interface Data Format”) for 48-bit color depth. For more information on DVI™, please refer to the Digital Visual Interface Specification that is available on the Digital Display Working Group website at www.ddwg.org.
4. Refer to Open LDI Specification and to LVDS Standard TIA/EIA 644 for Data Format Mapping Information.
5. Refer to EIA/CIA-861/A for more information about DVI and Open LDI in Consumer Electronics.

3.2.2 Digital Interface Standard/Specification Version/Revision Number – 4 Bytes – Byte #03h to #06h

Address/Offset **03h** to **06h** can be used to define a Version/Release Number (integer and decimal portion) and a Revision Number (integer and decimal portion) or a Letter Designation or a Year Code (yy/mm/dd) for the Digital Interface Standard/ Specification listed in table 3-6. **03h** lists the Type Definition and can be used to indicate the Version/Release Number (integer portion). **04h** can be used to indicate the Version/Release Number (decimal portion), the Letter Designation (using ASCII codes) or the Year. **05h** can be used to indicate the Revision Number (integer portion) or the Month. **06h** can be used to indicate the Revision Number (decimal portion) or the Day. Available selections are listed below in Table 3-7.

Address/Offset Within the extension block	No. of Bytes	Byte No.	Description	Format
03h	**4**	1	**Type Definition** {Bits 7 & 6}	'00' --- Version/Release Number, Letter Designation or Date Code is not specified or Display has an Analog Video Input. **03h, 04h, 05h** and **06h** are set to "00h".
				'01' --- Address/Offset Bytes **03h, 04h, 05h** and **06h** represent a Version/Release Number (integer {**03h**} and decimal {**04h**} portion) and a Revision Number (integer {**05h**} and decimal {**06h**} portion), if appropriate.
				'10' --- Address/Offset Bytes **04h** represents a Letter Designation using ASCII codes. **05h** and **06h** are set to "00h".
				'11' --- Address/Offset Bytes **04h** , **05h** and **06h** represents a Date Code (year, month and day)
			Version/Release Number (Integer Portion) {Bits 5 ⇒ 0}	If bits 7 & 6 (of **03h**) = '00', '10' or '11' then bits 5 ⇒ 0 are set to '000000'. If bits 7 & 6 (of **03h**) = '01' then bits 5 ⇒ 0 represent the Version/Release Number (integer portion). Range is 0 to 63 ("00h" to "3Fh").
04h		2	**Version/Release Number** (Decimal Portion), **Letter Designation or Year Code**	If bits 7 & 6 (of **03h**) = '00' then **04h** is set to "00h". If bits 7 & 6 (of **03h**) = '01' then **04h** represents the Version/Release Number (decimal portion). Range is .0 to .99 ("00h" to "63h"). If bits 7 & 6 (of **03h**) = '10' then **04h** represents the Letter Designation using ASCII codes. (e.g. "41h" is 'A', "42h" is 'B', … etc.) If bits 7 & 6 (of **03h**) = '11' then **04h** represents the Year Code. Year is determined by adding the data at **04h** to the year 1990. Range is 1990 to 2245. (e.g. the year 2001 is "0Bh")
05h		3	**Revision Number** (Integer Portion), **or Month Code**	If bits 7 & 6 (of **03h**) = '00' or '10' then **05h** is set to "00h". If bits 7 & 6 (of **03h**) = '01' then **05h** represents the Revision Number (integer portion). Range is 0 to 255 ("00h" to "FFh"). If bits 7 & 6 (of **03h**) = '11' then **05h** represents the Month Code. Range is 1 to 12 ("01h" to "0Ch")
06h		4	**Revision Number** (Decimal Portion), **or Day Code**	If bits 7 & 6 (of **03h**) = '00' or '10' then **06h** is set to "00h". If bits 7 & 6 (of **03h**) = '01' then **06h** represents the Revision Number (decimal portion). Range is .0 to .99 ("00h" to "63h"). If bits 7 & 6 (of **03h**) = '11' then **06h** represents the Day Code. Range is 1 to 31 ("01h" to "1Fh")

Table 3-7 --- Digital Interface Standard/Specification Version/Revision Number

3.2.3 Digital Interface Data Format Description – 2 Bytes – Bytes #07h to #08h

The "Digital Interface Data Format Description" parameters describe details of the digital video interface standard/specification selected in Table 3-6. Digital interfaces are described using the 2-byte definition shown in Table 3-8.

Address/Offset Within the extension block	**No. of Bytes**	**Byte No.**	**Description**	**Format**
07h	**2**	1	**Digital Interface Data Format Description**	
			Data Enable {Bits 7 & 6}	Bit 7: *Data Enable Signal Usage Available* '0' --- The display is not capable of using the Data Enable Signal '1' --- The display will use the Data Enable Signal, if present Bit 6: *Data Enable Signal High or Low* '0' --- Data enabled when the DE signal is low '1' --- Data enabled when the DE signal is high See NOTE 1:
			Edge of Shift Clock {Bits 5 & 4}	Bits 5 & 4: *Edge of Shift Clock Usage* '00' --- Edge of Shift Clock is not specified '01' --- Display uses rising edge of shift clock '10' --- Display uses falling edge of shift clock '11' --- Display uses both rising and falling edges of the shift clock
			High-bandwidth Digital Content Protection (HDCP™) {Bit 3}	Bit 3: *HDCP Support* '0' --- HDCP is not supported '1' --- HDCP is supported See NOTE 2:
			Double Clocking of Input Data {Bit 2} Note: See Appendix E for definition	Bit 2: *Double Clocking of Input Data* '0' --- Digital Receivers do not support Double Clocking of Input Data '1' --- Digital Receivers support Double Clocking of Input Data
			Packetized Digital Video Support {Bit 1}	Bit 1: *Support for Packetized Digital Video Support* '0' --- Packetized Digital Video is not supported '1' --- Packetized Digital Video is supported See NOTE 3:
			Reserved Bit {Bit 0}	Bit 0: '0' --- Undefined (Reserved) Do Not Use
08h		2	**Digital Interface --- Standard Data Formats** {Bits 7 ⇒ 0}	"00h" --- Display has an Analog Video Input "15h" --- 8-Bit Over 8-Bit RGB "19h" --- 12-Bit Over 12-Bit RGB "24h" --- 24-Bit MSB-Aligned RGB {Single Link} "48h" --- 48-Bit MSB-Aligned RGB {Dual Link --- Hi-Resolution} "49h" --- 48-Bit MSB-Aligned RGB {Dual Link --- Hi-Color} All other hex codes are Undefined (Reserved) Do Not Use See NOTE 4:

Table 3-8 --- Digital Interface Data Format Description

Notes:
1. If bit 7 is '0', then bit 6 shall be ignored (set to '0').
2. For more information on "High-bandwidth Digital Content Protection" (HDCP) go to www.digital-cp.com.
3. Refer to Section 3.4.7, Table 3-24 for more information on packetized digital video. Packetized digital video will be defined in a future specification/standard.
4. For Pixel Data Mapping Codes (Formats "15h", "19h", "24h", "48h" & "49h"), refer to Appendix A of this document.

3.2.4 Min., Max. & Crossover Pixel Clock Frequency Per Link - 5 Bytes – Bytes #09h to #0Dh

This section indicates the minimum pixel clock frequency (PCF) per link, the maximum PCF per link and the crossover PCF supported by the display’s/monitor’s digital video input circuitry. Available selections are listed in Table 3-9.

<table>
<tr><th>Address/Offset
Within the
extension block</th><th>No.
of
Bytes</th><th>Byte
No.</th><th>Description</th><th>Format</th></tr>
<tr><td rowspan="2">09h</td><td rowspan="6">5</td><td rowspan="2">1</td><td rowspan="2">Minimum Pixel Clock Frequency Per Link
“01h” ⇒ “FEh”</td><td></td></tr>
<tr><td>“00h” --- Display has an Analog Video Input
“aah” = Min-PCF (Range is 1 MHz to 254 MHz)
“FFh” --- Reserved (Do Not Use)</td></tr>
<tr><td rowspan="2">0Ah & 0Bh</td><td rowspan="2">2 & 3</td><td rowspan="2">Maximum Pixel Clock Frequency Per Link
“0001h” ⇒ “FFFEh”</td><td>See NOTE 1:
See NOTE 3:</td></tr>
<tr><td>“0000h” --- Display has an Analog Video Input
“bbbbh” = Max-PCF (Range is 1 MHz to 65,534 MHz)
“FFFFh” --- Reserved (Do Not Use)</td></tr>
<tr><td rowspan="2">0Ch & 0Dh</td><td rowspan="2">4 & 5</td><td rowspan="2">Crossover Frequency
“0001h” ⇒ “FFFEh”</td><td>See NOTE 2:
See NOTE 3:</td></tr>
<tr><td>“0000h” --- Display has an Analog Video Input
“cccch” = PCF @ Crossover (Range is 1 MHz to 65,534 MHz)
“FFFFh” --- Single Link – No Crossover Frequency</td></tr>
</table>

Table 3-9 --- Minimum PCF Per Link, Maximum PCF Per Link & Crossover PCF

NOTES:
1. The Maximum Pixel Clock Frequency (PCF) must never be less than the Minimum Pixel Clock Frequency.
2. The Crossover Frequency is the PCF where the Digital Interface switches from a Single Link to a Dual Link system. At the writing of this document, the Crossover Frequency is 165 MHz for DVI-Compatible Displays. This value is subject to change in the future. Refer to the latest version of the Digital Visual Interface (DVI) Specification for more information.
3. Addresses/Offsets **‘0Ah’** & **‘0Ch’** contain the Least Significant Byte (LSB) Data. Addresses/Offsets **‘0Bh’** & **‘0Dh’** contain the Most Significant Byte (MSB) Data.

3.3 Display Device - 6 Bytes – Bytes # 0Eh to # 13h - (Monitors with analog and/or digital video interface/s)

The “Display Device” parameters provide information related to the technology of the physical display device (CRT, LCD, Plasma, etc.). The ordering and size of the parameters are shown in Table 3-10.

6	Bytes	Sub-Section	Location
	3	Sub-Pixel Layout & Shape	See Section 3.3.1
	2	Dot/Pixel Pitch	See Section 3.3.2
	1	Major display characteristics	See Section 3.3.3

Table 3-10 --- Display Device

3.3.1 Sub-Pixel Layout, Configuration and Shape – 3 Bytes – Bytes # 0Eh to # 10h

The "Sub-Pixel Layout, Configuration and Shape" field is used to indicate the physical layout, configuration and shape of the sub-pixels used in the display technology. The physical layout of the sub-pixel elements is defined along the major (long) axis of the screen from left to right starting at the zero, zero pixel location. Refer to Appendix C for illustrations. Available selections are listed below in Table 3-11.

Address/Offset Within the extension block	**No. of Bytes**	**Byte No.**	**Description**	**Format**
0Eh	**3**	1	**Sub-Pixel Layout**	
				"00h" = Sub-Pixel Layout is not defined "01h" = RGB "02h" = BGR "03h" = Quad Pixel (a 2x2 sub-pixel arrangement of R, B + 2G) --- G at bottom left & top right "04h" = Quad Pixel (a 2x2 sub-pixel arrangement of R, B + 2G) --- G at bottom right & top left "05h" ⇒ FFh = Reserved (Do Not Use)
0Fh		2	**Sub-Pixel Configuration**	
				"00h" = Sub-pixel Configuration is not defined "01h" = Delta (Tri-ad) "02h" = Stripe "03h" = Stripe Offset "04h" = Quad Pixel --- 4 sub-pixels per displayed pixel "05h" ⇒ "FFh" = Reserved (Do Not Use)
10h		3	**Sub-Pixel Shape**	
				"00h" = Sub-pixel Shape is not defined "01h" = round "02h" = square "03h" = rectangular "04h" = oval "05h" = elliptical "06h" ⇒ "FFh" = Reserved (Do Not Use)

Table 3-11 --- Sub-Pixel Layout, Configuration & Shape

NOTE: For CRT (and some microdisplay devices) based displays, the term Sub-Pixel Layout has no meaning and must be set to '00h'. The monitor designer can still define Sub-Pixel Configuration and Shape for a CRT monitor/display.

3.3.2 Dot/Pixel Pitch – 2 Bytes – Bytes # 11h to # 12h

The dot/pixel pitch, shown in Table 3-12, is given in horizontal and vertical components. The value stored is equal to the actual pitch value in mm multiplied by one hundred. For example, the value 31 (decimal) or "1F" (hexadecimal) represents a dot pitch of 0.31mm. The Horizontal Dot/Pixel Pitch (HPP) is measured on the horizontal axis and the Vertical Dot/Pixel Pitch (VPP) is measured on the vertical axis in a fixed landscape display or a fixed portrait display. For displays that pivot, use the default screen orientation as defined by the manufacturer. The default screen orientation can be determined from the Horizontal & Vertical Image Size which is defined in the "Basic Display Properties and Features" (Section 3.6, Page 12) of the VESA E-EDID Standard, Release A, Rev. 1.

Address/Offset Within the extension block	**No. of Bytes**	**Byte No.**	**Description**	**Format**
11h	**2**	1	**HPP**	"00h" = Pitch is not defined (e.g. Projectors, etc.) or HPP is zero (e.g. portrait aperture grill CRT) "xxh" = HPP in mm * 100 (Range "01h" ⇒ "FFh")
12h		2	**VPP**	"00h" = Pitch is not defined (e.g. Projectors, etc.) or VPP is zero (e.g. landscape aperture grill CRT) "yyh" = VPP in mm * 100 (Range "01h" ⇒ "FFh")

Table 3-12 --- Dot/Pixel Pitch

NOTES:
1. If H & V Dot/Pixel Pitches are not defined (for example, standalone projectors) then set "xxh" and "yyh" to "00h".
2. The pitch specified in these bytes is that of the visible screen structure, i.e. for CRTs, the phosphor or filter dot pitch, as opposed to the shadow mask pitch or other such measurement.
3. Display devices that use continuous 'stripes' or similar phosphor or filter patterns should indicate this by setting the appropriate byte to "00h". For example, the typical aperture-grille (landscape) tube would specify a vertical pitch of zero in this section and the typical aperture-grille (portrait) tube would specify a horizontal pitch of zero in this section.
4. Displays that do not use a discrete dot structure in their screens, such as a monochrome CRT, shall set both bytes to "00h".
5. For displays that have variable pitch screen structures, use an average value for HPP and VPP.
6. The Dot/Pixel Pitch shall be rounded to the nearest 0.01mm.

3.3.3 Major Display Device Characteristics – 1 Byte – Byte # 13h

The major characteristics of the display device are described in a 1-byte field as defined in Table 3-13.

Address/Offset Within the extension block	**No. of Bytes**	**Byte No.**	**Description**	**Format**
13h	**1**	1	**Fixed Pixel Format** {Bit 7}	Bit 7: *Fixed Pixel Format* ’0’ --- Display Device does not have a Fixed Pixel Format (e.g. CRT, etc.) ’1’ --- Display Device has a Fixed Pixel Format (e.g. LCD, PDP, etc.)
			View Direction {Bits 6 & 5}	Bits 6 & 5: *View Direction* ’00’ --- View Direction is not specified ’01’ --- Direct View (e.g. CRT, rear projection, etc.) ’10’ --- Reflected View (e.g. front projection, etc.) ’11’ --- Direct & Reflected View (e.g. some projectors, etc.)
			Display Background {Bit 4}	Bit 5: *Display Background* ’0’ --- Display Device uses non-transparent background ’1’ --- Display Device uses transparent background See NOTE 1:
			Physical Implementation {Bits 3 & 2}	Bits 4 & 3: *Physical Implementation* ’00’ --- Physical Implementation is not specified ’01’ --- Large Image device for group viewing ’10’ --- Desktop or personal display ’11’ --- Eyepiece type personal display
			DDC/CI {Bit 1}	Bit 2: *DDC/CI* '0' --- Monitor/display does not support DDC/CI '1' --- Monitor/display does support DDC/CI See NOTE 2:
			Reserved Bit {Bit 0}	Bits 0: Reserved Bit ’0’ --- Reserved (Do Not Use) - Must be set to '0'

Table 3-13 --- Major Display Device Characteristics

NOTES:
1. When Bit 4 (Byte **13h**) is set to ‘1’, areas of the display that are not active allow the user to see through the display (e.g. some head-mounted displays).
2. If the monitor/display supports DDC/CI then VESA MCCS must be used for the command and control instructions.

3.4 Display Capabilities & Feature Support Set - 35 Bytes – Bytes # 14h to # 36h - (Monitors with analog and/or digital video interface/s)

The "Display Capabilities & Feature Support Set" parameters describe the additional features that the display supports or that are located within the display device. Forty-four bytes are used to describe the features of the display. The definitions of these bytes are shown below in Tables 3-15 through 3-24. Some of these features directly relate to the display of video. Others features may not be related to the display of video but instead are additional devices connected to or located in the same housing as the display device. The "Display Capabilities & Feature Support Set" (section 3.4) section has been partitioned into sub-sections. The order, titles, sizes and locations of these sub-sections are shown below in Table 3-14.

35	Bytes	Sub-Section	Location
	1	Miscellaneous Display Capabilities	See Section 3.4.1
	5	Frame Rate Conversion	See Section 3.4.2
	1	Display/Scan Orientation	See Section 3.4.3
	4	Color/Luminance Decoding Description	See Section 3.4.4
	7	Monitor Color Depth	See Section 3.4.5
	1	Aspect Ratio Conversion Modes	See Section 3.4.6
	16	Packetized Digital Video Support Information	See Section 3.4.7

Table 3-14 --- Display Capabilities & Feature Support Set

3.4.1 Miscellaneous Display Capabilities – 1 Byte – Byte #14h

Table 3-15 lists the definitions for the following Miscellaneous Display Capabilities: Legacy Modes, Stereo Video, Scaler on Board, Image Centering, Conditional Updates and Interlaced Video.

Address/Offset Within the extension block	**No. of Bytes**	**Byte No.**	**Description**	**Format**
14h	**1**	1	**Legacy Modes** {Bit 7}	Bit 7: *Legacy Modes* '0' --- All VGA/DOS Legacy Timing Modes are not supported '1' --- All VGA/DOS Legacy Timing Modes are supported See NOTE 1:
			Stereo Video {Bits 6 ⇒ 4}	Bits 6 ⇒ 4: *Stereo Video* '000' --- No direct stereo '001' --- Field seq. stereo via stereo sync signal '010' --- auto-stereoscopic, column interleave '011' --- auto-stereoscopic, line interleave '100' ⇒ '111' --- Reserved (Do Not Use)
			Scaler On Board {Bit 3}	Bit 3: *Scaler On Board* '0' --- Scaler is not on board the display '1' --- Scaler is on board the display See NOTE 2:
			Image Centering {Bit 2}	Bit 2: *Image Centering* '0' --- Image Centering is not available '1' --- Image Centering is available
			Conditional Update {Bit 1}	Bit 1: *Conditional Update* '0' --- Display does not support Conditional Updates. '1' --- Display need only be updated if the image changes.
			Interlaced Video {Bit 0}	Bit 0: *Interlaced Video* '0' --- Only non-interlaced video is supported '1' --- Both interlaced and non-interlaced video are supported

Table 3-15 --- Miscellaneous Display Capabilities

NOTES

1. Refer to Appendix B for a listing of the VGA/DOS Legacy Modes. Support for these modes means that a legible image is displayed on the screen. The image can be full screen (scaled), centered or cornered.
2. If Bit 3 (in Table 3-15) is '1', then any available Host Scaler shall be shut off, or the user shall be given the option to select between the Host Scaler and the Display Scaler.

3.4.2 Frame Rate Conversion – 5 Bytes – Bytes #15h to #19h

Table 3-16 list the definitions (Addresses **15h** => **19h**) for Frame Lock and Frame Rate Conversion.

Address/Offset Within the extension block	**No. of Bytes**	**Byte No.**	**Description**	**Format**
15h	**5**	1	**Frame Lock** {Bit 7}	Bit 7: *Frame Lock* --- See NOTE 1: '0' --- Display does not support Frame Lock '1' --- Display supports Frame Lock
			Frame Rate Conversion Capabilities {Bits 6 & 5}	Bits 6 & 5 : *Frame Rate Conversion* '00' --- Frame Rate Conversion is not supported. '01' --- Vertical is converted to a single frequency. '10' --- Horizontal is converted to a single frequency. '11' --- Both Vertical & Horizontal are converted to single frequencies.
			Reserved Bits {Bits 4 ⇒ 0}	Bits 4 ⇒ 0: *Reserved Bits* '00000' --- Undefined (Reserved) Must be set to '00000'
16h & 17h		2, 3	**Vertical Frequency** "0001h" ⇒ "FFFEh"	See NOTE 2: (Vertical is stored as "frequency x 100") "0000h" --- Vertical Conversion is not available "xxxxh" --- Conversion to Vertical Frequency (Range is 0.01Hz to 655.34 Hz) "FFFFh" --- Reserved (Do Not Use)
18h & 19h		4, 5	**Horizontal Frequency** "0001h" ⇒ "FFFEh"	See NOTE 2: (Horizontal is stored as "frequency x 100") "0000h" --- Horizontal Conversion is not available "xxxxh" --- Conversion to Horizontal Frequency (Range is 0.01kHz to 655.34 kHz) "FFFFh" --- Reserved (Do Not Use)

Table 3-16 --- Frame Rate Conversion

NOTES
1. For a definition of 'Frame Lock', refer to Appendix E - Glossary.
2. Addresses/Offsets **'16h'** & **'18h'** contain the Least Significant Byte (LSB) data. Addresses/Offsets **'17h'** & **'19h'** contain the Most Significant Byte (MSB) data.
3. Certain types of displays (e.g. LCDs) have a native mode (or fixed format). For monitors that have a scaler on board, the monitor designer can use the "Frame Rate Conversion" information in Table 3-16 to define the output Horizontal and Vertical Frequencies from the scaler.

3.4.3 Display/Scan Orientation – 1 Byte – Byte #1Ah

Table 3-17 (Address Byte **1Ah**) defines a method of describing the orientation and scan direction of a display screen. The purpose of this section is to allow the host to automatically (or by manual selection) switch the order of the video output data such that the displayed image is always in the correct orientation. There are 16 possible combinations of display screen/scan orientations. The Screen Orientation, the Zero Pixel Location and the Scan Direction define these combinations. The Current (or Default) Screen Orientation may be defined for a Variable Screen Orientation (screen pivots or rotates) Display or for a Fixed Screen Orientation (screen does not rotate) Display.

For a Variable Screen Orientation (screen pivots or rotates) Display, only the Current (or Default) Screen Orientation can be defined. The Screen Orientation Capabilities cannot be listed. This type of definition assumes that the user will manually select the order of the video output data from the host. For a display that pivots, only the Default Mode can be defined in a single EDID/DI-EXT Table. The default screen orientation can be determined from the Horizontal & Vertical Image Size which is defined in the "Basic Display Properties and Features" (Section 3.6) of the VESA E-EDID Standard., Release A, Revision 1.

For a Fixed Screen Orientation Display, these definitions apply to the Native Screen Orientation. They can be Landscape, (the minor {short screen} axis is on the vertical axis and the major {long screen} axis is on the horizontal axis), or Portrait (the minor {short screen} axis is on the horizontal axis and the major {long screen} axis is on the vertical axis).

Refer to Appendix C for illustrations of Landscape and Portrait displays.

Address/Offset Within the extension block	**No. of Bytes**	**Byte No.**	**Description**	**Format**
1Ah	**1**	1	**Display/Scan Orientation Definition Type** {Bits 7 & 6}	Bits 7 & 6: *Display/Scan Orientation Definition Type* '00' --- Display/Scan Orientation is not defined (ignore remaining bits in Byte **1Ah**) '01' --- Display has a Fixed Orientation (does not rotate). '10' --- Display/Scan Orientation (Default Orientation) is defined for a display that is capable of rotation (pivots). The definition of all possible states is not known. A Single EDID Extension Table can be used '11' --- Display/Scan Orientation (Current Orientation) is defined for a display that rotates (pivots). Multiple EDID Extension Tables are required (one for each orientation) See NOTE 1:
			Screen Orientation {Bit 5}	Bit 5: *Screen Orientation (Default or Current Orientation)* '0' --- Screen Orientation is Landscape (Major {Long} Axis is on the horizontal) '1' --- Screen Orientation is Portrait (Major {Long} Axis is on the vertical)
			Zero Pixel Location {Bits 4 & 3}	Bits 4 & 3: --- *Zero Pixel Location* '00' --- Zero (0,0) Pixel Location is the Upper Left Hand Corner of the screen '01' --- Zero (0,0) Pixel Location is the Upper Right Hand Corner of the screen '10' --- Zero (0,0) Pixel Location is the Lower Left Hand Corner of the screen '11' --- Zero (0,0) Pixel Location is the Lower Right Hand Corner of the screen
			Scan Direction {Bits 2 & 1}	Bits 2 & 1: --- *Scan Direction (Default or Current Mode)* '00' --- Scan Direction is not defined. '01' --- Fast Scan is on the Major (Long) Axis and Slow Scan is on the Minor (Short) Axis '10' --- Fast Scan is on the Minor (Short) Axis and Slow Scan is on the Major (Long) Axis '11' --- Undefined (Reserved) See NOTES 2 & 3:
			Standalone Projector {Bit 0}	Bit 0: --- *Standalone Projector* '0' --- Display is not a Standalone Projector '1' --- Display is a Standalone Projector

Table 3-17 --- Display/Scan Orientation

NOTES:
1. In Table 3-17, you can define "current orientation" or "default orientation" for a display that pivots (screen rotates). If you define "current orientation", you will need to use 2 or more separate EDID/DI-EXT Tables. If you define "default orientation", you can use a single EDID/DI-EXT Tables. The "default orientation" definition means that the display is capable of rotating, however, you cannot define the Screen Orientation Capabilities.
2. For flat panel displays, "Scan Direction" should be interpreted to indicate the axis that will be updated the fastest, usually the axis where the data is written as an entire line.
3. For certain types of micro-display devices where the entire frame is updated at the same time, then "Scan Direction" has no meaning and bits 2 & 1 of Byte Address/Offset **1Ah** must be set to '00'.

3.4.4 Color/Luminance Decoding Description – 4 Bytes – Bytes #1Bh to #1Eh

Section 3.4.4 defines the Default Color/Luminance Decoding, the Preferred Color/Luminance Decoding and the Color/Luminance Decoding Capabilities for the Primary Video Interface Connector (See Section 1.1) of the monitor/display. Color/Luminance Decoding is also known as "Color Space". The Default Color/Luminance Decoding occurs during startup of the system. The Default Color/Luminance Decoding for the video interface is described in the 1-byte field shown in Table 3-18. One decoding method must be defined.

Address/Offset Within the extension block	**No. of Bytes**	**Byte No.**	**Description**	**Format**
1Bh	**1**	1	**Default Color/Luminance Decoding**	"00h" = Default Color/Luminance Decoding is not defined. "01h" = BGR (additive color) "02h" = Y/C (S-Video) NTSC color (luminance/chrominance on separate channels) per ITU-R BT.470-6 (SMPTE 170M) "03h" = Y/C (S-Video) PAL color (luminance/chrominance on separate channels) per ITU-R BT.470-6 "04h" = Y/C (S-Video) SECAM color (luminance/ chrominance on separate channels) per ITU-R BT.470-6 "05h" = YCrCb per SMPTE 293M, SMPTE 294M (4:4:4) "06h" = YCrCb per SMPTE 293M, SMPTE 294M (4:2:2) "07h" = YCrCb per SMPTE 293M, SMPTE 294M (4:2:0) "08h" = YCrCb per SMPTE 260M (Legacy HDTV) "09h" = YPbPr per SMPTE 240M (Legacy HDTV) "0Ah" = YCrCb per SMPTE 274M (Modern HDTV) "0Bh" = YPbPr per SMPTE 274M (Modern HDTV) "0Ch" = Y B-Y R-Y BetaCam (Sony) "0Dh" = Y B-Y R-Y M-2 (Matsushita) "0Eh" = Monochrome "0Fh" ⇒ "FFh" are Reserved (Do Not Use)

Table 3-18 --- Default Color/Luminance Decoding Description

In some systems, the host may switch from the Default Color/Luminance Encoding (at startup) to the Preferred Color/Luminance Encoding (during normal operation). The Preferred Color/Luminance Decoding for the Primary Video Interface Connector is described in the 1-byte field shown in Table 3-19. Only one preferred decoding method must be defined. In the case where the display does not support multiple color/luminance decoding, then the Preferred Color/Luminance Decoding must be set to "00h".

Address/Offset Within the extension block	**No. of Bytes**	**Byte No.**	**Description**	**Format**
1Ch	**1**	1	**Preferred Color/Luminance Decoding**	"00h" = The display/monitor only supports the Default Color/Luminance Decoding (see Table 3-18) "01h" = BGR (additive color) "02h" = Y/C (S-Video) xxxxx color, See NOTE 1: "03h" = Yxx (SMPTE 2xxM), Color Difference (Component Video) See NOTE 2: "04h" = Monochrome "05h" ⇒ "FFh" are Reserved (Do Not Use)

Table 3-19 --- Preferred Color/Luminance Decoding Description

NOTES:
1. "Y/C (S-Video) xxxxx color" is defined in Table 3-20 - Color/Luminance Decoding Capabilities Description.
2. "Yxx (SMPTE 2xxM)" is defined in Table 3-20 - Color/Luminance Decoding Capabilities Description.

Address/Offset Within the extension block	**No. of Bytes**	**Byte No.**	**Description**	**Format**
1Dh	**2**	1	**Color/Luminance Decoding Capabilities** (Part 1) {Bits 7 $\Rightarrow$ 0}	Bit 7: = BGR (additive color) Bit 6: = Y/C (S-Video) NTSC color (luminance/ chrominance on separate channels) per ITU-R BT.470-6 (SMPTE 170M) Bit 5: = Y/C (S-Video) PAL color (luminance/chrominance on separate channels) per ITU-R BT.470-6 Bit 4: = Y/C (S-Video) SECAM color (luminance/ chrominance on separate channels) per ITU-R BT.470-6 Bit 3: = YCrCb per SMPTE 293M, SMPTE 294M (4:4:4) Bit 2: = YCrCb per SMPTE 293M, SMPTE 294M (4:2:2) Bit 1: = YCrCb per SMPTE 293M, SMPTE 294M (4:2:0) Bit 0: = YCrCb per SMPTE 260M (Legacy HDTV)
1Eh		2	**Color/Luminance Decoding Capabilities** (Part 2) {Bits 7 $\Rightarrow$ 0}	Bit 7: = YPbPr per SMPTE 240M (Legacy HDTV) Bit 6: = YCrCb per SMPTE 274M (Modern HDTV) Bit 5: = YPbPr per SMPTE 274M (Modern HDTV) Bit 4: = Y B-Y R-Y BetaCam (Sony) Bit 3: = Y B-Y R-Y M-2 (Matsushita) Bit 2: = Monochrome Bits 1 & 0: = Undefined (Reserved) Must be set to '0' See NOTES 1 and 2:

Table 3-20 --- Color/Luminance Decoding Capabilities Description

NOTES:

1. The Color/Luminance Decoding Capabilities for the monitor/display are defined by setting the appropriate bit/s (at Address/Offset Bytes **1Dh** and **1Eh**) to '1'.
2. In the case where the decoding capabilities are not defined, then the Color/Luminance Decoding Capabilities (at Address/Offset Bytes **1Dh** and **1Eh**) must be set to "00h".

3.4.5 Monitor Color Depth – 7 Bytes – Bytes #1Fh to #25h

Table 3-21 lists the definitions for Dithering, Monitor Color Depth for a BGR Video Input and Monitor Color Depth for a YCrCb or YPbPr Video Input.

Address/Offset Within the extension block	**No. of Bytes**	**Byte No.**	**Description**	**Format**
1Fh	**7**	1	**Dithering** {Bit 7}	Bit 7: *Dithering* '0' --- Display does not use Dithering '1' --- Display uses Dithering See NOTE 1.
			Reserved {Bits 6 ⇒ 0}	Bits 6 ⇒ 0: *Reserved Bit* '0' --- Undefined (Reserved) Must be set to '0' - do not use
			Monitor Color Depth for BGR Input	
20h		2	Supported Color Bit-Depth of Sub-Channel 0 ("Blue"), {Bits 7-0}	"00h" --- Indicates no Color Depth information for sub-channel 0. "01h" ⇒ "10h" --- Bits per color (1-16) "11h" ⇒ "FFh" --- Reserved (Do Not Use)
21h		3	Supported Color Bit-Depth of Sub-Channel 1 ("Green"), {Bits 7-0}	"00h" --- Indicates no Color Depth information for sub-channel 1. "01h" ⇒ "10h" --- Bits per color (1-16) "11h" ⇒ "FFh" --- Reserved (Do Not Use)
22h		4	Supported Color Bit-Depth of Sub-Channel 2 ("Red"), {Bits 7-0}	"00h" --- Indicates no Color Depth information for sub-channel 2. "01h" ⇒ "10h" --- Bits per color (1-16) "11h" ⇒ "FFh" --- Reserved (Do Not Use)
			Monitor Color Depth For YCrCb or YPbPr	See NOTE 2.
23h		5	Supported Color Bit-Depth of Sub-Channel 0 ("Cb/Pb"), {Bits 7-0}	"00h" --- Indicates no Color Depth information for sub-channel 0. "01h" ⇒ "10h" --- Bits per color (1-16) "11h" ⇒ "FFh" --- Reserved (Do Not Use)
24h		6	Supported Color Bit-Depth of Sub-Channel 1 ("Y"), {Bits 7-0}	"00h" --- Indicates no Color Depth information for sub-channel 1. "01h" ⇒ "10h" --- Bits per color (1-16) "11h" ⇒ "FFh" --- Reserved (Do Not Use)
25h		7	Supported Color Bit-Depth of Sub-Channel 2 ("Cr/Pr"), {Bits 7-0}	"00h" --- Indicates no Color Depth information for sub-channel 2. "01h" ⇒ "10h" --- Bits per color (1-16) "11h" ⇒ "FFh" --- Reserved (Do Not Use)

Table 3-21 --- Monitor Color Depth

NOTES:
1. The type of dithering is not defined.
2. Some displays/monitors may support both BGR and YCrCb (or YPbPr) Color Spaces but supporting different Color Depths.

3.4.6 Aspect Ratio Conversion Modes – 1 Byte – Byte #26h

3.4.6.1 Aspect Ratio Conversion Modes - Definitions & Data Structures

Some types of monitors/displays are capable of Aspect Ratio Conversion. These monitors/displays convert the aspect ratio of the incoming video signal to the aspect ratio of the display device (CRT, LCD, Plasma, etc.). The conversion process may expand (stretch) or compress (shrink) the displayed horizontal video data and/or the displayed vertical video data. Most flat panel displays, most microdisplay-based projectors and some CRT-based projectors do the Aspect Ratio Conversion by using scaling and filtering techniques. Most CRT based monitors/displays do the Aspect Ratio Conversion by changing the horizontal and/or vertical size of the raster. **Full Mode, Zoom Mode, Squeeze** (Sidebars/Letterbox) **Mode** and **Variable** (Expand/Shrink) **Mode** are the 4 Aspect Ratio Conversion Modes defined in this section.

The **Full Mode** does a linear expansion (stretch) or linear compression (shrink) of the displayed image on the horizontal axis. The vertical axis of the displayed image is unchanged.

The **Zoom Mode** does a linear expansion (stretch) or linear compression (shrink) of the displayed image on both the horizontal axis and the vertical axis.

The **Squeeze Mode** will display all of the active video contained in the Input Video Signal. The unused portions of the screen image are filled in with black (or gray) bars. In one case, the bars are called sidebars/pillars (vertical bars on the left and right side of the displayed image). In the other case, the bars are called letterbox (horizontal bars at the top and bottom of the displayed image). In some cases, the active video area may not be centered on the display screen.

The **Variable Mode** will display all of the active video contained in the Input Video Signal using non-linear expansion (stretching) or non-linear compression (shrinking) of the displayed image on the horizontal axis. The Aspect Ratio of the center of the displayed image's content is not distorted. However, the Aspect Ratio of the left side and right side portions of the displayed image content is distorted.

Table 3-22 lists the Aspect Ratio Conversion Modes that are supported by the monitor/display.

Address/Offset Within the extension block	**No. of Bytes**	**Byte No.**	**Description**	**Format**
26h		1	**Aspect Ratio Conversion Modes**	Bit 7: = "Full Mode" is supported in the display. Bit 6: = "Zoom Mode" is supported in the display. Bit 5: = "Squeeze (Side Bars/Letterbox) Mode" is supported in the display. Bit 4: = "Variable (Expand/Shrink) Mode" is supported in the display. Bits 3 ⇒ 0 = Reserved (Must be set to '0') - Do not use See NOTE 1 & 2:

Table 3-22 --- Aspect Ratio Conversion Modes

NOTES:

1. If the monitor/display does not support Aspect Ratio Conversion, then **Address/Offset Byte #26h** must be set to "00h".
2. The monitor/display supported Aspect Ratio Conversion Modes are defined by setting the appropriate bit/s (at Address/Offset Byte #**26h**) to ‘1’.

3.4.6.2 Aspect Ratio Conversion Modes - Examples (General Cases & Special Cases)

This section contains Definitions and Examples (General Cases & Special Cases) of the Aspect Ratio Conversion Modes. These examples (cases) are for 4x3 and 16x9 input video signals and display devices.
Note that in the following examples, 4x3 aspect ratio is used to indicate "Standard Screen Modes", which includes 4x3 and 5x4. 16x9 aspect ratio is used to indicate "Wide Screen Modes", which includes 16x9, 14x9, 16x10 and 16x10.24. When dealing with screen aspect ratios other than 4x3 and 16x9, care must be taken to maintain the correct aspect ratio of the displayed image. Refer to Appendix C (Figure 6-2) for more information on Aspect Ratio Conversion.
In Table 3-23, the following are definitions for the three possible General Cases:
Case 1: = The Aspect Ratio of the input video signal (4x3 or 16x9) is the same as the Aspect Ratio of the display device (4x3 or 16x9).
Case 2: = The Aspect Ratio of the input video signal (4x3) is smaller than the aspect ratio of the display device (16x9).
Case 3: = The Aspect Ratio of the input video signal (16x9) is larger than the aspect ratio of the display device (4x3).
Some Special Cases are also listed in Table 3-23.

<table>
<tr><th>Aspect Ratio Conversion Mode</th><th>Definition</th></tr>
<tr><td rowspan="4">Full Mode</td><td>The Full Mode does a linear expansion (stretch) or linear compression (shrink) of the displayed image on the horizontal axis. The vertical axis of the displayed image is unchanged. The Full Mode can do 3 conversions.</td></tr>
<tr><td><u>Case 1</u>: There is no Aspect Ratio Conversion in the monitor/display. The input video signal (all of the active video) is displayed on the monitor's screen and there is no distortion of the displayed image's aspect ratio. Use the Full Mode. See the Special Case listed below.</td></tr>
<tr><td><u>Case 2</u>: The Full Mode will do a linear stretch (expand) of the input video signal (4x3) on the horizontal axis. The vertical axis of the displayed image (16x9) is unchanged. The Aspect Ratio of the displayed image's content is distorted. The image content is displayed wide and short. In Case 2, the use of Full Mode is not recommended.</td></tr>
<tr><td><u>Case 3</u>: The Full Mode will do compression (shrink) of the input video signal (16x9) on the horizontal axis. The vertical axis of the displayed image (4x3) is unchanged. The Aspect Ratio of the displayed image's content is distorted. The image content is displayed narrow and tall. In Case 3, the use of Full Mode is not recommended.</td></tr>
<tr><td rowspan="5">Zoom Mode</td><td>The Zoom Mode does a linear expansion (stretch) or linear compression (shrink) of the displayed image on both the horizontal axis and the vertical axis. There are 3 cases for the Zoom Mode.</td></tr>
<tr><td><u>Case 1</u>: For Case 1, the Zoom Mode is not recommended. There is no Aspect Ratio Conversion in the monitor/display. Use the Full Mode. See the Special Case listed below.</td></tr>
<tr><td><u>Case 2</u>: The Zoom Mode will do a linear stretch (expand) of the input video signal (4x3) on both the horizontal axis and the vertical axis. All of the horizontal video information is displayed (16x9). Some of the vertical video information (near the top and bottom) is lost (overscanned, cropped). The Aspect Ratio of the displayed image's content is not distorted.</td></tr>
<tr><td><u>Case 3</u>: The Zoom Mode will do a linear stretch (expand) of the input video signal on both the horizontal axis and the vertical axis. The monitor/display will zoom in on the center of the input video signal (16x9) and will display (4x3) all of the vertical video information. Some of the horizontal video information (near the left and right edges) is lost (overscanned, cropped). The Aspect Ratio of the displayed image's content is not distorted.</td></tr>
<tr><td>NOTE: Some monitors/displays may support more than one Zoom Mode. The difference between these multiple Zoom Modes is determined by the amount of stretching (expansion).</td></tr>
</table>

Table 3-23 --- Aspect Ratio Conversion Modes Definitions

Aspect Ratio Conversion Mode	Definition
Squeeze Mode (Side Bars/Letterbox)	The Squeeze Mode will display all of the active video contained in the input video signal. The unused portions of the screen image are filled in with black (or gray) bars. In one case, the bars are called sidebars (pillars). In another case, the bars are called letterbox (horizontal bars at the top and bottom of the displayed image). In some cases, the active video area may not be centered on the display screen. There are 3 cases for the Squeeze Mode.
	Case 1: For Case 1, the Squeeze Mode is not recommended. There is no Aspect Ratio Conversion in the monitor/display. Use the Full Mode. See the Special Case listed below.
	Case 2: The Squeeze Mode will place all of the input video image (4x3) into the center of the 16x9 display device. Unused portions of the display screen (left & right side) will be filled in with black (or gray) sidebars (pillars). The Aspect Ratio of the displayed image's content is not distorted.
	Case 3: The Squeeze Mode will place all of the input video image (16x9) into the center of the 4x3 display device. Unused portions of the display screen (top & bottom) will be filled in with black (or gray). This is called "Letterbox". The Aspect Ratio of the displayed image's content is not distorted.
Variable Mode (Expand/Shrink) Mode	The Variable Mode will display all of the active video contained in the input video signal using non-linear expansion (stretching) or non-linear compression (shrinking) of the displayed image on the horizontal axis. The Aspect Ratio of the center of the displayed image's content is not distorted. However, the Aspect Ratio of the left side and right side portions of the displayed image content is distorted. There are 3 cases for the Squeeze Mode.
	Case 1: For Case 1, the Variable Mode is not recommended. There is no Aspect Ratio Conversion in the monitor/display. Use the Full Mode. See the Special Case listed below.
	Case 2: The Variable Mode will do a non-linear stretch (expansion) of the displayed image (displays a 4x3 input onto a 16x9 screen) on the horizontal axis. The vertical axis of the displayed image is unchanged. The Aspect Ratio of the center of the displayed image's content is not distorted. The Aspect Ratio of the left side and right side portions of the displayed image content is distorted. These areas are stretched. The image content is displayed wide and short on the left side and right side portions of the display screen.
	Case 3: The Variable Mode will do a non-linear compression (shrinking) of the displayed image (displays a 16x9 input onto a 4x3 screen) on the horizontal axis. The vertical axis of the displayed image is unchanged. The Aspect Ratio of the center of the displayed image's content is not distorted. The Aspect Ratio of the left side and right side portions of the displayed image content is distorted. These areas are shrunk. The image content is displayed narrow and tall on the left side and right side portions of the display screen.
Special Cases	
Anamorphic Video {Special Case 1}	Anamorphic Video is a 16x9 video content compressed (horizontal) into a 4x3 video input signal. Use the Full Mode to expand (horizontal) the video input signal to fill a 16x9 display device. The displayed image content will be full screen with the correct Aspect Ratio. For a 4x3 display device, Anamorphic Video should be displayed using the Variable (Shrink) Mode. The Aspect Ratio of the center of the displayed image's content is not distorted. The Aspect Ratio of the left side and right side portions of the displayed image content is distorted. These areas are shrunk. The image content is displayed narrow and tall on the left side and right side portions of the display screen.

Table 3-23 --- Aspect Ratio Conversion Modes Definitions (Continued)

Aspect Ratio Conversion Mode	Definition
Special Cases (Continued)	
Letterbox Video {Special Case 2}	Some 4x3 video input signals may contain 16x9 video content in a letterbox format (horizontal black {or gray} bars at the top and bottom of the 4x3 video input signal). In this case, use the Zoom Mode to expand (both horizontal & vertical) and display the 4x3 video input signal on a 16x9 display. The displayed image content will be full screen with the correct Aspect Ratio.
4x3 Input Video On A 5x4 Display {Special Case 3}	4x3 Video can be displayed on a 5x4 monitor screen using two different methods.
	Method 1: Use the Zoom Mode to fill a 5x4 monitor screen with a 4x3 Input Video. The displayed image is stretched in the vertical direction and the aspect ratio of the displayed image is distorted. The displayed image is tall and narrow.
	Method 2: Use the Squeeze Mode to display a 4x3 input video on a 5x4 monitor screen. The displayed image is placed at the top of the 5x4 monitor screen. Unused portions of the 5x4 monitor screen (near the bottom) are filled with horizontal black (or gray) bars. The aspect ratio of the displayed image is not distorted.

Table 3-23 --- Aspect Ratio Conversion Modes Definitions (Continued)

3.4.7 Packetized Digital Video Support Information – 16 Bytes – Bytes #27h to #36h

Packetized digital video support information is defined in Table 3-24.

Address/Offset Within the extension block	**No. of Bytes**	**Byte No.**	**Description**	**Format**
27h **36h**	**16**	1 ⇒ 16	**Packetized Digital Video Support Information**	All 16 Bytes are reserved (must be set to "00h"). These Bytes will be defined in a future revision to the DI-EXT Standard.

Table 3-24 --- Packetized Digital Video Support Information

Note 1: A packetized digital video interface standard/specification was in development during the first release (Release A) of the DI-EXT Standard. When a packetized digital video interface standard/specification is published, then a future release of DI-EXT will define the bytes in Table 3-24.

3.5 Unused Bytes – 17 Bytes – Bytes #37h to #47h

Table 3-25 defines the unused (17) bytes in the DI-EXT Block. They are reserved for new information that may be added in future releases of this document. They are not to be used for anything else. All bytes in this section must be set to ”00h”.

Address/Offset Within the extension block	**No. of Bytes**	**Byte No.**	**Description**	**Format**
37h **47h**	**17**	1 ⇒ 17	**Reserved Bytes**	All 17 Bytes are Reserved (Must be set to "00h"). These Bytes may be defined in a future revision to the DI-EXT Standard.

Table 3-25 --- Unused Bytes (Reserved)

3.6 Audio Support – 9 Bytes – Bytes #48h to #50h

Audio Support is defined in Table 3-26.

Address/Offset Within the extension block	**No. of Bytes**	**Byte No.**	**Description**	**Format**
48h **...** **...** **50h**	**9**	1 ⇒ 9	**Types & Definitions of Audio Supported by the Monitor/Display**	All 9 Bytes are Reserved (Must be set to "00h"). These Bytes will be defined in a future revision to the DI-EXT Standard.

Table 3-26 --- Audio Support

3.7 Display Transfer Characteristic – Gamma Definition – 46 Bytes – #51h to #7Eh - (Monitors with Analog &/or Digital Video Interface/s)

Bytes **#51h** to **#7Eh** have been reserved for defining the Display Transfer Characteristic (Gamma Function). The placement of data in this section is optional. This section is used in the case where the display does not follow the Standard CIE (Commission Internationale de l'Éclairage - International Commission on Illumination) Gamma Model (refer to Section 3.6 of the VESA E-EDID Standard, Release A, Revision 1, February 9, 2000 for more information). This section can also be used to store measured gamma data.

Most CRT monitors and some LCD monitors have Display Transfer Characteristics that are close to the Standard CIE Gamma Model and can use the Gamma Definition in the lower 128 bytes of E-EDID (Data Structure 1.3 or later). In this case, no data is needed in this section of DI-EXT. Unused data bytes in this section must be filled with “00h”.

The table contains values based on luminance measured at up to 16 equally spaced points (15 Data Points for each sub-channel, BGR Curves) or up to 46 equally spaced points (45 Data Points using a combination of 3 sub-channels, White Curve) from minimum to maximum luminance of the display. There may be three sets of values (one for each color sub-channel: sub-channel 0 (Blue); sub-channel 1 (Green) & sub-channel 2 (Red)) or a single set of values based on the combined color sub-channels (white). The data contained in the luminance table can be theoretical data (based on product design specifications), or the data can be measured (which is unique to that particular display) or the data can come from measured samples of the actual product (Product Type Data). Measured data can be used to define a precision color display. The data is normalized to one-byte values such that the value at maximum luminance is always “FFh”. Since this maximum value is constant, it is not recorded in the table.

The size of the table is either up to 45 bytes (listed sequentially in sub-channel 0, 1 & 2) if white values are specified or up to 15 bytes each sub-channel if separate colors (BGR) are specified. The 46^{th} Data Point or the three 16^{th} Data Points are not recorded. However, it is recommended that 45 bytes be used for White Curves or 15 Bytes be used for BGR Curves.

NOTE: 46 bytes have been reserved in the DI-EXT Block for the luminance table. If the luminance table contains less than 46 bytes, then unused bytes will be listed as “00h”. See Table 3-27.

Address Within the ext. block	No. of Bytes	Byte No.	Bit Numbers & Range of Values	Formats
51h	**46**	**Byte** 1	{Bits 7 & 6}	**Combined (White) or Separate (RGB) Sub-Channels** '00' = Display Transfer Characteristic is not defined. NOTE: Bits 5 ⇒ 0 are all set to '0'. All data stored in Bytes **52h** ⇒ **7Eh** must be set to "00h" and Byte **51h** must be set to "00h". '01' = Table contains up to a maximum of 45 luminance values for white (15 luminance values stored in each sub-channel 0, 1 & 2). This defines a single White Curve. The last value is normalized to "FFh" and is not contained in the table. The table is loaded with one less than the number of Data Points available. For example, if you have 32 Data Points, then load 31 of them into the table. The 32nd Data Point is assumed to be "FFh" and is not put into the table. '10' = Table contains up to a maximum of 45 luminance values: 15 values for sub-channel 0, followed by 15 luminance values for sub-channel 1, followed by 15 luminance values for sub-channel 2. This defines 3 separate Color Curves (eg. BGR). The last value for each sub-channel is normalized to "FFh" and is not contained in the table. The table is loaded with one less than the number of Data Points available for each sub-channel. For example, if you have 12 Data Points for each sub-channel, then load 11 of them into the table. The 12th Data Point is assumed to be "FFh" and is not put into the table. '11' = Reserved (Do Not Use)
			{Bits 5 ⇒ 0}	**Number of Luminance Entries** If bits 7 & 6 (Byte **51h**) is '00' then, bits 5 ⇒ 0 are set to '000000'. If bits 7 & 6 (Byte **51h**) is '01' then, bits 5 ⇒ 0 can have a value up to '101101' (45 Decimal). This value is one less than the number of measurements actually taken (maximum of 46) since the maximum value is always normalized to "FFh" and is not recorded in the table. The White Curve Data is combined in all 3 sub-channels (0, 1 & 2). Values in the Range '101110' (46 Decimal) to '111111' (63 Dec) are invalid and shall not be used. Data is normalized such that the last value is always "FFh" and is not displayed in the table. If bits 7 & 6 (Byte **51h**) is '10' then, bits 5 ⇒ 0 can have a value up to '001111' (15 Decimal). This value is one less than the number of measurements actually taken (maximum of 16) since the maximum value is always normalized to "FFh" and is not recorded in the table. The BGR Curve Data is stored in each sub-channel (0, 1 & 2), respectively. Values in the Range '010000' (16 Decimal) to '111111' (63 Decimal) are invalid and shall not be used. Data is normalized such that the last value in each sub-channel is always "FFh" and is not shown in the table.

Table 3-27 --- Gamma Definition

Address Within the ext. block	**No. of Bytes**	**Byte No.**	**Bit Numbers & Range of Values**	**Formats**
52h		2	{Bits 7 ⇒ 0}	**1st Luminance Value for White or** **1st Luminance Value for Blue in Sub-Channel 0**
			“00h”⇒“FEh”	If bits 7 & 6 (Byte **51h**) is ’01’ then “yyh(1)” = Value of Point #1 --- White Curve Data Or if bits 7 & 6 (Byte **51h**) is ’10’ then “yyh(1)” = Value of Point #1 --- Blue Curve Data
53h		3	{Bits 7 ⇒ 0}	**2nd Luminance Value for White or** **2nd Luminance Value for Blue in Sub-Channel 0**
			“00h”⇒”FEh”	If bits 7 & 6 (Byte **51h**) is ’01’ then “yyh(2)” = Value of Point #2 --- White Curve Data Or if bits 7 & 6 (Byte **51h**) is ’10’ then “yyh(2)” = Value of Point #2 --- Blue Curve Data
...		**...**	**...**	**...**
...		**...**	**...**	**...**
60h		16	{Bits 7 ⇒ 0}	**15th Luminance Value for White or** **15th Luminance Value for Blue in Sub-Channel 0**
			“00h”⇒“FEh”	If bits 7 & 6 (Byte **51h**) is ’01’ then “yyh(15)” = Value of Point #15 --- White Curve Data {if used} Or if bits 7 & 6 (Byte **51h**) is ’10’ then “yyh(15)” = Value of Point #15 --- Blue Curve Data {if used}
61h		17	{Bits 7 ⇒ 0}	**16th Luminance Value for White or** **1st Luminance Value for Green in Sub-Channel 1**
			“00h”⇒“FEh”	If bits 7 & 6 (Byte **51h**) is ’01’ then “yyh(16)” = Value of Point #16 --- White Curve Data {if used} Or if bits 7 & 6 (Byte **51h**) is ’10’ then “yyh(1)” = Value of Point #1 --- Green Curve Data
62h		18	{Bits 7 ⇒ 0}	**17th Luminance Value for White or** **2nd Luminance Value for Green in Sub-Channel 1**
			“00h”⇒“FEh”	If bits 7 & 6 (Byte **51h**) is ’01’ then “yyh(17)” = Value of Point #17 --- White Curve Data {if used} Or if bits 7 & 6 (Byte **51h**) is ’10’ then “yyh(2)” = Value of Point #2 --- Green Curve Data
...		**...**	**...**	**...**
...		**...**	**...**	**...**
6Fh		31	{Bits 7 ⇒ 0}	**30th Luminance Value for White or** **15th Luminance Value for Green in Sub-Channel 1**
			“00h”⇒“FEh”	If bits 7 & 6 (Byte **51h**) is ’01’ then “yyh(30)” = Value of Point #30 --- White Curve Data {if used} Or if bits 7 & 6 (Byte **51h**) is ’10’ then “yyh(15)” = Value of Point #15 --- Green Curve Data {if used}

Table 3-27 --- Gamma Definition (Continued)

Address Within the ext. block	**No. of Bytes**	**Byte No.**	**Bit Numbers & Range of Values**	**Formats**
70h		32	{Bits 7 ⇒ 0}	**31st Luminance Value for White or 1st Luminance Value for Red in Sub-Channel 1**
			"00h"⇒"FEh"	If bits 7 & 6 (Byte **51h**) is '01' then "yyh(31)" = Value of Point #31 --- White Curve Data {if used} Or if bits 7 & 6 (Byte **51h**) is '10' then "yyh(1)" = Value of Point #1 --- Red Curve Data
71h		33	{Bits 7 ⇒ 0}	**32nd Luminance Value for White or 2nd Luminance Value for Red in Sub-Channel 1**
			"00h"⇒"FEh"	If bits 7 & 6 (Byte **51h**) is '01' then "yyh(32)" = Value of Point #32 --- White Curve Data {if used} Or if bits 7 & 6 (Byte **51h**) is '10' then "yyh(2)" = Value of Point #2 --- Red Curve Data
...		**...**	**...**	**...**
...		**...**	**...**	**...**
7Eh		46	{Bits 7 ⇒ 0}	**45th Luminance Value for White or 15th Luminance Value for Red in Sub-Channel 1**
			"00h"⇒"FEh"	If bits 7 & 6 (Byte **51h**) is '01' then "yyh(45)" = Value of Point #45 --- White Curve Data {if used} Or if bits 7 & 6 (Byte **51h**) is '10' then "yyh(15)" = Value of Point #15 --- Red Curve Data {if used}

Table 3-27 --- Gamma Definition (Continued)

Examples of Gamma Definitions: Table 3-28 illustrates 4 possible scenarios for Display Transfer Characteristics (Gamma Definition) Data Structures:

1. a 46 Data Point (D.P.) White Curve {table contains 45 White Curve Data Points};
2. a 32 Data Point White Curve {table contains 31 White Curve Data Points};
3. 3x16 Data Point BGR Color Curves {table contains 45 Data Points, 15 Data Points for each Color Curve};
4. 3x12 Data Point BGR Color Curves {table contains 33 Data Points, 11 Data Points for each Color Curve}.

Address Within the Extension Block	**Byte #**	**46 Data Point White Curve**	**32 Data Point White Curve**	**3 x 16 Data Point RGB Color Curves**	**3 x 12 Data Point RGB Color Curves**	**Comments**
51h	1	"6Dh"	"5Fh"	"8Fh"	"8Bh"	Indicates Data Type & 1 less than the number of Data Point Entries
52h	2	1st White D.P.	1st White D.P.	1st Blue D.P.	1st Blue D.P.	
53h	3	2nd White D.P.	2nd White D.P.	2nd Blue D.P.	2nd Blue D.P.	
...	**...**	**...**	**...**	**...**	**...**	
...	**...**	**...**	**...**	**...**	**...**	
5Bh	11	10th White D.P.	10th White D.P.	10th Blue D.P.	10th Blue D.P.	
5Ch	12	11th White D.P.	11th White D.P.	11th Blue D.P.	11th Blue D.P.	
5Dh	13	12th White D.P.	12th White D.P.	12th Blue D.P.	"00h"	
5Eh	14	13th White D.P.	13th White D.P.	13th Blue D.P.	"00h"	
5Fh	15	14th White D.P.	14th White D.P.	14th Blue D.P.	"00h"	

Table 3-28 --- 4 Possible Scenarios for Gamma Data Structures

Address Within the Extension Block	**Byte** #	**46 Data Point White Curve**	**32 Data Point White Curve**	**3 x 16 Data Point RGB Color Curves**	**3 x 12 Data Point RGB Color Curves**	**Comments**
60h	16	15th White D.P.	15th White D.P.	15th BlueD.P.	“00h”	
61h	17	16th White D.P.	16th White D.P.	1st Green D.P.	1st Green D.P.	
62h	18	17th White D.P.	17th White D.P.	2nd Green D.P.	2nd Green D.P.	
…	**…**	**…**	**…**	**…**	**…**	
…	**…**	**…**	**…**	**…**	**…**	
6Ah	26	25th White D.P.	25th White D.P.	10th Green D.P.	10th Green D.P.	
6Bh	27	26th White D.P.	26th White D.P.	11th Green D.P.	11th Green D.P.	
6Ch	28	27th White D.P.	27th White D.P.	12th Green D.P.	“00h”	
6Dh	29	28th White D.P.	28th White D.P.	13th Green D.P.	“00h”	
6Eh	30	29th White D.P.	29th White D.P.	14th Green D.P.	“00h”	
6Fh	31	30th White D.P.	30th White D.P.	15th Green D.P.	“00h”	
70h	32	31st White D.P.	31st White D.P.	1st Red D.P.	1st Red D.P.	
71h	33	32nd White D.P.	“00h”	2nd Red D.P.	2nd Red D.P.	
…	**…**	**…**	**…**	**…**	**…**	
…	**…**	**…**	**…**	**…**	**…**	
79h	41	40th White D.P.	“00h”	10th Red D.P.	10th Red D.P.	
7Ah	42	41st White D.P.	“00h”	11th Red D.P.	11th Red D.P.	
7Bh	43	42nd White D.P.	“00h”	12th Red D.P.	“00h”	
7Ch	44	43rd White D.P.	“00h”	13th Red D.P.	“00h”	
7Dh	45	44th White D.P.	“00h”	14th Red D.P.	“00h”	
7Eh	46	45th White D.P.	“00h”	15th Red D.P.	“00h”	

Table 3-28 --- 4 Possible Scenarios for Gamma Data Structures (Continued)

3.8 Miscellaneous Items – 1 Byte

3.8.1 Checksum – 1 Byte – Byte #7Fh

This section indicates the checksum for the DI-EXT Block. Add all 128 bytes (in the DI-EXT Block) together and the total is equal to "00h".

Address Within the extension block	**No. of Bytes**	**Byte No.**	**Description**	**Format**
7Fh	**1**	**Byte** 1	**Checksum**	xxh = This byte should be programmed such that a one byte checksum (add all bytes together) of the entire 128-byte DI-EXT Block equals “00h”.

Table 3-29 --- Checksum

4. APPENDIX A - Digital Data Formats

This appendix documents the details of the digital data formats referenced in Table 3-8.

4.1 Pixel Data Mapping Codes

Dual scan STN use codes 15h & 19h. TFT modes have codes in the range 24h & 48h.

4.2 Summary Tables

Tables 4-1 and 4-2 summarize the pixel mappings for codes digital interface codes 15h, 19h, 24h & 48h.

Digital Interface Code #	15h	19h
Bit Number	8-Bit Over 8-Bit RGB STN-DD	12-Bit Over 12-Bit RGB STN-DD
0	UR0	UR0
1	UG0	UG0
2	UB0	UB0
3	UR1	LR0
4	LR0	LG0
5	LG0	LB0
6	LB0	UR1
7	LR1	UG1
8	UG1	UB1
9	UB1	LR1
10	UR2	LG1
11	UG2	LB1
12	LG1	UR2
13	LB1	UG2
14	LR2	UB2
15	LG2	LR2
16	SHFCLK*	LG2
17	–	LB2
18	–	UR3
19	–	UG3
20	–	UB3
21	–	LR3
22	–	LG3
23	–	LB3
Pixels per SHFCLK	16/3	8
Min Req'd for P&D & FPDI-2	Yes	Yes

Table 4-1 --- Summary of STN Data Formats

*Needed only if TMDS interface is being used.

NOTE: EDID specifies horizontal timing parameters in units of pixels. The relationship between pixels and SHFCLK is determined by the data format as shown here.

Digital Interface Code #	24h			48h		
Bit Number	24-Bit MSB-Aligned RGB TFT			48-Bit MSB-Aligned RGB TFT		
0	B0	–	–	B0	–	–
1	B1	–	–	B1	–	–
2	B2	B0	–	B2	B0	–
3	B3	B1	–	B3	B1	–
4	B4	B2	B0	B4	B2	B0
5	B5	B3	B1	B5	B3	B1
6	B6	B4	B2	B6	B4	B2
7	B7	B5	B3	B7	B5	B3
8	G0	–	–	G0	–	–
9	G1	–	–	G1	–	–
10	G2	G0	–	G2	G0	–
11	G3	G1	–	G3	G1	–
12	G4	G2	G0	G4	G2	G0
13	G5	G3	G1	G5	G3	G1
14	G6	G4	G2	G6	G4	G2
15	G7	G5	G3	G7	G5	G3
16	R0	–	–	R0	–	–
17	R1	–	–	R1	–	–
18	R2	R0	–	R2	R0	–
19	R3	R1	–	R3	R1	–
20	R4	R2	R0	R4	R2	R0
21	R5	R3	R1	R5	R3	R1
22	R6	R4	R2	R6	R4	R2
23	R7	R5	R3	R7	R5	R3
24	–	–	–	B8	–	–
25	–	–	–	B9	–	–
26	–	–	–	B10	B8	–
27	–	–	–	B11	B9	–
28	–	–	–	B12	B10	B8
29	–	–	–	B13	B11	B9
30	–	–	–	B14	B12	B10
31	–	–	–	B15	B13	B11
32	–	–	–	G8	–	–
33	–	–	–	G9	–	–
34	–	–	–	G10	G8	–
35	–	–	–	G11	G9	–
36	–	–	–	G12	G10	G8
37	–	–	–	G13	G11	G9
38	–	–	–	G14	G12	G10
39	–	–	–	G15	G13	G11
40	–	–	–	R8	–	–
41	–	–	–	R9	–	–
42	–	–	–	R10	R8	–
43	–	–	–	R11	R9	–
44	–	–	–	R12	R10	R8
45	–	–	–	R13	R11	R9
46	–	–	–	R14	R12	R10
47	–	–	–	R15	R13	R11
Pixels per SHFCLK	1			1		
Min Req'd for P&D & FPDI-2	Yes					

Table 4-2 --- Summary of TFT Data Formats

4.3 Data Format Details

Digital data formats allow a pixel or group of pixels to be addressed at each transfer. Due to differing color depths and other factors, bit assignments may differ from transfer to transfer in a periodic fashion. The tables in this section show several transfers for each encoding to show the pattern of bit assignments.

4.3.1 8-Bit Over 8-Bit RGB STN-DD - Code 15h

Bus Signal	1st Transfer	2nd Transfer	3rd Transfer	...
Bit 0	upper pixel 0 red	upper pixel 2 blue	upper pixel 5 green	...
Bit 1	upper pixel 0 green	upper pixel 3 red	upper pixel 5 blue	...
Bit 2	upper pixel 0 blue	upper pixel 3 green	upper pixel 6 red	...
Bit 3	upper pixel 1 red	upper pixel 3 blue	upper pixel 6 green	...
Bit 4	lower pixel 0 red	lower pixel 2 blue	lower pixel 5 green	...
Bit 5	lower pixel 0 green	lower pixel 3 red	lower pixel 5 blue	...
Bit 6	lower pixel 0 blue	lower pixel 3 green	lower pixel 6 red	...
Bit 7	lower pixel 1 red	lower pixel 3 blue	lower pixel 6 green	...
Bit 8	upper pixel 1 green	upper pixel 4 red	upper pixel 6 blue	...
Bit 9	upper pixel 1 blue	upper pixel 4 green	upper pixel 7 red	...
Bit 10	upper pixel 2 red	upper pixel 4 blue	upper pixel 7 green	...
Bit 11	upper pixel 2 green	upper pixel 5 red	upper pixel 7 blue	...
Bit 12	lower pixel 1 green	lower pixel 4 red	lower pixel 6 blue	...
Bit 13	lower pixel 1 blue	lower pixel 4 green	lower pixel 7 red	...
Bit 14	lower pixel 2 red	lower pixel 4 blue	lower pixel 7 green	...
Bit 15	lower pixel 2 green	lower pixel 5 red	lower pixel 7 blue	...
Bit 16	SHFCLK	SHFCLK	SHFCLK	...
Bit 17				
Bit 18				
Bit 19				
Bit 20				
Bit 21				
Bit 22				
Bit 23				

Table 4-3 --- Digital Format 15h

4.3.2 12-Bit Over 12-Bit RGB STN-DD - Code 19h

Bus Signal	1st Transfer	2nd Transfer	...
Bit 0	upper pixel 0 red	upper pixel 4 red	...
Bit 1	upper pixel 0 green	upper pixel 4 green	...
Bit 2	upper pixel 0 blue	upper pixel 4 blue	...
Bit 3	lower pixel 0 red	lower pixel 4 red	...
Bit 4	lower pixel 0 green	lower pixel 4 green	...
Bit 5	lower pixel 0 blue	lower pixel 4 blue	...
Bit 6	upper pixel 1 red	upper pixel 5 red	...
Bit 7	upper pixel 1 green	upper pixel 5 green	...
Bit 8	upper pixel 1 blue	upper pixel 5 blue	...
Bit 9	lower pixel 1 red	lower pixel 5 red	...
Bit 10	lower pixel 1 green	lower pixel 5 green	...
Bit 11	lower pixel 1 blue	lower pixel 5 blue	...
Bit 12	upper pixel 2 red	upper pixel 6 red	...
Bit 13	upper pixel 2 green	upper pixel 6 green	...
Bit 14	upper pixel 2 blue	upper pixel 6 blue	...
Bit 15	lower pixel 2 red	lower pixel 6 red	...
Bit 16	lower pixel 2 green	lower pixel 6 green	...
Bit 17	lower pixel 2 blue	lower pixel 6 blue	...
Bit 18	upper pixel 3 red	upper pixel 7 red	...
Bit 19	upper pixel 3 green	upper pixel 7 green	...
Bit 20	upper pixel 3 blue	upper pixel 7 blue	...
Bit 21	lower pixel 3 red	lower pixel 7 red	...
Bit 22	lower pixel 3 green	lower pixel 7 green	...
Bit 23	lower pixel 3 blue	lower pixel 7 blue	...

Table 4-4 --- Digital Format 19h

4.3.3 24-Bit MSB-Aligned BGR TFT - Code 24h {Single Link DVI}

Bus Signal	1st Transfer	8 to 1 bpp	2nd Transfer	8 to 1 bpp	3rd Transfer	...
Bit 0		bit 0		bit 0		...
Bit 1		bit 1 / 0		bit 1 / 0		...
Bit 2		bit 2 / 1 / 0		bit 2 / 1 / 0		...
Bit 3	pixel 0 blue	bit 3 / 2 / 1 / 0	pixel 1 blue	bit 3 / 2 / 1 / 0	pixel 2 blue	...
Bit 4		bit 4 / 3 / 2 / 1 / 0		bit 4 / 3 / 2 / 1 / 0		...
Bit 5		bit 5 / 4 / 3 / 2 / 1 / 0		bit 5 / 4 / 3 / 2 / 1 / 0		...
Bit 6		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		...
Bit 7		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		...
Bit 8		bit 0		bit 0		...
Bit 9		bit 1 / 0		bit 1 / 0		...
Bit 10		bit 2 / 1 / 0		bit 2 / 1 / 0		...
Bit 11	pixel 0 green	bit 3 / 2 / 1 / 0	pixel 1 green	bit 3 / 2 / 1 / 0	pixel 2 green	...
Bit 12		bit 4 / 3 / 2 / 1 / 0		bit 4 / 3 / 2 / 1 / 0		...
Bit 13		bit 5 / 4 / 3 / 2 / 1 / 0		bit 5 / 4 / 3 / 2 / 1 / 0		...
Bit 14		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		...
Bit 15		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		...
Bit 16		bit 0		bit 0		...
Bit 17		bit 1 / 0		bit 1 / 0		...
Bit 18		bit 2 / 1 / 0		bit 2 / 1 / 0		...
Bit 19	pixel 0 red	bit 3 / 2 / 1 / 0	pixel 1 red	bit 3 / 2 / 1 / 0	pixel 2 red	...
Bit 20		bit 4 / 3 / 2 / 1 / 0		bit 4 / 3 / 2 / 1 / 0		...
Bit 21		bit 5 / 4 / 3 / 2 / 1 / 0		bit 5 / 4 / 3 / 2 / 1 / 0		...
Bit 22		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		...
Bit 23		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		...

Table 4-5 --- Digital Format 24h

4.3.4 48-Bit MSB Aligned BGR TFT {for Dual Link DVI – High Resolution}- Code 48h

Bus Signal	1st Transfer	8 to 1 bpp on Link 0	2nd Transfer	8 to 1 bpp on Link 0	3rd Transfer	...
Bit 0		bit 0		bit 0		...
Bit 1		bit 1 / 0		bit 1 / 0		...
Bit 2		bit 2 / 1 / 0		bit 2 / 1 / 0		...
Bit 3	pixel 0 blue	bit 3 / 2 / 1 / 0	pixel 2 blue	bit 3 / 2 / 1 / 0	pixel 4 blue	...
Bit 4		bit 4 / 3 / 2 / 1 / 0		bit 4 / 3 / 2 / 1 / 0		...
Bit 5		bit 5 / 4 / 3 / 2 / 1 / 0		bit 5 / 4 / 3 / 2 / 1 / 0		...
Bit 6		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		...
Bit 7		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		...
Bit 8		bit 0		bit 0		...
Bit 9		bit 1 / 0		bit 1 / 0		...
Bit 10		bit 2 / 1 / 0		bit 2 / 1 / 0		...
Bit 11	pixel 0 green	bit 3 / 2 / 1 / 0	pixel 2 green	bit 3 / 2 / 1 / 0	pixel 4 green	...
Bit 12		bit 4 / 3 / 2 / 1 / 0		bit 4 / 3 / 2 / 1 / 0		...
Bit 13		bit 5 / 4 / 3 / 2 / 1 / 0		bit 5 / 4 / 3 / 2 / 1 / 0		...
Bit 14		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		...
Bit 15		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		...
Bit 16		bit 0		bit 0		...
Bit 17		bit 1 / 0		bit 1 / 0		...
Bit 18		bit 2 / 1 / 0		bit 2 / 1 / 0		...
Bit 19	pixel 0 red	bit 3 / 2 / 1 / 0	pixel 2 red	bit 3 / 2 / 1 / 0	pixel 4 red	...
Bit 20		bit 4 / 3 / 2 / 1 / 0		bit 4 / 3 / 2 / 1 / 0		...
Bit 21		bit 5 / 4 / 3 / 2 / 1 / 0		bit 5 / 4 / 3 / 2 / 1 / 0		...
Bit 22		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		...
Bit 23		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		...
Bus Signal	**1st Transfer**	**8 to 1 bpp on Link 1**	**2nd Transfer**	**8 to 1 bpp on Link 1**	**3rd Transfer**	**...**
Bit 24		bit 0		bit 0		...
Bit 25		bit 1 / 0		bit 1 / 0		...
Bit 26		bit 2 / 1 / 0		bit 2 / 1 / 0		...
Bit 27	pixel 1 blue	bit 3 / 2 / 1 / 0	pixel 3 blue	bit 3 / 2 / 1 / 0	pixel 5 blue	...
Bit 28		bit 4 / 3 / 2 / 1 / 0		bit 4 / 3 / 2 / 1 / 0		...
Bit 29		bit 5 / 4 / 3 / 2 / 1 / 0		bit 5 / 4 / 3 / 2 / 1 / 0		...
Bit 30		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		...
Bit 31		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		...
Bit 32		bit 0		bit 0		...
Bit 33		bit 1 / 0		bit 1 / 0		...
Bit 34		bit 2 / 1 / 0		bit 2 / 1 / 0		...
Bit 35	pixel 1 green	bit 3 / 2 / 1 / 0	pixel 3 green	bit 3 / 2 / 1 / 0	pixel 5 green	...
Bit 36		bit 4 / 3 / 2 / 1 / 0		bit 4 / 3 / 2 / 1 / 0		...
Bit 37		bit 5 / 4 / 3 / 2 / 1 / 0		bit 5 / 4 / 3 / 2 / 1 / 0		...
Bit 38		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		...
Bit 39		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		...
Bit 40		bit 0		bit 0		...
Bit 41		bit 1 / 0		bit 1 / 0		...
Bit 42		bit 2 / 1 / 0		bit 2 / 1 / 0		...
Bit 43	pixel 1 red	bit 3 / 2 / 1 / 0	pixel 3 red	bit 3 / 2 / 1 / 0	pixel 5 red	...
Bit 44		bit 4 / 3 / 2 / 1 / 0		bit 4 / 3 / 2 / 1 / 0		...
Bit 45		bit 5 / 4 / 3 / 2 / 1 / 0		bit 5 / 4 / 3 / 2 / 1 / 0		...
Bit 46		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		...
Bit 47		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		...

Table 4-6 --- Digital Format 48h (DVI --- High Resolution)

NOTE: Per the DVI Specification for Dual Link TMDS (in High Resolution Mode), odd pixels {0, 2, 4, …} are transmitted on Link 0 (the first link) and even pixels {1,3,5, …} are transmitted on Link 1 (the second link).

4.3.5 48-Bit MSB Aligned BGR TFT {for Dual Link DVI – High Color} - Code 49h

Bus Signal	1st Transfer	16 to 9 bpp on Link 0	2nd Transfer	16 to 9 bpp on Link 0	3rd Transfer	...
Bit 0	pixel 0 blue	bit 8	pixel 1 blue	bit 8	pixel 2 blue	...
Bit 1		bit 9 / 8		bit 9 / 8		...
Bit 2		bit 10 / 9 / 8		bit 10 / 9 / 8		...
Bit 3		bit 11 / 10 / 9 / 8		bit 11 / 10 / 9 / 8		...
Bit 4		bit 12 / 11 / 10 / 9 / 8		bit 12 / 11 / 10 / 9 / 8		...
Bit 5		bit 13 / 12 / 11 / 10 / 9 / 8		bit 13 / 12 / 11 / 10 / 9 / 8		...
Bit 6		bit 14 / 13 / 12 / 11 / 10 / 9 / 8		bit 14 / 13 / 12 / 11 / 10 / 9 / 8		...
Bit 7		bit 15 / 14 / 13 / 12 / 11 / 10 / 9 / 8		bit 15 / 14 / 13 / 12 / 11 / 10 / 9 / 8		...
Bit 8	pixel 0 green	bit 8	pixel 1 green	bit 8	pixel 2 green	...
Bit 9		bit 9 / 8		bit 9 / 8		...
Bit 10		bit 10 / 9 / 8		bit 10 / 9 / 8		...
Bit 11		bit 11 / 10 / 9 / 8		bit 11 / 10 / 9 / 8		...
Bit 12		bit 12 / 11 / 10 / 9 / 8		bit 12 / 11 / 10 / 9 / 8		...
Bit 13		bit 13 / 12 / 11 / 10 / 9 / 8		bit 13 / 12 / 11 / 10 / 9 / 8		...
Bit 14		bit 14 / 13 / 12 / 11 / 10 / 9 / 8		bit 14 / 13 / 12 / 11 / 10 / 9 / 8		...
Bit 15		bit 15 / 14 / 13 / 12 / 11 / 10 / 9 / 8		bit 15 / 14 / 13 / 12 / 11 / 10 / 9 / 8		...
Bit 16	pixel 0 red	bit 8	pixel 1 red	bit 8	pixel 2 red	...
Bit 17		bit 9 / 8		bit 9 / 8		...
Bit 18		bit 10 / 9 / 8		bit 10 / 9 / 8		...
Bit 19		bit 11 / 10 / 9 / 8		bit 11 / 10 / 9 / 8		...
Bit 20		bit 12 / 11 / 10 / 9 / 8		bit 12 / 11 / 10 / 9 / 8		...
Bit 21		bit 13 / 12 / 11 / 10 / 9 / 8		bit 13 / 12 / 11 / 10 / 9 / 8		...
Bit 22		bit 14 / 13 / 12 / 11 / 10 / 9 / 8		bit 14 / 13 / 12 / 11 / 10 / 9 / 8		...
Bit 23		bit 15 / 14 / 13 / 12 / 11 / 10 / 9 / 8		bit 15 / 14 / 13 / 12 / 11 / 10 / 9 / 8		...
Bus Signal	**1st Transfer**	**8 to 1 bpp on Link 1**	**2nd Transfer**	**8 to 1 bpp on Link 1**	**3rd Transfer**	**...**
Bit 24	pixel 0 blue	bit 0	pixel 1 blue	bit 0	pixel 2 blue	...
Bit 25		bit 1 / 0		bit 1 / 0		...
Bit 26		bit 2 / 1 / 0		bit 2 / 1 / 0		...
Bit 27		bit 3 / 2 / 1 / 0		bit 3 / 2 / 1 / 0		...
Bit 28		bit 4 / 3 / 2 / 1 / 0		bit 4 / 3 / 2 / 1 / 0		...
Bit 29		bit 5 / 4 / 3 / 2 / 1 / 0		bit 5 / 4 / 3 / 2 / 1 / 0		...
Bit 30		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		...
Bit 31		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		...
Bit 32	pixel 0 green	bit 0	pixel 1 green	bit 0	pixel 2 green	...
Bit 33		bit 1 / 0		bit 1 / 0		...
Bit 34		bit 2 / 1 / 0		bit 2 / 1 / 0		...
Bit 35		bit 3 / 2 / 1 / 0		bit 3 / 2 / 1 / 0		...
Bit 36		bit 4 / 3 / 2 / 1 / 0		bit 4 / 3 / 2 / 1 / 0		...
Bit 37		bit 5 / 4 / 3 / 2 / 1 / 0		bit 5 / 4 / 3 / 2 / 1 / 0		...
Bit 38		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		...
Bit 39		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		...
Bit 40	pixel 0 red	bit 0	pixel 1 red	bit 0	pixel 2 red	...
Bit 41		bit 1 / 0		bit 1 / 0		...
Bit 42		bit 2 / 1 / 0		bit 2 / 1 / 0		...
Bit 43		bit 3 / 2 / 1 / 0		bit 3 / 2 / 1 / 0		...
Bit 44		bit 4 / 3 / 2 / 1 / 0		bit 4 / 3 / 2 / 1 / 0		...
Bit 45		bit 5 / 4 / 3 / 2 / 1 / 0		bit 5 / 4 / 3 / 2 / 1 / 0		...
Bit 46		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 6 / 5 / 4 / 3 / 2 / 1 / 0		...
Bit 47		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		bit 7 / 6 / 5 / 4 / 3 / 2 / 1 / 0		...

Table 4-7 --- Digital Format 49h (DVI --- High Color)

NOTE: Per the DVI Specification for Dual Link TMDS (in High Color Mode), the higher order bits, above 24 bpp {8bpp ⇒ 15bpp per link} of color information, are transmitted on Link 0 (the first link) and the lower order bits of color information {0bpp ⇒ 7bpp} are transmitted on Link 1 (the second link).

5. APPENDIX B – Legacy VGA/DOS Modes

Table 5-1 contains a listing of the "Legacy VGA/DOS Modes". If the display supports all modes in Table 5-1, then Bit 7 of Byte **15h** must be set to '1' (see Table 3-15).

Mode #	Mode Type	Resolution in Pixels H x V	Vertical Refresh Rate
0	Text	320 x 200	70 Hz
0*	Text	320 x 350	70 Hz
0+	Text	360 x 400	70 Hz
1	Text	320 x 200	70 Hz
1*	Text	320 x 350	70 Hz
1+	Text	360 x 400	70 Hz
2	Text	640 x 200	70 Hz
2*	Text	640 x 350	70 Hz
2+	Text	720 x 400	70 Hz
3	Text	720 x 200	70 Hz
3*	Text	640 x 350	70 Hz
3+	Text	720 x 400	70 Hz
4	Graphics	320 x 200	70 Hz
5	Graphics	320 x 200	70 Hz
6	Graphics	640 x 200	70 Hz
7	Text	720 x 350	70 Hz
7+	Text	720 x 400	70 Hz
D	Graphics	320 x 200	70 Hz
E	Graphics	640 x 200	70 Hz
F	Graphics	640 x 350	70 Hz
10	Graphics	640 x 350	70 Hz
11	Graphics	640 x 480	60 Hz
12	Graphics	640 x 480	60 Hz
13	Graphics	320 x 200	60 Hz

Table 5-1 --- VGA/DOS Legacy Modes

6. APPENDIX C – Illustrations

This section contains drawings that illustrate definitions contained in Sections 3.3.1, 3.3.2, 3.4.3 and 3.4.6.

6.1 Landscape, Portrait and Major Axis

Figure 6-1 describes a Landscape Display, a Portrait Display and the Major Axis.

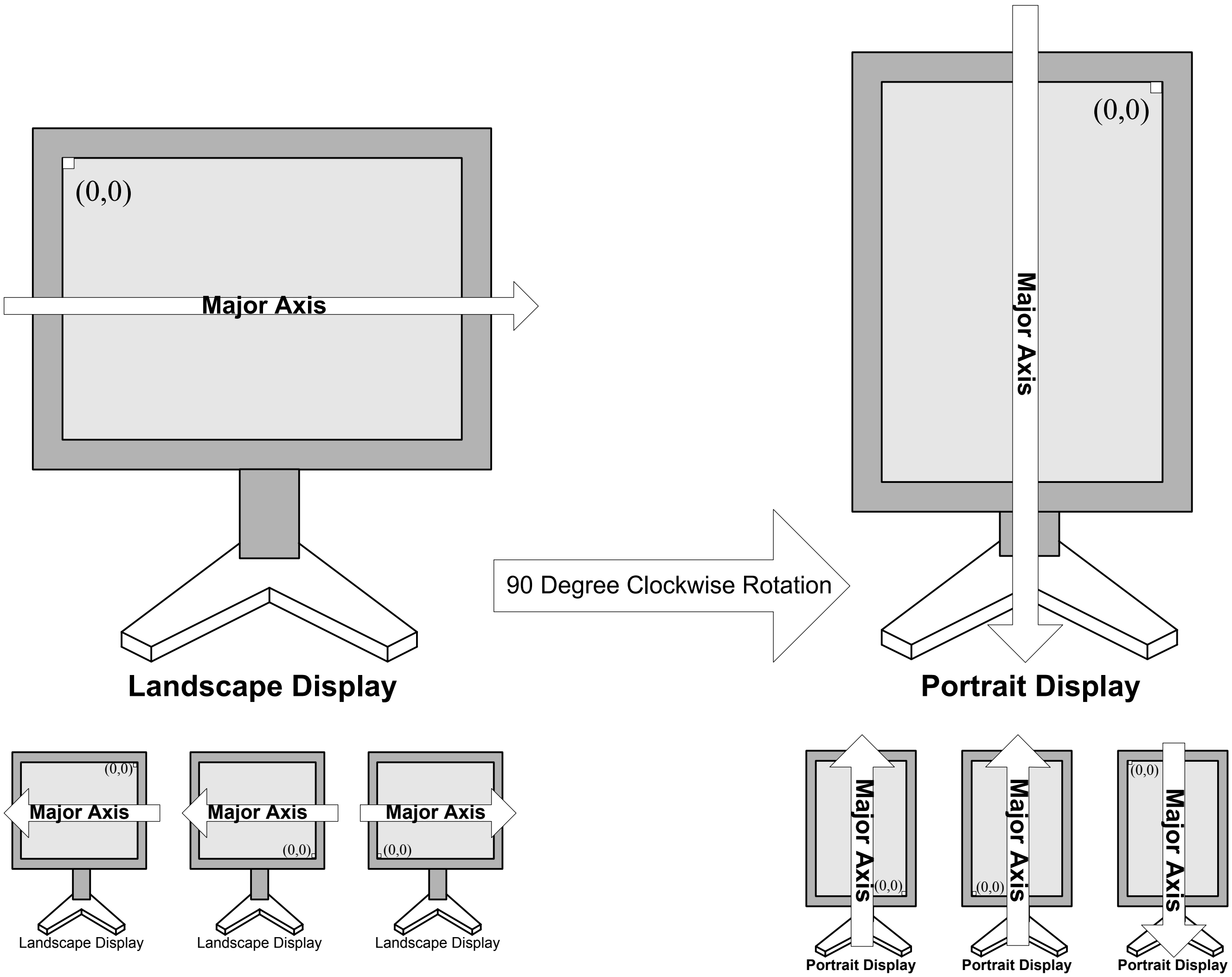

Figure 6-1

6.2 Aspect Ratio Conversions

Figure 6-2 (on the next 2 pages) describes the Aspect Ratio Conversions discussed in Section 3.4.6.

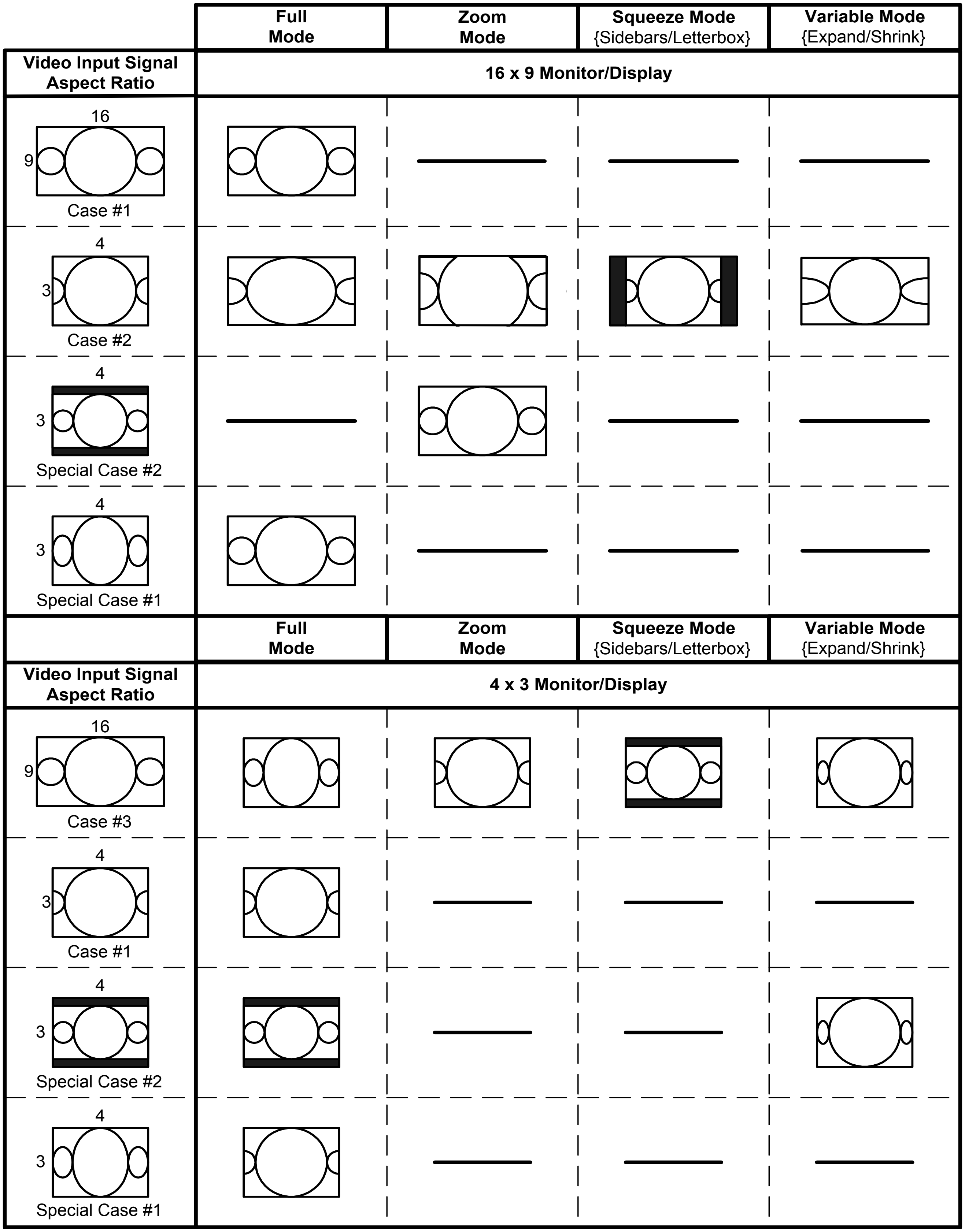
Full Mode
Zoom Mode
Squeeze Mode {Sidebars/Letterbox}
Variable Mode {Expand/Shrink}
Video Input Signal Aspect Ratio
16 x 9 Monitor/Display
16
9
Case #1
4
3
Case #2
4
3
Special Case #2
4
3
Special Case #1
Full Mode
Zoom Mode
Squeeze Mode {Sidebars/Letterbox}
Variable Mode {Expand/Shrink}
Video Input Signal Aspect Ratio
4 x 3 Monitor/Display
16
9
Case #3
4
3
Case #1
4
3
Special Case #2
4
3
Special Case #1

Figure 6-2

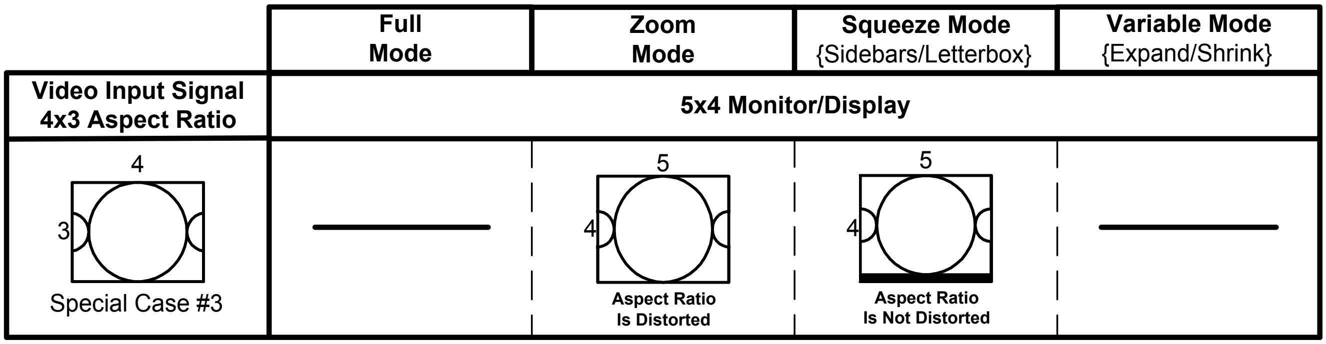

Figure 6-2 (Continued)

7. APPENDIX D - Sample DI-EXT Block

7.1 EXAMPLE 1 DI-EXT Block

DI-EXT Version 1 Data Structure Format -- Example1 -- CRT Desktop Monitor

This sample DI-EXT is included for *illustration only*. It should not be considered as representative of any particular monitor.

DESCRIPTION OF DISPLAY:

19” (18”Viewable) Flat Face CRT Monitor with:

- Aperture Grill CRT w/0.26mm average pitch
- Dual Link Digital Input (for High Resolution) compliant with DVI (Version 1.0)
- Continuous Frequency Chassis === F(h): 30 - 110 kHz, F(v): 50 – 180 Hz
- Capable of displaying all video modes up to 1600 x 1200 @ 85 Hz
- No scaler or centering
- Double Clocking of Input Data is not supported
- Packetized digital video is not supported
- High-bandwidth Digital Content Protection (HDCP) is supported
- Display is fixed orientation (does not rotate)

Byte # (decimal)	Byte # (hex)	Value (hex)	Value (binary)	Field Name and Comments
1	**00**	40		Block Header: Value must be “40h”.(See Section 3.1.1)
2	**01**	01		DI-EXT Version Number: 1 (See Section 3.1.2)
3	**02**	03		Digital Visual Interface (DVI) – Dual Link – High Resolution Specification supported. (See Section 3.2.1)
4	**03**	41		DVI Version Number 1.0 (See Section 3.2.2)
5	**04**	00		
6	**05**	00		There is no Revision Number.
7	**06**	00		
8	**07**	D8	‘11011000’	*Digital Interface Data Format Description:* (See Section 3.2.3) Bit 7: ’1’ => Data Enable (DE) Signal is supported, Bit 6: ’1’ => Data enabled when DE Signal is high, Bits 5 & 4: ’01’ => Display uses rising edge of Shift Clock. Bit 3: ‘1’ => HDCP is supported. Bit 2: '0' => Double Clocking of Input Data is not supported Bit 1: ’0’ => Packetized digital video is not supported. Bit 0: ’0’ => Undefined (Reserved).
9	**08**	48		Digital interface uses the Standard Data Format: 48-Bit MSB-Aligned RGB (Dual Link --- High Resolution). (See Section 3.2.3)
10	**09**	19		Minimum Pixel Clock Frequency is 25 MHz. (See Section 3.2.4)
11	**0A**	A5		Maximum Pixel Clock Frequency is 165 MHz (on primary link).
12	**0B**	00		(LSB first) (See Section 3.2.4)
13	**0C**	A5		Crossover Frequency is 165 MHz.
14	**0D**	00		(LSB first) (See Section 3.2.4)
15	**0E**	00		Sub-Pixel Layout is not defined. Display is a CRT. (See Section 3.3.1)
16	**0F**	02		Sub-Pixel Configuration is “Stripe”. CRT is an Aperture Grill. (See Section 3.3.1)

Table 7-1 --- DI-EXT – Example #1

Byte # (decimal)	Byte # (hex)	Value (hex)	Value (binary)	Field Name and Comments
17	**10**	00		Sub-Pixel Shape is not defined. Display is a CRT. (See Section 3.3.1)
18	**11**	1A		Horizontal Pixel Pitch is 0.26 mm. (See Section 3.3.2)
19	**12**	00		Vertical Pixel Pitch is 0.0 mm CRT is an Aperture Grill(See Section 3.3.2)
20	**13**	28	‘00101000’	*Major Display Device Characteristics:* (See Section 3.3.3) Bit 7: ’0’ => Display does not have a Fixed Pixel Format. Bits 6 & 5: ’01’ => Display is a Direct View Device. Bit 4: ’0’ => Display uses a non-transparent background. Bits 3 & 2: ’10’ => Display is a Desktop or Personal. Bit 1: '0' => Display does not support DDC/CI Bit 0: ’0’ => Undefined (Reserved).
21	**14**	80	‘10000000’	*Miscellaneous Display Capabilities:* (See Section 3.4.1) Bit 7: ’1’ => All VGA/DOS Legacy Timing Modes are supported. Bits 6 ⇒ 4: ’000’ => Direct Stereo is not supported. Bit 3: ’0’ => Scaler is not on board the display. Bit 2: ’0’ => Image Centering is not available. Bit 1: ‘0’ => Display does not support Conditional Updates. Bit 0: ’0’ => Interlaced Video is not supported.
22	**15**	00	‘00000000’	*Frame Rate Conversion:* (See Section 3.4.2) Bit 7: ’0’ => Display does not support Frame Lock. Bits 6 & 5: ’00’ => Frame Rate Conversion is not supported. Bits 4 ⇒ 0: ‘00000’ => Undefined (Reserved).
23	**16**	00		*Vertical Frame Rate Conversion Frequency:* (See Section 3.4.2)
24	**17**	00		’0000h’ => Vertical Frame Rate Conversion Frequency is not available.
25	**18**	00		*Horizontal Frame Rate Conversion Frequency:* (See Section 3.4.2)
26	**19**	00		’0000h’ => Horizontal Frame Rate Conversion Frequency is not available.
27	**1A**	42	‘01000010’	*Display/Scan Orientation:* (See Section 3.4.3) Bits 7 & 6: ’01’ => Display has a Fixed Orientation (does not rotate). Bit 5: ‘0’ => Screen Orientation is Landscape. Bits 4 & 3: ’00’ => Zero (0,0) Pixel Location is the Upper Left Hand Corner of the screen. Bits 2 & 1: ’01’ => Fast (kHz) Scan is on the Major (Long) Axis and the Slow (Hz) Scan is on the Minor (Short) Axis. Bit 0: ’0’ => Display is not a Standalone Projector.
28	**1B**	01		‘01h’ => Default Color/Luminance Decoding is BGR (additive color). (See Section 3.4.4)
29	**1C**	00		‘00h’ => Preferred Color/Luminance Decoding is the same as the Default Color/Luminance Decoding. (See Section 3.4.4)
30	**1D**	80	'10000000'	Color/Luminance Decoding Capability is BGR (additive color)
31	**1E**	00		(See Section 3.4.4)
32	**1F**	00	‘00000000’	*Monitor Color Depth:* (See Section 3.4.5) Bit 7: ’0’ => Display does not use Dithering. Bit 6 ⇒ 0: ’0000000’ => Undefined (Reserved).
33	**20**	08		BGR Monitor Color Depth is 8 bits for color blue on Sub-Channel 0.
34	**21**	08		BGR Monitor Color Depth is 8 bits for color green on Sub-Channel 1.
35	**22**	08		BGR Monitor Color Depth is 8 bits for color red on Sub-Channel 2.
36	**23**	00		YCrCb Monitor Color Depth is not defined for Sub-Channel 0.
37	**24**	00		YCrCb Monitor Color Depth is not defined for Sub-Channel 1.
38	**25**	00		YCrCb Monitor Color Depth is not defined for Sub-Channel 2.

Table 7-1 -- DI-EXT – Example 1 (Continued)

Byte # (decimal)	Byte # (hex)	Value (hex)	Value (binary)	Field Name and Comments
39	**26**	00		Aspect Ratio Conversion is not available in the display. (See Section 3.4.6)
40 55	**27** **36**	00 00		Bytes **25h** => **34h**: Packetized Digital Video Support Information (16 bytes) => To be defined in a future revision of the DI-EXT Standard. Must be set to '00'. (See Section 3.4.7) ...
57 72	**37** **47**	00 00		Bytes **37h** => **47h**: Unused Bytes (17 bytes) => Reserved for Future Revisions of the DI-EXT Standard. (See Section 3.5) ... ...
73 81	**48** **50**	00 00		Bytes **48h** => **50h**: Audio Support (9 bytes) => To be defined in a Future Revision of the DI-EXT Standard. Must be set to '00'. (See Section 3.6) ... ...
82	**51**	00		’00h’ => ‘Display Transfer Characteristic’ is not defined. Display uses a CRT that follows the Standard CIE Gamma Function. Gamma is defined in the lower 128 Bytes of the E-EDID (Data Structure Version 1.3 or newer). All Address Bytes **52h** => **7Eh** must contain the data “00h”. (See Section 3.7)
83 127	**52** **7E**	00 00		‘Display Transfer Characteristic’ is not defined. (See Section 3.7) ... ...
128	**7F**	59		The Checksum is ”59h”. (See Section 3.8.1)

Table 7-1 -- DI-EXT – Example 1 (Continued)

7.2 EXAMPLE 2 DI-EXT Block

DI-EXT Version 1 Data Structure Format -- Example 2 -- 3xLCD Stand-alone Projector

This sample DI-EXT is included for *illustration only*, it should not be considered as representative of any particular monitor.

DESCRIPTION OF DISPLAY:

3xLCD Projector with:

- Native Mode is 1024 x 768 @ 60 Hz.
- Single Link Digital Input compliant with DVI (Version 1.0).
- Continuous Frequency Chassis === F(h): 25 - 85 kHz, F(v): 56 – 120 Hz.
- Capable of displaying all video modes up to 1280 x 1024 @ 60 Hz (Scaled Up or Down).
- Scaler on Board Projector but no Centering.
- Aspect Ratio Conversion Modes supported include Full, Zoom and Squeeze Modes.
- Double Clocking of Input Data is not supported.
- Projector is capable of front or rear projection. Projector can be table mounted or ceiling (inverted) mounted.
- High-bandwidth Digital Content Protection (HDCP) is not supported.
- Packetized digital video is not supported.
- Measured Gamma (White Curve) data is available.

Byte # (decimal)	Byte # (hex)	Value (hex)	Value (binary)	Field Name and Comments
1	**00**	40		Block Header: Value must be “40h”.(See Section 3.1.1)
2	**01**	01		DI-EXT Version Number: 1 (See Section 3.1.2)
3	**02**	02		Digital Visual Interface (DVI) – Single Link – Specification supported. (See Section 3.2.1)
4	**03**	41		DVI Version Number 1.0 (See Section 3.2.2)
5	**04**	00		
6	**05**	00		There is no Revision Number (See Section 3.2.2)
7	**06**	00		
8	**07**	D0	‘11010000’	*Digital Interface Data Format Description:* (See Section 3.2.3) Bit 7: ’1’ => Data Enable (DE) Signal is supported, Bit 6: ’1’ => Data enabled when DE Signal is high, Bits 5 & 4: ’01’ => Display uses rising edge of Shift Clock. Bit 3: ‘0’ => HDCP is not supported. Bit 2: '0' => Double Clocking of Input Data is not supported Bit 1: ’0’ => Packetized digital video is not supported. Bit 0: ’0’ => Undefined (Reserved).
9	**08**	24		Digital interface uses the Standard Data Format: 24-Bit MSB-Aligned RGB (Single Link). (See Section 3.2.3)
10	**09**	19		Minimum Pixel Clock Frequency is 25 MHz. (See Section 3.2.4)
11	**0A**	70		Maximum Pixel Clock Frequency is 112 MHz (on primary link).
12	**0B**	00		(LSB first) (See Section 3.2.4)
13	**0C**	00		This is a Single Link DVI projector. There is no Crossover Frequency.
14	**0D**	00		(LSB first) (See Section 3.2.4)

Table 7-2 -- DI-EXT – Example 2

Byte # (decimal)	Byte # (hex)	Value (hex)	Value (binary)	Field Name and Comments
15	**0E**	00		Sub-Pixel Layout is not defined. (See Section 3.3.1)
16	**0F**	00		Sub-Pixel Configuration is not defined. (See Section 3.3.1)
17	**10**	00		Sub-Pixel Shape is not defined. (See Section 3.3.1)
18	**11**	00		Horizontal Pixel Pitch is not defined. (See Section 3.3.2)
19	**12**	00		Vertical Pixel Pitch is not defined. (See Section 3.3.2)
20	**13**	E4	‘11100100’	<u>*Major Display Device Characteristics:*</u> (See Section 3.3.3) Bit 7: ’1’ => Display has a Fixed Pixel Format. Bits 6 & 5: ’11’ => Display is intended to be used as a Direct View (rear projection) Device or a Reflected View (front projection) Device. Bit 4: ’0’ => Display uses a non-transparent background. Bits 3 & 2: ’01’ => Display is a Large Image Device for group viewing. Bit 1: '0' => Display does not support DDC/CI Bit 0: ’0’ => Undefined (Reserved).
21	**14**	09	‘00001001’	<u>*Miscellaneous Display Capabilities:*</u> (See Section 3.4.1) Bit 7: ’0’ => All VGA/DOS Legacy Timing Modes are not supported. Bits 6 ⇒ 4: ’000’ => Direct Stereo is not supported. Bit 3: ’1’ => Scaler is on board the display. Bit 2: ’0’ => Image Centering is not available. Bit 1: ‘0’ => Display does not support Conditional Updates. Bit 0: ’1’ => Interlaced Video is supported.
22	**15**	60	‘01100000’	<u>*Frame Rate Conversion:*</u> (See Section 3.4.2) Bit 7: ’0’ => Display does not support Frame Lock. Bits 6 & 5: ’11’ => Frame Rate Conversion - Both vertical & horizontal are converted to single frequencies. Bits 4 ⇒ 0: ‘00000’ => Undefined (Reserved).
23	**16**	70		<u>*Vertical Frame Rate Conversion Frequency:*</u> (See Section 3.4.2)
24	**17**	17		’1770h’ (LSB first) => Display supports Vertical Frame Rate Conversion to 60.00 Hz.
25	**18**	00		<u>*Horizontal Frame Rate Conversion Frequency:*</u> (See Section 3.4.2)
26	**19**	19		’1900h’ (LSB first) => Display supports Horizontal Frame Rate Conversion to 64.00 kHz.
27	**1A**	43	‘01000011’	<u>*Display/Scan Orientation:*</u> (See Section 3.4.3) Bits 7 & 6: ’01’ => Display has a Fixed Orientation (does not rotate). Bit 5: ‘0’ => Screen Orientation is Landscape. Bits 4 & 3: ’00’ => Zero (0,0) Pixel Location is the Upper Left Hand Corner of the screen. Bits 2 & 1: ’01’ => Fast (kHz) Scan is on the Major (Long) Axis and the Slow (Hz) Scan is on the Minor (Short) Axis. Bit 0: ’1’ => Display is a Standalone Projector.
28	**1B**	01		‘01h’ => Default Color/Luminance Decoding is BGR (additive color). (See Section 3.4.4)
29	**1C**	00		‘00h’ => Preferred Color/Luminance Decoding is the same as the Default Color/Luminance Decoding. (See Section 3.4.4)
30	**1D**	80	'10000000'	Color/Luminance Decoding Capability is BGR (additive color)
31	**1E**	00		(See Section 3.4.4)

Table 7-2 -- DI-EXT – Example 2 (Continued)

Byte # (decimal)	Byte # (hex)	Value (hex)	Value (binary)	Field Name and Comments
32	**1F**	00	‘00000000’	*Monitor Color Depth:* (See Section 3.4.5) Bit 7: ’0’ => Display does not use Dithering. Bit 6 ⇒ 0: ’0000000’ => Undefined (Reserved).
33	**20**	08		BGR Monitor Color Depth is 8 bits for color blue on Sub-Channel 0.
34	**21**	08		BGR Monitor Color Depth is 8 bits for color green on Sub-Channel 1.
35	**22**	08		BGR Monitor Color Depth is 8 bits for color red on Sub-Channel 2.
36	**23**	00		YCrCb Monitor Color Depth is not defined for Sub-Channel 0.
37	**24**	00		YCrCb Monitor Color Depth is not defined for Sub-Channel 1.
38	**25**	00		YCrCb Monitor Color Depth is not defined for Sub-Channel 2.
39	**26**	E0	‘11100000’	*Aspect Ratio Conversion:* The display supports Full Mode, Zoom Mode and Squeeze Mode. (See Section 3.4.6)
40 … … 55	**27** … … **36**	00 … … 00		Bytes **27h** => **36h**: Packetized Digital Video Support Information (16 bytes) => To be defined in a future revision of the DI-EXT Standard. Must be set to '00'. (See Section 3.4.7) …
56 … … 72	**37** … … **47**	00 … … 00		Bytes **37h** => **47h**: Unused Bytes (17 bytes) => Reserved for Future Revisions of the DI-EXT Standard. (See Section 3.5) … …
73 … … 81	**48** … … **50**	00 … … 00		Bytes **48h** => **50h**: Audio Support (9 bytes) => To be defined in a Future Revision of the DI-EXT Standard. Must be set to '00'. (See Section 3.6) … …
82	**51**	6D	‘01101101’	“6Dh” => ‘Display Transfer Characteristic’ is defined for a single White Curve using 46 data points (45 data points in the table).
83	**52**	00		1st White Data Point is “00h” (0 Dec).
84	**53**	01		2nd White Data Point is “01h” (1 Dec).
85	**54**	01		3rd White Data Point is “01h” (1 Dec).
86	**55**	02		4th White Data Point is “02h” (2 Dec).
87	**56**	04		5th White Data Point is “04h” (4 Dec).
88	**57**	05		6th White Data Point is “05h” (5 Dec).
89	**58**	07		7th White Data Point is “07h” (7 Dec).
90	**59**	08		8th White Data Point is “08h” (8 Dec).
91	**5A**	09		9th White Data Point is “09h” (9 Dec).
92	**5B**	0B		10th White Data Point is “0Bh” (11 Dec).
93	**5C**	0E		11th White Data Point is “0Eh” (14 Dec).
94	**5D**	11		12th White Data Point is “11h” (17 Dec).
95	**5E**	16		13th White Data Point is “16h” (22 Dec).
96	**5F**	19		14th White Data Point is “19h” (25 Dec).
97	**60**	1E		15th White Data Point is “1Eh” (30 Dec).
98	**61**	23		16th White Data Point is “23h” (35 Dec).
99	**62**	29		17th White Data Point is “29h” (41 Dec).
100	**63**	30		18th White Data Point is “30h” (48 Dec).
101	**64**	38		19th White Data Point is “38h” (56 Dec).
102	**65**	42		20th White Data Point is “42h” (66 Dec).
103	**66**	4F		21st White Data Point is “4Fh” (79 Dec).
104	**67**	5B		22nd White Data Point is “5Bh” (91 Dec).

Table 7-2 -- DI-EXT – Example 2 (Continued)

Byte # (decimal)	Byte # (hex)	Value (hex)	Value (binary)	Field Name and Comments
105	**68**	7F		23rd White Data Point is "7Fh" (127 Dec).
106	**69**	A3		24th White Data Point is "A3h" (163 Dec).
107	**6A**	AF		25th White Data Point is "AFh" (175 Dec).
108	**6B**	BC		26th White Data Point is "BCh" (188 Dec).
109	**6C**	C5		27th White Data Point is "C5h" (197 Dec).
110	**6D**	CE		28th White Data Point is "CEh" (206 Dec).
111	**6E**	D4		29th White Data Point is "D4h" (212 Dec).
112	**6F**	D8		30th White Data Point is "D8h" (219 Dec).
113	**70**	E0		31st White Data Point is "E0h" (224 Dec).
114	**71**	E5		32nd White Data Point is "E5h" (229 Dec).
115	**72**	E9		33rd White Data Point is "E9h" (233 Dec).
116	**73**	ED		34th White Data Point is "EDh" (237 Dec).
117	**74**	EF		35th White Data Point is "EFh" (239 Dec).
118	**75**	F3		36th White Data Point is "F3h" (243 Dec).
119	**76**	F5		37th White Data Point is "F5h" (245 Dec).
120	**77**	F6		38th White Data Point is "F6h" (246 Dec).
121	**78**	F8		39th White Data Point is "F8h" (248 Dec).
122	**79**	F9		40th White Data Point is "F9h" (249 Dec).
123	**7A**	FA		41st White Data Point is "FAh" (250 Dec).
124	**7B**	FB		42nd White Data Point is "FBh" (251 Dec).
125	**7C**	FC		43rd White Data Point is "FCh" (252 Dec).
126	**7D**	FD		44th White Data Point is "FDh" (253 Dec).
127	**7E**	FE		45th White Data Point is "FEh" (254 Dec). See NOTE 1:
128	**7F**	9C		The Checksum is "9Ch".

Table 7-2 --- DI-EXT – Example 2 (Continued)

NOTE: The 46th White Data Point is "FFh" by definition and is not shown in Table 7-2.

7.3 EXAMPLE 3 DI-EXT Block

DI-EXT Version 1 Data Structure Format -- Example 3 --- LCD Desktop Monitor

This sample DI-EXT is included for *illustration only*, it should not be considered as representative of any particular monitor.

DESCRIPTION OF DISPLAY:

15” LCD Monitor with:

- Native Mode is 1024x768 @ 60 Hz.
- VGA Analog Video Input (no Digital Inputs)
- Continuous Frequency Chassis === F(h): 31 ⇒ 50 kHz, F(v): 50 ⇒ 85 Hz
- Capable of displaying all input video modes up to 1024x768 @ 60 Hz (Scaled Up)
- Scaler on Board Monitor with Centering.
- Aspect Ratio Conversion Modes supported include Full, Zoom and Squeeze Modes.
- Monitor can be rotated (90 degrees clockwise) from the Landscape Position to the Portrait Position.
- 3 Curve (11 points each) RGB Gamma Definition.

Byte # (decimal)	Byte # (hex)	Value (hex)	Value (binary)	Field Name and Comments
1	**00**	40		Block Header: Value must be “40h”.(See Section 3.1.1)
2	**01**	01		DI-EXT Version Number: 1 (See Section 3.1.2)
3	**02**	00		Display has an Analog Video Input. (See Section 3.2.1)
4	**03**	00		Display has an Analog Video Input. (See Section 3.2.2)
5	**04**	00		There is no Version Number.
6	**05**	00		Display has an Analog Video Input. (See Section 3.2.2)
7	**06**	00		There is no Revision Number.
8	**07**	00	‘00000000’	*Digital Interface Data Format Description:* (See Section 3.2.3) Bit 7: ’0’ => Data Enable (DE) Signal is not supported, Bit 6: ’0’ => Data Enable (DE) Signal is ignored, Bits 5 & 4: ’00’ => Edge of Shift Clock is not specified. Bit 3: ‘0’ => HDCP is not supported. Bit 2: '0' => Double Clocking of Input Data is not supported Bit 1: ’0’ => Packetized digital video is not supported. Bit 0: ’0’ => Undefined (Reserved).
9	**08**	00		"00h" => Display has an Analog Video Input. (See Section 3.2.3)
10	**09**	00		"00h" => Display has an Analog Video Input. (See Section 3.2.4)
11	**0A**	00		"0000h" => Display has an Analog Video Input. (See Section 3.2.4)
12	**0B**	00		
13	**0C**	00		"0000h" => Display has an Analog Video Input. (See Section 3.2.4)
14	**0D**	00		
15	**0E**	01		"01h" => Sub-Pixel Layout is RGB. (See Section 3.3.1)
16	**0F**	00		"00h" => Sub-Pixel Configuration is not defined. (See Section 3.3.1)
17	**10**	03		"03h" => Sub-Pixel Shape is 'Rectangular'. (See Section 3.3.1)
18	**11**	1E		Horizontal Pixel Pitch is 0.30 mm per pixel. (See Section 3.3.2)
19	**12**	1E		Vertical Pixel Pitch is 0.30 mm per pixel. (See Section 3.3.2)

Table 7-3 --- DI-EXT – Example 3

Byte # (decimal)	Byte # (hex)	Value (hex)	Value (binary)	Field Name and Comments
20	**13**	A8	‘10101000’	<u>*Major Display Device Characteristics:*</u> (See Section 3.3.3) Bit 7: ’1’ => Display has a Fixed Pixel Format. Bits 6 & 5: ’01’ => Display is a Direct View Device. Bit 4: ’0’ => Display uses a non-transparent background. Bits 3 & 2: ’10’ => Display is a desktop device. Bit 1: '0' => Display does not support DDC/CI Bit 0: ’0’ => Undefined (Reserved).
21	**14**	0C	‘00001100’	<u>*Miscellaneous Display Capabilities:*</u> (See Section 3.4.1) Bit 7: ’0’ => All VGA/DOS Legacy Timing Modes are not supported. Bits 6 ⇒ 4: ’000’ => Direct Stereo is not supported. Bit 3: ’1’ => Scaler is on board the display. Bit 2: ’1’ => Image Centering is available. Bit 1: ‘0’ => Display does not support Conditional Updates. Bit 0: ’0’ => Interlaced Video is not supported.
22	**15**	60	‘01100000’	<u>*Frame Rate Conversion:*</u> (See Section 3.4.2) Bit 7: ’0’ => Display does not support Frame Lock. Bits 6 & 5: ’11’ => Frame Rate Conversion - Both vertical & horizontal are converted to single frequencies. Bits 4 ⇒ 0: ‘00000’ => Undefined (Reserved).
23	**16**	70		<u>*Vertical Frame Rate Conversion Frequency:*</u> (See Section 3.4.2)
24	**17**	17		’1770h’ (LSB first) => Display supports Vertical Frame Rate Conversion to 60.00 Hz.
25	**18**	E8		<u>*Horizontal Frame Rate Conversion Frequency:*</u> (See Section 3.4.2)
26	**19**	12		’1900h’ (LSB first) => Display supports Horizontal Frame Rate Conversion to 48.40 kHz.
27	**1A**	82	‘10000010’	<u>*Display/Scan Orientation:*</u> (See Section 3.4.3) Bits 7 & 6: ’10’ => Display/Scan Default Orientation is defined. Capabilities cannot be defined. Bit 5: ‘0’ => Default Screen Orientation is Landscape. Bits 4 & 3: ’00’ => Zero (0,0) Pixel Location is the Upper Left Hand Corner of the screen. Bits 2 & 1: ’01’ => Fast (kHz) Scan is on the Major (Long) Axis and the Slow (Hz) Scan is on the Minor (Short) Axis. Bit 0: ’0’ => Display is not a Standalone Projector.
28	**1B**	01		‘01h’ => Default Color/Luminance Decoding is BGR (additive color). (See Section 3.4.4)
29	**1C**	00		‘00h’ => Preferred Color/Luminance Decoding is the same as the Default Color/Luminance Decoding. (See Section 3.4.4)
30	**1D**	80	'10000000'	Color/Luminance Decoding Capability is BGR (additive color)
31	**1E**	00		(See Section 3.4.4)
32	**1F**	00	‘00000000’	<u>*Monitor Color Depth:*</u> (See Section 3.4.5) Bit 7: ’0’ => Display does not use Dithering. Bit 6 ⇒ 0: ’0000000’ => Undefined (Reserved).
33	**20**	08		BGR Monitor Color Depth is 8 bits for color blue on Sub-Channel 0.
34	**21**	08		BGR Monitor Color Depth is 8 bits for color green on Sub-Channel 1.
35	**22**	08		BGR Monitor Color Depth is 8 bits for color red on Sub-Channel 2.

Table 7-3 -- DI-EXT – Example 3 (Continued)

Byte # (decimal)	Byte # (hex)	Value (hex)	Value (binary)	Field Name and Comments
36	**23**	00		YCrCb Monitor Color Depth is not defined for Sub-Channel 0.
37	**24**	00		YCrCb Monitor Color Depth is not defined for Sub-Channel 1.
38	**25**	00		YCrCb Monitor Color Depth is not defined for Sub-Channel 2.
39	**26**	E0	'11100000'	<u>*Aspect Ratio Conversion:*</u> The display supports Full Mode, Zoom Mode and Squeeze Mode. (See Section 3.4.6)
40 … … 55	**27** … … **36**	00 … … 00		Bytes **25h** => **34h**: Packetized Digital Video Support Information (16 bytes) => To be defined in a future revision of the DI-EXT Standard. Must be set to '00'. (See Section 3.4.7) …
56 … … 72	**37** … … **47**	00 … … 00		Bytes **37h** => **47h**: Unused Bytes (17 bytes) => Reserved for Future Revisions of the DI-EXT Standard. (See Section 3.5) … …
73 … … 81	**48** … … **50**	00 … … 00		Bytes **48h** => **50h**: Audio Support (9 bytes) => To be defined in a Future Revision of the DI-EXT Standard. Must be set to '00'. (See Section 3.6) … …
82	**51**	8A	'10001010'	"8Ah" => 'Display Transfer Characteristic' is defined for 3 separate RGB Color Curves using 11 data points (10 data points in the table for each color).
83	**52**	00		1st B Data Point is "00h" (0 Dec).
84	**53**	05		2nd B Data Point is "05h" (5 Dec).
85	**54**	0E		3rd B Data Point is "0Eh" (14 Dec).
86	**55**	23		4th B Data Point is "23h" (35 Dec).
87	**56**	4F		5th B Data Point is "4Fh" (79 Dec).
88	**57**	BC		6th B Data Point is "BCh" (188 Dec).
89	**58**	E0		7th B Data Point is "E0h" (224 Dec).
90	**59**	F3		8th B Data Point is "F3h" (243 Dec).
91	**5A**	FA		9th B Data Point is "FAh" (250 Dec).
92	**5B**	FE		10th B Data Point is "FEh" (254 Dec). See NOTE 1:
93	**5C**	00		This Data Point is not used.
94	**5D**	00		This Data Point is not used.
95	**5E**	00		This Data Point is not used.
96	**5F**	00		This Data Point is not used.
97	**60**	00		This Data Point is not used.
98	**61**	01		1st G Data Point is "01h" (1 Dec).
99	**62**	06		2nd G Data Point is "06h" (6 Dec).
100	**63**	0F		3rd G Data Point is "0Fh" (15 Dec).
101	**64**	24		4th G Data Point is "24h" (36 Dec).
102	**65**	50		5th G Data Point is "50h" (80 Dec).
103	**66**	BB		6th G Data Point is "BBh" (187 Dec).
104	**67**	DF		7th G Data Point is "DFh" (223 Dec).
105	**68**	F2		8th G Data Point is "F2h" (242 Dec).
106	**69**	F9		9th G Data Point is "F9h" (249 Dec).
107	**6A**	FE		10th G Data Point is "FEh" (254 Dec). See NOTE 1:
108	**6B**	00		This Data Point is not used.
109	**6C**	00		This Data Point is not used.
110	**6D**	00		This Data Point is not used.

Table 7-3 --- DI-EXT – Example #3 (Continued)

Byte # (decimal)	Byte # (hex)	Value (hex)	Value (binary)	Field Name and Comments
111	**6E**	00		This Data Point is not used.
112	**6F**	00		This Data Point is not used.
113	**70**	00		1st R Data Point is “00h” (0 Dec).
114	**71**	04		2nd R Data Point is “04h” (4 Dec).
115	**72**	0D		3rd R Data Point is “0Dh” (13 Dec).
116	**73**	22		4th R Data Point is “22h” (34 Dec).
117	**74**	4E		5th R Data Point is “4Eh” (78 Dec).
118	**75**	BD		6th R Data Point is “BDh” (189 Dec).
119	**76**	E1		7th R Data Point is “E1h” (225 Dec).
120	**77**	F4		8th R Data Point is “F4h” (244 Dec).
121	**78**	FB		9th R Data Point is “FBh” (251 Dec).
122	**79**	FE		10th R Data Point is “FEh” (254 Dec). See NOTE 1:
123	**7A**	00		This Data Point is not used.
124	**7B**	00		This Data Point is not used.
125	**7C**	00		This Data Point is not used.
126	**7D**	00		This Data Point is not used.
127	**7E**	00		This Data Point is not used.
128	**7F**	40		The Checksum is “40h”.

Table 7-3 -- DI-EXT – Example 3 (Continued)

NOTE: The 11th BGR Color Data Point is “FFh” by definition and is not shown in Table 7-3.

7.4 EXAMPLE 4 DI-EXT Block

DI-EXT Version 1 Data Structure Format -- Example 4 -- 16x9 Direct View CRT HDTV/PC Monitor

This sample DI-EXT is included for *illustration only*. It should not be considered as representative of any particular monitor.

DESCRIPTION OF DISPLAY:

36" (34"Viewable) Flat Face 16x9 Direct View CRT HDTV/PC Monitor with:

- Aperture Grill CRT w/0.31mm average pitch
- Single Link DVI Input compliant with EIA/CEA-861/A
- Multiple Mode Frequency Chassis (Not a Continuous Frequency Chassis). Monitor only operates at certain horizontal and vertical frequencies. = Table 7-4 lists the video timing formats that are supported by the monitor
- No scaler or centering
- Aspect Ratio Conversion Modes supported include Full, Zoom, Squeeze and Variable Modes
- Double Clocking of Input Data is supported
- Packetized digital video is not supported
- High-bandwidth Digital Content Protection (HDCP) is supported
- Display is fixed orientation (does not rotate)
- Supports both RGB and YCrCb Color Spaces (all formats)
- Display Transfer Characteristic (Gamma Definition) is not available.

Video Formats	Horizontal Scan Rate in kHz	Vertical Refresh Rate in Hz	Aspect Ratio
640 x 400	31.49	70.0	4x3 PC
720 x 400	31.49	70.0	4x3 PC
720 x 480i	15.734/15.750	59.94/60.0	4x3, 16x9 DTV
640 x 480p	31.469/31.50	59.94/60.0	4x3 PC/DTV
720 x 480p	31.469/31.50	59.94/60.0	4x3 PC/DTV, 16x9 DTV
1280 x 720p	44.955/45.0	59.94/60.0	16x9 DTV
800 x 600	37.9	60.0	4x3 PC
1024 x 768	48.4	60.0	4x3 PC
1920 x 1080i	33.716/33.750	59.94/60.0	16x9 DTV

Table 7-4 --- Supported Video Formats for Example 4

Byte # (decimal)	Byte # (hex)	Value (hex)	Value (binary)	Field Name and Comments
1	**00**	40		Block Header: Value must be "40h".(See Section 3.1.1)
2	**01**	01		DI-EXT Version Number: 1 (See Section 3.1.2)
3	**02**	05		Digital Visual Interface (DVI) for Consumer Electronics (See Section 3.2.1)
4	**03**	80		EIA/CEA 861/A has a Letter Designation for the Version.
5	**04**	41		ASCII Code indicates letter "A" is the Version. (See Section 3.2.2)
6	**05**	00		There is no Revision Number. (See Section 3.2.2)
7	**06**	00		
8	**07**	DC	'11011100'	<u>*Digital Interface Data Format Description:*</u> (See Section 3.2.3) Bit 7: '1' => Data Enable (DE) Signal is supported, Bit 6: '1' => Data enabled when DE Signal is high, Bits 5 & 4: '01' => Display uses rising edge of Shift Clock. Bit 3: '1' => HDCP is supported. Bit 2: '1' => Double Clocking of Input Data is supported Bit 1: '0' => Packetized digital video is not supported. Bit 0: '0' => Undefined (Reserved).
9	**08**	24		Digital interface uses the Standard Data Format: 24-Bit MSB-Aligned RGB (Single Link). (See Section 3.2.3)
10	**09**	19		Minimum Pixel Clock Frequency is 25 MHz. (See Section 3.2.4)
11	**0A**	70		Maximum Pixel Clock Frequency is 112 MHz (0070h).
12	**0B**	00		(LSB first) (See Section 3.2.4)
13	**0C**	00		This is a Single Link DVI monitor. There is no Crossover Frequency.
14	**0D**	00		(LSB first) (See Section 3.2.4)
15	**0E**	00		Sub-Pixel Layout is not defined. Display is a CRT. (See Section 3.3.1)
16	**0F**	02		Sub-Pixel Configuration is "Stripe". CRT is an Aperture Grill. (See Section 3.3.1)
17	**10**	00		Sub-Pixel Shape is not defined. Display is a CRT. (See Section 3.3.1)
18	**11**	1F		Horizontal Pixel Pitch is 0.31 mm. (See Section 3.3.2)
19	**12**	00		Vertical Pixel Pitch is 0.0 mm CRT is an Aperture Grill(See Section 3.3.2)
20	**13**	26	'00100110'	<u>*Major Display Device Characteristics:*</u> (See Section 3.3.3) Bit 7: '0' => Display Device does not have a Fixed Pixel Format. Bits 6 & 5: '01' => Display is a Direct View Device. Bit 4: '0' => Display uses a non-transparent background. Bits 3 & 2: '01' => Display is a Large Image Device for group viewing. Bit 1: '1' => Display supports DDC/CI Bit 0: '0' => Undefined (Reserved).
21	**14**	01	'00000001'	<u>*Miscellaneous Display Capabilities:*</u> (See Section 3.4.1) Bit 7: '0' => All VGA/DOS Legacy Timing Modes are not supported. Bits 6 ⇒ 4: '000' => Direct Stereo is not supported. Bit 3: '0' => Scaler is not on board the display. Bit 2: '0' => Image Centering is not available. Bit 1: '0' => Display does not support Conditional Updates. Bit 0: '1' => Interlaced Video is supported.

Table 7-5 -- DI-EXT – Example 4

Byte # (decimal)	Byte # (hex)	Value (hex)	Value (binary)	Field Name and Comments
22	**15**	00	‘00000000’	*Frame Rate Conversion:* (See Section 3.4.2) Bit 7: ’0’ => Display does not support Frame Lock. Bits 6 & 5: ’00’ => Frame Rate Conversion is not supported. Bits 4 ⇒ 0: ‘00000’ => Undefined (Reserved).
23	**16**	00		*Vertical Frame Rate Conversion Frequency:* (See Section 3.4.2)
24	**17**	00		’0000h’ => Vertical Frame Rate Conversion Frequency is not available.
25	**18**	00		*Horizontal Frame Rate Conversion Frequency:* (See Section 3.4.2)
26	**19**	00		’0000h’ => Horizontal Frame Rate Conversion Frequency is not available.
27	**1A**	42	‘01000010’	*Display/Scan Orientation:* (See Section 3.4.3) Bits 7 & 6: ’01’ => Display has a Fixed Orientation (does not rotate). Bit 5: ‘0’ => Screen Orientation is Landscape. Bits 4 & 3: ’00’ => Zero (0,0) Pixel Location is the Upper Left Hand Corner of the screen. Bits 2 & 1: ’01’ => Fast (kHz) Scan is on the Major (Long) Axis and the Slow (Hz) Scan is on the Minor (Short) Axis. Bit 0: ’0’ => Display is not a Standalone Projector.
28	**1B**	01		‘01h’ => Default Color/Luminance Decoding is BGR (additive color). (See Section 3.4.4)
29	**1C**	03		‘03h’ => Preferred Color/Luminance Decoding is Yxx per (SMPTE 2xxM). The following modes are supported: • YCrCb per SMPTE 293M, SMPTE 294M (4:4:4) • YCrCb per SMPTE 293M, SMPTE 294M (4:2:2) • YCrCb per SMPTE 293M, SMPTE 294M (4:2:0) • YCrCb per SMPTE 260M (Legacy HDTV) • YPbPr per SMPTE 240M (Legacy HDTV) • YCrCb per SMPTE 274M (Modern HDTV) • YPbPr per SMPTE 274M (Modern HDTV) Refer to Tables 3-19 & 3-20. (See Section 3.4.4)
30	**1D**	8F	'10001111'	Color/Luminance Decoding Capabilities include:
31	**1E**	E0	'11100000'	• BGR (additive color) • YCrCb per SMPTE 293M, SMPTE 294M (4:4:4) • YCrCb per SMPTE 293M, SMPTE 294M (4:2:2) • YCrCb per SMPTE 293M, SMPTE 294M (4:2:0) • YCrCb per SMPTE 260M (Legacy HDTV) • YPbPr per SMPTE 240M (Legacy HDTV) • YCrCb per SMPTE 274M (Modern HDTV) • YPbPr per SMPTE 274M (Modern HDTV) Refer to Tables 3-20. (See Section 3.4.4)
32	**1F**	00	‘00000000’	*Monitor Color Depth:* (See Section 3.4.5) Bit 7: ’0’ => Display does not use Dithering. Bit 6 ⇒ 0: ’0000000’ => Undefined (Reserved).
33	**20**	08		BGR Monitor Color Depth is 8 bits for color blue on Sub-Channel 0.
34	**21**	08		BGR Monitor Color Depth is 8 bits for color green on Sub-Channel 1.
35	**22**	08		BGR Monitor Color Depth is 8 bits for color red on Sub-Channel 2.
36	**23**	08		YCrCb Monitor Color Depth is 8 bits for Cb Sub-Channel 0.
37	**24**	08		YCrCb Monitor Color Depth is 8 bits for Y on Sub-Channel 1.
38	**25**	08		YCrCb Monitor Color Depth is 8 bits for Cr on Sub-Channel 2.

Table 7-5 -- DI-EXT – Example 4 (Continued)

Byte # (decimal)	Byte # (hex)	Value (hex)	Value (binary)	Field Name and Comments
39	**26**	F0	'11110000'	<u>*Aspect Ratio Conversion:*</u> The display supports Full Mode, Zoom Mode, Squeeze Mode and Variable Mode. (See Section 3.4.6)
40 55	**27** **36**	00 00		Bytes **25h** => **34h**: Packetized Digital Video Support Information (16 bytes) => To be defined in a future revision of the DI-EXT Standard. Must be set to '00'. (See Section 3.4.7) ...
56 72	**37** **47**	00 00		Bytes **37h** => **47h**: Unused Bytes (17 bytes) => Reserved for Future Revisions of the DI-EXT Standard. (See Section 3.5) ... ...
73 81	**48** **50**	00 00		Bytes **48h** => **50h**: Audio Support (9 bytes) => To be defined in a Future Revision of the DI-EXT Standard. Must be set to '00'. (See Section 3.6) ... ...
82	**51**	00		'00h' => 'Display Transfer Characteristic' is not defined. Display uses a CRT that follows the Standard CIE Gamma Function. Gamma is defined in the lower 128 Bytes of the E-EDID (Data Structure Version 1.3 or newer). All Address Bytes **52h** => **7Eh** must contain the data "00h". (See Section 3.6)
83 127	**52** **7E**	00 00		'Display Transfer Characteristic' is not defined. (See Section 3.6) ... ...
128	**7F**	53		The Checksum is "53h". (See Section 3.8.1)

Table 7-5 -- DI-EXT – Example 4 (Continued)

8. APPENDIX E – Glossary of Terms & Acronyms

#	Term	Definition
1.	Conditional Updates	Conditional updates means transmitting (to the display) only the video data that has changed during each frame (or a given period of time). This allows for video interfaces to carry higher resolution images using less bandwidth.
2.	Data Enable	Data Enable is a control signal that indicates when displayable video data is present.
3.	Dithering	Used to refer to any of several methods for creating the appearance of a desired color, gray level, etc. over a given area, by rapidly altering the display between two or more other levels, colors, etc.. In "spatial dithering", for instance, a pattern of alternating black and white pixels would be perceived as gray. In "temporal dithering", alternating the area in question between white and black states on successive frames would result in the intended "gray" appearance to the viewer
4.	Double Clocking of Input data	Each data bit transmitted over the digital link requires 2 clock cycles.
5.	DVI	DVI stands for Digital Visual Interface. DVI Ver. 1is a specification for defining a digital video interface (using TMDS) between a host computer (or device) and a display device. DVI was developed by the DDWG (Digital Display Working Group). More information on DVI is available at the DDWG web-site at www.ddwg.org.
6.	Frame Lock	Each displayed image frame is locked (synchronized, without dropping or adding any frames) with each frame transmitted across the video interface. For CRT monitors, frame lock can generally be achieved at any supported refresh rate. For flat panel monitors, frame lock will generally only be available at the 'preferred timing'. The 'preferred timing' is defined in the base 128-byte EDID data structure, referenced by the 'Preferred Timing Bit' and the 'First Detailed Timing Block'. Refer to VESA E-EDID Release A (or later) for more information.
7.	Frame Rate Conversion	Frame Rate Conversion is the process of converting an incoming video signals vertical and/or horizontal scanning frequencies to an outgoing fixed vertical and/ horizontal scanning frequencies. This process is commonly used in scalers for converting multiple input scanning frequencies to single output frequencies.
8.	Gamma	Used generically to refer to the transfer characteristics of a display device, in terms of the output luminance vs. the input video signal level. Specifically, "gamma" is the exponent in a function which relates these as: $L = aV^{\gamma} + L_b$ Where "L" is the output luminance, "a" is a scaling constant (appropriate for the system in question), "V" is the input video signal level, "γ" is the "gamma" and L_b is an offset. For more information on "Gamma", refer to Section 302-5/A (Pages 48 – 50) of the VESA "Flat Panel Display Measurements Standard" (FPDM) Version 2.0, (May 1, 2001)
9.	HDCP	HDCP ("High Bandwidth Digital Content Protection"), from Digital Content Protection, LLC, is a digital copy protection scheme developed for the Digital Visual Interface (DVI). More information on HDCP is available at the DCP-LLC web-site at www.digital-cp.com
10.	LVDS	LVDS (Low Voltage Differential Signaling), developed by National/TI, is a transmission protocol for transporting video signals over a digital video link. A complete definition is listed in the EIA-644 Standard.

#	Term	Definition
11.	Scaler	A scaler is a device that is capable of converting an incoming video signal to an outgoing video signal. The conversion process can include changes in H and/or V resolution and sync frequencies.
12.	TMDS	TMDS (Transition Minimized Differential Signaling), developed by Silicon Image Inc, is a transmission protocol for transporting video signals over a digital video link.. TMDS is the transmission protocol used in VESA's Plug & Display (P&D) Standard, VESA's Digital Flat Panel (DFP) Standard and the DDWG's Digital Visual Interface (DVI) Specifications.